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GENERAL OBSERVATIONS

Because of rounding, the sum of partial details and percentages in the tables may not coincide with the total.

Explanation of symbols:

..	Not applicable
...	Data not available
—	Zero magnitude
0.0	Greater than zero, but lower than 0.05

The term “country” also may be used to designate territories or other areas.

PREFACE

A key function of the Pan American Health Organization (PAHO) is to disseminate information on the health situation and trends in the Region of the Americas. The Organization has performed this function without interruption since 1956, the first year in which an assessment of the health status of the population in the Americas was published. Entitled *Summary of Reports on Health Conditions in the Americas, 1950–1953*, that report was presented to the 15th Pan American Sanitary Conference, held in Santiago, Chile, in 1954. In 1966, the name of the report was changed to *Health Conditions in the Americas*, and from that year on it has been published every four years under that title. Continuing the tradition, the 1998 edition, entitled *Health in the Americas*, becomes the twelfth publication in this series of quadrennial reports. It is being presented to the 25th Pan American Sanitary Conference in September 1998.

Health in the Americas is PAHO's principal vehicle for producing, compiling, analyzing, and disseminating information on the health situation for use by Member Governments. The Organization also produces and distributes other publications that complement the information contained in this one, including *Basic Health Indicators*, *Health Statistics from the Americas*, the *Epidemiological Bulletin*, surveillance reports, progress evaluations of progress toward attaining the goal of health for all by the year 2000, and technical documents produced by various specific programs.

Over the years, PAHO has modified the publication's content and format, in order to adapt it to changes in the health profile of the Region's populations, a greater complexity of health systems and services, better and more available information in the countries, characteristics of technical cooperation among countries, and technological advances in the electronic production and processing of data.

The two volumes of this edition of *Health in the Americas* deal mainly with the period between 1993 and 1996. Volume I presents an overview, from PAHO's perspective, of the most relevant aspects of the health situation of the Region's population and analyzes the trends of that situation and the relationship between health and living conditions. It also examines the leading problems that affect special population groups and the manifestations and distribution of diseases and other health impairments. In addition, Volume I looks at the response of health services systems, with special attention to health sector reform and activities in health promotion and environmental protection. The final chapter reviews the trends and characteristics of regional financial assistance and new modalities of technical cooperation among countries. Volume II contains current information on the health situation and trends in each member country and territory of the Organization.

As with previous editions of this report, PAHO hopes that *Health in the Americas* will fulfill the function of keeping the Member Governments informed, and that it also will serve as a reference and source of information for national and international agencies and institutions and for investigators and other professionals working in the health field.

PAHO acknowledges the growing importance of information for decision-making, policy formulation, and evaluation in the countries and in the Secretariat, and it will continue to provide cooperation to strengthen methods, techniques, and procedures for the generation and dissemination of health information. PAHO also is aware that modern technology provides an exceptional opportunity to have universal access to information—thus democratizing it. In so doing, it can enhance and energize the collaboration between the countries and the Organization to achieve better health for the people of the Americas, with equity and sustainable human development.

George A. O. Alleyne
Director

INTRODUCTION

During the past decade, health conditions in the Americas have continued to improve. This is a reflection of a wide range of social, environmental, cultural, and technological factors, coupled with greater availability of health care services and public health programs. The characteristics and speed of this improvement have not been the same in all the countries or in all population groups within any one country. Some countries still face the traditional health problems associated with poverty, environmental degradation, and deteriorating living conditions. Other nations are experiencing a rise in illnesses and other problems associated with aging populations, rapid urbanization, and unhealthy lifestyles. Likewise, efforts to promote subregional and regional integration have produced new challenges related to the increased mobility of people, goods, and services.

The countries of the Americas, particularly those of Latin America and the Caribbean, are experiencing the same demographic and epidemiological changes under way in all societies in transition: lower fertility rates, rapidly aging populations, and increasing urbanization.

Between the mid-1980s and the mid-1990s, the average life expectancy in the Region rose from 68.7 to 71.1 years. In 1995, the average life expectancy was 70 years in Latin America and 74.3 years in the Caribbean. Throughout the Hemisphere, women have a longer life expectancy than men. Infant mortality rates fell to 27 per 1,000 live births for the Region as a whole and to 35 per 1,000 for Latin America and the Caribbean.

Poliomyelitis has been eradicated, measles is under control, and progress has been made toward interrupting the spread of Chagas' disease. Approximately half of the 1.6 million cases of AIDS reported worldwide since the beginning of the epidemic were reported in the Americas. After an absence of almost 100 years, cholera returned to the Region in 1991. Since the start of the epidemic, 21 countries have reported roughly 1.2 million cases. Only 18,000 cases were reported in 1997, however, about 5% of the number reported in 1991. Dengue, dengue hemorrhagic fever, and other vector-borne diseases still occur at epidemic rates in many countries of the Hemisphere. The emergence of new pathogens and diseases, the re-emergence of diseases such as tuberculosis, and the resistance of diseases to antibiotics confirm the need to maintain and upgrade systems to monitor diseases and other acute problems in the Region (1).

Between 1980 and 1994, despite population growth and a rise in the total number of deaths, there was a marked decline

in the number of years of potential life lost throughout the Region. Although part of this change can be attributed to the aging of the population, the leading cause was decreasing mortality in the first years of life, especially from communicable diseases. However, the intensity and speed of this reduction were not the same throughout the Region, and the inequalities among countries have either remained the same or widened. Noncommunicable diseases are responsible for about two-thirds of all deaths in Latin America and the Caribbean. Deaths from chronic and degenerative diseases outnumbered deaths from infectious and parasitic diseases by 5 to 1 in 1985, and this ratio is expected to increase to 10:1 by the year 2000.

National health authorities are concerned about the public health impact of such social problems as accidents and violence, including domestic violence. In the past decade, the risk of death from those and other external causes has remained the same for the Region as a whole. In some countries, however, there has been a marked increase in the number of deaths from homicide, even while deaths from accidents are decreasing. In addition, growing morbidity from mental disorders, as well as morbidity and mortality from smoking and alcoholism, make it necessary to strengthen prevention programs for these problems in virtually all the countries of the Region.

Nutrition has improved, according to assessments using such traditional anthropometric indicators as weight and height. The prevalence of both low weight-for-age and low weight-for-height has declined, especially among children. Low height-for-age resulting from periods of inadequate nutrition still can be found in approximately 50% of preschool and school-age children in some countries, however. This is a serious problem in terms not only of height, but also the implications for physical and intellectual development. Obesity, as indicated by excessive weight-for-height, has grown rapidly in the Region, mainly among lower socioeconomic groups, urban populations, and women. Obesity has mistakenly been considered a nutritional problem of "excess." Since it can occur along with deficiencies in specific micronutrients, such as iron, folic acid, and zinc, its prevention and cure are very complex. Although iodine and vitamin A deficiencies have gradually been reduced throughout the Hemisphere, iron deficiency remains the most widespread nutritional problem, especially among preschool children and women of child-bearing age.

It is estimated that about 78% of the population of Latin America and the Caribbean has access to drinking water through direct household connections or some other nearby source. Some 70% of this population receives treated water. That represents tremendous progress from 10 years ago, when only 20% received treated water. The sanitary disposal of wastewater and excreta is inadequate. Only 69% of the population has access to these services; furthermore, only 10% of the wastewater collected is treated in some way prior to its final disposal.

Other important environmental problems affecting the majority of the Region's countries include food contamination, inadequate solid waste disposal, inadequate housing, water and air pollution (especially in overpopulated areas), work-related accidents and occupational diseases, cross-border pollution, and damage to the ozone layer. In addition, many natural disasters, including ones caused by El Niño, have occurred in the past five years, resulting in widespread personal injury and material damage. Disaster preparedness is a high priority throughout the Hemisphere. Bettering the health of the population by improving the environment has become crucial. An environment free of health hazards satisfies the basic requirements for a healthy life and promotes equitable societal relationships. With this in mind, environmental interventions have concentrated on such natural resources as water, air, plant life, and such man-made environments as houses, cities, workplaces, and recreational sites. In all cases, corrective or remedial measures are necessary, together with long-term action to eliminate or reduce environmental risks.

Efforts are under way in the majority of the countries in the Region to modernize the State and reform the health sector (2, 3). The measures associated with these reforms have had a variety of political, economic, and social effects in these countries, particularly in terms of their health systems. There have been structural and operational changes in the health sector, such as decentralization, legal and administrative autonomy for institutions, new financing methods, emphasis on cost control and cost recovery, and the design of basic health care packages. These changes have created the need to identify, analyze, and reduce inequities in health. These inequities affect not only the health of individual communities but also the development of civil society, the democratization process, the governance of institutions and the State, and human development in general.

It is well known that the evolution of economic and social conditions is decisive in the overall level of health and health trends. It should also be recognized, however, that changes in the relationship between the State and civil society can have both positive and negative impacts on the health of the population. We need to step up our efforts to identify existing inequities in health and access to services for particular populations, specifying the groups at greatest risk in order to

develop and implement targeted, cost-effective programs capable of achieving the desired results. Empirical studies have clearly established that poor people have the worst health. Moreover, there is some evidence that countries with greater income equality have better health conditions (4).

The economic growth rate for the Region was 3.6% in 1996, versus 1% in 1995. The recovery was especially driven by the relatively high growth rates in Argentina and Mexico, whose economies had been more severely affected by earlier economic crises. Inflation was relatively low in 1996, averaging just over 1%. Investment continued to recover throughout the Region, growing by 5.6% in 1996. This was due primarily to a significant increase in investment in Argentina and Mexico; investment was lower in the rest of the Hemisphere. Most countries experienced strong export growth. In 1996, consumption grew more slowly than income, indicating that savings rates continued to increase, following a sharp drop at the beginning of the 1990s. Capital flows to Latin America rose in 1996, reaching US\$ 63,000 million, or approximately 3.5% of the Region's gross domestic product (GDP). Although many countries have had to apply economic adjustment policies that have played a major role in the changes of the past decade, there are good reasons for optimism, which should lead to greater investment in such sectors as health and education (2).

According to estimates by the Economic Commission for Latin America and the Caribbean (ECLAC), the percentage of poor families in Latin America decreased from 41% to 39% between 1990 and 1994 (5, 6). This did not make up for the increase in poverty that occurred between 1980 and 1990, from 35% to 41%. The share of families living in extreme poverty fell only one percentage point, from 18% to 17%, while the absolute number of people living in extreme poverty increased by 6.4 million. These data suggest that one out of every six families in Latin America is unable to meet its basic needs, even assuming they spend all of their income on food (5, 6).

Income is distributed more unevenly in Latin America than in any other region of the world, according to measurements using the Gini coefficient system. The average coefficient for the countries of Latin America is 0.56, which is 15 points worse than that of the developed countries or the countries of Southeast Asia and almost comparable to averages in Africa. Following the serious deterioration in income distribution in the 1980s, the Region has not made significant progress in achieving equitable income distribution, despite the more recent economic growth (2).

Economic expansion in this decade has not been reflected in employment indicators, either. In 1989, between 5 and 6 of every 100 Latin Americans that were able to work were unemployed. In 1996, unemployment reached 8%, with urban unemployment exceeding 17% in some of the countries of the Region. Unemployment rates continue to be high, especially among lower-income families, individuals with limited edu-

cation, young people, and women. There are signs that current unemployment is due more to lower growth in the demand for labor than to increases in the labor supply (2, 5, 6).

The democratization movements that began to appear in the Hemisphere in the 1980s have continued into the 1990s. Perhaps the greatest challenges to solidifying democracy are social and economic inequality and the exclusion of the most disadvantaged sectors of society from the benefits of economic growth, which triggers social conflict and violence. In addition, Latin American countries should take steps to ensure that governmental institutions function well, to distribute State power through decentralization, and to promote authentic societal participation (2).

Although economic integration is not a new phenomenon in international relations, the current globalization process is qualitatively different from previous experiences in several ways. Today, many countries throughout the world are participating in economic globalization. Advances in technology have significantly lowered costs and permitted the use of transportation, telecommunications, and electronic data processing on a massive scale, thus increasing and facilitating the integration of national economies into world markets. Moreover, technology has made it possible for companies to place facilities for the same production process cost-effectively in different countries, which, in turn, encourages technology transfer. Applying political policies to overcome international trade barriers is another important element in this process. Appropriate management of globalization processes at the national and international levels, with increasing concern for global equity, offers new opportunities to create jobs and reduce poverty in the countries of the Region (3, 7, 8).

Equity is of central importance in the health policies of almost every country in the Region. Governments agree that the principal goal of the current health sector reform process is to ensure greater equity in the distribution of health services, improve quality and, at the same time, lower the costs for services, or at least slow any increases. Clearly, health service reform should not be considered in isolation. Reform, instead, is part of the modernizing of the State, whereby roles and functions of central agencies are subject to review and change. The deconcentration and decentralization of State agencies, with the resulting strengthening of local governments, are critical aspects of public management that influence the changes to the health system. Ministries of health are tending to cut back on their responsibilities as direct service providers, while enhancing their roles in such areas as public policy management, administration, policy coordination and articulation, and regulation of public and private health care resources.

The countries of the Region have expressed a growing interest in new ways of financing their health systems, which have been deeply affected by current reforms. Once again,

there is no clear model, but countries are increasingly recognizing that the State should be responsible for public assets with a high degree of externality¹ and for ensuring that a basic package of services is provided to the entire population. Virtually every country in the Hemisphere has a mix of public and private health services, with the private sector responding to the demands of the market.

In 1995, national health spending as a percentage of GDP ranged from 14.3% to 3.5% in the various countries of the Region. These differences are even more obvious when expressed as national per capita health expenditures. In 1995 dollars, they ranged from US\$ 3,858 to US\$ 9.

The public sector in Latin American countries usually spends about 25% of GDP, while in an industrialized country the figure is more than 40%. The most notable difference is the level of spending on social security systems, which in industrialized countries is 15% and in Latin America averages 2.5% (2). Spending for social security and education grew faster than any other area of public expenditures in the countries of the Region between 1990 and 1995. Average per capita public expenditures grew 24.4% for education and nearly 50.0% for social security during the first five years of this decade. According to a study conducted by ECLAC, this increased expenditure in education and health has meant that per capita public spending has risen in 9 out of 13 countries that were part of the research (5).

Social investment funds were created in the countries of the Region as a way to mitigate the impact on society of economic stabilization and adjustment policies. Originally intended as short-term and emergency measures, they were later incorporated into medium- and long-term projects. The funds were turned into social programs that supported the decentralization processes, societal participation, and involvement by nongovernmental organizations in carrying out and coordinating activities in the public and private sectors.

Reinforcing the leadership and regulatory role of the State is another essential element of reform. Even if the State does not provide health services, it is responsible for setting standards and exercising functions that are essential to public health, such as developing policies, evaluating the health situation, and analyzing health trends.

The dominant concept for organizing health services systems emphasizes the influence of market economies, self-management, institutional pluralism in both the delivery and financing of services, efficiency, cost control, and the impact of services on health conditions. In today's highly competitive environment, the countries of the Region should continue to pursue accessibility, equity, and quality care.

¹Externalities are effects produced by actions or activities that extend beyond the immediate site of their application. A classic example is vaccination, which is administered to an individual but produces effects that extend beyond that person.

The private sector is an important component of the health care delivery system. Recognizing that implies accepting the multi-institutional nature of the model, in which functional elements take on greater importance in relation to structural and hierarchical elements in the formation of modern service networks. New hiring procedures, new methods of providing compensation for work, and shared service structures in fields related to diagnostic, therapeutic, and logistical support become highly important elements in this functional relationship.

The goal of health sector reform is to redefine the role of central governments, as well as regional and local governments, in the management of health systems, while guaranteeing the entire population equitable access to services. To this end, decentralization programs have been planned and implemented to transfer power and resources to local governmental bodies, which are in direct contact with the institutions responsible for providing health care. Another goal of reform is to strengthen the leadership and the standards-setting capabilities of the ministries of health, thus enabling them to regulate the new forms of societal participation in health service delivery and financing.

Another component of reform is regulating benefits by establishing basic packages of health services that correspond with the prevailing epidemiological profiles, the availability of resources, and the policy options available to each country. The goal of this strategy is to provide universal access to health services.

In the delivery of services, the goal of reform is to increase the number and variety of public and private providers, so as to increase competition and broaden the choices available to service users and those who pay for the services. Another goal is to restructure public hospitals, turning them into service providers that are independently managed and capable of recovering costs. New incentives are therefore being introduced to promote and evaluate the productivity and performance of personnel and institutions in order to ensure quality care and keep costs down. Adding new technologies is one of the most important factors affecting how health systems are organized and operated, and also has a major effect on the quality and cost of services (9).

Increasingly, modern diagnostic procedures are permitting early and effective treatment of diseases. Better knowledge of cellular and molecular structures will make it possible to develop drugs with much greater specificity. These will be high-cost pharmaceuticals protected by the international patent system. In the near future, the number of products obtained from biotechnology will multiply, highly complex technologies will become available that will allow diseases previously requiring hospitalization to be treated at home, biosensor implants will make it possible to continuously monitor chronically ill patients, and the mass use of electronic data process-

ing and information dissemination technologies will revolutionize telematics in the field of health (10).

Nevertheless, incorporating new technologies also raises new questions, challenges, and problems, especially in terms of ethics and economics. For example, what criteria will be used to determine who will receive organ transplants or new, costly drugs? What ethical and humanistic concerns will emerge from the new techniques and procedures in genetic engineering? How can we solve the problems arising from the impossibility of providing expensive technology to the most economically and socially disadvantaged population groups? (10).

Organizations responsible for managing health must have methods and information at their disposal to continually assess the effectiveness of health technologies. They must also establish procedures for organizing and regulating the selection, incorporation, and application of new technologies in health systems to ensure that they are implemented in a cost-effective manner.

Priority has been given in the Region to reshaping health care models. This process has emphasized integrating promotion, prevention, cure, and rehabilitation; coordinating health care programs; incorporating intersectoral approaches; and promoting effective societal participation. Promoting health and preventing and controlling disease are fundamental approaches for continued improvement of the population's health. This involves interventions to improve the standard of living of marginalized populations and to eliminate unnecessary, avoidable, and unjust inequalities in health and in individual and collective well-being.

Our societies are persistently and increasingly demanding an end to these inequalities and calling for efforts to speed the improvement of socioeconomic conditions in the Region. If achieved, that will solidify progress in health and reduce the gaps within and among countries with respect to health conditions, access to services, and the availability of resources. The result will be an equitable distribution of development benefits to all population groups.

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I. HEALTH SITUATION TRENDS¹

HEALTH AND LIVING CONDITIONS

As the millennium draws to a close, the Region of the Americas finds itself immersed in a vibrant process of democratization in which the strengthening of civil society and citizenship, reform of the State, subregional integration, and the building of human capital are explicit political objectives shared by both governments and the people. This plurality of national objectives is complemented by the uniqueness of the countries' historical and social contexts, which help to intensify and enrich efforts aimed at attaining higher, sustainable levels of human development. Within the dynamics of these structural transformations there emerges the fundamental ethical issue of social equity, especially in the health sphere. Today more than ever, efforts are called for to identify, measure, and close gaps in living conditions and opportunities for access, utilization, and gains in health.

Inequalities in health conditions—which, in fact, may reflect a lack of equity—are not the only indicator of social differences. Economic differentials in the Region have been cause for concern throughout this period of adjustments in national development models. Because these economic differences are so closely tied to health condition indices, they become an issue that is highly relevant to all sectors.² An analysis of the Region's health conditions and trends should, therefore, consider these differences. That is precisely why this edition of *Health in the Americas* opens with a classification of the countries and territories of the Region by level of economic development, as expressed by per capita gross national product.

¹Specific data are presented in tables in the Annex at the end of this chapter; further references on data sources and methodologies are presented in the Technical Notes at the end of this chapter.

²Pan American Health Organization. The Director's Message. In: *Annual report of the Director 1996: Healthy people, healthy places*. Washington, DC: PAHO; 1997. (Official Document 283).

Regional Differentials in Economic Development

Since the level of economic development of any population/space unit is a determining factor in that unit's health situation, an analysis must deal with health trends as dependent variables on the actual resources available for social investment in the countries and territories of the Region, as a practical expression of the "level of economic development." In most countries in the Region, and certainly in Latin American and the Caribbean countries, the gross domestic product (GDP) is significantly higher than the gross national product (GNP). This means that the value added by foreign-owned goods and services exceeds that of domestically-owned goods and services (negative net payments factor); this difference between the two, although included in the national GDP, also is included in the GNP of countries that export those goods and services.³ Consequently, of these two standard aggregate measures of output, GNP is felt to be the one that most accurately represents—and measures—the level of resources available for social investment in the countries of the Americas. In other words, the necessary resources to meet the population's basic needs, particularly in the current context of market openness and global economies.

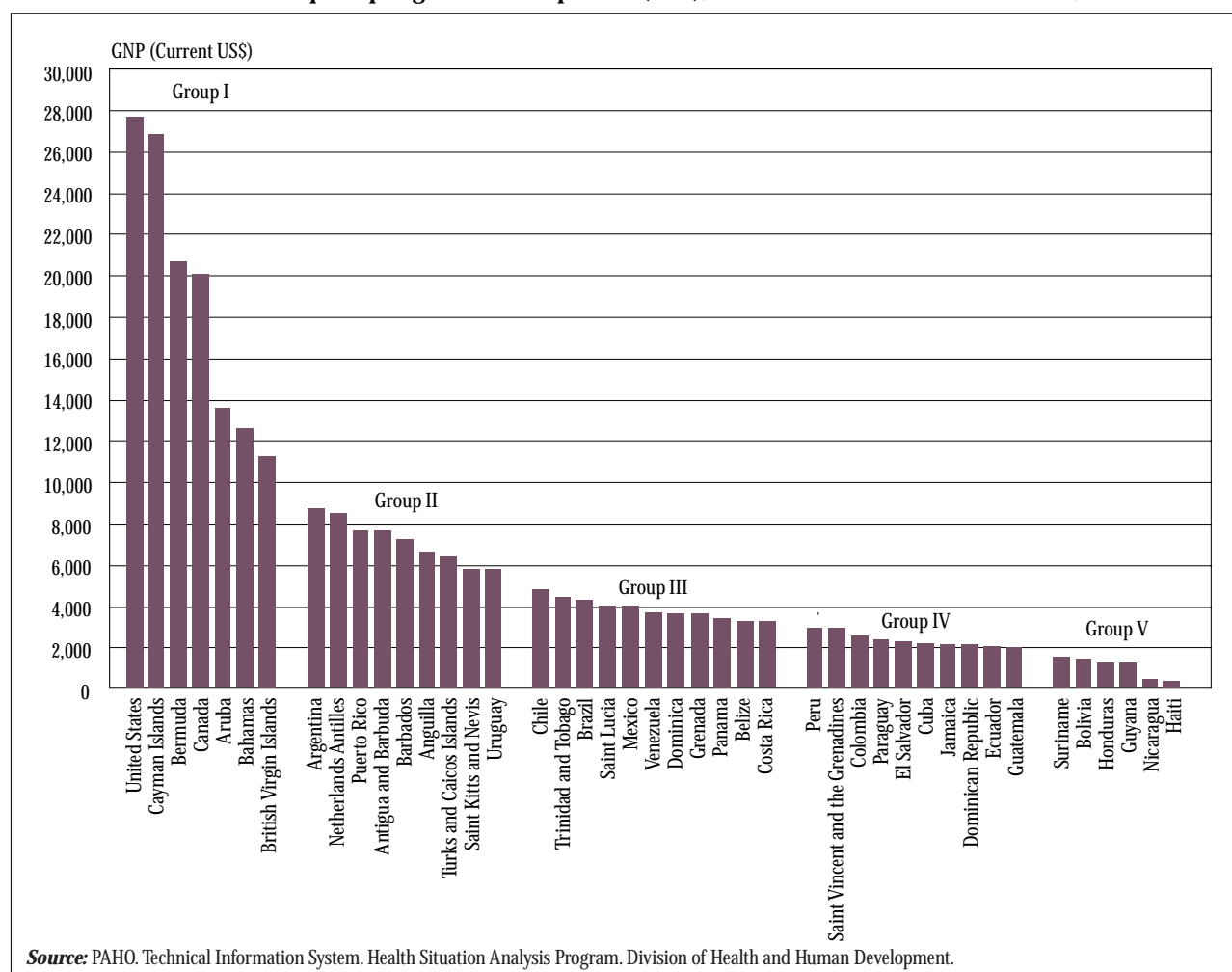
So that regional economic differences could be taken into account in the analysis of the health situation, the countries of the Americas were ranked (Figure 1) and then classified into five groups according to per capita GNP, as expressed in current United States dollars (Table 1).⁴ The groups were defined through a hierarchical clustering analysis, which maximizes both homogeneity within the groups and heterogeneity from group to group (Figure 2).⁵ Group I, which includes seven

³See the Technical Notes.

⁴Calculated by the World Bank Atlas Method. In: *World Development Indicators 1997*. Washington, DC: World Bank; 1997:xxv–xxvi.

⁵See the Technical Notes.

FIGURE 1
Distribution of the per capita gross national product (GNP), in selected countries of the Americas, 1995.



countries, had a median per capita GNP equivalent to US\$ 19,380 in 1995, ranging from US\$ 10,600 (British Virgin Islands) to US\$ 26,980 (the United States); Group II, made up of nine countries, had a median per capita GNP of US\$ 6,560, ranging from US\$ 5,170 (Uruguay) to US\$ 8,030 (Argentina); Group III, with 11 countries, had a median per capita GNP of US\$ 3,020, ranging from US\$ 2,610 (Costa Rica) to US\$ 4,160 (Chile); Group IV, with 10 countries, had a median per capita GNP of US\$ 1,566, ranging from US\$ 1,340 (Guatemala) to US\$ 2,310 (Peru); and Group V, with six countries, had a median per capita GNP of US\$ 595, ranging from US\$ 250 (Haiti) to US\$ 880 (Suriname).

Per capita GNP tended to increase in all the groups between 1975 and 1995. Differences between and within the groups increased as well, however, reflecting the widening of economic gaps over the period. The median per capita GNP for Group I countries was US\$ 4,205 in 1975 and US\$ 10,390

in 1985; for Group II, the figures were US\$ 1,440 and US\$ 2,310; for Group III, US\$ 975 and US\$ 1,500; for Group IV, US\$ 560 and US\$ 980; and for Group V, US\$ 355 and US\$ 430. Comparisons between groups reveal that in 1975 the median per capita GNP of Group I was 11.8 times that of Group V; by 1985, the ratio had risen to 24.2, climbing further to 32.6 in 1995. Within the groups, per capita GNP for Groups I and II increased by 4.6 times between 1975 and 1995, Group III was 3.1 times higher, Group IV 2.8 times, and Group V 1.7 times. These trends reflect changes in the makeup of the country groups, which once more show variations in the Region's economic growth during the period. For instance, Venezuela moved from Group I in 1975, to Group II in 1985, and to Group III in 1995. Mexico, which was in Group II in 1975 and 1985, fell to Group III in 1995. Trinidad and Tobago rose from Group II in 1975 to Group I in 1985, dropping back to Group III in 1995. Jamaica, which was part of Group II in

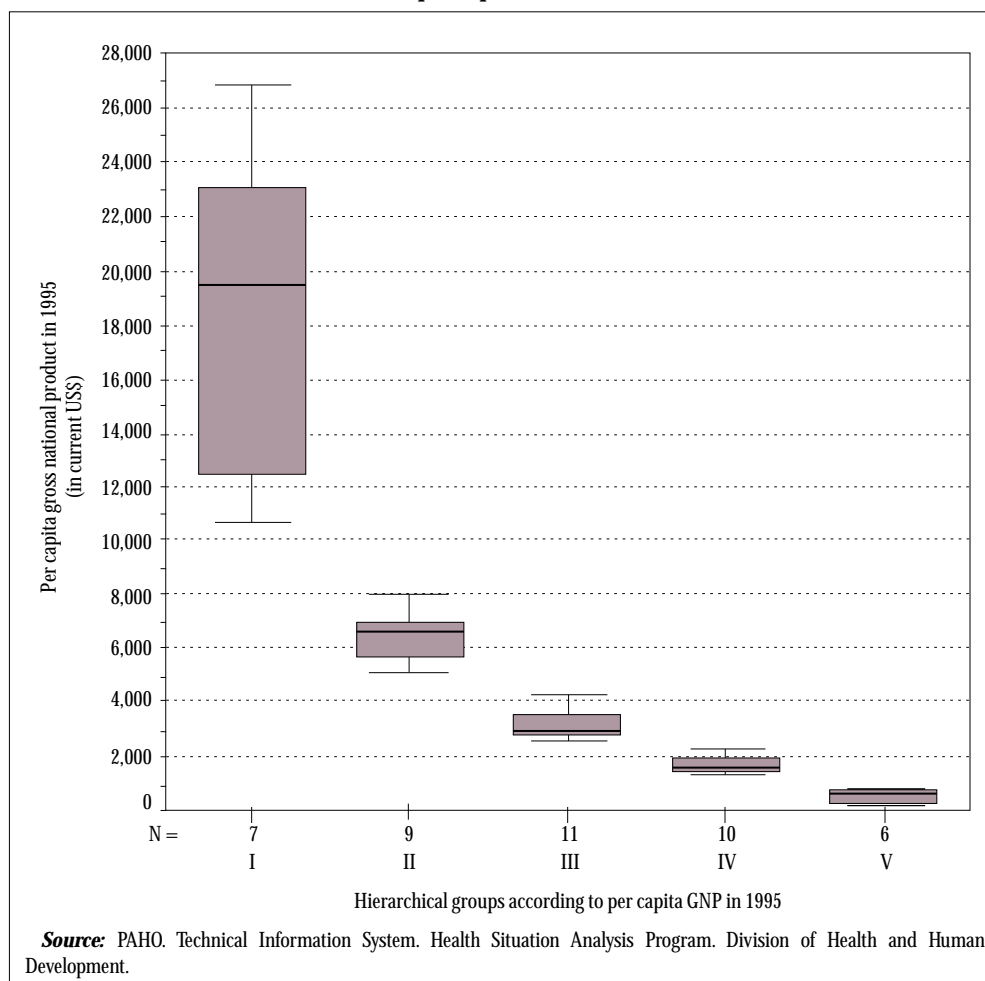
TABLE 1
Grouping of countries according to a hierarchical clustering analysis of the per capita GNP,
Region of the Americas, countries for which there is information, 1975–1995.

Country	1995 per capita GNP (US\$)	1995 hierarchical group	1985 per capita GNP (US\$)	1985 hierarchical group	1975 per capita GNP (US\$)	1975 hierarchical group
United States of America	26,980	I	16,790	I	7,400	I
Cayman Islands	26,200	I	...		...
Bermuda	20,000	I	...		...
Canada	19,380	I	11,830	I	5,680	I
Aruba	12,900	I	...		...
Bahamas	11,940	I	8,950	I	2,730	I
Virgin Islands (UK)	10,600	I	...		...
Argentina	8,030	II	2,130	II	1,810	II
Netherlands Antilles	7,800	II	...		...
Puerto Rico	7,000	II	...		...
Antigua and Barbuda	6,970	II	...		...
Barbados	6,560	II	4,640	II	1,520	II
Anguilla	5,930	II	...		...
Turks and Caicos Islands	5,700	II	...		...
Saint Kitts and Nevis	5,170	II	...		...
Uruguay	5,170	II	1,580	III	1,330	II
Chile	4,160	III	1,420	III	860	III
Trinidad and Tobago	3,770	III	7,020	I	1,720	II
Brazil	3,640	III	1,630	III	1,070	III
Saint Lucia	3,370	III	...		...
Mexico	3,320	III	2,180	II	1,360	II
Venezuela	3,020	III	3,830	II	2,380	I
Dominica	2,990	III	...		...
Grenada	2,980	III	...		...
Panama	2,750	III	2,060	II	1,030	III
Belize	2,630	III	1,140	IV	790	III
Costa Rica	2,610	III	1,400	III	950	III
Peru	2,310	IV	980	IV	1,000	III
Saint Vincent and the Grenadines	2,280	IV	1,050	IV	350	V
Colombia	1,910	IV	1,270	IV	550	IV
Paraguay	1,690	IV	2,440	II	550	IV
El Salvador	1,610	IV	840	IV	430	IV
Cuba ^a	1,522	IV	...		...
Jamaica	1,510	IV	910	IV	1,260	II
Dominican Republic	1,460	IV	790	IV	660	IV
Ecuador	1,390	IV	1,180	IV	540	IV
Guatemala	1,340	IV	1,200	IV	570	IV
Suriname	880	V	...		...
Bolivia	800	V	430	V	360	V
Honduras	600	V	740	IV	360	V
Guyana	590	V	540	V	640	IV
Nicaragua	380	V	760	IV	630	IV
Haiti	250	V	320	V	150	V

^aThe 1995 GNP figure for Cuba was derived through power regression based on estimated GDP data for 1994 (UNDP, 1997 *Human development report*).

Source: PAHO. Technical Information System. Health Situation Analysis Program. Division of Health and Human Development.

FIGURE 2
Summary distribution of country groups, according to a hierarchical clustering analysis
of the per capita GNP in 1995.



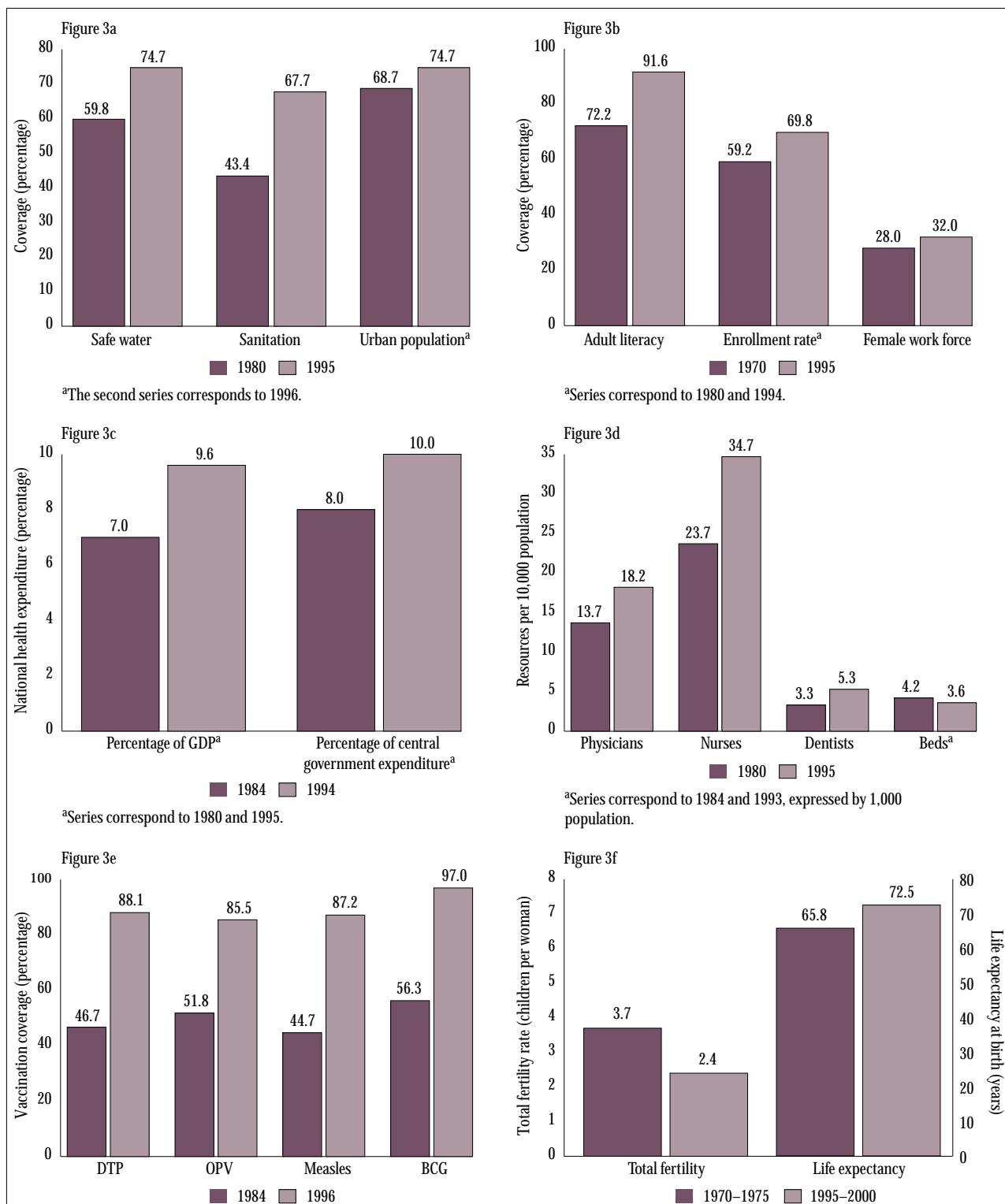
1975, and Peru, which was in Group III, both fell to Group IV in 1985 and 1995. Saint Vincent and the Grenadines moved from Group V in 1975 up to Group IV in 1985 and 1995.

Regional Inequalities in Human Development

Basic human development indicators are of crucial importance to any health situation analysis, in that they document living conditions and define the social setting in which health status changes occur. Living conditions in the Region of the Americas as a whole have gradually improved, as evidenced by average values—weighted for population size—for several basic human development indicators over the last few decades (Figure 3). For example, access to safe water rose from 59.8% in 1980 to 74.7% in 1995, and sanitation coverage

rose from 43.4% to 67.7%. Both these indicators improved while the Region's urban populations grew briskly (from 68.7% of the total population in 1980 to 74.7% in 1996). In addition, adult literacy climbed from 72.2% to 91.6% between 1970 and 1995, and access to education, from 59.2% to 69.8% between 1980 and 1994. The female work force grew from 28.0% in 1970 to 32.0% in 1995. Between 1984 and 1994, health expenditure as a percentage of GDP rose from 7.0% to 9.6%, and as a percentage of central government expenditure, from 8.0% to 10.0%. The ratio of physicians, professional nurses, and dentists per 10,000 population rose from 13.7 to 18.2, from 23.7 to 34.7, and from 3.3 to 5.3, respectively, between 1980 and 1995. The number of hospital beds per 1,000 population, however, dropped from 4.2 to 3.6 between 1984 and 1993. Vaccination coverage rose dramatically between 1984 and 1996: from 46.7% to 88.1% for DTP, from 51.8% to

FIGURE 3
Trends in basic health and human development indicators, population-weighted averages,
Region of the Americas, 1970–1995.



Source: PAHO. Technical Information System. Health Situation Analysis Program. Division of Health and Human Development.

85.5% for OPV, from 44.7% to 87.2% for measles, and from 56.3% to 97.0% for BCG. The total fertility rate declined from 3.7 to 2.4 children per woman between 1970 and 1995, while infant mortality fell from 51.7 to 24.0 per 1,000 live births. Between 1970–1975 and the current five-year period,⁶ life expectancy at birth rose by nearly 7 years (from 65.8 to 72.5 years) in the Region.

The general trend toward better living conditions Region-wide also is observed in each of the country groups, although the different economic levels are systematically mirrored in differences in living conditions from one group to the next. This is a telltale sign that social inequalities persist. Living conditions and the pace of their change are not distributed equally among country groups, which means that not everyone in the Region has the same opportunity to attain higher, sustainable levels of human development. Figure 4 illustrates these inequalities based on regional patterns of access to safe water and basic sanitation, health expenditure, total fertility rate, infant mortality, and life expectancy in each of the five country groups, using a summary indicator weighted by population size. The following paragraphs take a closer look at the distribution of these indicators and their trends by country group.

Access to Safe Water and Basic Sanitation

Access to an adequate supply of safe water and basic sanitation is critical for maintaining a healthy environment. The harm to health that comes about when these services are not available is reflected in such areas as the levels of morbidity and mortality from diarrheal diseases and nutrition-related problems. The urban population's growth burst poses a special challenge to meeting these basic needs. Since the housing policies followed by many Latin American countries have, for the most part, been limited in scope, the spread of human settlements without adequate housing and sanitation has both eroded the people's health and degraded the environment in many Latin American cities.

Figure 5 shows the distribution of levels of access to safe water in the five country groups in 1980 and 1995: although all the groups posted considerable improvements, the levels achieved in Groups IV and V (70%) are much lower than those for Groups I and II (97%). The difference is significant, and it is worth noting that safe water coverage in the 16 coun-

tries of Groups IV and V in 1995 was identical to the 1980 coverage levels of 11 Group I, II, and III countries for which information was available. The situation was worst in Haiti, where this indicator in 1995 (39%) lagged well behind that for the rest of the Region.

Data on basic sanitation (Figure 6) reveal that three countries for which information was available in Group I (the group with the highest income level) saw a significant increase in sanitation coverage between 1980 and 1995 (from 60% to 85%); one country had attained 100% coverage (Bahamas). Groups II and III increased their coverage levels from 65% to 91% and from 68% to 83%, respectively, over the same period. Sanitation coverage in Groups IV and V rose from 33% to 69% and from 27% to 66% between 1980 and 1995, respectively; levels attained after this increase, however, were similar to those seen in Groups I, II, and III back in 1980.

Despite the trend toward greater water supply and sanitation coverage in the Region, serious access and quality gaps remain (especially in urban areas), which can put the population at high risk, as seen during the cholera and leptospirosis epidemics and the greater incidence of waterborne diseases.

Changes in Education Levels

Education level is a key measure of human development, and it is directly related to a population's health status. Great strides have been made in the Region in this area in recent decades, but significant differences continue to be seen from country to country, and these are linked to the level of economic development. In Latin America and the Caribbean, illiteracy dropped from 42% in 1950 to 14% in 1995; although there was little differentiation by sex, some countries did show higher levels of female illiteracy. Figure 7 shows the distribution and trends in literacy rates between 1970 and 1995 for the five country groups.

In 1995, the literacy rate in Group I countries (those with a per capita GNP of US\$ 10,600 and higher surpassed 98%. In Group II countries (1995 per capita GNP between US\$ 5,170 and US\$ 8,030), the rate ranged from 89% (Antigua and Barbuda) to 99% (Turks and Caicos Islands); in Group III (1995 per capita GNP between US\$ 2,610 and US\$ 4,160), the rate ranged from 75% (Belize) to 98% (Grenada); in Group IV (1995 per capita GNP between US\$ 1,340 and US\$ 2,310), the rate ranged from 72% (El Salvador) to 96% (Cuba and Saint Vincent and the Grenadines), with Guatemala showing levels well below those of the rest of the group (61%). In Group V (1995 per capita GNP below US\$ 900), the literacy rate ranged from 58% (Haiti) to 98% (Guyana). As these figures show, the values for this indicator vary widely, depending on each country's income level.

⁶Except as otherwise indicated, the five-year periods used in this chapter reflect standard demographic usage, i.e., they are calculated as of the midpoint of the years indicated. In other words, the five-year period 1970–1975 covers the period running from the second half of 1970 through the first half of 1975.

FIGURE 4
Trends in basic health and development indicators, weighted by population, by per capita GNP groups, Region of the Americas, 1970–1995.

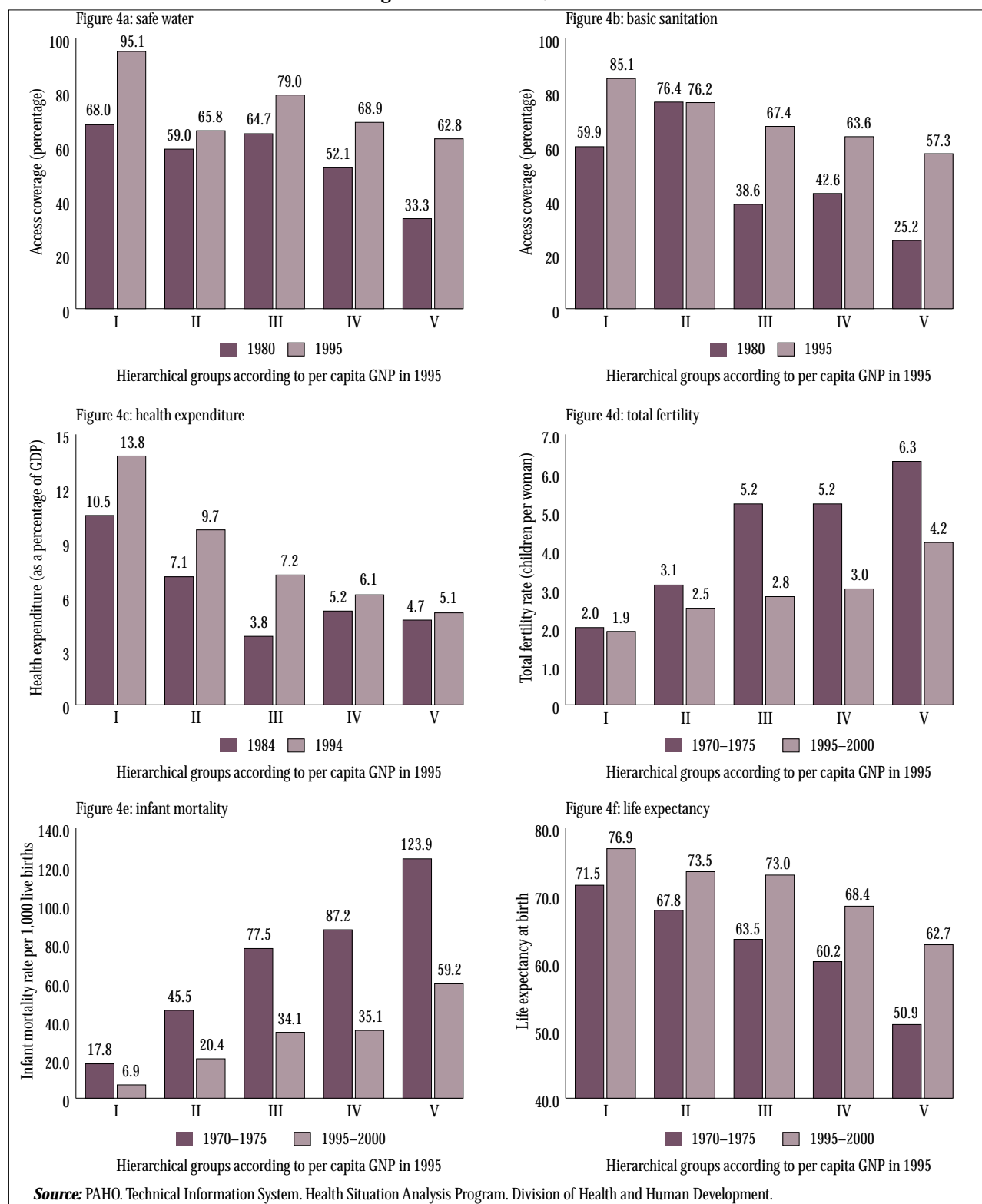


FIGURE 5
Trends in access to safe water,
Region of the Americas, 1980–1995.

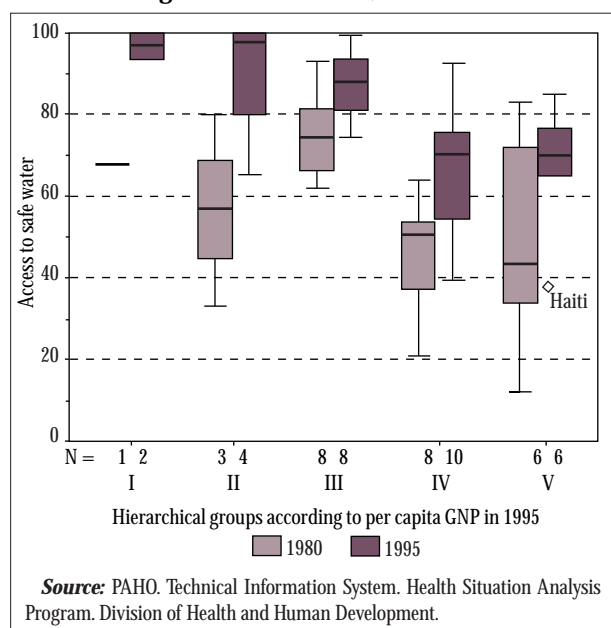
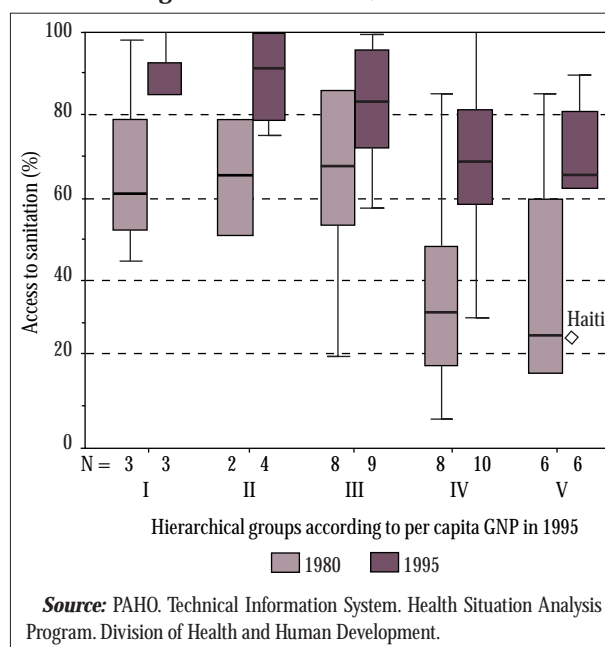


FIGURE 6
Trends in access to sanitation,
Region of the Americas, 1980–1995.



Gross school enrollment rates⁷—an indicator of access to education—also have exhibited a rising trend over the past few decades. Between 1980 and 1994, the rate rose from 70% to 75% in Group I, from 65% to 76% in Group II, from 59% to 68% in Group III, from 60% to 65% in Group IV, and from 54% to 64% in Group V (Figure 8). Although Guatemala (a Group IV country) also showed improvements in this indicator over the period (from 35% to 46%), its 1994 level was well below the level registered by the other countries in this group. In 1994, Groups IV and V posted similar levels to those that Groups I and II had attained at least 15 years previously.

Enrollment has increased, especially in secondary and higher education. Since 1990, there have been no observable differences by sex in primary, secondary, and tertiary enrollment. The tertiary level, however, has a higher female dropout rate, and the academic structure continues to favor males in programs that prepare graduates for jobs with higher qualifications and opportunities for advancement into management positions. The long-term trend towards women's greater professional status may herald medium- and long-term changes in the social structure. This is true in the allied health professions, in which female enrollment levels already outpace male levels in many countries; despite higher dropout rates among women, more female than male physicians graduated in some

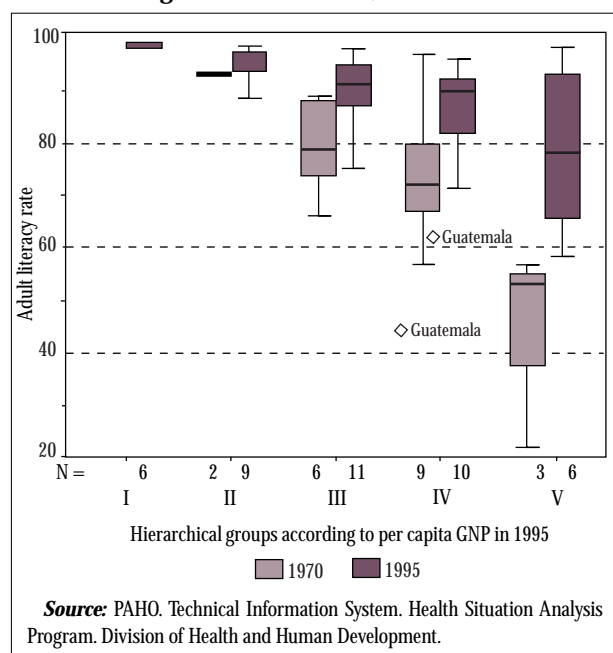
years. As women have gained greater access to formal education, more have been able to join the health work force (as nursing staff, auxiliaries, health professionals). This has contributed to a substantial increase in women's participation in the formal economy of all the country groups in recent years (Figure 9).

Trends in Human Resources for Health: Physicians

In 1995, the Region of the Americas had a median ratio of 11.1 physicians per 10,000 population, although distribution was skewed (the population-weighted average was 18.2) and varied considerably both between and within countries. Cuba, for instance, had 32 times more physicians per population than Haiti (51.8 per 10,000, compared with 1.6). One hundred million people (13.0% of the Region's population) lived in 19 countries having fewer than 8.6 physicians per 10,000 population (representing the two bottom quintiles). A look at the indicators for two countries helps to illustrate the magnitude of within-country differences in this indicator: 11 million Mexicans (12.1% of that country's population) live in four states that have more than 16.5 physicians per 10,000 population, but 24 million (26.3%) live in four other states that have fewer than 8.6 physicians per 10,000 population. In Peru, 8 million people (35% of the population) live in four *departamentos* with

⁷See the Technical Notes.

FIGURE 7
Trends in adult literacy,
Region of the Americas, 1970–1995.

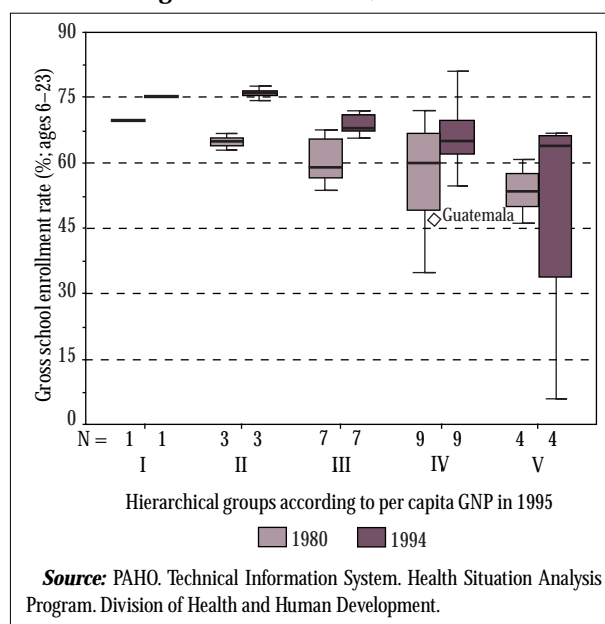


more than 11.4 physicians per 10,000 population, while another 12.8 million (53.8%) live in 17 *departamentos* with fewer than 4.9 physicians per 10,000 population.⁸

Figure 10 illustrates the rising trend in this indicator between 1980 and 1995 in the five country groups. Group I showed an average increase of 7 physicians per 10,000 population (from 9.0 in 1980 to 16.0 in 1995); Group II grew by a factor of 6.3 physicians per 10,000 population (from 6.5 to 12.8); Group III grew by nearly 4 (from 6.9 to 10.8), as did Group IV (from 6.0 to 9.9). Group V, however, grew by a factor of only 0.6 (from 4.4 to 5.0); in this group, the indicator ranged from 8.2 (Nicaragua) to 1.6 (Haiti), reflecting the yawning disparities within the group, as well as between this group and the others. In 1995, Cuba (51.8 physicians per 10,000 population), Uruguay (35.6), and the United States (24.3) had the highest ratios of physicians per population, well above the other countries in their respective groups; in 1980, Cuba, with 15.6 physicians per 10,000 population was the only country exhibiting such levels.

⁸Pan American Health Organization. The Health Situation. In: *Annual report of the Director 1996: healthy people, healthy places*. Washington, DC: PAHO; 1997. (Official Document 283).

FIGURE 8
Trends in school enrollment,
Region of the Americas, 1980–1994.

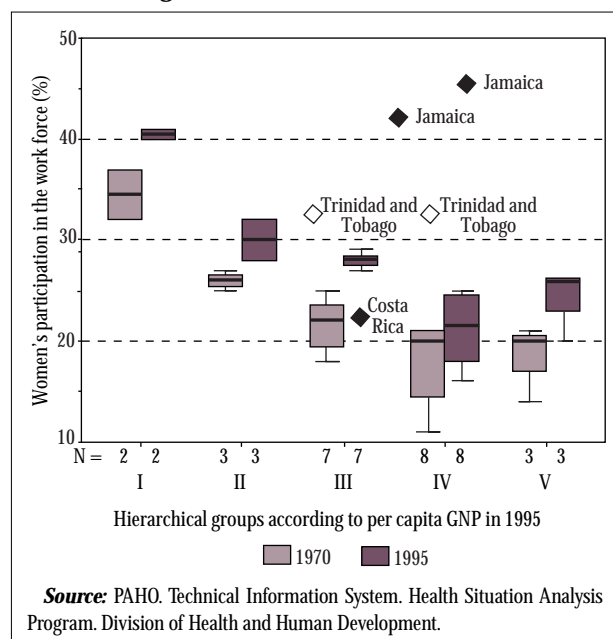


Trends in Health Expenditure

National health expenditure as a percentage of GDP presented an upward trend in Groups I through IV between 1984 and 1994 (Figure 11). The median values for this indicator rose from 7.5% to 11.3% for Group I, from 5.6% to 7.7% for Group II, from 4.1% to 7.7% for Group III, and from 3.7% to 5.9% for Group IV. The increase in Group V was insignificant (from 5.1% in 1984 to 5.2% in 1994).

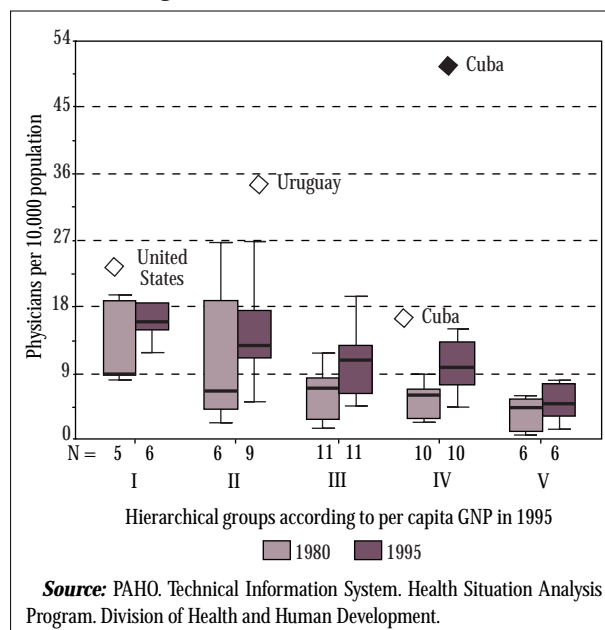
National health expenditure as a percentage of central government expenditure also showed a rising trend in all the country groups between 1980 and 1995 (Figure 12). The median value for this indicator in Group I rose from 8.8% in 1980 to 10.9% in 1995, although significant differences continued to exist within the group, as shown by the distribution ranges: from 5.8% to 11.7% in 1980 and from 4.9% to 16.9% in 1995, with the lowest value recorded in Canada and the highest in the United States for both years. The increase in the median value for this group can be attributed to the growth in this indicator in one country (the United States). In Group II, central government health expenditure stood at 3.1% in 1980 (ranging from 2.0% in Argentina to 4.1% in Uruguay) and 3.8% in 1995 (ranging from 2.2% in Argentina to 5.4% in Uruguay); this was the group with the lowest allocation of resources as a percentage of central expenditure. In Group III, the median was 8.1% in 1980 (ranging from 1.4% in Mexico

FIGURE 9
Trends in women's participation in the work force,
Region of the Americas, 1970–1995.



to 25.0% in Costa Rica) and 11.4% in 1995 (ranging from 3.0% in Mexico to 26.7% in Costa Rica); in Group IV, it was 7.5% in 1980 (ranging from 4.3% in Paraguay to 10.1% in the Dominican Republic) and 8.0% in 1995 (ranging from 5.4%

FIGURE 10
Trends in health resources, physicians,
Region of the Americas, 1980–1995.



in Colombia to 11.0% in the Dominican Republic); and in Group V, it was 9.4% in 1980 (ranging from 5.5% in Bolivia to 13.3% in Nicaragua) and 9.9% in 1995 (ranging from 6.3% in Bolivia to 13.4% in Nicaragua).

FIGURE 11
Trends in national expenditure on health as a
percentage of the gross domestic product (GDP),
Region of the Americas, 1984–1994.

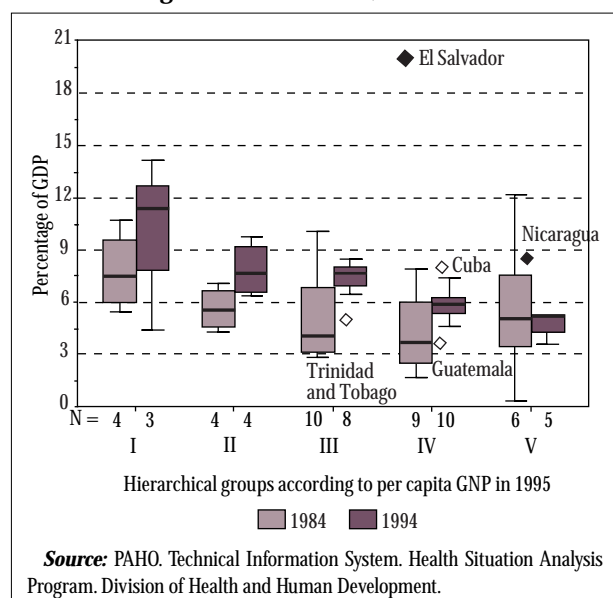
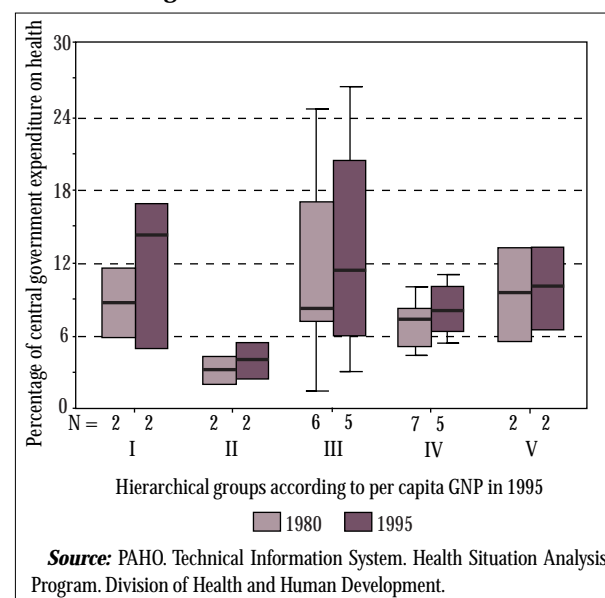


FIGURE 12
Trends in national expenditure on health as a
percentage of central government expenditure,
Region of the Americas, 1980–1995.



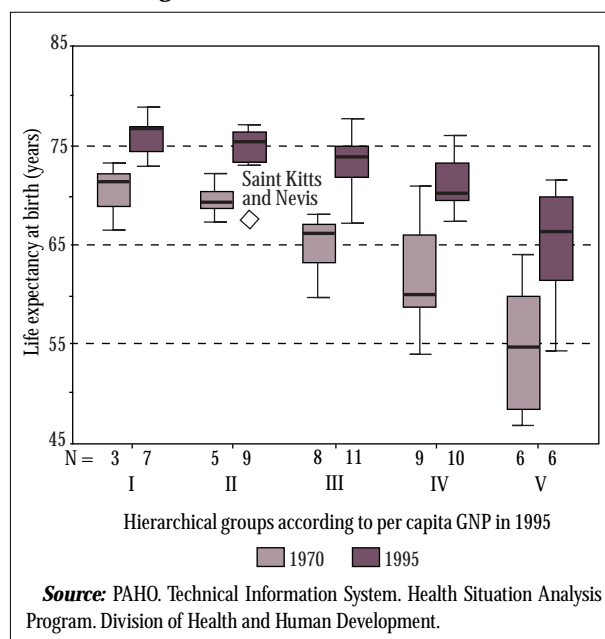
In the countries of the Americas, health expenditure as a percentage of GDP and of central government expenditure increased modestly, as a direct consequence of the prevailing macroeconomic climate and the structural changes implemented by the countries. Specifically, lower inflation, higher investment levels, and financial regulation have boosted the GDP, while fiscal adjustments, privatization, and lower public expenditure have made more central government resources available. Since these percentage increases were higher than the rate of population growth, the trends suggest real growth in absolute terms of per capita resources for health. Two key considerations should be borne in mind when analyzing this indicator: first, the shifting impact of prices and demand, i.e., the lower relative cost of private health care services and the increase in demand for such services⁹ as a result of changing epidemiological profiles and prevailing economic models, and second, the inequitable redistribution of available resources to ensure health care for the various segments of the population.

Life Expectancy at Birth

As mentioned earlier, the Region of the Americas is enjoying longer life expectancies. In Latin America especially, life expectancy at birth rose from approximately 50 years after the Second World War to 67 years in 1990 and to 69 years in 1995. The risk of death for children is significantly lower than 50 years ago and in some countries (or areas of countries) it has dropped to one tenth its previous level. Although the long-term trend of this indicator tends toward an increase, the gradient between groups tends to decrease: in other words, as countries secure health gains, their population's life expectancy increases, but lower economic levels still mean shorter life expectancies. The seven countries in Group I had the highest median value for life expectancy at birth: 71 years for the period 1970–1975 and 77 years for 1995–2000, ranging from 73 years (British Virgin Islands) to 79 years (Canada) in the latter period. The median value for this indicator in Group II rose from 69 to 75 years between the same periods, from 66 to 74 years in Group III, from 60 to 70 years in Group IV, and from 55 to 66 years in Group V (Figure 13).

Looking at the individual values for the 48 countries and territories of the Region for the 1995–2000 period, all of them (except for Haiti) had life expectancies at birth of over 60 years, which was the target set in the global strategy of Health for All by the Year 2000; in 36 countries, it was over 70 years, which was set as the regional Health for All target. These figures are country-wide estimates and, accordingly, do not re-

FIGURE 13
Trends in life expectancy,
Region of the Americas, 1970–1995.



flect the fact that life expectancy exhibits very different values and patterns in different population subgroups, depending on the area of residence (rural, urban, marginal urban), race, ethnic group, occupation, geographical location, and other factors. Sex is used as a key variable in disaggregating life expectancy at birth. In the Region of the Americas, improvements in this indicator benefited women most: between 1950–1955 and 1995–2000, the gap between male and female life expectancy grew from 3.3 to 5.7 years in Latin America, from 2.7 to 5.2 years in the Caribbean, and from 5.7 to 6.6 years in North America.

Women enjoyed higher life expectancies than men in all countries of the Region. This is in line with expectations and, indeed, very few countries in the world display the opposite trend.¹⁰ Available data for the Americas indicate that general mortality has always been higher among men than women. While biological factors may play a role in higher male mortality, lifestyles and living conditions are, without doubt, the main factors. A discussion of mortality by cause and by sex is presented below in the section on mortality profiles. The difference between male and female life expectancy is 6.4 years

⁹See the section on national health expenditure in Chapter 4 of this publication.

¹⁰Longer male life expectancies have been documented in India and Sri Lanka, for instance, owing to a combination of circumstances that affect the female population, e.g., high prevalence of malnutrition, high fertility rates, and high maternal mortality.

for the Region and for Latin America, although considerable variation exists from one subregion or country to the next. In Brazil, for example, the difference is 7.8 years, while in the Latin Caribbean it is 4.3 years; in Aruba, the difference is 8 years, and in Montserrat and Saint Vincent and the Grenadines, it is 3 years; in Argentina, it is 7.2 years, and in Paraguay, 4.5 years. It is interesting to note that in Cuba, where life expectancy has reached levels as high as 76 years, the difference in mortality between males and females yields a difference of only 3.8 years in life expectancy at birth; a similar situation is observed in Belize, Montserrat, and, to a lesser extent, Costa Rica. Other countries with similar overall life expectancies, such as Barbados, the United States, and Puerto Rico, display very marked differences between the two sexes.

Life expectancies have presented a clear trend in the Region of the Americas over the last 25 years: the gaps in this robust summary indicator of health gains are slowly being closed. In at least six cases, the country-to-country differences in life expectancy at birth shrank considerably between 1970–1975 and 1995–2000: between Jamaica (from 68.6 to 74.6 years) and Chile (from 63.6 to 75.3 years); between Argentina (from 67.2 to 73.2 years) and Mexico (from 62.6 to 72.5 years); between Suriname (from 64.0 to 71.5 years) and the Dominican Republic (from 59.9 to 70.9 years); between Paraguay (from 66.0 to 69.7 years) and Honduras (from 54.1 to 69.8 years); between Guyana (from 60.0 to 64.4 years) and Peru (from 55.5 to 68.3 years); and between Brazil (from 59.8 to 67.1 years) and Guatemala (from 54.0 to 67.2 years). Of course, survival is not a linear function of life expectancy; that is to say, the gain of one additional year of life in a life expectancy of, for instance, 60 years is not the same as a gain of one year of additional life in a life expectancy of 75 years. Nevertheless, gaps in life expectancy at birth have closed between selected countries that are representative of each of the various groups analyzed and of different life expectancies. This steady decrease in country-to-country differences in life expectancy not only means that real health gains have been achieved, which may be attributable to population-wide health measures applied in the countries of the Region over the last 25 years, but it also fundamentally illustrates the varying degrees of success that the countries of the Americas have had in attaining higher, sustainable levels of human development.

POPULATION TRENDS

The Region had a total population of approximately 800 million in 1998 (Table 2) and represented 13.5% of the world population. One-third of the Region's population was located in the United States, one-third in Brazil and Mexico, and the remaining third in the other 45 countries and territories. North America—with just over 300 million inhabitants—

was the most populous of the subregions,¹¹ followed by Brazil, with a population equivalent to just over one-half North America's population (Figure 14). The Andean Area had 106 million inhabitants spread over five countries, with Colombia being the most populous (38 million) and Bolivia the least (8 million). Mexico's population may well break the 100 million mark during the first year of the next century. Of the four countries that make up the Southern Cone, Argentina had the largest population (36 million) and Uruguay the smallest (3 million). In the Central American Isthmus, nearly 30% of the subregion's 34 million inhabitants live in Guatemala, against a total of 230,000 in Belize. In the Latin Caribbean, Cuba had the largest population (11 million) and Puerto Rico the smallest (nearly 4 million). The subregion of the rest of the Caribbean, with its 23 countries and territories, was the least populous: just under 8 million, ranging from 2.5 million in Jamaica to 8,000 in Anguilla.

Population Growth¹²

Although, the size of the population in each of the subregions differed considerably, as the preceding figures show, the growth in the actual number of persons in each subregion over a given period bears some similarities. For instance, even though the population of the United States was 65% larger than Brazil's, U.S. population growth between 1993 and 1998 was only 10% higher (11.7 million compared to 10.6 million), because the annual rate of population growth in the United States (0.9%) was lower than in Brazil (1.3%). The difference in the rate of population growth between the two countries is expected to grow (from 0.7% in 1998 to 1.2% in 2003), so the next five-year period should see greater population growth in Brazil than in the United States (10.5 million compared to 10.0 million), despite immigration flows into the latter country. A similar comparison can be drawn between Brazil and the Andean Area, which grew by 9.5 million in the periods considered. The population of the Central American Isthmus, however, grew more than the Southern Cone's did, although

¹¹The countries and territories of the Americas have been grouped into three broad areas: North America, the Caribbean, and Latin America. North America comprises Bermuda, Canada, and the United States. The Caribbean is divided into two subregions: the Latin Caribbean (Cuba, the Dominican Republic, Haiti, and Puerto Rico) and the Caribbean *per se*, which includes all the other countries and territories in the basin, including three non-insular Caribbean countries: French Guiana, Guyana, and Suriname. Latin America is divided into five subregions: the Andean Area (Bolivia, Colombia, Ecuador, Peru, and Venezuela), the Southern Cone (Argentina, Chile, Paraguay, and Uruguay), Brazil, Mexico, and the Central American Isthmus (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama).

¹²The 10 statistical tables in the Annex at the end of this chapter (A1 through A10) present figures on this and other topics addressed in this section.

TABLE 2
Population of the Americas: size, five-year change, and annual growth by subregion and country, 1993, 1998, and 2003.

Subregion and country	Population (thousands)			Five-year change		Average annual growth (%)	
	1993	1998	2003	1993–1998	1998–2003	1993–1998	1998–2003
Region of the Americas	751,675	803,208	852,450	51,533	49,242	1.3	1.2
Latin America	423,336	457,367	490,749	34,031	33,382	1.5	1.4
Rest of America	328,339	345,841	361,701	17,502	15,860	1.0	0.9
Andean Area	96,229	105,859	115,438	9,630	9,579	1.9	1.7
Bolivia ^a	7,064	7,957	8,894	893	937	2.4	2.2
Colombia ^a	34,534	37,684	40,696	3,150	3,012	1.7	1.5
Ecuador ^a	10,981	12,175	13,343	1,194	1,168	2.1	1.8
Peru ^a	22,740	24,801	26,951	2,061	2,150	1.7	1.7
Venezuela ^a	20,910	23,242	25,554	2,332	2,312	2.1	1.9
Southern Cone	55,369	59,414	63,426	4,045	4,012	1.4	1.3
Argentina ^a	33,869	36,125	38,401	2,256	2,276	1.3	1.2
Chile ^a	13,771	14,822	15,774	1,051	952	1.5	1.2
Paraguay ^a	4,580	5,228	5,922	648	694	2.6	2.5
Uruguay ^a	3,149	3,239	3,329	90	90	0.6	0.5
Brazil ^a	154,846	165,473	175,949	10,627	10,476	1.3	1.2
Central American Isthmus	30,094	34,115	38,330	4,021	4,215	2.5	2.3
Belize	203	230	259	27	29	2.5	2.4
Costa Rica ^a	3,269	3,649	4,018	380	369	2.2	1.9
El Salvador ^a	5,395	6,057	6,706	662	649	2.3	2.0
Guatemala ^a	9,462	10,802	12,309	1,340	1,507	2.6	2.6
Honduras ^a	5,336	6,147	7,001	811	854	2.8	2.6
Nicaragua ^a	3,891	4,463	5,053	572	590	2.7	2.5
Panama ^a	2,538	2,767	2,984	229	217	1.7	1.5
Mexico ^a	87,983	95,830	103,301	7,847	7,471	1.7	1.5
Latin Caribbean	28,909	30,791	32,635	1,882	1,844	1.3	1.2
Cuba ^a	10,845	11,115	11,308	270	193	0.5	0.3
Dominican Republic ^a	7,542	8,232	8,877	690	645	1.8	1.5
Haiti ^a	6,893	7,637	8,466	744	829	2.0	2.1
Puerto Rico	3,629	3,807	3,984	178	177	1.0	0.9
Caribbean	7,326	7,714	8,115	388	401	1.0	1.0
Anguilla	8	8	9	0	1	0.0	2.4
Antigua and Barbuda	65	67	69	2	2	0.6	0.6
Aruba	69	72	75	3	3	0.9	0.8
Bahamas	269	293	315	24	22	1.7	1.4
Barbados	259	263	267	4	4	0.3	0.3
Cayman Islands	29	34	39	5	5	3.2	2.7
Dominica	71	71	72	0	1	0.0	0.3
French Guiana	135	166	198	31	32	4.1	3.5
Grenada	92	93	95	1	2	0.2	0.4
Guadeloupe	411	444	474	33	30	1.5	1.3
Guyana	813	856	900	43	44	1.0	1.0
Jamaica	2,422	2,539	2,659	117	120	0.9	0.9
Martinique	372	392	410	20	18	1.0	0.9
Montserrat	11	11	11	0	0	0.0	0.0
Netherlands Antilles	191	198	205	7	7	0.7	0.7

TABLE 2 (continued)
Population of the Americas: size, five-year change, and annual growth by subregion and country, 1993, 1998, and 2003.

Subregion and country	Population (thousands)			Five-year change		Average annual growth (%)	
	1993	1998	2003	1993–1998	1998–2003	1993–1998	1998–2003
Saint Kitts and Nevis	42	41	41	–1	0	–0.5	0.0
Saint Lucia	139	148	158	9	10	1.3	1.3
Saint Vincent and the Grenadines	110	115	120	5	5	0.9	0.9
Suriname	416	442	466	26	24	1.2	1.1
Trinidad and Tobago	1,267	1,318	1,380	51	62	0.8	0.9
Turks and Caicos Islands	13	16	18	3	2	4.2	2.4
Virgin Islands (UK)	18	20	23	2	3	2.1	2.8
Virgin Islands (US)	104	107	111	3	4	0.6	0.7
North America	290,919	304,012	315,256	13,093	11,244	0.9	0.7
Bermuda	63	64	67	1	3	0.3	0.9
Canada	28,802	30,194	31,390	1,392	1,196	0.9	0.8
United States	262,054	273,754	283,799	11,700	10,045	0.9	0.7

^a**Source:** Latin American Center for Demography. Projections for the population in Latin America. Santiago, Chile: CELADE; 1997.

Source: United Nations. Annex I. Demographic Indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.

the size of the population is smaller. Lastly, while the Latin Caribbean grows by 2 million persons every five years, the rest of the Caribbean grew very little in the last period and, if current trends continue, there will be virtually no growth over the coming five years.

At the subregional level, the highest annual growth rates were observed in the Central American Isthmus and the lowest were in North America (Figure 15). The Caribbean subregion includes the countries and territories with the highest rates of population growth (French Guiana and the Turks and Caicos Islands), as well as those with the slowest growth (Saint Kitts and Nevis). Except for Panama, the countries of the Central American Isthmus were growing at rates of over 2% per annum; Honduras, the country with the fastest population growth, grew at an annual rate of 2.8% between 1993 and 1998. Countries in other subregions also posted rapid growth rates, e.g., Paraguay, Bolivia, and Haiti.

In nearly all the countries, population growth rates have presented a long-term downward trend. Since the drop has only been by a few decimal points, the population of these countries is expected to continue growing for several decades into the coming century if this trend continues.

Births

Despite falling birth and fertility rates, most of the subregions have not shown any decrease in the number of births;

in fact, the number has increased in some. Prenatal and post-natal care planners must consider the fact that, although fertility rates have declined and are expected to continue to do so, the number of women who will become pregnant over the coming five years will not decline in most of the countries of the Americas. A similar situation will be observed concerning the number of births and young children: according to United Nations projections, 15.4 million children will be born in the Americas in 1998 and roughly the same number will be born in the year 2003 (Table A1). Even so, there are some noteworthy differences between the subregions: in the Andean Area, Mexico, the Caribbean, and North America, births will drop slightly over the coming five years, while in the rest of the subregions they will show a slight increase; the net result for the Region as a whole will be an increase of 47,000 births between 1998 and 2003.

The distribution of births in the Americas is different from the population distribution. Births in the United States, Brazil, and Mexico represent a lower percentage than their percent share of the Region's population; in the other 45 countries, births represent higher proportions with regard to the total for the Americas.

Birth Rates

Birth rates in the Americas have fallen significantly over the last 35 years, and the trend is expected to continue. The

FIGURE 14
Population of the Region of the Americas,
by subregion, 1998.

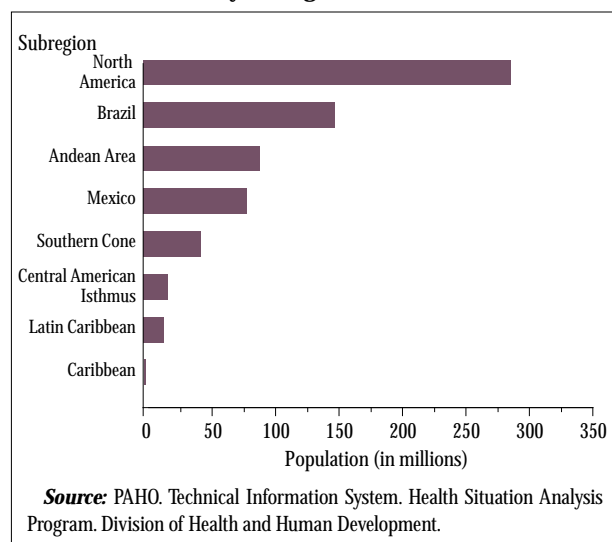
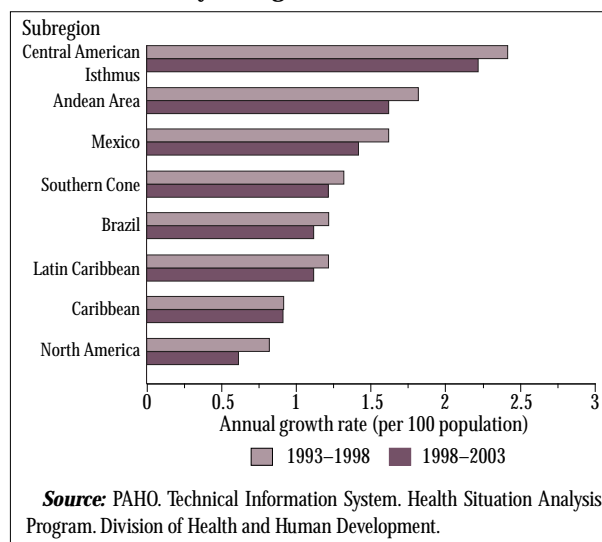


FIGURE 15
Population growth in the Americas,
by subregion, 1993–2003.



rates observed in most of the countries of the Region in the 1960s were of a magnitude rarely seen elsewhere. With the exception of North America, the Caribbean, and two countries of the Southern Cone (Argentina and Uruguay), rates in the Hemisphere exceeded 40 births per 1,000 population; in Mexico, Brazil, and some countries of the Central American Isthmus and the Andean Area, they fluctuated around 45 births per 1,000 population.

Family planning programs began to be implemented in most countries of the Region around 1970, and had become firmly entrenched in the Americas by the 1980s; as a result, the birth rate for 1998 has been estimated at 19.2 per 1,000 population for the Region as a whole. At the subregional level, the highest rates were estimated in the Central American Isthmus (31.2), the Andean Area (24.8), and Mexico (24.4), while North America (13.5), the Caribbean (17.8), and Brazil (19.5) had the lowest rates. At the individual country level, Guatemala (36.1), Haiti (34.0), Honduras (33.2), Nicaragua (33.2), and Bolivia (32.9) had the highest rates, while Canada (11.9), Cuba (13.0), the Turks and Caicos Islands (13.0), and the United States (13.7) had the lowest ones (Table A1).

Fertility Rates

In the Region of the Americas, fertility rates continued to describe a downward trend. At the subregional level, the total fertility rate was lowest in North America (2.00 children per woman) and Brazil (2.16) (Table A1). If these levels are maintained and there is no international immigration, the popula-

tions of these subregions will begin to drop.¹³ The Caribbean subregion, too, had low fertility rates, although with considerable variations between countries. For example, the 1998 rate was estimated at 1.35 for the Cayman Islands, but at 3.65 for Grenada. Country-to-country variations are more accentuated in the Latin Caribbean: Cuba's total fertility rate for 1988 was calculated at 1.55 and has been below the replacement level¹⁴ for several years; Puerto Rico's fertility rate is right at the replacement level; and Haiti has one of the highest rates in the Americas (4.58). The subregion with the highest fertility rate is Central America: Guatemala and Honduras have total fertility rates of more than 4 children per woman.

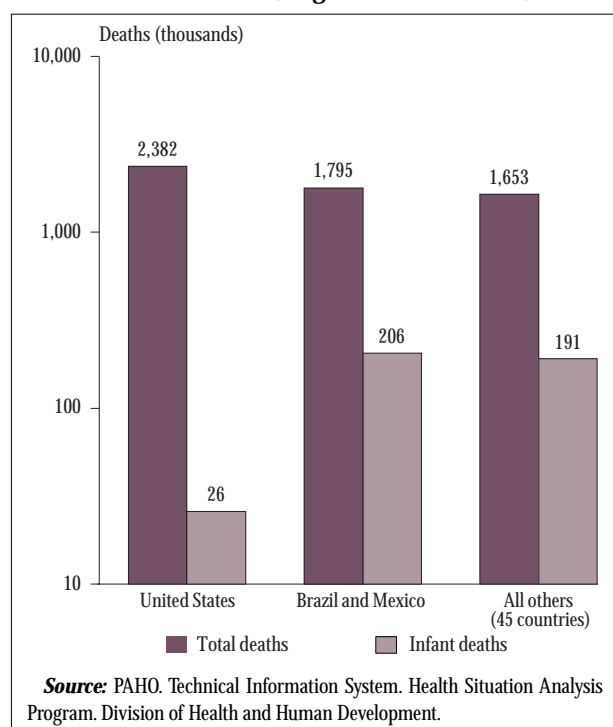
Deaths

In the Americas, deaths exhibit wholly different distribution patterns from births: the country with the most deaths was the United States, followed by Brazil and Mexico (combined), and then by the remaining 45 other countries of the Region (Figure 16). At the subregional level, the highest number of deaths was found in North America (45% of the regional total), followed by Brazil (20%); the remaining 35% was distributed among the other subregions (Table A2). These differences stem from the population's size, age structure, and specific mortality for each age group. North America, for example, had a considerably higher proportion of peo-

¹³See the Technical Notes.

¹⁴See the Technical Notes.

FIGURE 16
Total and infant deaths, Region of the Americas, 1998.



ple aged 55 years and older than the other subregions; the Caribbean, on the other hand, had the smallest total population of all the subregions.

Crude Death Rate

Crude death rates fluctuated very little among the subregions and reflected the aging of the population: North America had the highest rate (8.6 per 1,000 population in 1998) and Mexico the lowest (5.1 per 1,000). At the individual country level, Costa Rica had the lowest crude death rate (3.8 per 1,000), although that rate has begun to rise as the country's population structure ages; it is expected to reach 4.0 in the year 2003. The high crude rates found in Haiti and Bolivia reflect high mortality at younger ages in an eminently young population.

As indicated above, life expectancy at birth in most of Latin American countries has more than doubled since the beginning of the century. At present, North America is the subregion with the highest life expectancy at birth (77 years), followed by the Caribbean (74 years), and the Southern Cone (73.5 years). There are significant differences within the subregions, however. In the Latin Caribbean, for instance, life expectancy at birth in Cuba and Puerto Rico is more than 20

years higher than in Haiti, while in the Andean Area, Venezuelans and Colombians can expect to live about 10 years longer than Bolivians (Table A3).

International Migration

One of the least documented demographic phenomena worldwide is international migration and, consequently, estimates of international migratory movements may not fully reflect the actual situation. Estimates are usually based on changes in the number of foreign-born individuals as identified by national censuses. Data from national immigration services are calculated from the number of residency visas issued in a given year. Some of these visas are issued to persons already living in the country, however, so the data do not accurately depict migratory movements. The data also do not indicate whether these persons arrived directly from their country of birth. Two other phenomena that need to be considered when analyzing international migration are illegal migration and refugees. The United States, for example, issued residency visas to 405,000 Mexican-born individuals in 1989, 679,000 in 1990, and 946,000 in 1991, but this does not mean that all those people entered the country in those years; many of them were conceivably in the country prior to that date and were granted legal residence under special legislation to normalize their status. This section presents data from four countries that have historically received large flows of immigrants: Argentina, Canada, the United States, and Venezuela; the data refer exclusively to immigrants born in the Americas and who reside in one of these four countries. Censuses conducted in 1990 reveal that the four countries had a total of 12.7 million non-native-born residents, representing 1.7% of the regional population of 718 million (i.e., only those countries for which information was available).

The information presented in Table A4 underscores the impact of migration on countries with the highest rates of emigration. For example, 20% of Grenadians, 19% of Guyanese, 18% of Barbadians, and 16% of Jamaicans live in Argentina, Canada, the United States, or Venezuela. The Latin Caribbean also exhibited high rates of emigration: 7% of Cubans, 5% of Dominicans, and 4% of Haitians lived in one of these four countries. Roughly 5% of native-born Mexicans (some 4.3 million people) had left the country for one of the four above-mentioned countries, mostly the United States.

The United States is the largest recipient of immigrants in the world, significantly more than any other country in the Americas. Based on 1990 census data, the United States had 10.2 million residents who were born elsewhere in the Americas; Venezuela had 0.7 million. Even so, the immigrant population represented a relatively similar proportion in each of the four countries. In other words, immigration is propor-

tional to the size of the population of the host country. Immigrants accounted for 3.6% of the population in the United States and 3.5% in Venezuela; similar patterns were observed in Argentina (2.7%) and Canada (2.5%). Each of these countries attracts people from different countries and with different characteristics. In the United States, 48% of resident foreigners from elsewhere in the Region were Mexican, 8% were Canadian, and 8% were Cuban; in Venezuela, 77% were Colombian; in Canada, 36% were United States nationals and 15% were Jamaican; in Argentina, 84% of the immigrant population came from neighboring countries: Paraguay (29%), Chile (28%), Uruguay (21%), and Bolivia (16%).

Projections of international migratory movements depend on host country legislation and on conditions in prospective emigrants' home countries. Judging by the number of residency visas issued by the Immigration and Naturalization Service of the United States, legal immigration flows have dropped steadily since 1993. Available data for the 1993–1995 period indicate that, on average, 315,000 immigrants born in other countries of the Americas had been admitted each year, 85% of whom were from Latin America and the rest from the Caribbean and Canada; 35% were born in Mexico (109,000) and 23% were born in Latin Caribbean countries, mainly the Dominican Republic (45,000). Emigration from the Central American Isthmus to the United States continued to run high; an average of 43,000 people were granted residency each year between 1993 and 1995, accounting for 14% of all residency visas issued to nationals of countries in the Americas. El Salvador was the largest contributor, with a total of 19,000 people each year.

Urbanization

Size of the Urban Population

The countries of the Americas display high degrees of urbanization, if this can be stated as the percentage of the population that lives in urban areas. In 1998, the Southern Cone was the subregion with the highest percentage of urban population (85%), two percentage points higher than North America. The countries of the Andean Area exhibited different levels of urbanization: while Venezuela stood at 87%, for Bolivia and Ecuador the percentages were 63% and 61%, respectively. Similar patterns were observed in the Latin Caribbean, ranging from 77% in Cuba to 34% in Haiti.

Rural and Urban Populations

The concentration of public and private services that cities offer makes them magnets for rural inhabitants. This, cou-

pled with the expansion of transportation and communications networks, has led much of the farming population to leave the countryside to live with their families in the city and enjoy the social services offered by city living. It is not surprising, then, that for the Region as a whole the rural population has remained constant, i.e., the natural growth of rural areas has been absorbed by the cities, triggering an upswing in urban growth rates.

In the Southern Cone, Brazil, the Caribbean, and North America, the rural population has begun to shrink (Table A5); in the Andean Area, it has remained constant; and in Mexico and the Latin Caribbean, it continues to grow, although more slowly. The only subregion showing significant rural growth was the Central American Isthmus (Table A6). All the countries present a similar pattern: rural population growth rates over the next five years are expected to be lower than those recorded during the 1993–1998 period. The only exceptions are found in the Caribbean, where some less populous countries and territories could see an increase in rural growth rates. Brazil, too, represents a kind of an exception, in that the rural growth rate for the coming five years (–1.4%) is expected to be higher than the current rate (–1.7%); these negative rates mean that the expected decrease in the rural population over the next five years will be less than the decrease observed between 1993 and 1998. A similar situation was observed in Argentina and Uruguay. In order to determine the specific contribution of rural-to-urban migration and the impact of the reclassification of rural localities into urban centers on the drop in the rural population, urbanization in each country must first be examined in detail.

Urban growth rates are the result of both natural growth and rural-to-urban migration. In the early stages of urbanization, migration often is slow, since there are usually very few cities that hold sufficient draw. As development models progress, though, rural populations exhibit a greater tendency to emigrate to urban areas. Even when emigration rates are low, the fact that the size of the rural population is larger than the urban population means that the number of migrants has a significant impact, producing high urban growth rates, especially in capital cities. This explains the rapid growth and consolidation of capital cities such as Buenos Aires, Caracas, Lima, Mexico, Santiago, and others. Exceptions to this virtually exclusive growth of the capital city can be found in Brazil, Colombia, Ecuador, and the United States.

Once a country's rural population falls below 50%, the contribution of rural-to-urban migration to the urban growth rate begins to steadily decrease. As an area becomes more urbanized, the urban growth rate decreases, not only because the number of rural immigrants becomes less significant as a share of the urban population, but also because the natural growth in urban areas is less than in rural areas, owing to lower fertility rates. This explains why the subregion of the Central American

Isthmus, with an urban population of only 48%, has the highest rates of urban population growth: over 3% per annum for the 1993–1998 period. North America and the Southern Cone, on the other hand, already have high percentages of urban population, so urban growth rates there are low. Here again, Brazil is an exception, because of the high rate of negative rural growth that helped to fuel urbanization processes in that country. This resulted from Brazil's creation of 1,000 new *municípios* between 1992 and 1996 (an increase of 23%), which led to the reclassification of many rural areas as urban.

Pace of Urbanization: Differences in Rates

Latin America's urbanization pace has been somewhat faster than that of the other subregions, but given changes expected in the 1993–1998 and 1998–2003 periods, the pace will likely slow down for all the subregions. This phenomenon can be attributed almost entirely to the situation in Brazil, where urbanization occurred at a much faster pace than in the other subregions; as indicated earlier, Brazil's rural population fell sharply between 1993 and 1998 and is expected to continue falling, albeit somewhat more slowly, over the coming five-year period.

Growth of Cities

Examining changes and trends in urban and rural populations is only part of an analysis of urbanization. The Region's cities range from sprawling agglomerations to relatively small urban centers, and the characteristics and needs of urban populations are often quite different, depending on the size of the city where they live. Cities in the Region began to boom in the 1950s, especially in Latin America. In the 1950s and 1960s, metropolitan areas of 100,000 inhabitants and more grew more rapidly in that subregion than anywhere else in the world, expanding at a rate of nearly 60% per decade. In the course of 15 years, Latin American cities doubled their populations. The Region's major cities are now growing more slowly, although the rate is still significant in absolute terms. The situation in the Americas for 1998 indicates that there will be as many people living in cities of 750,000 and more as in cities under 750,000 (Table A7).

Age Structure

A country's population is considered to be young when roughly one-half is under age 20. Such a structure occurs only when the fertility rate is high. Changes in mortality have little impact on a population's age structure; and for migration to

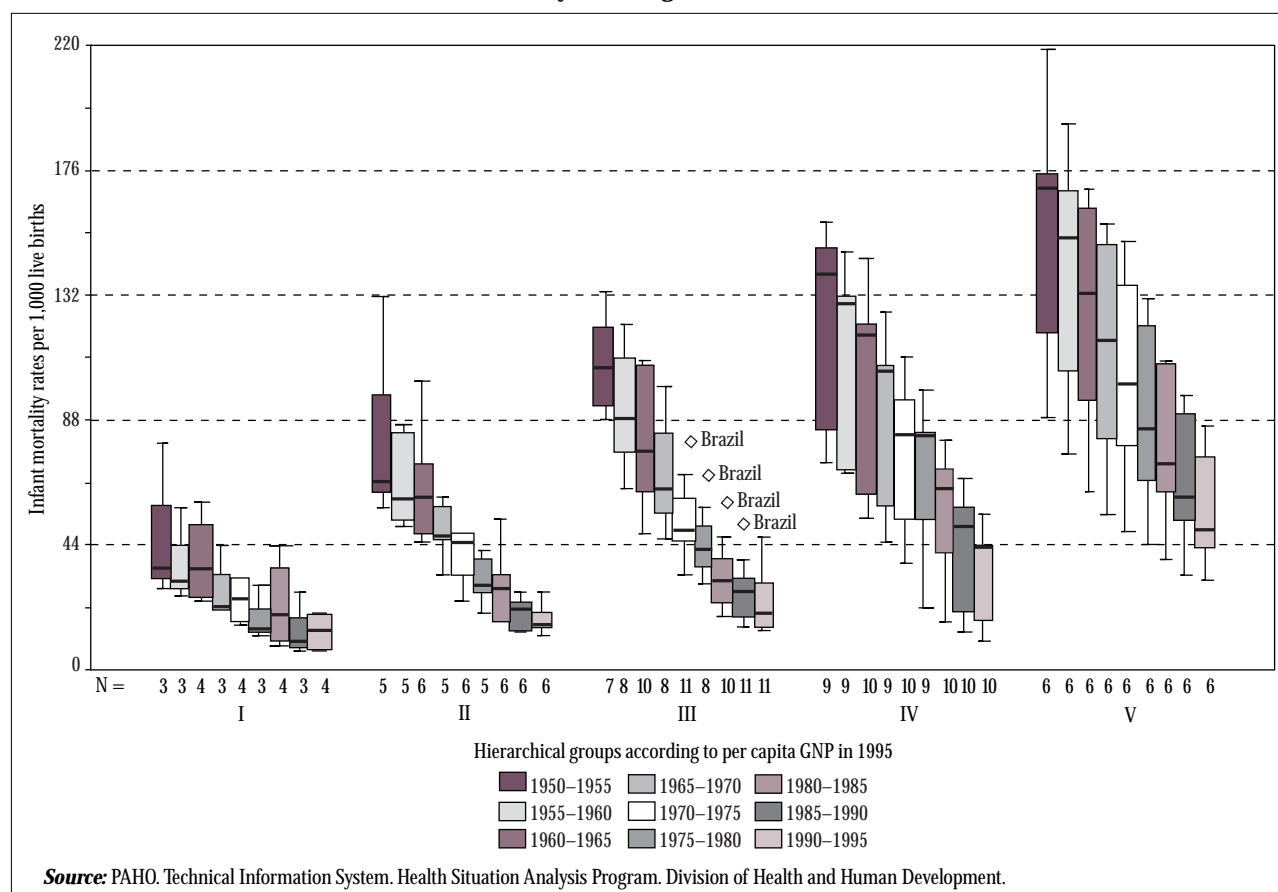
produce a young structure, there would have to be a major influx of very young people or a continuous outflow of adults. Around the middle of the century, the populations of most Latin American countries had a very young age structure. This pattern peaked in the mid-1960s, as a result of the rapid decrease in mortality, especially among children under 5 years old. The early 1970s saw a gradual aging of Latin American populations; fertility plummeted and remained low, and mortality among adults 50 years old and older also dipped sharply. In some countries (e.g., the United States, Canada, Argentina, and Uruguay), this process had already begun in the century's early decades.

Central America has both the highest percentage of children under 15 years old and intermediate fertility rate levels; the lowest percentage of young people is found in North America, which has always had the lowest fertility rates in all the Americas (Table A8). In contrast, the percentage of persons 65 and older is higher in the subregions with lower fertility rates (North America, the Southern Cone, and the Latin Caribbean). The population aged 85 and older (especially women) is the fastest growing age group in the Region, confirming that the aging process of the population is under way in the Americas. Although the ratio of adults to the elderly was still high in most countries of the Region (Table A9), changes in the age structure have begun to have an impact on social security and pension systems.

THE RISK OF DYING

Death is the health event that has the highest social cost associated with it, and it continues to be a key indicator of the health situation. Mortality rates are not only an indicator of the magnitude of this event, but are essentially an indicator of the absolute risk of death in terms of cause, age, population, and time. Tables A10, A11, and A12 show estimated specific mortality rates by age group for selected countries in the Region of the Americas over the last three five-year periods. The following analysis provides an overview of mortality trends in the Region for two age groups that represent different points in the human life cycle and different risks of dying: children under 1 year of age and adults 45–64 years old. General trends in specific mortality rates by age and sex are presented for the five country groups (ranked by per capita GNP) and, to give an idea of the respective proportional distributions, specific mortality rates by cause of death are presented for each of 14 countries selected because they are considered to be representative of their country group and geographical subregions of the Americas: Canada and the United States (Group I); Argentina and Barbados (Group II); Brazil, Chile, Costa Rica, Mexico, and Venezuela (Group III); Colombia, Cuba, El Salvador, and Peru (Group IV); and Nicaragua (Group V).

FIGURE 17
Trends in infant mortality rates, Region of the Americas, 1950–1995.



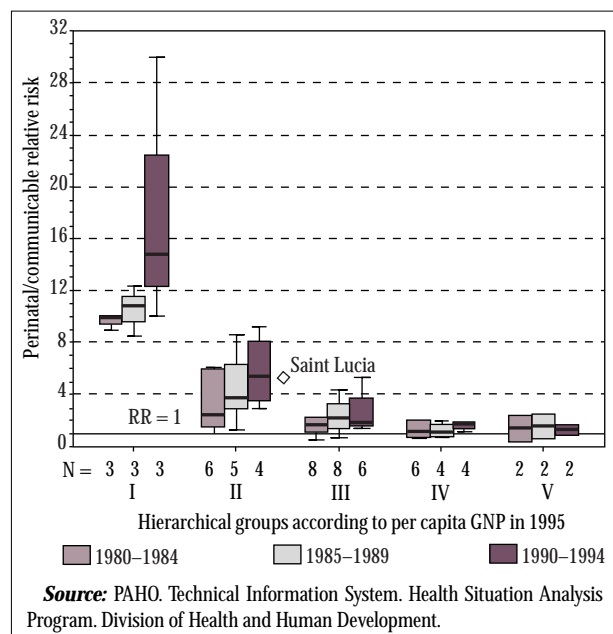
The Risk of Dying in Early Childhood

Infant mortality has steadily decreased in the Americas, and this is obvious in all five country groups (Figure 17). Decreases represent approximately a threefold drop between 1950–1955 and 1990–1995 in each country group. The rate of decline levels off at a threshold of around 40–45 deaths per 1,000 live births. This can be seen in Groups I–III, which have already dropped below this value. Variations in this indicator—especially the interquartile range—have been gradually decreasing in each group and in each period, which suggests that the groups are becoming increasingly homogeneous over time. In other words, the differences in infant mortality are narrowing within each group (group effect). Group III is the only one that includes a country (Brazil) that has infant mortality that is consistently higher than the rest of the group. Infant mortality trends point to the continued presence of differences among the country groups: in the most recent five-year period (1990–1995), Group V exhibited a median value for infant mortality (around 45 per 1,000 live births)

that Group I had attained more than 40 years ago (before 1950), Group II had reached 25 years ago (1965–1970), Group III had reached 20 years ago (1970–1975), and Group IV had reached 5 years ago (1985–1990). Considering that Group V reported a level of 100 deaths per 1,000 live births in 1970–1975, which (according to the time series examined) Group III had displayed in 1950–1955 (20 years earlier) and Group IV in 1965–1970 (5 years earlier), these group-to-group differences (cohort effect) do not appear to have widened, although they have held constant over the past 40 years. The long-standing nature of these differences in infant mortality in the Region means that, for instance, if in 1952 a child under 1 year of age in a Group V country was, on average, at 4.7 times greater risk of dying than a child in a Group I country (170.5/36.0), by 1992 (40 years later), the increased risk of death was still 3.6 times greater (49.0/13.5).

Viewed broadly, infant mortality can be considered to have two major groups of contributing causes: communicable diseases and perinatal conditions. The impact of the first is associated with broad changes in living conditions (safe water,

FIGURE 18
Trends in the ratio of perinatal mortality rates to communicable disease mortality rates in children younger than 1 year, Region of the Americas, 1980–1994.



sanitation, education, etc.), while the effect of the second is more directly related to access to high quality services and technology. A high rate of infant mortality can usually be reduced significantly first by means of interventions that address the communicable disease component. Subsequently, efforts to further reduce infant mortality through interventions that address the perinatal component will have less of an impact and entail higher costs. This is borne out by the ratio between mortality rates from perinatal conditions and from communicable diseases in the Region, as presented in Figure 18. A ratio of perinatal to communicable causes of 1:1 assumes that each component has equal weight in the infant mortality rate, thus indicating a higher potential for reduction, mainly at the expense of its communicable disease component. The greater the ratio, the greater the weight of the perinatal component compared to the communicable disease component, and the more dependent further efforts to reduce that rate will be on investing in high-quality technology. In the Americas, a very clear pattern can be seen in this indicator: the ratio of perinatal to communicable causes is lower (actually approaching 1:1) in the lower-income country groups, thus indicating a greater relative contribution of communicable diseases in the Region's higher infant mortality rates. For the 1990–1994 period, the median value for this indicator in Group I was 14.7:1, in Group II it was 5.4:1, in Group III it was 1.8:1, in Group IV it was 1.7:1, and in Group V it was 1.3:1. A long-term upward trend has been observed in

this indicator, i.e., the ratio of perinatal causes to communicable disease causes has increased in recent decades in all the country groups. This increase is consistent with the steep drop registered in infant mortality rates in the Region, especially as a result of interventions intended to reduce the communicable disease component. This upward trend is more clearly discernible in the higher-income countries, which had curtailed communicable diseases as a cause of infant mortality in previous decades. Hence, while the ratio for Group I rose from 10.0:1 in 1975 to 14.7:1 in 1995, for Group III it rose from 1.6:1 to 1.8:1 and for Group V from 1.4:1 to 1.3:1.

The shifting proportional profile of infant mortality by major groups of causes of death can be better appreciated by analyzing the structure of infant mortality in selected countries. For this, specific mortality rates were estimated for children under 1 year of age, rather than using general infant mortality. In other words, the denominator is the estimated population of children under 1 year of age, instead of the total number of live births, since the specific mortality rate for these children is usually somewhat higher than the general infant mortality rate (the correlation between the two is greater than 99.5% for the period under study). The specific mortality rates for children under 1 year of age are estimates, as pointed out above, and are expressed in terms of 100,000 population.

Between 1980–1984 and 1990–1994,¹⁵ most of the countries halved their mortality rates from communicable diseases among children under 1 year old (Figures 19a and 19b), although Groups I and II registered lower rates. Conditions originating in the perinatal period accounted for a proportionally larger share of mortality, especially in Groups I and II. The pattern reverses for the other groups, where communicable diseases took a higher toll. In Brazil, Mexico, and Nicaragua, the sharp drop in specific mortality rates for children under 1 year of age was owed mainly to a significant reduction in the communicable disease component, with no appreciable change in the perinatal component over the last three five-year periods. Some countries, however, achieved sizeable decreases in the rates for both types of causes, notably Chile, Costa Rica, Cuba, and El Salvador. Over the period studied, Chile consistently reported the highest mortality rates from external causes for children under 1 year of age; this situation merits further study. Lastly, the role of the residual component—i.e., the group of other diseases (which includes congenital anomalies)—in the specific mortality rate for children under 1 year of age has remained relatively stable in all countries and periods studied. That notwithstanding,

¹⁵In the following paragraphs, the five-year periods are based on calendar years, e.g., the period 1980–1984 covers the period from 1 January 1980 through 31 December 1984.

FIGURE 19a
Mortality in children younger than 1 year, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.

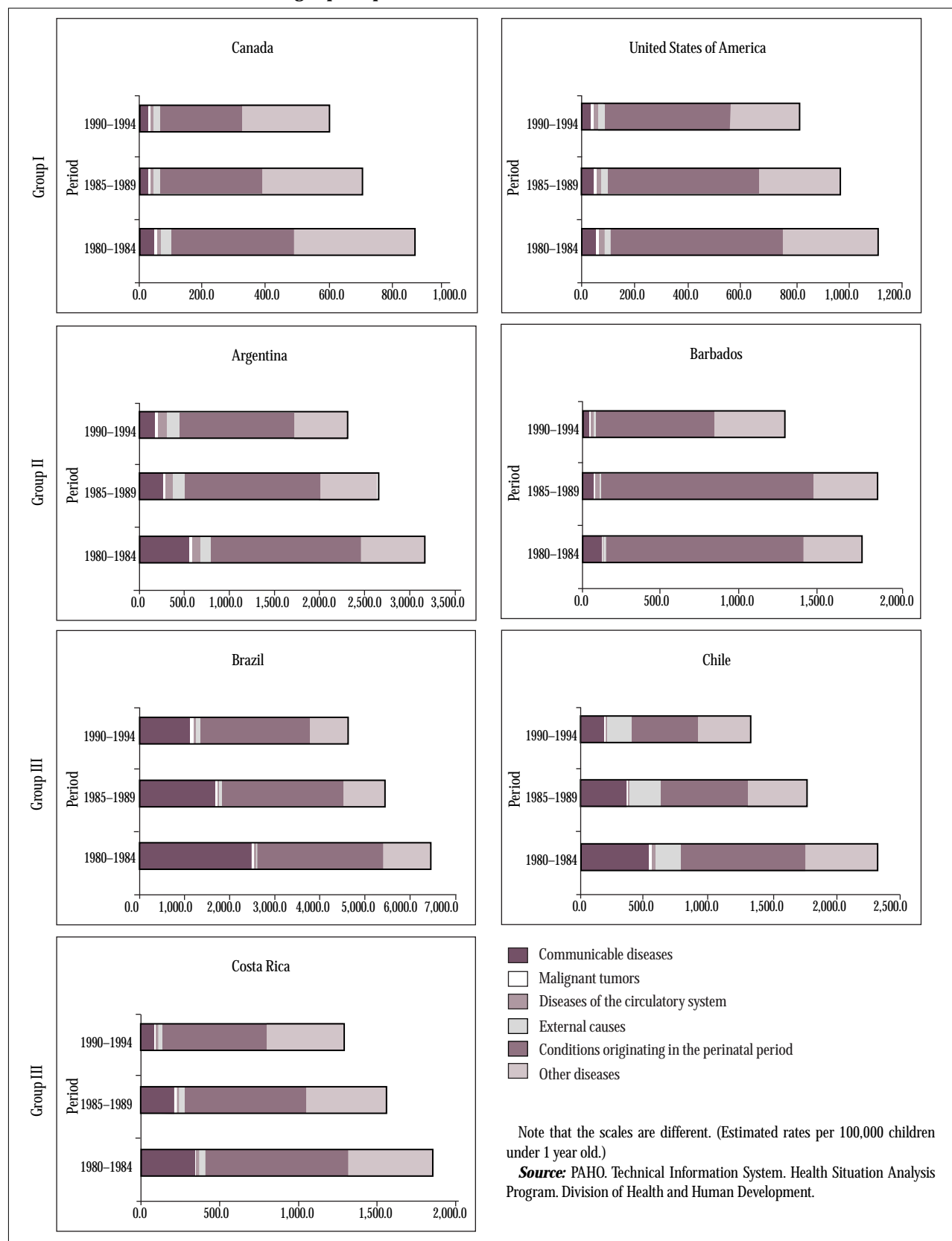


FIGURE 19b
Mortality in children younger than 1 year, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.

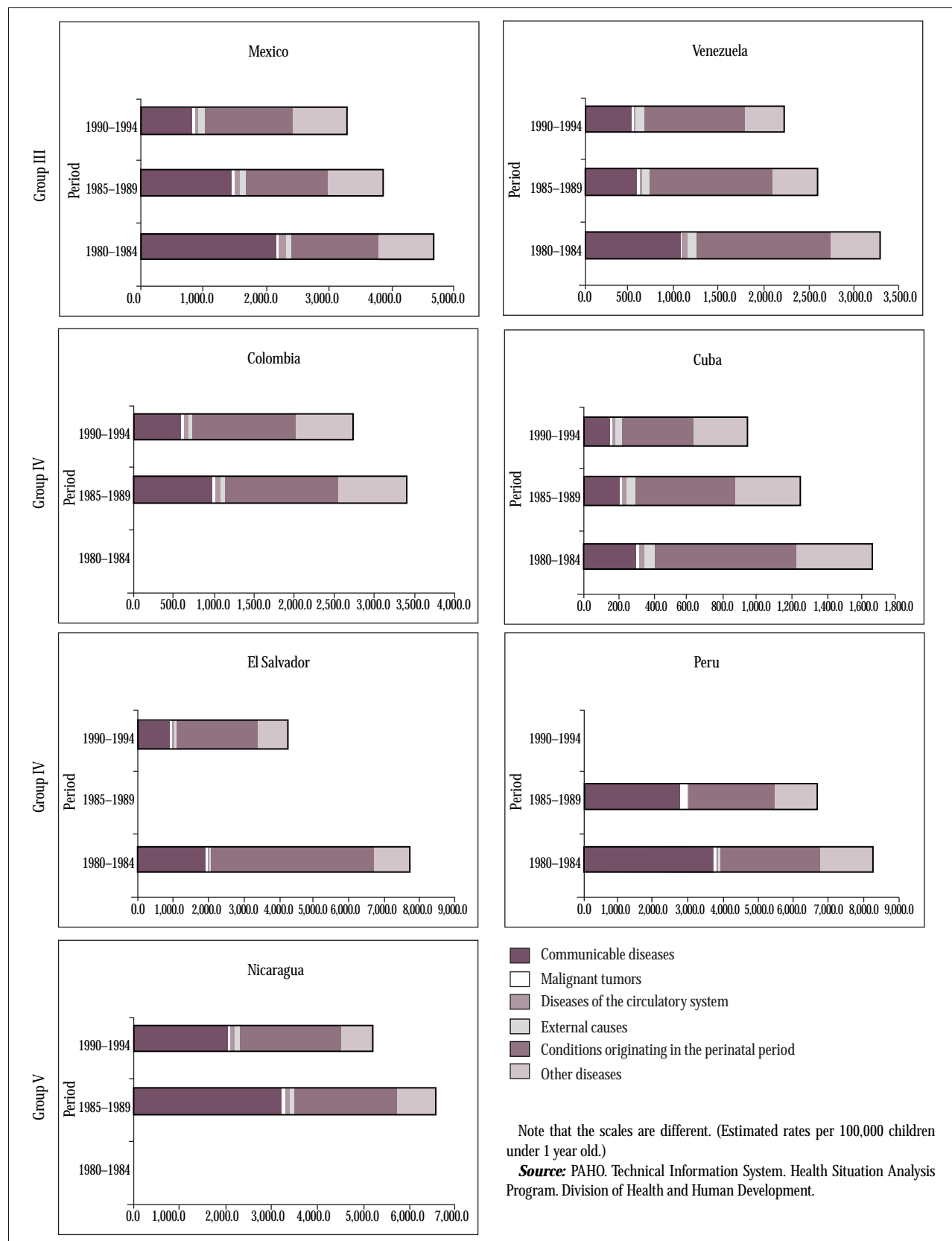
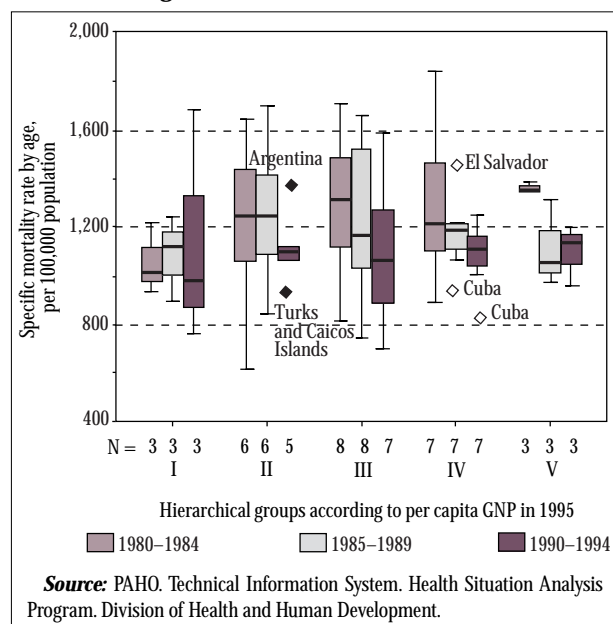


FIGURE 20
Trends in mortality in men aged 45–64 years, all causes,
Region of the Americas, 1980–1994.

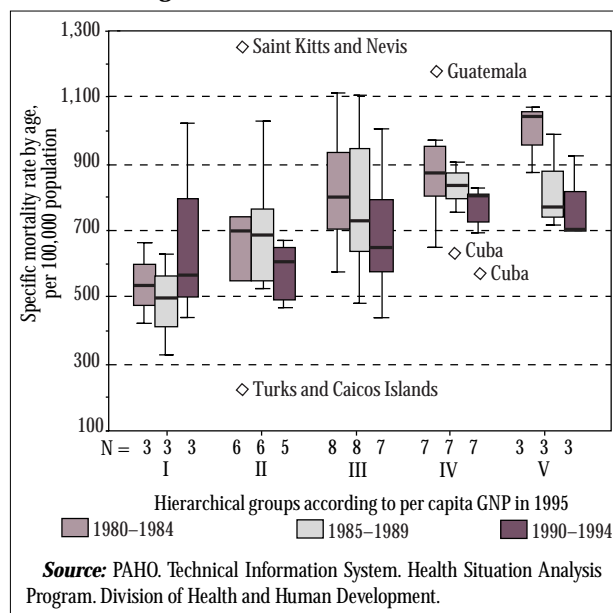


figures and percentages varied from one country to the next: the United States and Canada, for instance, reported the highest proportional mortality from this group of causes of death (between 35% and 40%).

The Risk of Dying in Adulthood

Unlike the situation with infant mortality, mortality among the 45–64-year-old age group in the Region of the Americas showed differences by sex. Mortality, and consequently the risk of dying, among males in this age group (approximately $1,200 \pm 400$ per 100,000) doubled that calculated for women (approximately 700 ± 200 per 100,000) during the period studied. Mortality in males in every country group showed no clear trend upwards or downwards between 1980 and 1994 (Figure 20): the median values for the five-year periods declined overall, but their distribution ranges shifted upward, thus somewhat stabilizing the overall trend. No group-to-group patterns could be detected in mortality levels among men in this age group; the risk of dying, and indeed the intensity of the event, was very homogenous in this cohort, regardless of the country group and, by extension, regardless of per capita income. This contrasts sharply with the mortality pattern observed among women in this age group (Figure 21). In addition to a modest, long-term downward trend within each country group (especially in Groups IV and V), there is an obvious gradient across groups: female mortality was systemat-

FIGURE 21
Trends in mortality in women aged 45–64 years, all causes,
Region of the Americas, 1980–1994.

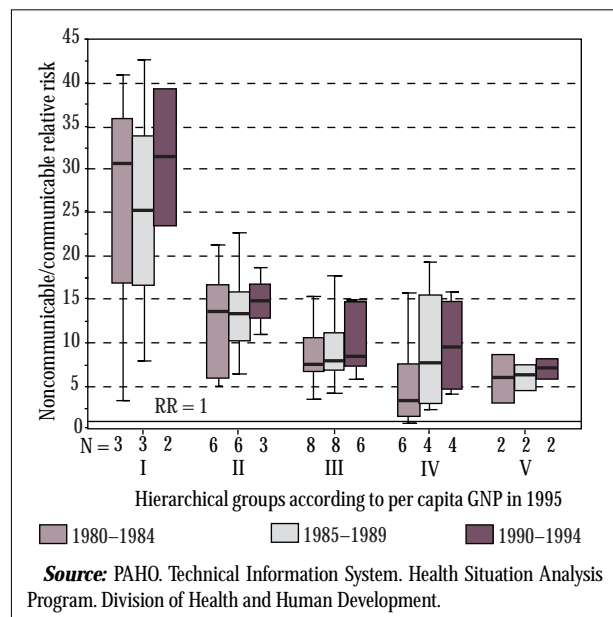


ically higher in the lower-income country groups, suggesting some type of gender inequality. Adult males in the Americas seem to have secured relatively greater and more equal access to preventive, curative, or palliative care services overall (see the breakdown of mortality by causes in these groups). Access for adult women, however, may have continued to be influenced by their economic level. That said, it should be noted that mortality among women in this age group was gradually declining.

Recent decades have seen a kind of epidemiological polarization in the Americas, with chronic noncommunicable diseases becoming more prominent in mortality profiles as a result of demographic changes (especially the aging of the population) and of lifestyle changes in the various population groups. This is reflected in the ratio between mortality from noncommunicable causes (neoplasms and diseases of the circulatory system) and that from communicable causes (Figure 22). A ratio of noncommunicable to communicable causes of 1:1 assumes that the two components of mortality in adults have equal weight: the higher the ratio, the greater the relative weight of the noncommunicable component and the more advanced the stage of epidemiological polarization, with the resultant implications in terms of investments, service access, and timeliness of health care. As did the pattern observed in the ratio of perinatal to communicable causes in children under 1 year of age, the ratio of noncommunicable to communicable causes for the age group 45–64 years old also presents a gradient across groups: the ratio (which is an indica-

FIGURE 22

Trends in the ratio of noncommunicable disease mortality rates to communicable disease mortality rates, population aged 45–64 years, Region of the Americas, 1980–1994.



tor of relative risk) is lower in the lower-income country groups, thus signaling the greater relative contribution of noncommunicable diseases (i.e., greater polarization) in adult mortality in the Region's more developed countries. For the 1990–1994 period, the median value for the ratio of noncommunicable to communicable causes in Group I was 31.5:1, while in Group II it was 14.8:1, in Group III it was 8.5:1, in Group IV it was 9.4:1, and in Group V it was 7.0:1. The ratio has risen over the past few decades in all country groups, although the increase has been more pronounced among lower-income countries, which are precisely the ones that continue to have a larger communicable disease component in their adult mortality profile and are the ones that are reducing this component most rapidly. Indeed, while the ratio of noncommunicable to communicable causes rose from 30.7:1 in 1975 to 31.5:1 in 1995 in Group I, in Group IV it rose from 3.3:1 to 9.4:1 and in Group V from 5.9:1 to 7.0:1. The indicator did not present any significant variations by sex in this age cohort.

Among adult males in this age group (45 to 64 years), diseases of the circulatory system continued to be the leading cause of death in all the countries studied (Figures 23a and 23b), except in Canada and Chile, where tumors shared this position. Although the mortality rates from these two groups of causes declined over the last three five-year periods, diseases of the circulatory system dropped more rapidly. This led

to a general approximation of the two rates in some cases (in Chile, for instance, circulatory diseases stood at 236.1 per 100,000 adult males and neoplasms at 230.2 per 100,000 in 1990–1994, compared with 331.0 and 281.1, respectively, in the 1980–1984 period), and in others it prompted an inversion of the positions (as in Canada, where the rates were 297.8 per 100,000 for neoplasms and 263.3 per 100,000 for circulatory diseases in 1990–1994, compared with 320.7 and 440.7 in 1980–1984). Among adult women in this age group, neoplasms were the leading cause of death in all the countries studied (Figures 24a and 24b), with the notable exception of Brazil, where diseases of the circulatory system systematically presented a 40% to 50% greater risk of death than neoplasms; minor exceptions also were observed in Colombia, Cuba, El Salvador, and Nicaragua, where mortality from diseases of the circulatory system was still slightly higher than mortality from neoplasms. Mortality from both groups of causes has declined over the last three five-year periods. The faster drop in mortality from diseases of the circulatory system led to a broadening of the gap between the two rates in Chile (233.9 per 100,000 adult females for neoplasms and 141.3 per 100,000 for diseases of the circulatory system in 1990–1994, compared with 251.7 and 194.5 in 1980–1984) and in Canada (241.8 per 100,000 for neoplasms and 94.1 per 100,000 for diseases of the circulatory system in 1990–1994, compared with 252.1 and 153.9 in 1980–1984). In other words, the general mortality pattern for all adults between the ages of 45 and 64 in the Region of the Americas points to diseases of the circulatory system (the leading cause of mortality among men today) being overtaken by neoplasms (the leading cause among women today) as the leading cause of death, as mortality from the former group of diseases declines faster than that of the latter. This difference can be partly attributed to the success of actions undertaken in support of healthier lifestyles and partly to longer life expectancies (i.e., the delaying of death) as a result of recent advances in therapeutic technologies.

External causes, too, show a clear trend in adult mortality in the Americas. As indicated earlier, the risk of dying is twice as high for males as for women in this age group. In all the countries of the Region, the risk of dying from external causes was even higher for males. In Costa Rica (with a male-to-female ratio of 6.2:1), El Salvador (6.0:1), Puerto Rico (6.0:1), Colombia (5.9:1), Mexico (5.9:1), Chile (5.4:1), Ecuador (5.1:1), and Venezuela (5.0:1), the highest values for this indicator were reported during the 1990–1994 period, with very little variation observed over the previous two periods, except in El Salvador (7.3:1), Costa Rica (6.9:1), and Chile (6.2:1), which have shown a downward trend since 1980–1984, and Ecuador (4.1:1), which has shown an upward trend since that period. Men faced a greater risk of dying from external than other causes in Colombia, Chile, El Sal-

FIGURE 23a
Mortality in men aged 45–64 years, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.

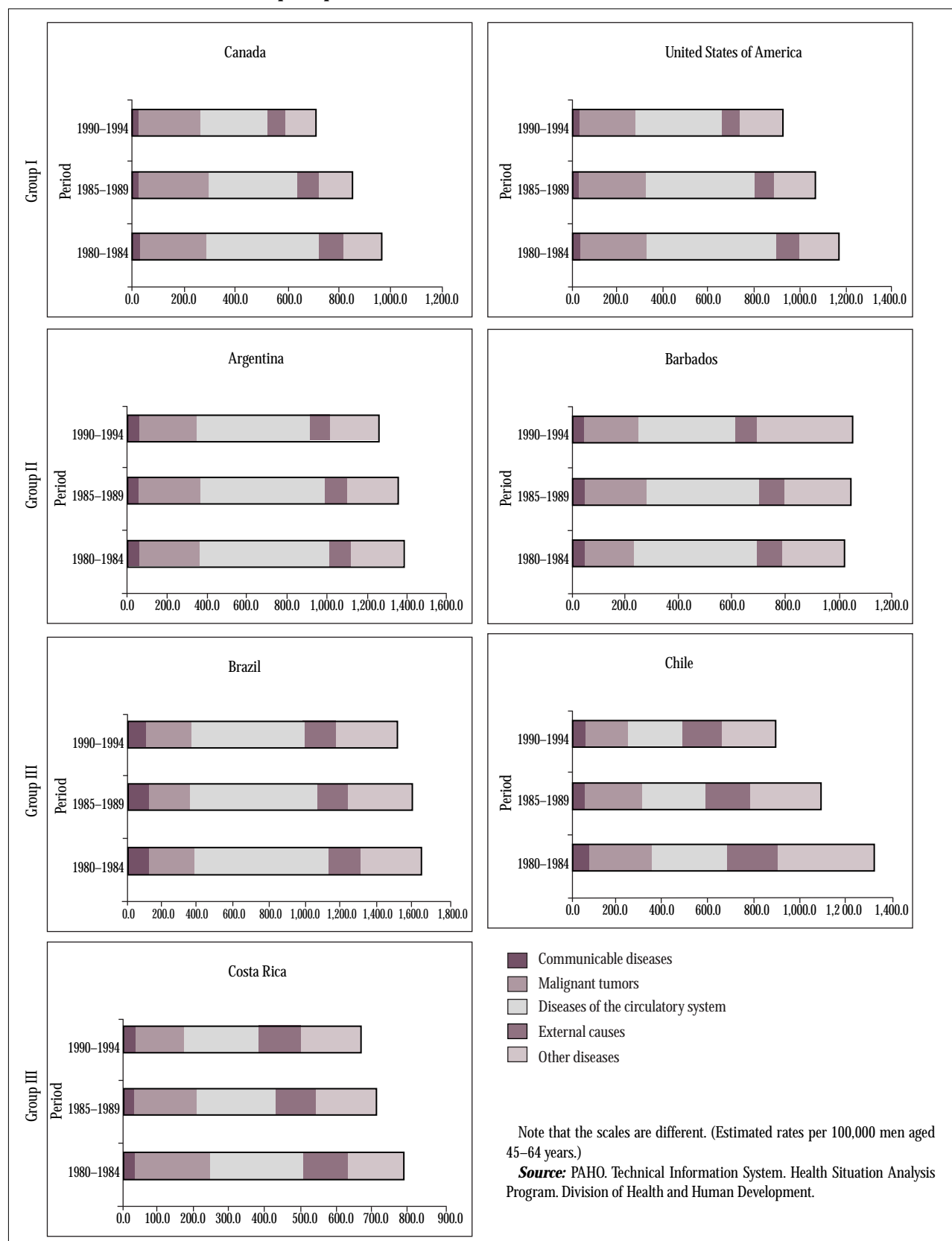


FIGURE 23b
Mortality in men aged 45–64 years, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.

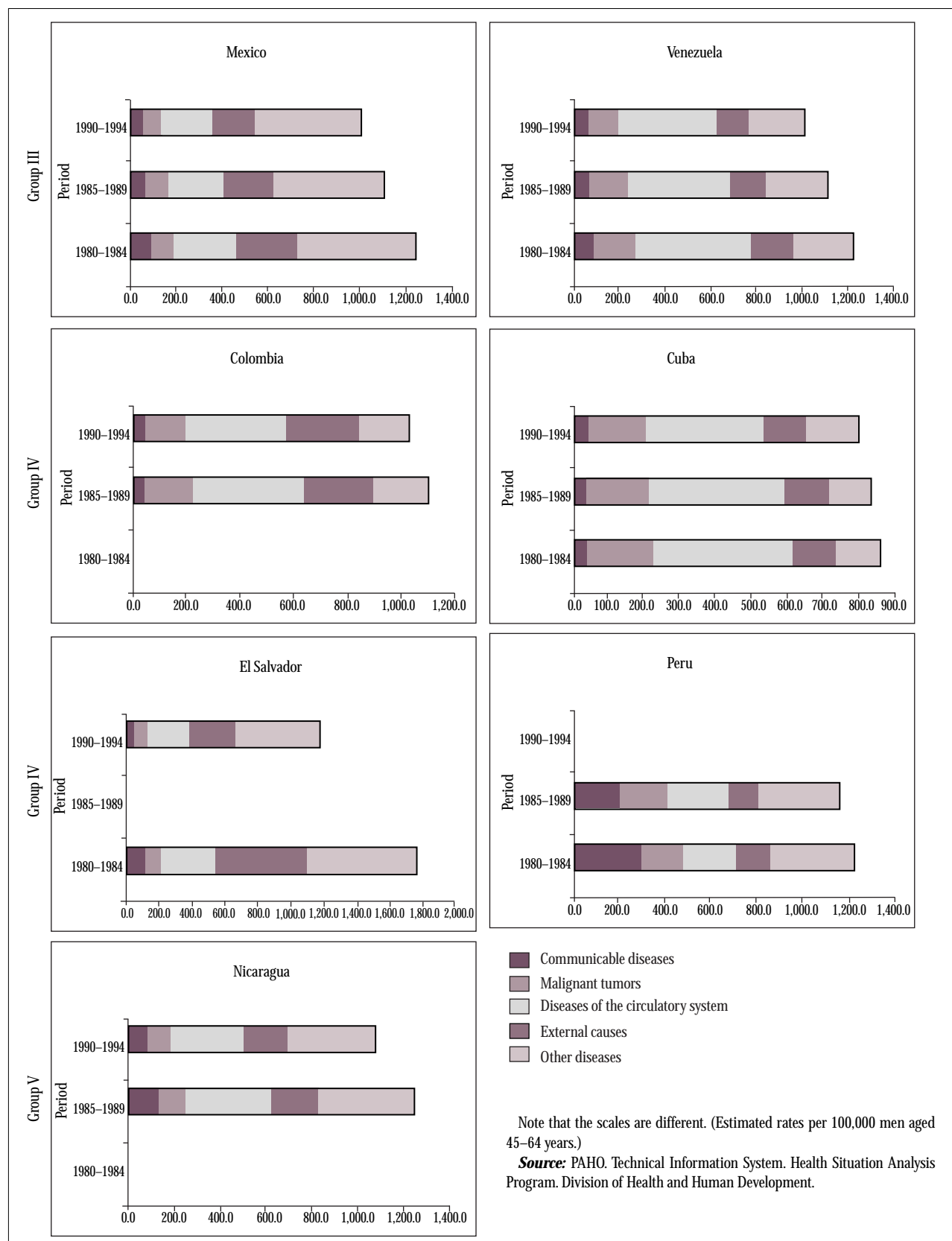


FIGURE 24a
Mortality in women aged 45–64 years, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.

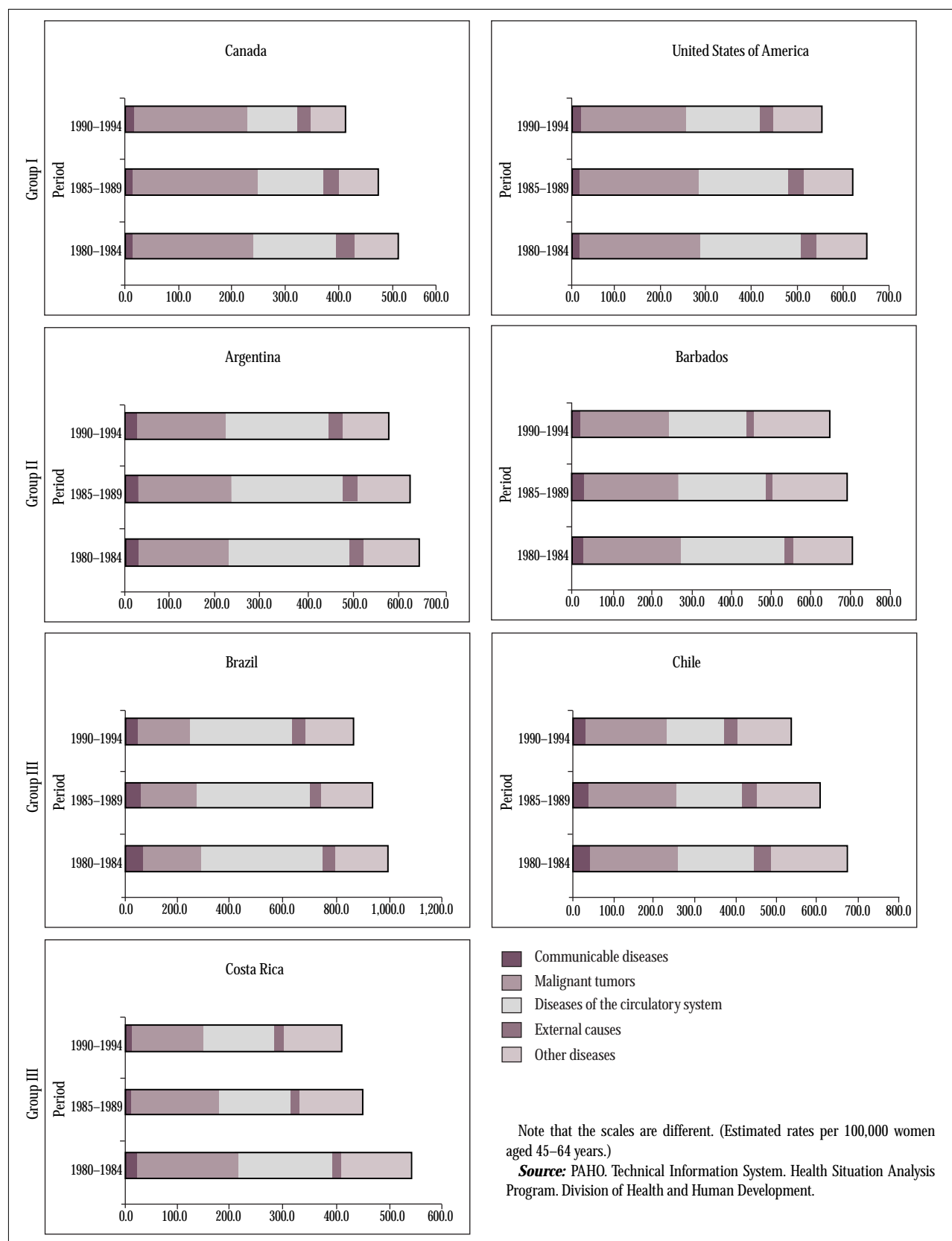
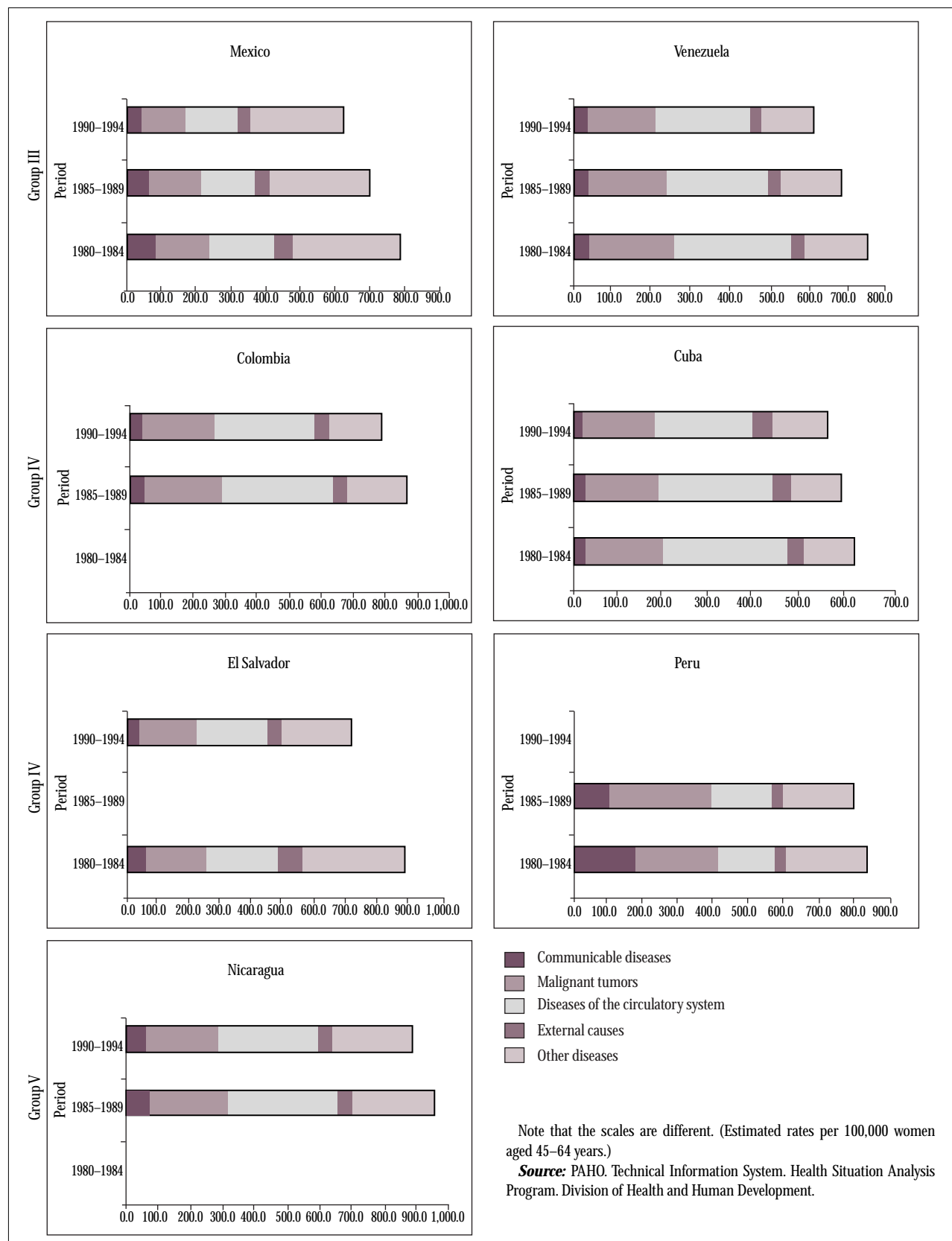


FIGURE 24b
Mortality in women aged 45–64 years, by broad groups of causes, in countries grouped according to per capita GNP, 1980–1984, 1985–1989, and 1990–1994.



vador, Mexico, and Nicaragua. These figures underscore the significant role played by this group of causes in mortality profiles for the economically productive adult population; they also document the scope of gender inequalities, in terms both of lifestyle choices that favor such causes and the social determinants that promote conditions for violence.

MORTALITY PROFILE

In order to analyze the profile of mortality in the Region and changes in the profile over recent years, it was necessary to find an indicator capable of expressing both the scope of mortality (i.e., number of deaths) and its impact in terms of premature deaths. The indicator selected was years of potential life lost (YPLL) before a given age, i.e., the minimum desirable longevity. Although this indicator is related to life expectancy, it is not based exclusively on it, since life expectancy varies within each country and between the sexes, and it also changes (increases) over time. For this analysis, the YPLL was calculated for 7 subregions and 29 countries that reported information, using age 75 as the benchmark age (i.e., YPLL before age 75) and a list of 20 groups of causes of death based on the International Classification of Diseases, Ninth Revision (ICD-9).¹⁶

Comparison of Mortality Profiles for 1980 and 1994

In the 29 countries studied, there were 13% more deaths in 1994 than in 1980; this percentage was less than the overall growth rate of the population. Deaths had increased mainly in the older age groups and dropped in the younger ones. The largest increase was in female deaths in North America (+23%). The total number of deaths remained virtually unchanged among men in Central America; in Mexico this figure declined (–4% for males and –2% for females).

Total YPLL dropped for both sexes, although more sharply among women (without exception). The largest decreases were observed in Mexico (–39%) and Brazil (–30%) among women, while the smallest occurred in the Andean Area and North America among men (–5% in both subregions).¹⁷ The overall decrease in YPLL was linked to the age group under 20 years old and was associated mainly with mortality from infectious diseases; comparisons of 1980 and 1994 data for some diseases and external causes, however, indicated an increase as of age 25 (see discussion below).

The ratio of YPLL to total deaths also dropped for both sexes in all subregions (Table 3), pointing to higher mean ages at death and thus longer life expectancies. To isolate the phenomenon of early mortality, the ratio was calculated on the basis of all deaths, so the figure does not actually reflect the mean number of years lost for each death before age 75. The percentage of YPLL lost before age 5 is shown in Table 4, where it can be seen that levels declined in both sexes and in all subregions. Also worth noting is the fact that the ratio of YPLL to total deaths was consistently higher among males: in 1994, there were 1.2 male deaths for each female death; the ratio of male YPLL to female YPLL was 1.7:1. What this means is that males are dying at higher rates and at earlier ages. As can be seen from Table 4, the percentage of YPLL in children under 5 years old was higher among females. The lower percentage of YPLL for boys under 5 years old can be explained by the high concentration of deaths between the ages of 10 and 49, when the male-to-female ratio of YPLL exceeds 2:1 (for the 20–29 cohort, it is over 3:1).

Differences by sex were observed throughout Latin America (but not in North America or the English-speaking Caribbean) and were more pronounced in the Andean Area and in Brazil, owing principally to the higher risk of death from external causes (especially among males), particularly from homicide. Other causes of death also have increased more among males, such as cirrhosis and diabetes. It is worth noting that although more women still die from diabetes than men, the gap has shrunk. As a result, despite the fact that general mortality and total YPLL have dropped and life expectancy has increased for both sexes, the gap between male and female life expectancies widened in most of the countries of Latin America.

The declines in total YPLL, ratio of YPLL to deaths, and YPLL before age 5 could simply be a reflection of changes in the population's age structure—the aging of the population, as was seen in the previous section on demographic trends. With a higher percentage of the population now at more advanced ages, deaths are occurring later, including after age 75 (deaths after age 75 were not included in YPLL calculations). However, a look at general mortality rates for 1980–1985 and 1990–1995 shows that these rates dropped in most of the countries: for the Region of the Americas as a whole, the rate fell from 8.2 to 7.6 per 1,000 population. Aging of the population has caused some countries to have stable or slightly higher rates of general mortality; for example, Canada, Chile, the United States, and Uruguay.

An analysis of patterns in general mortality rates by age group confirms the observation made earlier that the rate has increased in some areas as a result of growth in the population group over 65 years old; it is surprising, though, that the rates have fallen for all age groups below age 65 in all the subregions, including in the aforementioned countries. In other

¹⁶See the Technical Notes.

¹⁷Tables A13–A19, included in the Annex at the end of this chapter present the structure of YPLL for the 10 leading causes of death (of the 20 contained in the list), by sex and year, for the seven subregions considered.

TABLE 3
Ratio of years of potential life lost (YPLL) to total deaths, by sex and subregion,
Region of the Americas, 1980 and 1994.

Subregion	1980			1994		
	Male	Female	Total	Male	Female	Total
North America	12.9	8.5	10.9	11.3	6.5	8.9
Mexico	37.5	34.2	36.1	27.0	21.3	24.5
English-speaking Caribbean	25.0	20.4	22.9	20.1	16.0	18.2
Central America and the Latin Caribbean	41.1	40.6	40.9	30.1	27.6	29.0
Andean Area	36.1	33.2	34.8	29.3	23.7	27.0
Brazil	35.3	33.4	34.5	25.3	20.4	23.3
Southern Cone	20.3	17.5	19.1	15.9	11.9	14.1
Total (29 countries)	23.4	19.4	21.6	18.3	12.5	15.7

Source: PAHO. Technical Information System. Health Situation Analysis Program. Division of Health and Human Development.

TABLE 4
Percentage of years of potential life lost (YPLL) in children under 5 years old,
by sex and subregion, Region of the Americas, 1980 and 1994.

Subregion	1980 (%)			1994 (%)		
	Male	Female	Total	Male	Female	Total
North America	16.5	22.5	18.6	12.1	17.2	13.9
Mexico	55.1	65.7	59.4	39.4	50.8	43.7
English-speaking Caribbean	42.9	47.6	44.8	28.1	32.1	29.7
Central America and the Latin Caribbean	60.1	72.3	65.1	46.8	57.8	51.2
Andean Area	56.8	65.1	60.3	36.4	50.0	41.4
Brazil	58.9	67.2	62.3	28.2	37.9	31.7
Southern Cone	43.8	51.5	46.9	31.8	40.9	35.2
Total (29 countries)	45.3	55.5	49.4	29.0	39.4	32.8

Source: PAHO. Technical Information System. Health Situation Analysis Program. Division of Health and Human Development.

words, the risk of premature death has decreased, and it is no longer possible to explain differences in mortality profiles solely on the basis of demographic changes, as will be seen in the following section.

Changes in the Profile of Mortality by Cause of Death

Communicable Diseases

In the 29 countries studied, intestinal infectious diseases (20/01) were responsible for 10.2% of YPLL in 1980, ranking second after conditions originating in the perinatal period. As Table 5 shows, YPLL from these diseases had decreased 70% by 1994, ranking as the tenth most common cause of YPLL (accounting for 3.7% of the total). The decrease was observed

among both males and females. The only subregion reporting an increase was North America, although the number of deaths was so low in 1980 that the increase was insignificant. This may be a normal fluctuation that does not necessarily reflect a trend and, in fact, it is fully in line with the level of 0.1% of YPLL attributed to these causes.

The decline in mortality from intestinal infectious diseases was one of the main factors in the drop in infant mortality (analyzed elsewhere in this publication), and is undoubtedly related to the broader coverage of various health interventions and programs, such as oral rehydration, the promotion of breast-feeding, and improved supply of safe water in many areas.

The reappearance of cholera in the Hemisphere in 1991—after 100 years with no reported cases—not only caused over 11,000 deaths in the Region as of 1996, but it also under-

scored the precarious nature of living conditions for broad sectors of Latin America's population. Ultimately, however, it also contributed to the subsequent sharp decline in intestinal infectious diseases. This decline was due mainly to the fact that the community's greater awareness and the population's more rapid mobilization in the face of the cholera epidemic led to an intensification of prevention and control measures whenever symptoms of diarrhea were detected. As a result, not only did cholera present the lowest case fatality rates in history (less than 1% in many places), but mortality was also lower for cases of diarrhea from other causes.

Tuberculosis (20/02) was not among the 10 leading causes of YPLL in 1980 in any of the subregions. Accounting for between 0.1% and 1.9% of total YPLL, this disease was situated between 14th and 19th position. A program to control this disease has been in place for many years, and the decrease of tuberculosis for both sexes and all subregions in 1994 is noteworthy. The sharpest decreases were reported in the Southern Cone (–61%) and in Mexico (–46%).

In 1980, vaccine-preventable diseases (20/03)—whooping cough, diphtheria, tetanus, measles, and poliomyelitis—were among the leading causes of death only in Central America and the Latin Caribbean (fourth most common cause of YPLL, accounting for 5.3% of the total). For the 29 countries studied, these diseases ranked 15th in terms of causes of mortality, with 1.5% of all YPLL. Even so, 18,348 deaths were attributed to this cause in 1980, and many other deaths were probably not reported as such or were coded under a different cause of death. By 1994, the figure had dropped to 2,355 reported deaths, representing an 87% decrease in total deaths reported and a 90% decrease in YPLL. Thanks to control programs launched in all the countries before 1994, vaccine-preventable diseases ranked only 19th as a cause of YPLL in the Andean Area and 20th in the other subregions that year, representing only 0.2% of YPLL for the 29 countries as a whole. During the 1980–1994 period, poliomyelitis was eradicated, deaths from whooping cough and diphtheria disappeared in many countries, and tetanus and measles were brought under control.

Neonatal tetanus was not included in this group of diseases, mainly because mortality data were not available in many countries (especially for 1980). ICD-9 classifies neonatal tetanus as a subcategory (771.3) of infections specific to the perinatal period (771), and, as a result, the disease is not mentioned separately in the reports of several countries. Underreporting is suspected to be very high. Since all deaths from this disease occur within the first few weeks after birth, the number of years of life lost for each death is very high. Accordingly, the true impact of vaccine-preventable diseases may well be higher than what available data indicate.

Although retrospective studies have indicated that acquired immunodeficiency syndrome (AIDS) was probably re-

TABLE 5
Percentage of years of potential life lost (YPLL)
due to infectious intestinal diseases, by subregion,
Region of the Americas, 1980 and 1994.

Subregion	YPLL due to infectious intestinal diseases (%)		Total YPLL change, 1980–1994 (%)
	1980	1994	
North America	0.1	0.1	32
Mexico	16.8	4.7	–81
English-speaking Caribbean	6.0	3.9	–44
Central America and the Latin Caribbean	18.5	10.9	–57
Andean Area	13.7	6.7	–57
Brazil	14.1	4.4	–72
Southern Cone	4.7	1.4	–75
Total (29 countries)	10.2	3.7	–70

Source: PAHO. Technical Information System. Health Situation Analysis Program. Division of Health and Human Development.

sponsible for a number of deaths in 1980 and even before that, the first diagnosed cases did not appear until 1981; as a result, mortality statistics for 1980 do not show AIDS as a cause of death in any country of the Americas. ICD-9, which was drawn up in the 1970s, does not include a specific code for AIDS and, consequently, there are no standard coding criteria for use by the countries of the Region. Despite the fact that morbidity data point to a significant impact of AIDS in the English-speaking Caribbean, it was not possible to calculate the YPLL for this subregion, owing to the lack of coding criteria. For these same reasons, AIDS does not appear as a specific category in the list used in this analysis.

Among the other subregions, Brazil and especially North America presented the highest rates of AIDS morbidity and mortality. In Brazil, AIDS accounted for 2.6% of YPLL in 1994 (3.2% among males and 1.5% among females) and was the 11th most common cause of death among males and 15th among females. In the 20–39-year-old age group, AIDS was the fourth leading cause of death and of YPLL among males and fifth among females. It was in North America, however, and especially in the United States, that AIDS appeared as one of the leading causes of death in 1994 (seventh among males). The 20–49 age group was hit hardest, making AIDS a cause of early mortality; indeed, it was the fourth leading cause of YPLL (third among males and ninth among females). In 1994, a total of 42,114 AIDS deaths were reported in the United States. In North America overall, the disease ranked as the leading cause of death among males aged 30 to 39 (over 11% of the total) and the second most common cause among women in this age group (nearly 12%). The total

number of AIDS deaths in the United States in 1995 was very similar to the 1994 level, although the 1996 mortality data published by that country's Centers for Disease Control and Prevention (CDC) reported a 24% drop in the number of deaths in 1995, which still situated the disease among the leading causes of death and YPLL.

Between 1980 and 1994, the total number of deaths for which the basic cause was coded as septicemia (20/04) rose by 66% and the respective YPLL climbed 15%. Increases were reported in all subregions, starting in the population aged 30 or 40 years old and older, while levels decreased in the population under 20 or 30 years old, except in Central America and the Latin Caribbean, and in Brazil, where increases were observed in virtually all age groups. This pattern can be explained by a series of factors, including the aging of the population and, indirectly, the increase in mortality from certain chronic degenerative causes, such as malignant neoplasms, diabetes, and diseases of the urinary system. Death certificates often do not specifically mention many of these diseases, indicating instead a general category of terminal complications, in this case septicemia. A similar situation is observed in deaths from AIDS. The heading of septicemia also includes deaths from nosocomial infections, mainly because such infections are not usually mentioned on death certificates and because the basic cause of death is normally considered to be the condition or ailment for which the patient was hospitalized and not a related complication (e.g., hospital-acquired infection). The drop in the number of deaths from communicable diseases, with the exception of AIDS, has been possible thanks basically to highly effective interventions that are relatively low-cost but that depend on broad coverage; reduction of septicemia, on the other hand, requires a substantial improvement of medical care quality, which entails high costs, specialized personnel, drugs, and hospitalization, areas in which recent advances have been much more modest.

In all the subregions and for both sexes, the number of deaths and YPLL from acute respiratory infections (20/05) declined among the younger age groups and increased among the older ones. In Mexico and the Andean Area, however, reductions were observed in all age groups; the Southern Cone reported a drop in the under-60 cohort, but rates increased in the higher age groups. In North America, mortality from acute respiratory infections (ARIs) showed a decline in the population up to age 29, but then increased considerably; a similar pattern was observed in Central America and the Latin Caribbean up to age 25, while in Brazil the increase occurred from age 10 onward. In the English-speaking Caribbean, increases were observed in the 15–49 cohort, but not in the over-50 age group. ARI mortality dropped sharply among children under 15 years old in all subregions, owing to a general decrease in mortality among this age group, as

well as specific ARI control efforts targeted at children. The higher number of deaths and YPLL in the older age groups can be explained in part by the larger size of these groups in absolute terms and by the fact that ARIs often appear in the terminal stages of many other diseases that are usually not mentioned on death certificates, as was seen earlier in the case of septicemia.

Maternal and Child Health Conditions

The principal conditions originating in the perinatal period (20/17) include maternal conditions affecting the fetus or newborn, low birthweight and prematurity, birth trauma, and respiratory conditions of the newborn. Congenital anomalies were not included in this group since they have a separate ICD heading; in the list used for the present analysis, they are listed under category 20/16.

Deaths from conditions originating in the perinatal period occur mostly in the first few days following birth, becoming much less frequent after the infant's first month of life, and very rare after the first year. Some countries do not agree with the use of this classification for deaths occurring after the 11-month cutoff, but their position is questionable. However, since 98% of these deaths occur among children under 1 year of age even in the countries that admit this as a cause for later occurring deaths, the results of the specific analysis of mortality from this cause based on the number of deaths or YPLL are not affected. Still, it is important to note that—owing precisely to this concentration—deaths from this cause produce the highest impact in the calculation of total YPLL.

That being said, deaths from conditions originating in the perinatal period dropped 31% between 1980 and 1994 in the 29 countries studied and for both sexes. The steepest drops were reported in Central America and the Latin Caribbean (–47%), North America (–37%), the Southern Cone (–36%), and Brazil (–28%); in the other subregions, decreases ranged between –16% and –22%. These figures point to a proportionally lower decline in these conditions with regard to other causes of infant and child mortality, such as intestinal infectious diseases, ARIs, and vaccine-preventable diseases. Considering that the 1980–1994 period also saw a sharp decrease in birth rates, the lower risk of death from perinatal conditions was not that significant, and in some countries it remained unchanged. It is much more difficult and costly to reduce mortality from this group of causes than from the other causes mentioned.

Deaths from congenital anomalies (20/16) also occur mainly during the first year of life (in around 90% of the cases). In most of the countries, the number of deaths from this cause remained constant or increased, except in North America where they dropped by 37%. The fact that the num-

ber of births had either remained stable or fallen means that mortality from congenital anomalies also remained stable or may have actually increased in many countries of the Region.

Mortality patterns from conditions originating in the perinatal period and congenital anomalies were quite different in North America than in the rest of the Hemisphere, according to comparisons of 1980 and 1994 data. Specifically, birth rates in this subregion remained virtually unchanged, hovering at the already low levels reported in 1980 (between 15 and 16 per 1,000 population). In other words, the number of births increased very little, basically keeping pace with average annual population growth (roughly 1%). If the total number of deaths from congenital anomalies dropped 15% and those from perinatal conditions dropped 37% in North America, then specific mortality from these causes also dropped. This helps to explain, at least in part, why the gap between North America and the other subregions increased proportionately, despite the drop in infant mortality in all the subregions.

Another difference with regard to conditions originating in the perinatal period was that, as far back as 1980, they were either the first or second leading cause of death in almost all the countries (for both sexes), except in North America, where they dropped from fourth position in 1980 to seventh by 1994. Ranking alone does not, of course, provide a sufficient basis for a meaningful evaluation, since it merely reflects relative importance vis-à-vis the other causes. In the case of North America, however, it can be seen that mortality from conditions originating in the perinatal period in fact did decrease.

Something also should be said about sudden infant death syndrome (ICD-9, 798). Aside from Canada and the United States, in none of the countries studied did this syndrome account for more than 1% of infant deaths (i.e., children under one year of age). In Canada, 11% of infant deaths were coded as resulting from this cause in 1994; in the United States, the figure was 13%. Since this syndrome is classified under the heading of ill-defined rather than perinatal causes, the former group of causes—which accounted for between 1.1% and 1.5% of all deaths in these two countries—stood at 13.6% in Canada and 15.6% in the United States for children under 1 year old. It is quite likely that the other countries code deaths from this syndrome in a residual category under the heading of perinatal conditions, in which case they would not be included under ill-defined causes. This might explain why the percentage of ill-defined causes in children under 1 year old is not very different from the general rate in most countries. If deaths from sudden infant death syndrome are combined with those from perinatal conditions, the resulting total would represent the fifth leading cause of YPLL in North America, rather than seventh, as 1994 data indicate.

Maternal mortality from complications of pregnancy, labor, and the puerperium (20/15) dropped 31% in the 29 countries between 1980 and 1994. Decreases were recorded in all the subregions, especially the Southern Cone (–42%), Mexico (–38%), Brazil (–35%), and the English-speaking Caribbean (–35%); Central America and the Latin Caribbean experienced smaller declines (–4%). The drop in maternal mortality was observed mainly in the 20–39-year-old age group. Among adolescent females (10 to 19 years of age) and women over age 40, the number of pregnancies may be much lower, but the risk of complications is significantly higher; in these groups, maternal mortality experienced much more modest declines and in some cases even increased.

Noncommunicable Diseases

Deaths from nutritional deficiencies and anemia (20/08) dropped among the age group under 25 and increased in varying degrees in the population aged 25 or 30 years and older in almost all countries of the Region, with the exception of the Andean Area, where decreases occurred in all age groups. Despite lower reported levels among the younger age groups, Central America and the Latin Caribbean were the only subregions in which nutritional deficiencies still ranked among the 10 leading causes of YPLL in 1994. The increase begins to be observed in intermediate age groups. It is a direct result of practices followed in the medical certification of deaths, especially deaths due to malignant neoplasms (mainly of the respiratory and digestive systems) and AIDS, since the terminal stages of these diseases are often associated with serious malnutrition. Death certificates often mention only the terminal complications and not the true basic cause of death.

The total number of deaths from malignant neoplasms (20/06) in the seven subregions rose at a much faster rate than overall population growth, leading to higher specific mortality rates among the general population. The increase intensified beginning at 25 or 30 years of age and was more widespread among females. This phenomenon can be explained by the general aging of the population, brought about by decreases in mortality from earlier, avoidable causes, as was seen above. The decline in earlier deaths ultimately exposes people to risk factors of malignant neoplasms for a much longer time, thus producing an increase in deaths at later ages. Because of the above-mentioned decline, as well as advances in early detection and higher survival rates, the increase in the number of deaths has not been accompanied by any significant increases in YPLL from malignant neoplasms.

Among males, the most frequent sites for malignant neoplasms continued to be the lungs, digestive system (esopha-

gus and stomach, mainly), and the prostate; lung cancer was the leading cause of death in the more developed countries, while neoplasms of the digestive system were more frequent in the less developed ones. The leading causes of death among women in this category were malignant neoplasms of the digestive system (colon and rectum, mainly), breast cancer, and cancer of the uterus; breast cancer was more common in the developed countries, and cancer of the uterus was more common in the developing countries.

Mortality from diabetes mellitus (20/07) increased dramatically in terms of the number of deaths and total YPLL, especially among the population over 25 years old. The increase was most evident in the subregion that has traditionally had the highest mortality from this cause, namely the English-speaking Caribbean. Diabetes-related deaths for this subregion in 1994 had increased 147% over their 1980 level and represented the third leading cause of YPLL among women and tenth among men (5.5% and 3.6% of the total, respectively). In the other subregions, the highest increases in the total number of deaths from diabetes were recorded in the Andean Area (+126%), Brazil (+113%), and Mexico (+107%); the lowest increases were in the Southern Cone (+44%) and North America (+64%). Proportionally, the increase was greater among men in all the subregions, although the actual total number of deaths was higher among females.

Ischemic heart disease (20/09) dropped between 1980 and 1994 as a cause of mortality and YPLL in North America and the Southern Cone, especially among males. This decrease is in keeping with the trend observed in many developed countries around the world. In the other subregions, however, mortality and YPLL from this cause increased, especially in Mexico, where the number of deaths doubled between 1980 and 1994. Despite the drop observed in North America, ischemic heart disease continues to be the second leading cause of YPLL for both sexes in this subregion, after malignant neoplasms. In the other subregions, only Mexico and Central America and the Latin Caribbean did not report this disease as one of the 10 leading causes of YPLL in 1994.

The reverse is observed for diseases of pulmonary circulation and other forms of heart disease (20/10), which increased in North America and in the Southern Cone, but decreased in the other subregions (except in Central America and the Latin Caribbean, where they also increased). This group of diseases of the circulatory system includes ill-defined forms and designations of circulatory diseases, such as heart failure and, especially, cardiac arrest. ICD-9 classifies heart failure under cardiac dysrhythmias, assuming that certified deaths from heart failure are due to cardiogenic causes. In practice, however, physicians in Latin America and many other areas of the world often certify deaths giving heart fail-

ure as the basic cause, which is reported more as the "manner" of death than the cause *per se*. In Argentina, for instance, more than 5% of all deaths (4% in Paraguay) were coded as being cases of heart failure, without necessarily being related to diseases of the circulatory system. In fact, this is actually a question of incorrect medical certification or improper codification of the basic cause. This can be verified by examining the distribution of such deaths by age, which shows the profile of general mortality and not just mortality from diseases of the circulatory system.

Cerebrovascular disease (20/11) decreased as a cause of death in North America, in terms both of total number of deaths and especially of YPLL. In the other subregions, the total number of deaths was approximately the same in 1980 as in 1994, with a slight drop in YPLL. The fact that the total population grew in all the subregions over the 1980–1994 period means that mortality from cerebrovascular disease has dropped.

Mortality and YPLL from cirrhosis (20/13) increased in four subregions: Central America and the Latin Caribbean, the Andean Area, Brazil, and Mexico. In Mexico, cirrhosis was the sixth leading cause of YPLL among males in 1994 (5.5% of the total), and in Brazil it ranked tenth (2.3%); the overall level dropped in North America, the English-speaking Caribbean, and the Southern Cone. In all seven subregions, mortality from this cause was approximately three times higher among men than women.

Despite the increase in the number of deaths from diseases of the urinary system (20/14) in the population 35 years of age and older, the specific mortality rate among the total population remained stable, or even dipped slightly, with an accompanying drop in YPLL. The only exception was Central America and the Latin Caribbean, which saw a doubling of the total number of deaths and YPLL. Even so, these diseases did not rank among the 10 leading causes of YPLL in this or any other subregion.

Aside from a slight increase in the older age groups, mortality from bronchitis, emphysema, and asthma (20/12) declined among the total population between 1980 and 1994 throughout the Region, except in North America and the Southern Cone, where the global rates remained unchanged but the over-35 age group reported a significant increase.

External Causes

Between 1980 and 1994, the number of deaths and YPLL from motor-vehicle traffic accidents (20/18) fell significantly in North America and the English-speaking Caribbean; the rate also decreased in Mexico, although not as dramatically. The other subregions reported level or slightly lower levels. The major exception was Brazil, where mortality and YPLL

from such accidents rose by over 44%, far exceeding the increase in total population growth for the period. In all the subregions, nearly three times as many males as females died from this cause, which accounted for between 4.1% and 8.1% of YPLL among males and maintained its ranking among the 10 leading causes of YPLL in all the subregions.

Mortality from other accidents (20/19) also showed a much higher level for males than females (2.5 times), despite the drop in the total number of deaths and YPLL from these causes throughout most of the Region of the Americas. The steepest drop was observed in Mexico and the English-speaking Caribbean (around 30%); North America, the Andean Area, and the Southern Cone exhibited decreases of between 5% and 20%. In Central America and the Latin Caribbean, the total number of deaths rose slightly, although specific rates remained stable. Brazil, on the other hand, not only showed an increase in the total number of deaths and YPLL, but also in specific mortality rates from these causes.

In 1994, a total of 116,623 deaths from homicides (20/20) were reported in the 29 countries studied; of that total, 103,367 (88.6%) were in males and 13,256 (11.4%) were in females. This represented a 65% increase over the 1980 level for males, with a 73% increase in YPLL; for females, the increase was 30%, with a 33% increase in YPLL and a slight increase in specific mortality rates. Mortality from injuries purposely inflicted by others (homicides) were 7 to 12 times more frequent among men in 1994 in all subregions.

Mortality from homicides displayed different patterns across the Hemisphere. In Mexico, and especially in the North America subregion, the number of deaths from this cause increased at a slower rate than total population growth; as a result, the specific mortality rates declined. The Southern Cone was the only subregion where homicides did not rank among the 10 leading causes of YPLL in 1994 (accounting for 1.9% of the total and ranking 11th that year). It is worth noting that Chile, which accounted for roughly 20% of the subregion's reported deaths in this category, did not specify whether the cause was accidental or intentional in one-half of all deaths from external causes (by far, the highest proportion in the entire Hemisphere). As a result, homicides—which increased by 72% between 1980 and 1994 in the Southern Cone—may well be among the 10 leading causes of YPLL in this subregion for 1994.

The situation in Central America and the Latin Caribbean warrants individual analysis. Although the data from the six countries studied show an overall reduction in deaths and YPLL from homicides, it should be kept in mind that this cause includes injuries from legal interventions and from operations of war. The form used by many countries for reporting data to PAHO in 1980 did not differentiate between homicides and the other two categories. Not including Guatemala, which reported thousands of deaths resulting from opera-

tions of war in 1980 but a different situation in 1993 (the most recent year for which data are available), it can be seen that for the other five countries, which did not report any deaths from operations of war, deaths from homicides were up by 60%.

The other subregions showed a marked increase in the number of homicide-related deaths and YPLL among males; in Brazil, the number more than doubled. Many countries also reported increases among females, although to a much lesser degree. The most striking situation was observed in Colombia, which reported three times as many homicides in 1994 as in 1984 (the earliest year for which data were available) among both sexes, although the male-to-female ratio was 12:1. That year, homicides were the leading cause of death among males and accounted for 41% of all YPLL.

Technical Notes

1. **Sources.** Both primary and secondary data sources were consulted in drafting this chapter. Primary data were drawn from the Regional Database on Mortality organized by the Technical Information System under PAHO's Health Situation Analysis Program; these data were used in estimating rates of specific mortality by age, sex, and groups of causes of death and for calculating the rates and sex ratios used herein. The Regional Database on Mortality compiles information from the national death registers of all the Member Governments of PAHO. All other data used in this chapter were drawn from the following secondary sources:

- United Nations. Annex I: Demographic indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.
- United Nations. Annex II: Demographic indicators by major area, region and country. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996 (total population;¹⁸ total fertility rate and life expectancy at birth 1970–1975, 1995–2000; infant mortality rate, from 1950–1955 to 1990–1994, 1995–2000).
- United Nations. *World urbanization prospects: The 1996 revision*. Annex tables. New York: UN, Population Division; 1997 (percentage of urban population 1980, 1996).
- World Bank. *World tables 1992*. Washington, DC: World Bank; 1992 (gross national product 1975, 1985).
- World Bank. *World development indicators 1997*. Washington, DC: World Bank; 1997 (gross national product 1995;

¹⁸This was used in weighting regional and group averages for indicators; under certain circumstances, annual estimates were interpolated or the fertility's medium-variant five-year projection was used.

physicians per population 1980; population per hospital bed 1980).

- World Bank. *World development report 1997: The State in a changing world*. Washington, DC: World Bank; 1997 (gross national product 1995; female work force 1995; health expenditure as a percentage of central government expenditure 1981–1990 and 1991–1995).

- World Bank. *World development report 1996: From plan to market*. Washington, DC: World Bank; 1996 (population with access to sanitation 1980).

- World Bank. *World development report 1995: Workers in an integrating world*. Washington, DC: World Bank; 1995 (female work force 1970).

- United Nations Development Program. *Human development report 1997*. New York: Oxford University Press; 1997 (population with access to safe water 1975–1980; adult literacy rate 1970; gross school enrollment rate 1980, 1994).

- United Nations Educational, Scientific, and Cultural Organization. *Statistical yearbook 1996*. Paris: UNESCO; 1996 (adult literacy rate 1995).

- Pan American Health Organization. Volume I: *Health conditions in the Americas, 1981–1984*. Washington DC: PAHO; 1986. (Scientific Publication 500) (population with access to safe water 1975–1980; population with access to sanitation 1980).

- Pan American Health Organization. *Mid-decade evaluation of water supply and sanitation in Latin America and the Caribbean*. Washington, DC: PAHO; 1997 (population with access to safe water 1992–1995; population with access to sanitation 1992–1995).

- Pan American Health Organization. *Health services in the Americas. Analysis of basic indicators*. Washington, DC: PAHO; 1988. (Technical Publication 14) (physicians per population 1980; professional nurses per population 1980; dentists per population 1980; hospital beds per population 1984; health expenditure as a percentage of GDP 1984; vaccination coverage 1984: DTP, OPV, measles, BCG).

- Pan American Health Organization. *Third evaluation of the implementation of the Strategy of Health for All by the Year 2000. Country reports*. Washington, DC: PAHO; 1997 (physicians per population 1995; professional nurses per population 1995; dentists per population 1995; hospital beds per population 1993; population with access to safe water 1992–1995; population with access to sanitation 1992–1995).

- Pan American Health Organization. *National health expenditure in Latin America and the Caribbean: 1980–1994*. Washington, DC: PAHO, Health and Human Development Division, Health and Public Policies Program; 1997 (national health expenditure as a percentage of GDP 1994).

- Pan American Health Organization. *Health situation in the Americas: Basic indicators 1997*. Washington, DC: PAHO, Health and Human Development Division, Health Situation

Analysis Program; 1997 (vaccination coverage 1996: DTP, OPV, measles, BCG).

- Pan American Health Organization. The Director's Message. In: *Annual Report of the Director 1996: Healthy people, healthy places*. Washington, DC: PAHO; 1997. (Official Document 283).

2. **GNP Versus GDP.** GNP refers to the value added by domestically-owned production factors, unlike GDP, which measures value added domestically, but not necessarily by domestically-owned factors.¹⁹ Value added domestically refers to the market value of final goods and services produced by labor and means located in the country, but not necessarily provided by nationals of the country, whether they reside in the country or elsewhere, as is the case with GNP. Consequently, GNP equals GDP, plus a factor of net payments to and from the rest of the world. The net payments factor is usually zero (i.e., inflows and outflows balance out to zero), so GNP and GDP are often the same. When there is a positive net payments factor, i.e., the value added of domestically-owned goods and services exceeds that of the value added by foreign-owned goods and services, then GNP is higher than GDP (e.g., in Canada, the United States, etc.). When the net payments factor is negative, i.e., the value added of foreign-owned goods and services exceeds that of domestically-owned ones, then GNP is lower than GDP (e.g., in Latin America and the Caribbean). GNP is considered today to be not only the most common measure of economic growth,²⁰ but also of primary income.²¹

3. **Hierarchical Clustering Analysis.** The following parameters were used—cluster method: between-groups linkage; clustering similarity (distance) measure for interval data: squared Euclidian distance; number of clusters—five, with three downward iterations.

4. **Frequency Distribution Summary.** The boxplot in Figure 2 presents the frequency distribution summary. The middle bar represents the interquartile range, with the lower edge marking the position of the first quartile and the top edge marking the third quartile; the horizontal line in the middle of the interquartile range is the median. The vertical lines outside the interquartile range identify the paths to the minimum (lower) and maximum (upper) values of the fre-

¹⁹Blanchard O. Massachusetts Institute of Technology. *Macroeconomics*. New Jersey: Prentice Hall; 1997.

²⁰Economic Development Institute of The World Bank. *Policy choices and practical problems in health economics: Cases from Latin America and the Caribbean*. Washington, DC: EDI; 1995:5.

²¹World Bank. *System of national accounts* 1993. Washington, DC: World Bank; 1993:41.

quency distribution. Values between 1.5 and 3 times the longitude of the interquartile range (above and below) are considered external values (outliers); those that are more than three times that longitude (above and below) are considered extreme values (extremes) of the distribution.

5. Gross School Enrollment Rate. This indicator represents the number of students enrolled in some level of formal education (primary, secondary, or tertiary), regardless of whether they belong to the relevant age group for that level. It is expressed as a percentage of the population in the relevant age group for that level.

6. Estimated Rates of Specific Mortality by Age, Sex, and Cause of Death. The mortality rates cited in this section are estimates based on the number of deaths reported by the countries to PAHO's Regional Database on Mortality.²² They are five-year averages intended to control for potential instability in annual mortality rates, especially for the less populous countries and territories. The standard procedures used for estimating mortality rates have been presented elsewhere.²³ Estimated rates are obtained from observed mortality rates, by means of an algorithm to compensate for under-reporting and another algorithm to redistribute deaths from ill-defined causes by excluding external causes. The causes of death used are those presented in PAHO list 6/61 of groups of causes of death,²⁴ coded according to ICD-9: communicable diseases (001–139, 320–322, 460–466, 480–487), neoplasms (140–239), diseases of the circulatory system (390–459), certain conditions originating in the perinatal period (760–779), external causes of injuries and poisoning (E800–E999) and other diseases (all remaining categories of 001–779). The analysis of infant mortality trends in the Region of the Americas was based on the temporal series of infant mortality rates (per 1,000 live births) estimated by the United Nations Population Division.²⁵

7. Demographic Information. The demographic information utilized in the section on regional population trends was drawn principally from United Nations sources. Population data are presented for 1998, along with references to the situation five years previously and five years later. These esti-

mates are based on population projections recently updated by the United Nations in New York and the United Nations Latin American Demography Center in Chile. Data on mortality by cause and age were taken from the PAHO database, which uses information provided by the countries.

8. Births. Data on births can be analyzed demographically from two different approaches: the birth rate and the fertility rate. The birth rate expresses the number of births per 1,000 population, while the fertility rate expresses the number of births to mothers in a specific age group, per 1,000 women of a given age or age group. The specific fertility rates by age are grouped into the total fertility rate, which expresses the number of births that, on average, a woman just entering reproductive age would have if, throughout her reproductive life, she had as many births as those implied by the specific fertility rates observed in a given year.

9. Replacement Level Fertility. A total fertility rate of around 2.1 implies that the population will neither grow nor decrease; i.e., births will simply replace deaths, whence the name replacement level fertility. If the total fertility rate falls below 2.1 and remains there for a long period of time, the population will decrease; if it is higher, the population will grow.

10. Urbanization. Urbanization in the Americas, principally in Latin America, has been characterized by rapid growth of the urban population. Consequently, attention has centered on ways to measure the pace of this change. Using the percentage of urban population as an exclusive indicator of urbanization is questionable, since, as that percentage grows (i.e., as it approaches 100%), the pace of change slows drastically, despite the fact that the urban population continues to grow. Given this, it is recommended that the pace of urbanization be measured by using the difference between the growth rates of the urban and rural populations.

11. Years of Potential Life Lost (YPLL). This indicator can be calculated in various ways, depending on the age groups used and the values assigned to deaths in each age group. Since the concept of YPLL is related to life expectancy (although it is not recommended that life expectancy be used for calculating YPLL, since values differ from country to country and between the sexes, and they have been increasing over time), the benchmark was set at a level slightly higher than the general regional value estimated for the last five-year period of the century (72.5 years). The analysis contained herein is based on YPLL before age 75, i.e., all deaths before age 75 are included in the calculation. Deaths were broken down into the following age groups: under 1 year old, 1 to 4 years old, and five-year cohorts from 5–9 up to 70–74 years.

²²Pan American Health Organization, Technical Information System, Health Situation Analysis Program, Human Development and Health Division.

²³Pan American Health Organization. *Health statistics from the Americas*. 1992 Edition. Washington, DC: PAHO; 1992. (Scientific Publication 542).

²⁴Pan American Health Organization. *Health statistics from the Americas*. 1995 Edition. Washington, DC: PAHO; 1995. (Scientific Publication 556).

²⁵United Nations. Annex II: Demographic indicators by major area, region and country. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.

For infants under 1 year old, each death was considered to represent 74.9 YPLL (rather than 74.5, which would be the midpoint), since most deaths in this group occur very early on. For the second group (1 to 4 years old), YPLL was calculated at 73, owing again to the high concentration of deaths during the first two years. For the other groups, the midpoint value was used, i.e., 67.5 years for the 5–9 age group, 62.5 for the 10–14 group, and so forth.

12. YPLL: List of 20 Groups of Causes of Death (ICD-9). Selecting an appropriate list of causes of death is crucial for properly analyzing mortality data. This is particularly critical if one of the objectives is to rank the principal causes in order of priority, since this can be strongly influenced by a list's structure. The present study seeks mainly to analyze recent changes in mortality profiles in the Region of the Americas based on a comparison of YPLL for 1980 and 1994. Accordingly, focus was placed on causes (or groups of causes) of death whose reduction could be linked to control programs or interventions, causes common among older age groups (often referred to as "chronic degenerative" causes), and external causes. The list was kept relatively short so as to keep conclusions clearer. Taking into account the constraints imposed by aggregated data from some countries, especially for 1980, the following list of 20 groups was drawn up:

- 00 – All causes (001–E999)
- 99 – Ill-defined causes (780–799)
- 01 – Intestinal infectious diseases (001–009)
- 02 – Tuberculosis (010–018)
- 03 – Vaccine-preventable diseases (032, 033, 037, 045, 055)
- 04 – Septicemia (038)
- 05 – Acute respiratory infections (460–466, 480–487)
- 06 – Malignant neoplasms (tumors) (140–208)
- 07 – Diabetes mellitus (250)
- 08 – Nutritional deficiencies and anemia (260–269, 280–285)
- 09 – Ischemic heart disease (410–414)
- 10 – Diseases of pulmonary circulation and other forms of heart disease (415–429)
- 11 – Cerebrovascular disease (430–438)
- 12 – Bronchitis (chronic), emphysema, and asthma (490–493)
- 13 – Cirrhosis and other chronic diseases of the liver (571)
- 14 – Diseases of the urinary system (580–599)
- 15 – Complications of pregnancy, labor, and the puerperium (630–676)
- 16 – Congenital anomalies (740–759)
- 17 – Conditions originating in the perinatal period (760–779)
- 18 – Motor-vehicle traffic accidents (E810–E819)

- 19 – Accidents other than motor-vehicle traffic accidents (E800–E807, E820–E848, E850–E949, E980–E989)
- 20 – Homicides and injuries resulting from legal interventions and operations of war (E960–E978, E990–E999)
- 98 – All other causes (all causes not specified above, 001–E999)

13. YPLL: Countries and Territories, Periods, and Subregions Considered. A preliminary study on YPLL for selected countries compared data for three-year averages (1979–1981 and 1992–1994) with individual data for 1980 and 1994; the results of the two analyses were virtually equal, especially when the countries were grouped by subregions. Accordingly, the present analysis used data for those two years rather than three-year averages. Although some of the territories for which individualized data were available cannot be considered independent countries, herein all such units are referred to as "countries." Data coverage (i.e., reporting or underreporting levels in each country) presented a special methodological problem. Since it is known that underreporting is higher in areas where health conditions are worst (as reflected in mortality data) and that coverage increased (although less than might be desired) between 1980 and 1994, the countries with less favorable conditions may be better represented in 1994 than in 1980. Considering that changes in the mortality profiles are showing clear improvements in health conditions, at least in terms of causes of death, what may be happening is that the differences between subregions are narrowing, without this affecting the significance of the changes or the main conclusions. Accordingly, country data have been used as reported, without making any allowance for underreporting; the YPLL was calculated on the basis of absolute figures and percentages, rather than on YPLL rates per population. The years 1980 and 1994 are, respectively, the earliest and the most recent years for which mortality data were available from a large enough number of countries in each subregion—coded according to ICD-9, with minimally acceptable coverage and quality levels, and adequately disaggregated by cause and age—to allow the use of a single list and to calculate the YPLL using a single methodology. In order for the analysis to approximate as closely as possible the geographical subregions normally used by PAHO, data have been included for years after 1980 for seven countries and for years before 1994 for eight countries, for a total of 29 countries (and territories). Even so, it was necessary to combine the subregions of the Central American Isthmus and the Latin Caribbean in a new grouping, referred to herein as Central America and the Latin Caribbean. The other adjustment was to include Belize in the Caribbean subregion, referred to herein as the English-speaking Caribbean. Given the lack of mortality data with the necessary features for the

years mentioned, some countries were not able to be included, e.g., Bolivia, Cuba, Haiti, Honduras, Jamaica, and Nicaragua, with populations of between 2.5 million and 11.0 million. As a result, the following seven subregions were identified, covering a total of 29 countries or territories:

<i>Subregion</i>	
<i>Countries and Territories</i>	<i>Years</i>
North America	
Canada	1980 and 1994
United States of America	1980 and 1994
Mexico	
Mexico	1980 and 1994
Central America and the Latin Caribbean	
Costa Rica	1980 and 1994
Dominican Republic	1980 and 1994
El Salvador	1981 and 1994
Guatemala	1980 and 1993
Panama	1980 and 1989
Puerto Rico	1980 and 1992
English-speaking Caribbean	
Bahamas	1980 and 1994
Barbados	1980 and 1994
Belize	1980 and 1994
British Virgin Islands	1981 and 1994
Cayman Islands	1984 and 1992
Dominica	1980 and 1994
Guyana	1984 and 1994
Saint Lucia	1981 and 1994
Suriname	1980 and 1992
Trinidad and Tobago	1980 and 1994
Turks and Caicos Islands	1980 and 1994
Andean Area	
Colombia	1984 and 1994
Ecuador	1980 and 1994
Peru	1983 and 1992
Venezuela	1980 and 1994
Brazil	
Brazil	1980 and 1994
Southern Cone	
Argentina	1980 and 1993
Chile	1980 and 1994
Paraguay	1980 and 1994
Uruguay	1980 and 1990

ANNEX

TABLE A1
Births, birth rates, and total fertility rates, by subregion and country, Region of the Americas, 1993, 1998, and 2003.

Subregion and country	Estimated births (in thousands)			Birth rate (per 1,000 population)			Total fertility rate		
	1993	1998	2003	1993	1998	2003	1993	1998	2003
Region of the Americas	15,763	15,404	15,451	21.0	19.2	18.1	...	...	...
Latin America	11,194	11,151	11,208	24.7	22.7	21.2	...	...	...
Rest of the Americas	4,569	4,254	4,243	15.3	13.6	13.1	...	...	...
Andean Area	2,636	2,630	2,619	27.4	24.8	22.7	3.56	3.19	2.89
Bolivia	250	262	269	35.5	32.9	30.2	4.76	4.32	3.88
Colombia	889	874	861	25.7	23.2	21.2	2.90	2.67	2.50
Ecuador	308	309	307	28.0	25.4	23.0	3.48	3.07	2.74
Peru	621	612	604	27.3	24.7	22.4	3.39	2.95	2.62
Venezuela	568	574	578	27.2	24.7	22.6	3.26	2.95	2.70
Southern Cone	1,208	1,225	1,240	21.8	20.6	19.6	3.04	2.85	2.69
Argentina	701	716	726	20.7	19.8	18.9	2.81	2.60	2.43
Chile	298	292	286	21.6	19.7	18.1	2.53	2.43	2.34
Paraguay	155	163	174	33.8	31.1	29.4	4.51	4.14	3.81
Uruguay	54	54	54	17.1	16.8	16.3	2.32	2.24	2.19
Brazil	3,314	3,232	3,317	21.4	19.5	18.9	2.41	2.16	2.10
Central American Isthmus	1,014	1,064	1,095	33.7	31.2	28.6	4.01	3.59	3.18
Belize	7	7	7	33.9	30.9	27.1	4.13	3.61	3.09
Costa Rica	85	87	90	26.1	23.8	22.3	3.12	2.93	2.77
El Salvador	160	167	166	29.7	27.6	24.7	3.46	3.06	2.74
Guatemala	364	390	414	38.5	36.1	33.6	5.31	4.85	4.28
Honduras	196	204	208	36.7	33.2	29.7	4.86	4.24	3.67
Nicaragua	138	148	151	35.6	33.2	29.9	4.35	3.80	3.31
Panama	63	62	60	24.8	22.3	20.1	2.86	2.61	2.41
Mexico	2,354	2,334	2,272	26.8	24.4	22.0	3.08	2.72	2.47
Latin Caribbean	668	665	666	23.1	21.6	20.4	2.90	2.75	2.65
Cuba	160	144	131	14.7	13.0	11.6	1.60	1.55	1.56
Dominican Republic	201	196	192	26.7	23.9	21.6	3.06	2.78	2.55
Haiti	242	260	278	35.2	34.0	32.8	4.77	4.58	4.38
Puerto Rico	64	65	65	17.7	17.0	16.4	2.17	2.10	2.10
Caribbean	142	137	135	19.3	17.8	16.7	2.42	2.28	2.14
Anguilla ^a	...	z	...	...	24.0	...	3.05	3.00	2.90
Antigua and Barbuda ^a	...	1	...	...	17.0	...	1.70	1.70	1.70
Aruba ^a	...	1	...	...	14.0	...	1.80	1.80	1.80

Bahamas	5	5	5	18.4	17.9	17.2	1.95	1.95	1.96
Barbados	4	4	4	15.1	14.2	13.4	1.73	1.73	1.74
Cayman Islands ^a	...	1	...	...	15.0	...	1.50	1.35	...
Dominica ^a	...	2	...	...	18.0	...	2.00	1.90	1.80
French Guiana ^a	...	4	...	...	25.0	...	3.55	3.35	2.98
Grenada ^a	...	3	...	...	29.0	...	4.00	3.65	3.02
Guadeloupe	8	8	8	18.9	18.4	17.4	2.14	2.10	2.10
Guyana	...	14	...	...	19.0	...	2.53	2.30	2.10
Jamaica	58	54	50	23.8	21.4	18.9	2.59	2.42	2.25
Martinique	7	7	7	17.7	16.8	16.2	2.05	2.01	2.10
Montserrat ^a	...	z	...	...	15.0	...	2.10	1.80	...
Netherlands Antilles	3	3	3	18.0	15.6	15.0	2.19	2.10	2.10
Saint Kitts and Nevis ^a	...	1	...	...	23.0	...	2.65	2.45	2.14
Saint Lucia ^a	...	3	...	...	22.0	...	2.50	2.20	1.90
Saint Vincent and the Grenadines ^a	...	2	...	...	19.0	...	2.15	1.95	1.80
Suriname	10	9	9	25.0	21.5	18.4	2.65	2.36	2.10
Trinidad and Tobago	23	22	24	17.8	16.7	17.2	2.27	2.10	2.10
Turks and Caicos Islands ^a	...	z	...	...	13.0	...	2.25	1.75	...
Virgin Islands (UK)	...	...	...	...	...	...	...	...	...
Virgin Islands (US) ^a	...	2	...	...	18.0	...	2.60	2.15	...
North America	4,428	4,116	4,108	15.2	13.5	13.0	2.00	2.00	2.00
Bermuda ^a	...	1	...	...	15.0	...	1.80	1.80	...
Canada	402	358	361	14.0	11.9	11.5	1.73	1.62	1.69
United States	4,017	3,761	3,755	15.3	13.7	13.2	2.10	2.10	2.10

z = under 500.

^a**Source:** US Bureau of the Census. *World population profile 1996*. Washington, DC: US Bureau of the Census; 1996.

Sources: United Nations. Annex II: Demographic indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996. Latin American Center for Demography. Projections for the population in Latin America. Santiago, Chile: CELADE; 1997.

TABLE A2
Deaths and crude mortality rates, by subregion and country, Region of the Americas, 1993, 1998, and 2003.

Subregion and country	Deaths (in thousands)			Mortality rate (per 1,000 population)		
	1993	1998	2003	1993	1998	2003
Region of the Americas	5,569	5,830	6,143	7.4	7.3	7.2
Latin America	3,012	3,159	3,373	6.6	6.4	6.4
Rest of the Americas	2,557	2,671	2,769	8.6	8.6	8.6
Andean Area	593	623	660	6.2	5.9	5.7
Bolivia	71	72	72	10.1	9.0	8.1
Colombia	200	211	224	5.8	5.6	5.5
Ecuador	68	73	77	6.2	6.0	5.8
Peru	156	158	167	6.9	6.4	6.2
Venezuela	98	109	120	4.7	4.7	4.7
Southern Cone	412	430	454	7.4	7.2	7.2
Argentina	277	285	299	8.2	7.9	7.8
Chile	76	83	90	5.5	5.6	5.7
Paraguay	27	28	30	5.9	5.4	5.1
Uruguay	32	34	35	10.3	10.4	10.4
Brazil	1,127	1,177	1,267	7.3	7.1	7.2
Central American Isthmus	189	196	207	6.3	5.7	5.4
Belize	1	1	1	4.8	4.3	3.9
Costa Rica	12	14	16	3.7	3.8	4.0
El Salvador	34	36	39	6.3	6.0	5.8
Guatemala	72	72	73	7.6	6.6	6.0
Honduras	32	33	36	6.0	5.4	5.1
Nicaragua	25	26	27	6.3	5.8	5.3
Panama	13	14	15	5.3	5.1	5.1
Mexico	457	489	528	5.2	5.1	5.1
Latin Caribbean	233	246	257	8.1	8.0	7.9
Cuba	75	78	82	6.9	7.0	7.3
Dominican Republic	42	44	46	5.6	5.3	5.2
Haiti	90	97	100	13.1	12.7	11.8
Puerto Rico	26	27	29	7.3	7.2	7.4
Caribbean	55	56	58	7.5	7.3	7.2
Anguilla ^a	...	z	...	...	8.0	...
Antigua and Barbuda ^a	...	z	...	...	5.0	...
Aruba ^a	...	z	...	...	6.0	...
Bahamas	1	2	2	5.1	5.2	5.2
Barbados	2	2	2	9.1	8.9	8.5
Cayman Islands ^a	...	z	...	...	5.0	...
Dominica ^a	...	z	...	...	5.0	...
French Guiana ^a	...	1	...	...	5.0	...
Grenada ^a	...	1	...	...	6.0	...
Guadeloupe	3	3	3	6.8	6.5	6.4
Guyana	6	6	6	7.9	7.4	7.0
Jamaica	15	15	14	6.3	5.8	5.4
Martinique	3	3	3	7.0	7.1	7.2
Montserrat ^a	...	z	...	...	10.0	...
Netherlands Antilles	1	1	1	6.2	6.1	6.2
Saint Kitts and Nevis ^a	...	z	...	...	9.0	...
Saint Lucia ^a	...	1	...	...	6.0	...
Saint Vincent and the Grenadines ^a	...	1	...	...	5.0	...
Suriname	2	2	3	5.8	5.5	5.4
Trinidad and Tobago	8	8	8	6.1	6.0	6.1
Turks and Caicos Islands ^a	...	z	...	...	5.0	...
Virgin Islands (UK)	...	...	...	...	...	...
Virgin Islands (US) ^a	...	1	...	...	5.0	...
North America	2,502	2,615	2,711	8.6	8.6	8.6
Bermuda ^a	...	z	...	...	7.0	...
Canada	205	225	246	7.1	7.4	7.8
United States	2,303	2,382	2,469	8.8	8.7	8.7

z = under 500.

^a**Source:** US Bureau of the Census. *World population profile 1996*. Washington, DC: US Bureau of the Census; 1996.

Source: United Nations. Annex I: Demographic indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996. Latin American Center for Demography. Projections for the population in Latin America. Santiago, Chile: CELADE; 1997.

TABLE A3
Life expectancy at birth, by sex, by subregion and country, Region of the Americas, 1998.

Subregion and country	Life expectancy at birth (years)			Men/women difference (years)
	Total	Men	Women	
Region of the Americas	72.5	69.4	75.8	6.4
Latin America	70.0	66.9	73.2	6.4
Rest of the Americas	76.6	73.4	79.9	6.5
Andean Area	70.0	67.4	72.7	5.2
Bolivia	61.7	60.0	63.4	3.4
Colombia	71.0	68.3	73.8	5.5
Ecuador	69.9	67.4	72.6	5.2
Peru	68.5	66.0	71.1	5.0
Venezuela	72.9	70.1	75.8	5.7
Southern Cone	73.5	70.2	76.8	6.6
Argentina	73.3	69.7	76.9	7.2
Chile	75.4	72.4	78.4	6.0
Paraguay	69.8	67.6	72.1	4.5
Uruguay	72.9	69.6	76.1	6.5
Brazil	67.2	63.5	71.3	7.8
Central American Isthmus	70.0	67.5	72.6	5.1
Belize	74.8	73.5	76.2	2.7
Costa Rica	76.9	74.6	79.3	4.7
El Salvador	69.6	66.6	72.6	6.0
Guatemala	67.4	64.9	70.0	5.1
Honduras	69.9	67.6	72.4	4.8
Nicaragua	68.4	66.0	70.8	4.8
Panama	74.0	71.9	76.5	4.6
Mexico	72.6	69.6	75.6	6.0
Latin Caribbean	69.4	67.4	71.7	4.3
Cuba	76.1	74.3	78.1	3.8
Dominican Republic	71.0	69.0	73.2	4.2
Haiti	54.5	52.9	56.3	3.4
Puerto Rico	76.6	72.6	80.6	8.0
Caribbean	74.0	71.6	77.5	4.9
Anguilla ^a	74.3	71.3	77.3	6.0
Antigua and Barbuda ^a	74.3	72.3	76.4	4.1
Aruba ^a	77.2	73.2	81.2	8.0
Bahamas	73.9	70.6	77.2	6.6
Barbados	76.5	73.7	78.8	5.1
Cayman Islands ^a	77.0	75.0	79.0	4.0
Dominica ^a	77.3	75.3	80.3	5.1
French Guiana ^a	76.4	73.4	79.4	6.0
Grenada ^a	71.4	68.3	73.5	5.2
Guadeloupe	75.6	72.2	78.9	6.7
Guyana	64.6	61.3	68.1	6.8
Jamaica	74.7	72.5	76.9	4.4
Martinique	77.2	73.8	80.4	6.6
Montserrat ^a	76.0	74.0	77.0	3.0
Netherlands Antilles	76.5	73.5	79.4	5.9
Saint Kitts and Nevis ^a	67.6	64.6	70.7	6.1
Saint Lucia ^a	70.4	67.3	74.4	7.1
Saint Vincent and the Grenadines ^a	73.4	71.5	74.5	3.0
Suriname	71.6	69.1	74.1	5.0
Trinidad and Tobago	73.8	71.6	76.3	4.7
Turks and Caicos Islands ^a	75.0	73.0	77.0	4.0
Virgin Islands (UK)	...	...	...	...
Virgin Islands (US) ^a	75.0	74.0	77.0	3.0
North America	77.0	73.7	80.3	6.6
Bermuda ^a	75.0	73.0	77.0	4.0
Canada	79.0	76.1	81.9	5.7
United States	76.8	73.5	80.2	6.7

^a**Source:** US Bureau of the Census. *World population profile 1996*. Washington, DC: US Bureau of the Census; 1996 (figures for 1996).

Source: (figures interpolated from): United Nations. Annex I. Demographic Indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.

TABLE A4
Population from the Region who immigrated to Argentina, Canada, the United States, and Venezuela, by country of origin, Region of the Americas, around 1991.

Country of origin	Population from the Americas (thousands) that is part of the census in					Census count in each country [6]	Population originating in each country [5]+[6] [7]	Percentage that lives outside the country [5]/[7](%) [8]
	Argentina 1991 [1]	Canada 1991 [2]	United States 1990 [3]	Venezuela 1990 [4]	Total [5]			
Total	871.3	691.2	10,232.2	684.9	12,479.6	718,180.7	730,660.3	1.71
Anguilla	...	0.1	z	z	0.1	7.0	7.1	1.55
Antigua	...	2.0	z	z	2.0	64.0	66.0	3.01
Argentina	...	11.1	92.6	9.0	112.7	32,527.1	32,639.8	0.35
Aruba	...	0.6	z	z	0.6	67.0	67.6	0.81
Bahamas	...	1.1	21.6	0.0	22.7	255.0	277.7	8.19
Barbados	...	14.8	43.0	0.2	58.1	257.0	315.1	18.43
Belize	...	1.0	30.0	z	30.9	187.0	217.9	14.19
Bermuda	...	1.7	z	z	1.7	61.0	62.7	2.78
Bolivia	143.6	1.6	31.3	2.1	178.6	6,572.8	6,751.4	2.65
Brazil	33.5	7.3	82.5	4.1	127.4	148,029.5	148,156.9	0.09
Canada	...	...	744.8	0.9	745.8	27,791.0	28,536.8	2.61
Chile	244.4	22.9	55.7	20.8	343.8	13,099.5	13,443.3	2.56
Colombia	...	7.9	286.1	529.9	823.9	32,596.0	33,419.9	2.47
Costa Rica	...	1.3	43.5	1.6	46.4	3,034.6	3,081.0	1.51
Cuba	...	1.8	737.0	10.1	748.9	10,627.7	11,376.5	6.58
Dominican Republic	...	2.8	347.9	17.4	368.1	7,110.3	7,478.4	4.92
Ecuador	...	8.0	143.3	23.5	174.8	10,264.1	10,438.9	1.67
El Salvador	...	28.3	465.4	1.0	494.7	5,030.7	5,525.4	8.95
Grenada	...	4.7	17.7	0.4	22.9	91.0	113.9	20.09
Guatemala	...	8.9	225.4	0.6	234.9	8,749.0	8,983.9	2.61
Guyana	...	66.1	120.7	4.4	191.1	795.0	986.1	19.38
Haiti	...	39.9	225.4	1.8	267.1	6,486.0	6,753.1	3.95
Honduras	...	2.3	108.9	0.4	111.6	4,878.8	4,990.4	2.24
Jamaica	...	102.4	334.1	0.2	436.8	2,366.0	2,802.8	15.58
Mexico	...	19.4	4,298.0	2.8	4,320.2	83,226.0	87,546.2	4.93
Nicaragua	...	6.5	168.7	2.3	177.4	3,567.9	3,745.2	4.74
Panama	...	1.2	85.7	1.4	88.3	2,397.5	2,485.8	3.55
Paraguay	250.5	4.9	z	0.3	255.7	4,218.7	4,474.4	5.71
Peru	15.9	11.5	144.2	28.3	199.9	21,569.3	21,769.2	0.92
Puerto Rico ^a	...	0.2	1,200.0	0.9	1,201.1	3,783.0	4,984.1	24.10
Saint Lucia	...	1.8	z	0.1	1.8	133.0	134.8	1.37
Suriname	...	0.0	z	0.1	0.1	400.0	400.1	0.03
Trinidad and Tobago	...	49.4	115.7	3.4	168.5	1,236.0	1,404.5	12.00
United States	...	249.1	...	11.1	260.2	254,106.0	254,366.2	0.10
Uruguay	183.5	5.2	20.8	5.8	215.3	3,094.2	3,309.5	6.50
Venezuela	...	3.5	42.1	...	45.6	19,501.8	19,547.4	0.23
Immigrant percentage	2.68	2.49	3.55	3.51	...	...	...	...

z = under 50.

^aData on persons living in Puerto Rico (US Bureau of the Census; *World population profile 1997*) and of persons born in Puerto Rico living in the United States (Current Population Survey; March 1996) are for 1996. Persons born in Puerto Rico and counted in the United States (1.2 million) are not considered to be born outside the United States, but they are taken into account in determining the percentage of all persons born in Puerto Rico but who live outside the island.

Sources: Instituto Nacional de Estadística y Censos. *República Argentina. Censo de Población 1991*; Características generales codificadas, pp. 87. Statistics Canada. Immigration and Citizenship; Ottawa; 1992, Table 2. 1990 US Census of Population. Social and Economic Characteristics, CP-2-1. US Bureau of the Census; 1993, Table 144. Oficina Central de Estadística e Informática. *El Censo 90 en Venezuela*. Caracas, 1993; Table 7.

TABLE A5
Urban population, rural population, by subregion and country, Region of the Americas, 1993, 1998, and 2003.

Subregion and country	Urban population (in thousands)			Rural population (in thousands)			Urban percentage		
	1993	1998	2003	1993	1998	2003	1993	1998	2003
Region of the Americas	566,758	619,816	671,028	184,917	183,392	181,422	75.4	77.2	78.7
Latin America	329,736	367,778	405,449	123,694	123,704	123,630	72.7	74.8	76.6
Rest of the Americas	237,022	252,038	265,579	61,223	59,688	57,792	79.5	80.9	82.1
Andean Area	68,880	78,356	87,934	27,349	27,503	27,504	71.6	74.0	76.2
Bolivia ^a	4,135	5,019	5,961	2,929	2,938	2,933	58.5	63.1	67.0
Colombia ^a	24,713	27,879	30,970	9,821	9,805	9,726	71.6	74.0	76.1
Ecuador ^a	6,301	7,427	8,574	4,680	4,748	4,769	57.4	61.0	64.3
Peru ^a	15,941	17,867	19,911	6,799	6,934	7,040	70.1	72.0	73.9
Venezuela ^a	17,790	20,165	22,518	3,120	3,077	3,036	85.1	86.8	88.1
Southern Cone	46,301	50,402	54,461	9,068	9,012	8,965	83.6	84.8	85.9
Argentina ^a	29,622	32,108	34,561	4,247	4,017	3,840	87.5	88.9	90.0
Chile ^a	11,521	12,498	13,411	2,250	2,324	2,363	83.7	84.3	85.0
Paraguay ^a	2,332	2,852	3,434	2,248	2,376	2,488	50.9	54.6	58.0
Uruguay ^a	2,826	2,944	3,055	323	295	274	89.7	90.9	91.8
Brazil ^a	119,108	132,610	145,369	35,738	32,863	30,580	76.9	80.1	82.6
Central American Isthmus	13,765	16,267	19,118	16,329	17,848	19,212	45.7	47.7	49.9
Belize	95	107	122	108	123	137	46.9	46.5	46.9
Costa Rica ^a	1,582	1,856	2,150	1,687	1,793	1,868	48.4	50.9	53.5
El Salvador ^a	2,404	2,784	3,205	2,991	3,273	3,501	44.6	46.0	47.8
Guatemala ^a	3,647	4,299	5,121	5,815	6,503	7,188	38.5	39.8	41.6
Honduras ^a	2,271	2,807	3,418	3,065	3,340	3,583	42.6	45.7	48.8
Nicaragua ^a	2,374	2,841	3,339	1,517	1,622	1,714	61.0	63.7	66.1
Panama ^a	1,392	1,573	1,763	1,146	1,194	1,221	54.8	56.9	59.1
Mexico ^a	64,263	70,914	77,538	23,720	24,916	25,763	73.0	74.0	75.1
Latin Caribbean	17,421	19,228	21,029	11,488	11,563	11,606	60.3	62.4	64.4
Cuba ^a	8,121	8,565	8,931	2,724	2,550	2,377	74.9	77.1	79.0
Dominican Republic ^a	4,560	5,259	5,942	2,982	2,973	2,935	60.5	63.9	66.9
Haiti ^a	2,109	2,571	3,117	4,784	5,066	5,349	30.6	33.7	36.8
Puerto Rico	2,631	2,834	3,039	998	973	945	72.5	74.4	76.3
Caribbean	4,292	4,702	5,133	3,034	3,012	2,982	58.6	61.0	63.3
Anguilla	1	1	1	7	7	8	10.7	11.6	13.0
Antigua and Barbuda	23	24	26	42	43	43	35.6	36.4	37.8
Aruba	0	0	0	69	72	75	0.0	0.0	0.0
Bahamas	230	257	282	39	36	33	85.3	87.7	89.4
Barbados	120	129	138	139	134	129	46.3	48.9	51.7
Cayman Islands	29	34	39	0	0	0	100.0	100.0	100.0
Dominica	49	50	52	22	21	20	68.7	70.3	72.0
French Guiana	102	129	157	33	37	41	75.6	77.4	79.1
Grenada	32	34	38	60	59	57	35.2	37.1	39.5
Guadeloupe	407	442	473	4	2	1	99.0	99.6	99.8
Guyana	281	317	362	532	539	538	34.5	37.1	40.2
Jamaica	1,279	1,400	1,530	1,143	1,139	1,129	52.8	55.1	57.5
Martinique	343	369	391	29	23	19	92.2	94.3	95.4
Montserrat	2	2	2	9	9	9	15.6	17.6	20.0
Netherlands Antilles	131	138	146	60	60	59	68.8	69.9	71.4
Saint Kitts and Nevis	14	14	14	28	27	27	34.2	34.1	34.6
Saint Lucia	52	56	61	87	92	97	37.2	37.6	38.6
Saint Vincent and the Grenadines	50	60	70	60	55	50	45.1	52.1	58.2
Suriname	200	225	252	216	217	214	48.2	51.0	54.0
Trinidad and Tobago	895	964	1,039	372	354	341	70.7	73.1	75.3
Turks and Caicos Islands	6	7	8	7	9	10	43.2	44.6	46.5
Virgin Islands (UK)	0	0	0	18	20	23	0.0	0.0	0.0
Virgin Islands (US)	47	49	53	57	58	58	44.9	45.9	47.5
North America	232,729	247,336	260,446	58,190	56,676	54,810	80.0	81.4	82.6
Bermuda	63	64	67	0	0	0	100.0	100.0	100.0
Canada	22,080	23,231	24,315	6,722	6,963	7,075	76.7	76.9	77.5
United States	210,587	224,040	236,064	51,467	49,714	47,735	80.4	81.8	83.2

Total population projections differed by source; the urban percentage was interpolated and applied to the figure projected by CELADE.

^a**Source:** Latin American Center for Demography. Population projections for Latin America. Santiago, Chile: CELADE; 1997.

Source: United Nations. Annex I. Demographic Indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.

TABLE A6
Urban and rural annual growth rate and pace of urbanization, by subregion and country, Region of the Americas,
1993–1998 and 1998–2003.

Subregion and country	Annual rate of growth				Pace of urbanization	
	Urban		Rural			
	1993–1998	1998–2003	1993–1998	1998–2003	1993–1998	1998–2003
Region of the Americas	1.8	1.6	–0.2	–0.2	2.0	1.8
Latin America	2.2	2.0	0.0	0.0	2.2	2.0
Rest of the Americas	1.2	1.0	–0.5	–0.6	1.7	1.7
Andean Area	2.6	2.3	0.1	0.0	2.5	2.3
Bolivia	3.9	3.4	0.1	0.0	3.8	3.5
Colombia	2.4	2.1	0.0	–0.2	2.4	2.3
Ecuador	3.3	2.9	0.3	0.1	3.0	2.8
Peru	2.3	2.2	0.4	0.3	1.9	1.9
Venezuela	2.5	2.2	–0.3	–0.3	2.8	2.5
Southern Cone	1.7	1.5	–0.1	–0.1	1.8	1.7
Argentina	1.6	1.5	–1.1	–0.9	2.7	2.4
Chile	1.6	1.4	0.6	0.3	1.0	1.1
Paraguay	4.0	3.7	1.1	0.9	2.9	2.8
Uruguay	0.8	0.7	–1.8	–1.5	2.7	2.2
Brazil	2.1	1.8	–1.7	–1.4	3.8	3.3
Central American Isthmus	3.3	3.2	1.8	1.5	1.6	1.8
Belize	2.3	2.6	2.6	2.2	–0.3	0.3
Costa Rica	3.2	2.9	1.2	0.8	2.0	2.1
El Salvador	2.9	2.8	1.8	1.3	1.1	1.5
Guatemala	3.3	3.5	2.2	2.0	1.1	1.5
Honduras	4.2	3.9	1.7	1.4	2.5	2.5
Nicaragua	3.6	3.2	1.3	1.1	2.2	2.1
Panama	2.5	2.3	0.8	0.5	1.6	1.8
Mexico	2.0	1.8	1.0	0.7	1.0	1.1
Latin Caribbean	2.0	1.8	0.1	0.1	1.8	1.7
Cuba	1.1	0.8	–1.3	–1.4	2.4	2.2
Dominican Republic	2.9	2.4	–0.1	–0.3	2.9	2.7
Haiti	4.0	3.9	1.1	1.1	2.8	2.8
Puerto Rico	1.5	1.4	–0.5	–0.6	2.0	2.0
Caribbean	1.8	1.8	–0.1	–0.2	2.0	2.0
Anguilla	1.6	4.6	–0.2	2.0	1.8	2.5
Antigua and Barbuda	1.0	1.3	0.4	0.2	0.7	1.2
Aruba	0.0	0.0	0.9	0.8	–0.9	–0.8
Bahamas	2.3	1.8	–1.8	–1.5	4.1	3.4
Barbados	1.4	1.4	–0.7	–0.8	2.1	2.2
Cayman Islands	3.2	2.7	0.0	0.0	3.2	2.7
Dominica	0.5	0.8	–1.1	–0.9	1.6	1.7
French Guiana	4.6	3.9	2.6	2.0	2.0	1.9
Grenada	1.3	1.7	–0.4	–0.4	1.6	2.1
Guadeloupe	1.7	1.3	–15.0	–9.9	16.6	11.2
Guyana	2.5	2.6	0.2	0.0	2.2	2.6
Jamaica	1.8	1.8	–0.1	–0.2	1.9	2.0
Martinique	1.5	1.1	–5.1	–3.7	6.6	4.9
Montserrat	2.3	2.6	–0.5	–0.6	2.8	3.2
Netherlands Antilles	1.0	1.1	0.0	–0.3	1.0	1.4
Saint Kitts and Nevis	–0.6	0.3	–0.4	–0.2	–0.2	0.5
Saint Lucia	1.4	1.8	1.1	1.0	0.3	0.9
Saint Vincent and the Grenadines	3.8	3.0	–1.8	–1.8	5.6	4.9
Suriname	2.3	2.2	0.1	–0.2	2.2	2.4
Trinidad and Tobago	1.5	1.5	–1.0	–0.8	2.5	2.3
Turks and Caicos Islands	4.8	3.2	3.7	1.7	1.1	1.5
Virgin Islands (UK)	0.0	0.0	2.1	2.8	–2.1	–2.8
Virgin Islands (US)	1.0	1.4	0.2	0.1	0.8	1.3
North America	1.2	1.0	–0.5	–0.7	1.7	1.7
Bermuda	0.3	0.9	0.0	0.0	0.3	0.9
Canada	1.0	0.9	0.7	0.3	0.3	0.6
United States	1.2	1.0	–0.7	–0.8	1.9	1.9

Sources: United Nations. Annex I. Demographic Indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996. Latin American Center for Demography. Population projections for Latin America. Santiago, Chile: CELADE; 1997.

TABLE A7
Urban population in cities with more and less than 750,000 inhabitants (in thousands) and annual rate of growth, by subregion and selected countries of the Region of the Americas, 1993, 1998, and 2003.

Subregion and country	Urban population in cities of						Annual rate of growth			
	More than 750,000 inhabitants			Less than 750,000 inhabitants			More than 750,000 inhabitants		Less than 750,000 inhabitants	
	1993	1998	2003	1993	1998	2003	1993–1998	1998–2003	1993–1998	1998–2003
Region of the Americas	269,236	294,036	315,181	293,230	321,077	350,714	1.8	1.4	1.8	1.8
Latin America	149,246	166,927	182,445	180,490	200,852	223,004	2.2	1.8	2.1	2.1
Rest of the Americas	119,990	127,110	132,736	112,740	120,226	127,710	1.2	0.9	1.3	1.2
Andean Area	31,090	35,588	39,872	37,790	42,768	48,063	2.7	2.3	2.5	2.3
Bolivia	1,924	2,381	2,852	2,211	2,638	3,108	4.3	3.6	3.5	3.3
Colombia	12,427	14,219	15,803	12,285	13,660	15,166	2.7	2.1	2.1	2.1
Ecuador	2,953	3,431	3,940	3,348	3,996	4,634	3.0	2.8	3.5	3.0
Peru	6,331	7,133	7,888	9,610	10,734	12,023	2.4	2.0	2.2	2.3
Venezuela	7,455	8,425	9,387	10,335	11,740	13,131	2.4	2.2	2.5	2.2
Southern Cone	21,787	23,295	24,747	24,513	27,107	29,714	1.3	1.2	2.0	1.8
Argentina	14,727	15,646	16,522	14,895	16,462	18,039	1.2	1.1	2.0	1.8
Chile	4,731	5,113	5,457	6,790	7,385	7,954	1.6	1.3	1.7	1.5
Paraguay	1,020	1,190	1,388	1,312	1,663	2,046	3.1	3.1	4.7	4.1
Uruguay	1,310	1,347	1,380	1,516	1,598	1,676	0.6	0.5	1.0	1.0
Brazil	52,179	57,354	61,922	66,929	75,256	83,447	1.9	1.5	2.3	2.1
Central American Isthmus	6,880	8,264	9,703	6,884	8,003	9,415	3.7	3.2	3.0	3.2
Costa Rica	869	1,006	1,153	712	850	997	2.9	2.7	3.5	3.2
El Salvador	1,142	1,335	1,543	1,262	1,449	1,663	3.1	2.9	2.8	2.7
Guatemala	1,993	2,500	3,013	1,653	1,799	2,108	4.5	3.7	1.7	3.2
Honduras	905	1,143	1,398	1,366	1,664	2,020	4.7	4.0	3.9	3.9
Nicaragua	1,051	1,241	1,438	1,323	1,600	1,901	3.3	2.9	3.8	3.4
Panama	919	1,040	1,159	472	534	604	2.5	2.2	2.4	2.5
Mexico	28,515	32,280	34,912	35,748	38,634	42,626	2.5	1.6	1.6	2.0
Latin Caribbean	8,795	10,145	11,289	8,626	9,084	9,740	2.9	2.1	1.0	1.4
Cuba	2,177	2,270	2,336	5,944	6,296	6,595	0.8	0.6	1.2	0.9
Dominican Republic	4,016	4,867	5,519	544	392	423	3.8	2.5	-6.5	1.5
Haiti	1,330	1,659	2,008	779	912	1,110	4.4	3.8	3.1	3.9
Puerto Rico	1,271	1,349	1,427	1,360	1,485	1,612	1.2	1.1	1.8	1.7
North America	119,990	127,110	132,736	112,740	120,226	127,710	1.2	0.9	1.3	1.2
Canada	11,665	12,624	13,305	10,415	10,607	11,010	1.6	1.1	0.4	0.7
United States	108,325	114,486	119,431	102,262	109,554	116,633	1.1	0.8	1.4	1.3

Source: (interpolated from): United Nations. Annex tables: *World urbanization prospects: The 1996 revision*. New York: UN, Population Division; 1997.

TABLE A8
Age structure of the population and annual rate of growth, by broad age groups and by subregion and selected countries of the Region of the Americas, 1998–2003.

Subregion and country	Age distribution 1998 (%)			Annual rate of growth 1998–2003 (%)			
	<15 years	15 to 64 years	65 years and older	<15 years	15 to 64 years	65 years and older	85 years and older
Andean Area	34.0	46.7	3.6	0.4	2.3	3.2	5.0
Bolivia	40.1	44.7	3.3	1.6	2.4	2.8	5.0
Colombia	33.3	47.8	3.7	0.2	2.1	2.8	4.1
Ecuador	29.9	41.1	3.2	0.4	2.3	3.4	4.6
Peru	34.4	48.2	3.8	0.1	2.1	3.6	6.2
Venezuela	34.9	47.3	3.5	0.5	2.5	3.2	6.4
Southern Cone	29.2	48.2	6.9	0.5	1.5	1.6	4.2
Argentina	28.2	48.5	7.7	0.5	1.4	1.4	4.7
Chile	28.9	48.7	5.6	0.1	1.5	2.5	4.2
Paraguay	40.4	44.3	2.8	1.4	3.2	3.2	3.1
Uruguay	24.0	49.0	10.2	0.2	0.4	0.3	2.0
Brazil	29.6	50.9	4.1	−0.7	1.7	3.1	4.1
Central American Isthmus	39.2	44.0	3.1	1.4	2.7	3.4	5.5
Belize ^a	42.2	54.3	3.6	0.8	3.5	2.2	2.7
Costa Rica	33.9	47.2	4.0	0.6	2.5	3.5	5.5
El Salvador	36.2	48.1	3.7	1.1	2.0	3.4	7.2
Guatemala	41.3	39.7	2.7	1.9	3.1	2.8	3.5
Honduras	42.6	43.5	2.7	1.4	3.2	4.4	6.6
Nicaragua	41.9	44.5	2.5	1.3	3.1	3.5	7.0
Panama	32.2	48.5	4.4	0.1	1.9	3.0	5.0
Mexico	34.1	48.7	3.7	0.1	1.7	3.4	1.8
Latin Caribbean	29.9	50.7	5.7	0.3	1.2	2.5	4.1
Cuba	21.8	51.8	7.5	−1.6	0.1	2.4	4.6
Dominican Republic	33.9	48.1	3.6	0.0	1.9	3.2	6.0
Haiti	40.1	44.5	3.2	1.8	2.2	1.9	1.9
Puerto Rico ^a	24.5	65.3	10.2	0.3	0.9	2.3	3.6
North America	21.5	65.8	12.7	0.0	1.0	0.5	2.9
Canada ^a	19.8	67.8	12.5	−0.5	1.0	1.5	4.0
United States ^a	21.7	65.6	12.7	0.0	1.0	0.4	2.7

^aEstimated age distribution based on the age distribution in the US Bureau of the Census projection, adjusted for the total population estimated by the United Nations (*World population prospects: The 1996 revision*).

Source: Latin American Center for Demography. Population projections for Latin America. Santiago, Chile: CELADE; 1997.

TABLE A9
Adult to elderly ratio and female to male ratio by age of the male, by subregion and selected countries in the Americas, 1988.

Subregion and country	Number of adults per elderly person ^a	Number of women per 100 men	
		65 years and older	85 years and older
Andean Area	13.0	119	149
Bolivia	13.5	122	151
Colombia	13.0	121	139
Ecuador	12.9	116	158
Peru	12.7	117	156
Venezuela	13.5	119	162
Southern Cone	7.0	140	226
Argentina	6.3	141	235
Chile	8.6	139	208
Paraguay	15.7	140	191
Uruguay	4.8	140	231
Brazil	12.3	127	164
Central American Isthmus	14.1	113	148
Belize ^b	15.1	104	134
Costa Rica	11.7	115	144
El Salvador	13.0	121	187
Guatemala	14.7	107	130
Honduras	16.0	115	153
Nicaragua	17.7	121	190
Panama	11.1	105	122
Mexico	13.1	121	148
Latin Caribbean	8.9	114	122
Cuba	6.9	109	107
Dominican Republic	13.4	104	123
Haiti	14.0	119	126
Puerto Rico ^b	6.4	131	138
North America	5.2	143	240
Canada ^b	5.4	136	192
United States ^b	5.2	143	252

^aEstimated age distribution based on the age distribution in the US Bureau of the Census projection, adjusted for the total population estimated by the United Nations (*World population prospects: The 1996 revision*).

^bNumber of persons 15–64 years old for each person 65 years old and older.

Source: United Nations. Annex I. Demographic Indicators. In: United Nations. *World population prospects: The 1996 revision*. New York: UN, Population Division; 1996.

TABLE A10
Age-specific, estimated mortality rates by age (per 100,000 population) in selected countries
of the Region of the Americas, 1980–1984 five-year period.

Country	Age groups					
	<1	1 to 4	5 to 14	15 to 44	45 to 64	65 and older
Argentina	3,309.0	135.0	43.0	166.2	1,043.1	5,766.3
Barbados	1,865.3	69.4	29.8	109.4	875.7	5,057.0
Bolivia	11,851.5	1,559.3	327.1	478.5	1,471.4	7,413.7
Brazil	6,772.0	353.0	76.0	292.2	1,366.4	6,826.6
Canada	914.1	50.2	28.2	108.2	770.8	4,840.4
Chile	2,417.0	112.0	46.0	172.9	1,030.1	5,783.3
Colombia	4,260.0	282.0	68.0	267.6	1,086.1	5,800.4
Costa Rica	1,952.0	119.0	37.8	115.4	696.7	4,968.5
Cuba	1,728.0	98.0	45.4	150.6	775.7	4,877.9
Dominican Republic	7,563.0	467.0	84.0	201.2	919.4	5,729.8
Ecuador	7,216.0	699.0	138.0	247.0	989.4	5,777.0
El Salvador	8,140.0	1,156.1	115.0	679.2	1,366.2	5,877.2
Guatemala	8,352.0	1,065.0	229.0	467.3	1,409.5	6,400.5
Haiti	11,702.5	1,361.2	240.8	555.0	1,942.9	8,109.8
Honduras	6,828.0	981.0	189.0	369.5	1,199.6	5,401.5
Mexico	4,880.0	271.0	77.0	265.2	1,051.6	5,606.1
Nicaragua	8,458.0	1,048.7	192.0	421.8	1,222.7	5,956.2
Panama	3,118.0	313.8	77.2	178.6	831.4	5,255.8
Paraguay	5,090.8	365.2	90.9	170.3	1,003.0	7,080.8
Peru	8,655.0	984.0	145.0	267.0	1,076.8	6,183.4
Puerto Rico	1,745.8	48.2	27.3	149.9	822.7	4,927.9
Saint Kitts and Nevis	4,242.5	207.9	34.4	169.6	1,430.5	7,161.9
Saint Lucia	2,250.2	127.4	35.2	150.0	1,049.6	5,876.0
Suriname	2,798.0	228.8	61.7	187.1	1,107.7	6,183.8
Trinidad and Tobago	1,592.3	112.2	44.8	184.7	1,353.1	6,284.6
Turks and Caicos Islands	1,822.1	27.0	34.8	80.7	411.8	4,210.5
United States	1,159.8	58.3	28.4	139.0	927.3	5,126.8
Uruguay	3,445.0	103.0	38.0	140.0	1,044.1	5,851.4
Venezuela	3,446.0	232.0	60.0	204.0	1,025.6	5,692.3
Virgin Islands (UK)	5,010.9	128.2	0.0	169.0	664.6	5,396.8

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A11
Age-specific estimated mortality rates (per 100,000 population) in selected countries,
Region of the Americas, 1985–1989 five-year period.

Country	Age groups (years)					
	<1	1 to 4	5 to 14	15 to 44	45 to 64	65 and older
Argentina	2,777.0	123.0	39.0	158.0	1,021.6	5,758.0
Barbados	1,963.5	55.3	37.6	122.7	882.2	5,388.7
Bolivia	9,669.1	1,034.1	299.9	434.0	1,416.3	7,257.9
Brazil	5,753.0	254.0	63.0	285.9	1,312.3	6,472.5
Canada	748.5	42.1	22.2	100.2	696.9	4,706.7
Chile	1,864.0	88.0	36.6	150.4	882.0	5,416.5
Colombia	3,563.0	260.0	64.0	255.3	1,022.4	5,653.5
Costa Rica	1,660.0	75.9	31.0	104.0	614.5	4,622.7
Cuba	1,305.0	78.0	42.8	148.0	748.2	5,067.5
Dominican Republic	5,747.0	753.0	121.4	230.6	1,024.4	5,789.7
Ecuador	5,983.0	517.0	101.0	225.6	908.8	5,385.6
El Salvador	5,652.0	699.1	83.0	434.5	1,139.9	5,102.9
Guatemala	6,825.0	562.0	136.0	310.0	1,034.4	5,061.1
Haiti	10,365.8	1,144.2	205.2	499.1	1,868.9	7,996.1
Honduras	5,526.0	395.0	71.0	175.4	850.0	5,427.0
Mexico	4,073.0	235.0	60.6	216.0	947.8	5,337.0
Nicaragua	6,830.0	683.1	157.0	382.0	1,149.4	5,964.1
Panama	2,908.0	252.0	63.0	171.0	775.1	5,159.2
Paraguay	4,856.3	306.5	84.3	165.3	965.8	6,950.2
Peru	7,034.0	753.0	121.2	230.8	1,025.6	5,810.9
Puerto Rico	1,392.3	48.4	23.8	191.8	812.6	4,993.6
Saint Kitts and Nevis	...	...	48.8	207.4	1,335.2	7,241.9
Saint Lucia	1,940.8	95.8	39.5	156.2	1,155.3	6,154.3
Suriname	2,315.9	154.0	43.5	151.7	906.3	5,503.1
Trinidad and Tobago	1,134.1	77.2	35.1	182.0	1,325.6	6,703.3
Turks and Caicos Islands	1,535.7	23.8	20.1	117.2	690.2	4,634.1
United States	1,016.2	51.0	25.9	146.2	864.6	5,106.1
Uruguay	2,491.0	87.0	36.4	132.0	1,052.6	5,858.6
Venezuela	2,747.0	150.0	51.0	186.4	938.0	5,396.1
Virgin Islands (UK)	2,777.8	55.6	11.8	216.6	761.9	6,715.7

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A12
Age-specific estimated mortality rates (per 100,000 population) in selected countries,
Region of the Americas, 1990–1994 five-year period.

Country	Age groups (years)					
	<1	1 to 4	5 to 14	15 to 44	45 to 64	65 and older
Argentina	2,483.0	104.0	33.0	142.7	950.2	5,549.6
Barbados	1,369.5	58.8	29.0	164.0	861.5	5,627.3
Bolivia	7,972.7	656.6	282.1	401.2	1,366.2	6,999.6
Brazil	4,907.0	181.0	52.0	275.0	1,241.9	6,072.4
Canada	638.0	31.9	19.3	100.6	601.4	4,521.5
Chile	1,420.0	69.0	30.0	131.2	753.9	5,086.1
Colombia	2,877.0	242.0	59.0	245.4	946.8	5,503.7
Costa Rica	1,384.0	64.0	26.0	95.2	570.9	4,501.4
Cuba	1,012.0	73.0	39.0	142.2	713.9	5,110.3
Dominican Republic	4,341.0	587.0	103.0	202.8	979.0	5,418.5
Ecuador	5,173.0	414.0	81.0	210.4	850.0	5,122.8
El Salvador	4,581.0	343.0	59.0	293.5	995.0	4,627.7
Guatemala	5,325.0	446.0	115.4	279.1	954.0	4,806.6
Haiti	9,178.4	956.7	174.5	449.4	1,794.0	7,873.7
Honduras	4,456.0	378.0	68.0	174.0	832.8	5,272.4
Mexico	3,486.0	205.0	50.6	185.2	857.2	4,964.3
Nicaragua	5,453.0	468.0	124.6	277.9	1,030.4	4,991.6
Panama	2,565.0	202.1	52.0	156.4	709.2	5,090.9
Paraguay	4,493.5	270.4	72.5	159.8	923.3	6,579.9
Peru	5,800.0	587.0	103.0	202.8	979.0	5,418.5
Puerto Rico	1,306.0	47.4	23.0	237.8	786.0	4,743.6
Saint Kitts and Nevis	...	...	...	...	...	...
Saint Lucia	...	...	...	...	...	...
Suriname	1,589.3	113.4	37.8	164.9	942.3	4,850.0
Trinidad and Tobago	1,200.9	71.2	37.8	190.6	1,231.0	7,052.1
Turks and Caicos Islands	1,260.5	72.5	15.4	165.6	642.0	4,938.3
United States	862.2	44.8	23.3	157.3	764.7	4,969.9
Uruguay	2,028.0	116.0	46.0	173.0	855.2	5,106.0
Venezuela	2,364.0	116.0	46.0	173.0	853.6	5,106.4
Virgin Islands (UK)	2,546.9	110.0	47.5	249.5	1,352.3	8,962.3

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A13
North America: percentage of years of potential life lost (YPLL) from the 10 leading causes of death, according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	06 Malignant neoplasms	21.5	[+11]	17.3	(1)	29.0	(1)	18.4	(1)	14.6	(2)	25.2	(1)
2	09 Ischemic heart disease	9.8	[−34]	11.0	(2)	7.7	(2)	14.1	(2)	16.3	(1)	10.3	(2)
3	18 Motor-vehicle traffic accidents	7.5	[−32]	8.1	(4)	6.4	(4)	10.5	(3)	12.2	(3)	7.5	(4)
4	... AIDS	6.9	[...]	9.0	(3)	3.2	(9)	(...)	(...)	(...)	(...)	(...)	(...)
5	19 Accidents, other than motor-vehicle traffic accidents	6.0	[−23]	7.1	(5)	3.9	(7)	7.4	(5)	8.9	(4)	4.7	(6)
6	10 Diseases of pulmonary circulation and other forms of heart disease	5.6	[+14]	5.7	(7)	5.6	(5)	4.7	(6)	4.7	(7)	4.7	(7)
7	17 Conditions originating in the perinatal period	5.4	[−37]	4.7	(8)	6.7	(3)	8.2	(4)	7.2	(5)	9.8	(3)
8	20 Homicides	5.1	[+8]	6.3	(6)	2.9	(10)	4.5	(7)	5.5	(6)	2.7	(9)
9	16 Congenital anomalies	3.5	[−24]	2.8	(9)	4.7	(6)	4.4	(8)	3.7	(8)	5.7	(5)
10	11 Cerebrovascular disease	2.7	[−19]	2.3	(10)	3.6	(8)	3.2	(9)	2.6	(10)	4.3	(8)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A14
Mexico: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death, according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	17 Conditions originating in the perinatal period	15.2	[−22]	14.4	(1)	16.6	(1)	13.4	(3)	13.0	(2)	13.8	(3)
2	19 Accidents, other than motor-vehicle traffic accidents	8.6	[−37]	10.7	(2)	5.0	(6)	9.3	(4)	12.4	(4)	4.7	(4)
3	05 Acute respiratory infections	8.2	[−61]	7.3	(4)	9.7	(3)	14.3	(2)	12.5	(3)	16.2	(2)
4	06 Malignant neoplasms	6.8	[+57]	4.8	(8)	10.1	(2)	3.0	(9)	1.9	(11)	4.3	(5)
5	16 Congenital anomalies	6.4	[+42]	5.4	(7)	8.1	(4)	3.1	(8)	2.8	(9)	3.6	(7)
6	20 Homicides	6.4	[+22]	9.3	(3)	1.7	(16)	3.6	(6)	5.3	(6)	1.0	(18)
7	18 Motor-vehicle traffic accidents	5.7	[−13]	7.3	(5)	3.0	(9)	4.5	(5)	5.8	(5)	2.4	(10)
8	01 Intestinal infectious diseases	4.7	[−81]	4.2	(9)	5.7	(5)	16.8	(1)	15.2	(1)	19.3	(1)
9	13 Cirrhosis and other chronic diseases of the liver	4.2	[+32]	5.5	(6)	2.0	(14)	2.2	(11)	3.0	(13)	1.0	(19)
10	07 Diabetes mellitus	3.1	[+92]	2.4	(11)	4.3	(7)	1.1	(17)	0.9	(19)	1.4	(15)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A15
English-speaking Caribbean: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death, according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	17 Conditions originating in the perinatal period	13.4	[−16]	12.9	(1)	14.0	(1)	13.9	(1)	13.3	(1)	14.8	(1)
2	06 Malignant neoplasms	8.2	[+19]	6.2	(4)	11.2	(2)	6.1	(4)	4.7	(7)	8.0	(3)
3	09 Ischemic heart disease	5.9	[+18]	6.5	(3)	5.1	(5)	4.4	(8)	5.1	(6)	3.3	(10)
4	19 Accidents, other than motor-vehicle traffic accidents	5.6	[−30]	7.0	(2)	3.5	(10)	7.0	(3)	8.6	(2)	4.8	(8)
5	11 Cerebrovascular disease	4.6	[−16]	4.2	(6)	5.2	(4)	4.7	(7)	4.6	(8)	5.2	(6)
6	05 Acute respiratory infections	4.4	[−46]	4.2	(7)	4.6	(6)	7.1	(2)	6.5	(3)	8.1	(2)
7	07 Diabetes mellitus	4.3	[+83]	3.6	(10)	5.5	(3)	2.0	(13)	1.4	(15)	3.0	(11)
8	10 Diseases of pulmonary circulation and other forms of heart disease	3.9	[−20]	3.5	(11)	4.5	(7)	4.3	(9)	3.8	(10)	4.9	(7)
9	01 Intestinal infectious diseases	3.9	[−44]	4.1	(9)	3.5	(9)	6.0	(5)	6.0	(4)	6.0	(5)
10	20 Homicides	3.4	[+95]	4.4	(5)	1.8	(13)	1.5	(14)	2.0	(13)	0.8	(18)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A16
Central America and Latin Caribbean: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death, according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	17 Conditions originating in the perinatal period	14.2	[−50]	12.8	(1)	16.4	(2)	21.0	(1)	20.2	(1)	22.2	(1)
2	05 Acute respiratory infections	14.1	[−11]	12.5	(2)	16.6	(1)	11.6	(3)	10.4	(3)	13.3	(3)
3	01 Intestinal infectious diseases	10.9	[−57]	9.7	(3)	12.7	(3)	18.2	(2)	16.4	(2)	21.6	(2)
4	20 Homicides ^a	5.5	[−20]	8.4	(4)	1.2	(18)	5.1	(5)	7.8	(4)	1.1	(12)
5	08 Nutritional deficiencies and anemia	4.4	[−1]	3.7	(7)	5.6	(5)	3.3	(6)	2.8	(8)	3.9	(5)
6	06 Malignant neoplasms	4.4	[+48]	3.3	(8)	6.1	(4)	2.2	(11)	1.6	(11)	3.1	(6)
7	19 Accidents, other than motor-vehicle traffic accidents	4.1	[+8]	5.2	(5)	2.4	(8)	2.8	(7)	3.7	(6)	1.5	(10)
8	18 Motor-vehicle traffic accidents	3.2	[−6]	4.3	(6)	1.5	(13)	2.5	(8)	3.3	(7)	1.4	(11)
9	16 Congenital anomalies	3.0	[−1]	2.6	(10)	3.6	(6)	2.2	(10)	2.0	(10)	2.6	(8)
10	10 Diseases of pulmonary circulation and other forms of heart disease	2.9	[+45]	2.7	(9)	3.3	(10)	1.5	(12)	1.3	(12)	1.8	(9)

^aIncludes deaths from operations of war.

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A17
Andean Area: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death,
according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	20 Homicides	14.5	[+193]	21.1	(1)	3.0	(11)	4.4	(6)	7.0	(5)	0.8	(18)
2	17 Conditions originating in the perinatal period	13.4	[-19]	12.0	(2)	15.8	(1)	14.6	(1)	14.6	(1)	14.6	(2)
3	05 Acute respiratory infections	8.8	[-33]	7.6	(4)	11.0	(2)	11.6	(3)	10.1	(3)	13.8	(3)
4	06 Malignant neoplasms	7.0	[+43]	4.9	(7)	10.7	(3)	4.3	(7)	3.2	(9)	5.9	(4)
5	19 Accidents, other than motor-vehicle traffic accidents	6.9	[-12]	8.2	(3)	4.6	(6)	7.0	(4)	9.1	(4)	4.1	(7)
6	01 Intestinal infectious diseases	6.7	[-57]	5.8	(6)	8.2	(4)	13.7	(2)	12.4	(2)	15.4	(1)
7	18 Motor-vehicle traffic accidents	5.4	[+2]	6.7	(5)	3.3	(7)	4.7	(5)	6.5	(6)	2.4	(12)
8	16 Congenital anomalies	4.0	[+32]	3.4	(8)	4.9	(5)	2.7	(10)	2.5	(10)	2.8	(8)
9	09 Ischemic heart disease	3.1	[+42]	3.1	(9)	3.0	(12)	1.9	(14)	2.1	(11)	1.7	(16)
10	10 Diseases of pulmonary circulation and other forms of heart disease	2.5	[-2]	2.1	(10)	3.2	(8)	2.3	(11)	2.0	(12)	2.5	(10)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A18
Brazil: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death,
according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	17 Conditions originating in the perinatal period	15.7	[-28]	13.9	(1)	18.9	(1)	19.4	(1)	18.7	(1)	20.1	(1)
2	20 Homicides	8.1	[+143]	11.5	(2)	2.0	(14)	3.0	(11)	4.4	(6)	0.7	(19)
3	06 Malignant neoplasms	7.6	[+35]	6.0	(5)	10.5	(2)	5.0	(4)	4.1	(7)	5.8	(4)
4	18 Motor-vehicle traffic accidents	6.5	[+44]	7.8	(3)	4.2	(8)	4.0	(7)	5.1	(5)	2.3	(9)
5	05 Acute respiratory infections	6.3	[-45]	5.7	(6)	7.3	(3)	10.1	(3)	8.9	(3)	11.2	(3)
6	19 Accidents, other than motor-vehicle traffic accidents	5.9	[+28]	7.3	(4)	3.5	(10)	4.1	(6)	5.4	(4)	2.2	(10)
7	11 Cerebrovascular disease	4.7	[+22]	4.0	(8)	6.1	(4)	3.4	(9)	3.2	(10)	3.8	(7)
8	01 Intestinal infectious diseases	4.4	[-72]	3.9	(9)	5.3	(5)	14.1	(2)	13.1	(2)	15.7	(2)
9	09 Ischemic heart disease	3.9	[+23]	4.1	(7)	3.5	(9)	2.8	(12)	3.2	(9)	2.1	(11)
10	10 Diseases of pulmonary circulation and other forms of heart disease	3.8	[-3]	3.4	(10)	4.4	(7)	3.4	(18)	3.1	(11)	3.9	(6)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

TABLE A19
Southern Cone: Percentage of years of potential life lost (YPLL) from the 10 leading causes of death,
according to the list of 20 categories, by sex, 1994 and 1980.

No.	Cause of death	1994						1980					
		Total		Males		Females		Total		Males		Females	
		%	var	%	rank	%	rank	%	rank	%	rank	%	rank
1	06 Malignant neoplasms	14.6	[+10]	12.5	(2)	18.1	(1)	10.9	(2)	9.3	(2)	12.4	(2)
2	17 Conditions originating in the perinatal period	14.1	[-37]	12.9	(1)	16.2	(2)	18.1	(1)	17.4	(1)	19.2	(1)
3	10 Diseases of pulmonary circulation and other forms of heart disease	8.1	[+5]	8.3	(4)	7.9	(3)	6.4	(5)	6.5	(4)	6.2	(4)
4	19 Accidents, other than motor-vehicle traffic accidents	7.7	[-3]	9.0	(3)	5.7	(5)	6.6	(4)	7.9	(3)	4.6	(7)
5	16 Congenital anomalies	6.4	[+3]	5.5	(5)	7.7	(4)	5.1	(6)	4.6	(7)	5.9	(5)
6	11 Cerebrovascular disease	4.9	[+2]	4.7	(8)	5.3	(6)	4.0	(9)	3.8	(10)	4.2	(8)
7	18 Motor-vehicle traffic accidents	4.2	[+6]	5.2	(6)	2.5	(9)	3.3	(10)	4.2	(9)	1.9	(12)
8	09 Ischemic heart disease	4.2	[-21]	5.1	(7)	2.7	(8)	4.4	(8)	5.5	(6)	2.7	(9)
9	05 Acute respiratory infections	4.1	[-50]	3.8	(9)	4.5	(7)	6.7	(3)	5.7	(5)	7.6	(3)
10	04 Septicemia	2.0	[-16]	1.8	(12)	2.5	(10)	2.0	(12)	1.7	(12)	2.4	(10)

"Ill-defined" causes were excluded from the calculation of percentage YPLL by cause of death.

The percentage variation (var) of YPLL for each cause of death, for 1994 and 1980, is shown in brackets.

The ranking (rank) of each cause of death for each sex is shown in parentheses.

Source: PAHO. Technical Information System. Health Situation Analysis Program, Health and Human Development Division.

II. HEALTH BY POPULATION GROUP

HEALTH OF CHILDREN

Infant Mortality

Mortality in children under 1 year of age is an important health indicator. It is associated with a great variety of factors, including maternal health, quality of and access to health services, socioeconomic conditions, and public health practices. In recent decades, the countries of the Region of the Americas have reduced infant mortality considerably. The available data indicate that the majority of the countries have already achieved the goal proposed by the World Summit for Children, of reducing infant mortality to 50 per 1,000 live births between 1990 and 2000 (1). Nevertheless, the profile of infant mortality reflects the myriad and complex processes that influence living conditions in the Region. For example, in Haiti, one of the poor countries with limited social development in the Region, infant mortality for the 1990–1995 period was estimated at 86 per 1,000 live births, whereas in Canada it was 7 per 1,000. Table 1 presents five-year estimates of the infant mortality rate (IMR) from 1950–1955 through 1990–1995, for each country of the Region.

The Latin American Demography Center periodically produces infant mortality estimates for 20 countries, which together account for about 97% of the population and 98% of the births in Latin America and the Caribbean. These countries are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela. The overall estimated infant mortality rate for this group of countries as a whole dropped from 127 in 1950–1955 to 40 in 1990–1995 (2).

In Latin America and the Caribbean, the average annual number of deaths of children under 1 year of age during the 1950–1954 five-year period was 940,000, compared to 123,000 in North America (Canada and the United States),

which corresponds to IMRs of 125 and 29 per 1,000 live births, respectively. In the 1980–1984 period, the corresponding values were 690,000 and 44,000, respectively, with rates of 59 and 11 per 1,000 live births. According to IMR estimates for 1990–1995, infant deaths decreased to 460,000 annually in Latin America and the Caribbean and to 36,000 in North America (rates of 40 and of 8 per 1,000 live births, respectively). If the rate that prevailed at the beginning of the 1950s had continued, the number of infant deaths in Latin America and the Caribbean would have reached almost 1.5 million. Instead, there has been a reduction of two-thirds, or 1 million deaths a year.

The pattern of infant mortality in the second half of this century in the countries of the Region of the Americas is analyzed below in two complementary ways, first in terms of the percentage reduction between 1950–1955 and 1990–1995, and then in terms of the reduction in absolute value of the rates between the two periods. It should be pointed out that equivalent percentage reductions are sometimes associated with very different numbers of children whose deaths have been prevented. The countries with the highest rates at the beginning of the period of analysis had the greatest potential to achieve large reductions in absolute terms, which translates into greater gains in longevity of a population, as measured by life expectancy at birth.

Table 2 presents the percentage reduction in the IMR for various groups of countries; within each group the countries are listed in descending order, according to their percentage of reduction. The reductions range from a high of 88% in Chile, Cuba, and Barbados to a low of 41% in Paraguay (3).

Table 3 shows the reduction in the IMR in descending order by magnitude of the reduction in points for groups of countries. Within each group, the countries are also presented in descending order according to the magnitude of the reduction each achieved. Decreases range from 133 points dropped in Haiti to 20 points dropped in the United States.

TABLE 1
Estimated infant mortality rates, by country, 1950–1955 to 1990–1995.

Country	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975	1975–1980	1980–1985	1985–1990	1990–1995
Anguilla	...	...	...	...	...	...	...	...	26
Antigua and Barbuda	...	...	...	...	...	...	...	...	19
Argentina	66	60	60	57	48	39	32	27	24
Aruba	...	...	...	...	...	...	...	...	8
Bahamas	80	57	44	44	32	29	28	27	19
Barbados	132	87	61	46	33	27	17	13	16
Belize	88	78	69	60	52	45	39	36	35
Bermuda	...	...	...	...	...	...	...	...	13
Bolivia	175	169	163	157	151	131	109	90	75
Brazil	134	122	109	100	90	78	64	55	47
Canada	36	30	26	21	16	12	9	7	7
Chile	120	118	109	89	68	45	24	18	14
Colombia	123	105	92	82	73	59	41	35	28
Costa Rica	94	88	81	68	53	30	19	16	14
Cuba	80	70	59	49	38	22	17	13	10
Dominica	...	...	...	...	48	...	...	15	14
Dominican Republic	149	132	117	105	93	84	71	55	42
Ecuador	139	129	119	107	95	82	68	57	44
El Salvador	151	137	122	110	99	87	77	54	44
Grenada	...	...	62	...	33	...	24	28	20
Guadeloupe	68	54	45	50	42	25	15	14	11
Guatemala	140	131	119	107	95	82	70	59	48
French Guiana	...	...	...	...	...	...	...	...	20
Guyana	119	105	95	82	79	67	63	56	46
Haiti	219	193	170	150	135	121	108	97	86
Honduras	169	154	135	119	104	81	65	53	43
Jamaica	85	71	54	45	42	26	18	17	17
Martinique	65	56	48	42	35	22	14	11	10
Mexico	121	101	88	79	69	57	47	39	34
Montserrat	...	...	114	...	43	...	40	19	12
Netherlands Antilles	97	84	72	61	44	29	25	22	15
Nicaragua	172	150	131	114	98	90	80	65	52
Panama	93	75	63	51	43	35	30	28	25
Paraguay	73	70	62	58	53	53	49	47	43
Peru	158	148	136	126	110	99	81	68	55
Puerto Rico	63	51	45	33	25	20	17	14	12
Saint Kitts and Nevis	...	...	102	...	48	...	53	20	27
Saint Vincent and the Grenadines	...	...	145	...	56	...	60	21	18
Saint Lucia	...	...	107	...	49	...	24	20	19
Suriname	89	76	63	55	49	44	39	33	31
Trinidad and Tobago	79	64	48	46	42	38	31	24	17
United States	28	26	25	22	18	14	11	10	8
Uruguay	57	53	48	47	46	42	33	24	20
Venezuela	106	89	73	60	49	39	34	27	23
Virgin Islands (UK)	...	...	59	...	32	...	44	...	20

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition.* Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

TABLE 2
Percentage reduction in the infant mortality rate between 1950–1955 and 1990–1995.

80% and more	Chile, Cuba, Barbados; Costa Rica, Martinique, Netherlands Antilles; Guadeloupe; Canada; Puerto Rico; Jamaica
70%–79%	Venezuela, Trinidad and Tobago; Colombia; Bahamas; Honduras; Panama; Mexico, Dominican Republic; El Salvador, United States; Nicaragua
60%–69%	Ecuador; Guatemala; Brazil, Peru, Suriname, Uruguay; Argentina; Guyana, Haiti; Belize
50%–59%	Bolivia
40%–49%	Paraguay

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition.* Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

TABLE 3
Reduction, in points, of the infant mortality rate between 1950–1955 and 1990–1995.

Reduction in points	Countries
100 and more	Haiti; Honduras; Nicaragua; Barbados; El Salvador, Dominican Republic; Chile; Peru; Bolivia
80 to 99	Colombia, Ecuador; Guatemala; Brazil, Mexico; Venezuela; Netherlands Antilles; Costa Rica
60 to 79	Guyana; Cuba; Panama; Jamaica, Trinidad and Tobago; Bahamas
40 to 59	Suriname; Guadeloupe; Martinique; Belize; Puerto Rico; Argentina
20 to 39	Uruguay; Paraguay; Canada; United States

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition.* Washington, DC: PAHO; 1998. (Scientific Publication 567). In press. (Scientific Publication 567). In press.

Mortality in Children Aged 1–4

In Latin America and the Caribbean in the 1950–1954 five-year period, the annual average number of deaths of children aged 1–4 was 480,000, while in North America (Canada and the United States), the figure was 21,000. For the 1980–1984 period, the corresponding values were 190,000 and 9,000, respectively. Estimates for 1990–1994 indicate that child deaths declined to 120,000 a year in Latin America and the

Caribbean and to 8,000 in North America. If the rates that prevailed in the early 1950s had continued up to 1990–1994, the number of deaths in the 1–4 age group in Latin America and the Caribbean would have reached 760,000 annually. Instead, there was a reduction of 640,000 in the annual number of deaths.

Deaths in the 1–4 age group have fallen by a greater percentage than deaths in infants. In the 1–4 age group, deaths declined by 360,000 deaths, dropping from 480,000 per year during the 1950–1954 five-year period to 120,000 per year during 1990–1994—a reduction of 75%. In comparison, infant deaths declined 51%, from 940,000 annually during 1950–1954 to 460,000 per year during 1990–1994.

Table 4 shows estimated five-year mortality rates for children aged 1–4 in the countries of the Region, from 1950–1954 to 1990–1994.

The pattern of mortality in children aged 1–4 years in the countries of the Region during the second half of this century is analyzed in the same way as was done above with infant mortality, first in terms of the percentage reduction of the rates between 1950–1954 and 1990–1994 and then in terms of the reduction in the absolute value of the rate between the two periods. The percentage reduction is presented in Table 5, in descending order by magnitude of the percentage of reduction for groups of countries; within each group, the countries also appear in descending order according to the magnitude of reduction achieved. The percentage reductions range from 96% in Costa Rica to 47% in Uruguay. Table 6 shows the reduction in mortality, in points, among children aged 1–4 in descending order by magnitude of the decrease for groups of countries; the countries in each group are also presented in descending order, according to the magnitude of the point reduction registered in each one. The reductions range from a high of 37 points in Bolivia to a low of 0.8 points in the United States and Uruguay.

For the vast majority of the Region's countries, mortality among children under 5 has become increasingly concentrated in the group under 1 year of age. As a result, using mortality among children under 5, which attempts to measure the probability of dying between birth and the fifth birthday, may confuse issues associated with child health, rather than elucidate them. It may also reduce the possibilities for effective surveillance and evaluation of programs designed to help children.

From another perspective, taking into account the marked underregistration of child deaths in many countries, strengthening vital statistics registries has become an essential priority. It can ensure continuous monitoring of mortality trends, as well as surveillance, especially in the short term, of the impact of activities to improve child health. Hence, improving vital statistics systems can be considered a more effective investment than conducting surveys.

TABLE 4
Estimated five-year mortality rates in children aged 1–4 years (per 1,000), by country, 1950–1954 to 1990–1994.^a

Country	1950–1954	1955–1959	1960–1964	1965–1969	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994
Argentina	5.4	4.5	3.5	3.2	2.5	1.9	1.7	1.5	1.4
Bolivia	43.6	40.0	36.6	33.1	29.6	22.5	15.6	10.3	6.6
Brazil	15.8	13.9	12.4	11.1	9.6	7.8	3.5	2.6	1.9
Canada	1.8	1.3	1.1	0.9	0.8	0.7	0.5	0.4	0.3
Chile	10.1	8.9	7.2	4.6	3.1	2.0	1.1	0.9	0.7
Colombia	19.6	13.9	11.0	9.0	7.7	5.6	2.8	2.5	2.2
Costa Rica	14.0	10.9	8.1	5.4	3.1	2.3	1.2	0.8	0.6
Cuba	8.9	6.6	4.5	2.4	1.4	1.2	1.0	0.8	0.7
Dominican Republic	32.2	25.5	19.9	15.3	11.0	7.5	4.5	4.0	3.8
Ecuador	20.5	18.5	16.5	14.1	11.7	9.4	7.0	5.2	4.1
El Salvador	23.5	20.9	18.1	16.3	13.9	12.8	11.3	9.6	8.4
Guatemala	37.6	34.3	30.3	25.5	19.6	16.0	13.3	11.0	8.9
Haiti	38.8	32.3	26.8	22.4	19.0	16.1	13.6	11.4	9.6
Honduras	34.7	30.0	24.8	21.1	17.8	14.2	9.8	5.6	4.5
Mexico	23.7	16.0	11.5	9.6	7.0	4.5	3.3	2.9	2.6
Nicaragua	26.3	23.3	20.4	17.8	15.3	13.5	12.2	9.6	7.3
Panama	12.3	10.5	9.4	8.3	6.7	4.5	3.1	2.5	2.0
Paraguay	7.8	7.4	6.4	6.0	5.5	5.3	4.8	4.4	3.9
Peru	35.9	31.1	26.1	22.3	16.5	13.5	10.1	7.4	4.3
Puerto Rico	7.5	4.0	2.6	1.4	0.8	0.6	0.5	0.5	0.5
Trinidad and Tobago	6.0	4.5	2.4	2.3	1.9	1.5	1.1	0.8	0.7
United States	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5
Uruguay	1.7	1.6	1.5	1.5	1.4	1.3	1.0	0.9	0.9
Venezuela	11.9	10.1	8.3	6.5	5.0	3.3	2.3	1.5	1.2

^a Rates were not calculated for countries with less than 500,000 inhabitants in 1950.

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition*. Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

Causes of Infant Mortality

The two most important causes of mortality among children under 1 year of age have remained the same for several decades. An analysis of mortality trends among children under 1 year of age by the major groups of causes included in PAHO's list 8/30¹ reveals that in the 1990–1994 five-year pe-

riod—as in 1960–1964²—the two most important causes continue to be communicable diseases³ and certain conditions originating in the perinatal period. Mortality from communicable diseases has declined to one-fourth or one-fifth of the values of the 1960–1964 five-year period. Nevertheless, mortality from this cause in children under 1 during the 1990–1994 period in Latin America (with the exception of

¹ See List 8/30 in: Organización Panamericana de la Salud. *Health statistics from the Americas. 1998 edition*. Washington, DC: OPS; 1998. (Scientific Publication 567). In press.

² The estimates of five-year mortality rates for the major groups of causes are published in: Pan American Health Organization. *Health statistics from the Americas. 1998 edition*. Washington, DC: OPS; 1998. (Scientific Publication 567). In press.

³ The categories from the *International Classification of Diseases, Ninth Revision*, included in this group are: 001–139, 320–322, 460–466, and 480–487.

TABLE 5
Percentage reduction of mortality in children aged 1–4
years between 1950–1954 and 1990–1994.

Percentage reduction	Countries
80% and more	Costa Rica; Puerto Rico; Chile; Cuba; Venezuela; Colombia, Mexico; Brazil, Trinidad and Tobago; Peru, Dominican Republic; Honduras; Bolivia; Panama; Canada; Ecuador
70%–79%	Guatemala; Haiti; Argentina; Nicaragua
60%–69%	El Salvador; United States
50%–59%	Paraguay
40%–49%	Uruguay

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition.* Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

Puerto Rico) was at least 10 times higher than the rates for the same period in Canada, which has the lowest infant mortality rate in the Region. The Latin American countries and territories with the lowest rates are Costa Rica, Cuba, Chile, Puerto Rico, and Uruguay.

In 1990–1994, communicable diseases and certain conditions originating in the perinatal period together accounted for percentages of mortality ranging from 52.4% in Canada to 87.1% in Nicaragua. There was strong positive correlation between the total percentage for these two groups of causes and the overall mortality rate. Table 7 shows the estimated rates for the 1990–1994 five-year period for all causes and for three of the major groups from List 8/30: certain conditions originating in the perinatal period, communicable diseases, and congenital anomalies. It also shows the percentage of the overall rate attributable to the combination of these three groups of causes.⁴

Of the 19 countries for which information is available for at least one of the last two quinquenni in the period 1960–1964 and 1990–1994, only in Ecuador, Nicaragua, and Paraguay were the estimated mortality rates from communicable diseases higher in 1990–1994 or 1985–1989 than the rates for conditions originating in the perinatal period. (In Nicaragua there are problems of underregistration and the quality of medical certification of causes of death, which produce large fluctuations in estimated mortality by groups of causes.) Mortality from conditions originating in the perinatal period

TABLE 6
Reduction, in points, of mortality in children aged 1–4
years between 1950–1954 and 1990–1994.

Reduction in points	Countries
25 and more	Bolivia; Peru; Honduras; Haiti; Guatemala; Dominican Republic
15 to 24	Mexico; Nicaragua; Colombia; Ecuador; El Salvador
10 to 14	Brazil; Costa Rica; Venezuela; Panama
5 to 9	Chile; Cuba; Puerto Rico; Trinidad and Tobago
Less than 5	Argentina; Paraguay; Canada; United States, Uruguay

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition.* Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

is more than twice the rate of mortality due to communicable diseases in Argentina, Canada, Costa Rica, Cuba, Puerto Rico, Trinidad and Tobago, United States, Uruguay, and Venezuela. In Canada, it is nearly 17 times higher, and in the United States, 11 times higher, while in Brazil, Chile, Colombia, and El Salvador, the rate is at least 1.5 times higher.

The causes of death included in the cause group “certain conditions originating in the perinatal period” are strongly associated with certain groups of risk factors: (a) maternal-fetal malnutrition, (b) infection (uterine, fetal, and neonatal), (c) premature rupture of the membranes (with or without ovular infection), (d) prematurity, whether due to spontaneous premature delivery, pathological states, iatrogenic causes, induction of labor, or cesarean section, (e) hypertension, which may be chronic or pregnancy-induced (with or without premature separation of the placenta or placental infarction), (f) dystocia and other complications during delivery (due to trauma; use of oxytocic agents, anesthetics, analgesics, and other drugs; amniotomy; or excessive use of cesarean sections), and (g) fetoneonatal hypoxia (due to accidents of the umbilical cord or aspiration of meconium). Many of these causes increase the likelihood of low birth-weight, which in turn is responsible for the vast majority of neonatal deaths in the first week of life, as well as growth and development disorders and neurological sequelae in the child.

Table 8 shows the structure of mortality in children under 1 year of age for the cause group “conditions originating in the perinatal period” in selected countries of the Region circa 1993. The information is broken down by the following subgroups: obstetric complications affecting the fetus or newborn; slow fetal growth, fetal malnutrition, and fetal immaturity; birth trauma; and hypoxia, birth asphyxia, and other respiratory conditions of the fetus or newborn. Various problems make it difficult to compare data between countries. For

⁴The methods used to estimate mortality rates by groups of causes are described in the technical notes included in: Pan American Health Organization. *Health statistics from the Americas. 1992 edition.* Washington, DC: OPS; 1992. (Scientific Publication 542).

TABLE 7
Estimated death rates in children under 1 year of age (per 1,000 live births), due to all causes and by conditions originating in the perinatal period, communicable diseases, and congenital anomalies, in selected countries, 1990–1994.

Country	Rates				Percent of total due to these three groups
	All causes	Conditions originating in the perinatal period	Communicable diseases	Congenital anomalies	
Argentina	24	12.8	3.2	4.0	83
Brazil	47	25.1	14.4	4.5	94
Canada	7	3.4	0.2	2.5	87
Chile	14	5.0	2.8	3.5	81
Colombia	28	12.3	7.8	3.3	84
Costa Rica	14	6.2	2.3	3.7	87
Cuba	10	4.0	2.4	2.6	90
El Salvador	44	24.6	13.4	2.9	93
Mexico	34	13.7	10.7	4.3	84
Nicaragua	52	16.9	28.3	3.2	93
Puerto Rico	12	7.2	0.8	2.3	85
Trinidad and Tobago	17	9.7	1.8	3.0	85
United States	8	4.4	0.4	2.1	86
Uruguay	20	9.1	3.0	3.9	80
Venezuela	23	10.9	5.8	2.6	84

Note: The categories from the *International Classification of Diseases, Ninth Revision*, included in each group of causes are: certain conditions originating in the perinatal period: 760–779; communicable diseases: 001–139, 320–322, 460–466, 480–487; congenital anomalies: 740–759.

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition*. Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

example, different countries apply different criteria in coding septicemia and tetanus of the newborn. According to ICD-9, in the newborn these causes should be coded as 771.8 and 771.3, respectively. In other words, both these causes should fall into the group of conditions originating in the perinatal period. For other age groups, however, ICD-9 codes 038 and 037—which come under “communicable diseases”—should be utilized. These codes are not always applied as recommended in the classification, which hinders comparability of the information.

In most countries, estimated mortality from external causes in children under 1 remained relatively constant from 1960–1964 to 1990–1994, but some countries showed substantial decreases. In Canada, the rate dropped from 121.4 to 19.2 per 100,000; in Cuba from 71.8 to 37.7 per 100,000 (for this country, the first five-year period for which information is available is 1965–1969); in Costa Rica, from 42.1 to 18.4 per 100,000; and in the United States, from 90.5 to 29.0 per 100,000. In several other countries, the rates increased during the period, notably Argentina (from 37.6 per 100,000 in 1960–1964 to 113.8 per 100,000 in 1990–1994), Chile (from 106.7 to 208.9), and Uruguay (from 33.7 to 154.9). Of the countries for which data are available, these three had the

highest rates for this group of causes among children under 1 year of age.⁵

Causes of Death in Children Aged 1–4

In the countries where mortality among children aged 1–4 years was high in the 1960–1964 five-year period, the declines observed since then are due largely to the reduction of mortality from communicable diseases. This is especially true where there were the largest reductions in total mortality in this age group, such as in Chile, Costa Rica, Puerto Rico, and Venezuela. These four also experienced significant reductions in mortality from nutritional deficiencies.

Another important cause of death in children aged 1–4 is the group of external causes. Table 9 shows mortality from all causes and from communicable diseases and external causes. It also gives the percentage of total infant mortality from all

⁵ See the estimated death rates from external causes in: Pan American Health Organization. *Health statistics from the Americas. 1998 edition*. Washington, DC: OPS; 1998. (Scientific Publication 567). In press.

TABLE 8
Registered deaths in children under 1 year of age, due to conditions originating in the perinatal period and percentages for five subgroups of these causes, selected countries of the Americas, circa 1993.

Countries	Registered deaths due to conditions originating in the perinatal period	Percentage by subgroup				
		Obstetric complications affecting fetus or newborn	Slow fetal growth, fetal immaturity	Birth trauma	Hypoxia, birth asphyxia, and other respiratory conditions	Rest of ICD-9 760-779
Argentina	7,549	2.7	25.2	3.9	42.0	26.2
Brazil	35,867	5.5	14.5	1.1	54.1	24.7
Canada	1,053	25.5	18.9	3.4	35.4	16.7
Chile	1,212	3.9	38.5	1.6	37.6	18.4
Colombia	4,809	7.5	5.3	2.2	62.4	22.7
Costa Rica	505	7.1	12.9	1.2	58.6	20.2
Cuba	575	0.0	4.7	3.5	67.0	24.9
Ecuador	2,509	3.1	26.9	1.3	45.6	23.1
Mexico	20,584	5.8	5.1	3.8	60.4	24.9
Paraguay	645	4.3	17.8	2.9	43.3	31.6
Puerto Rico	475	1.5	40.8	0.2	41.1	16.4
Trinidad and Tobago	172	2.9	32.6	7.0	40.1	17.4
United States	14,315	16.2	29.9	1.6	29.3	22.9
Uruguay	489	0.6	18.6	4.1	43.4	33.3
Venezuela	6,249	5.8	4.2	1.6	64.2	24.1

Note: The categories of the *International Classification of Diseases, Ninth Revision*, included in each group of causes are: conditions originating in the perinatal period: 760-779; obstetric complications that affect the fetus or the newborn: 761-763; slow fetal growth, fetal immaturity: 764-765; birth trauma: 767; hypoxia, birth asphyxia, and other respiratory conditions: 768-770.

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition*. Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

causes that was due to these two specific groups combined. Communicable diseases and external causes together account for between 40% and 80% of all deaths in the 1-4 age group, with the majority of the figures clustered around 50%. The relative importance of these two groups of causes varies considerably from country to country.

In general, the group of external causes accounts for a higher proportion of deaths in countries with relatively low levels of mortality in the 1-4 age group, such as Canada, Chile, Costa Rica, Cuba, the United States, and Uruguay. On the other hand, the group of communicable diseases is more important as a cause of death in countries with high levels of mortality in this age group, including Colombia, El Salvador, Mexico, and Nicaragua. Nevertheless, mortality from external causes often is higher in countries with high levels of mortality, where the death rates due to external causes are four to six times higher than in Canada and Costa Rica.

Mortality from external causes has remained fairly constant for the majority of the countries, although there are important exceptions. On the one hand, El Salvador and Nicaragua experienced substantial increases in certain recent periods, which may have been related to armed conflict in

those two countries. On the other hand, by 1990-1994 estimated mortality from external causes in Canada, Chile, Costa Rica, and Venezuela had fallen to less than half of the values registered in 1960-1964. Canada and Costa Rica have the lowest estimated death rates from external causes, around 10 per 100,000—that is, five to six times less than those of the countries with the highest death rates from this group of causes.

Childhood Illnesses and the Integrated Management of Childhood Illness Strategy (IMCI)

A great many deaths and episodes of illness in children under 5 in the Region of the Americas continue to be caused by a group of infectious diseases and other health problems for which effective control technologies are available. In many cases, these illnesses occur in combination or in association with malnutrition, which aggravates the condition and increases the risk of death. Acute respiratory infections, diarrheal diseases, and nutritional deficiencies remain three of the leading causes of death in children under 5. Other impor-

TABLE 9
Estimated mortality rates in children aged 1–4 years (per 100,000) from all causes and from communicable diseases and external causes, and percentage of the total rate due to these two major groups, in selected countries, 1990–1994.

Country	Estimated rates			Percentage of total due to communicable diseases and external causes
	All causes	Communicable diseases	External causes	
Argentina	136.7	35.6	34.8	51.5
Brazil	180.5	86.7	25.9	62.4
Canada	29.4	2.6	11.1	46.5
Chile	73.4	16.5	29.6	62.8
Colombia	228.3	89.5	42.8	57.9
Costa Rica	60.3	14.3	12.8	45.0
Cuba	72.5	16.2	21.6	52.2
El Salvador	840.3	435.4	65.1	59.6
Mexico	260.2	123.4	47.0	65.5
Nicaragua	730.3	515.8	58.1	78.6
Puerto Rico	51.3	6.0	14.2	39.4
Trinidad and Tobago	71.7	15.5	15.9	43.8
United States	49.6	4.1	21.9	52.5
Uruguay	89.8	14.8	26.3	45.8
Venezuela	98.8	45.1	23.0	68.9

Note: The categories of the *International Classification of Diseases, Ninth Revision*, that are included in each group of causes are: communicable diseases: 001–139, 320–322, 460–466, 480–487; external causes: E800–E999.

Source: Pan American Health Organization. *Health Statistics from the Americas. 1998 edition*. Washington, DC: PAHO; 1998. (Scientific Publication 567). In press.

tant causes of disease and death in this age group are some of the vaccine-preventable diseases, including whooping cough, diphtheria, tetanus, measles, tuberculous meningitis, and septicemia. In some endemic areas, malaria also is a frequent cause of childhood illness and death.

This group of diseases has been termed “prevalent childhood illnesses” by PAHO/WHO and UNICEF, which have designed an integrated strategy for their control that makes it possible to reduce morbidity and mortality from these causes and improve the quality of care. The strategy is known as Integrated Management of Childhood Illness (IMCI).

Mortality from Prevalent Childhood Illnesses

The latest data on registered mortality sent to PAHO by the countries of the Region and available in the database of the Organization’s Technical Information System are for the years between 1980 and 1995. Tables 10 and 11 show registered death rates among children under 1 year and children aged 1–4 years, due to prevalent childhood illness. Considering only those countries for which information is available for some year during the 1990s, the data in Table 10 show that the percentage of infant deaths from defined causes (that is, the

total number of deaths from all causes except “signs, symptoms, and ill-defined conditions”) that is attributable to prevalent childhood illnesses ranges from 2.3% in Canada to 42.1% in Paraguay. In children aged 1–4 years, these illnesses caused between 6.2% of deaths from defined causes (in Canada) and 69.2% (in Paraguay).

If the countries are grouped according to their estimated infant mortality rates for the 1990–1995 period, it is observed that for those for which there are data from 1990 or later and where the estimated IMR is 40 or more per 1,000 live births, prevalent childhood illnesses are responsible for between 30% (Ecuador, El Salvador) and 42% (Paraguay) of the deaths of children under 1 and between 45% (Brazil) and 69% (Paraguay) of the deaths of children aged 1–4 years.

The majority of deaths from prevalent childhood illnesses are due to acute respiratory infections and diarrheal diseases. Together, these two causes are responsible for up to 88% of all infant deaths from prevalent childhood illnesses (in Nicaragua) and 87% of all deaths among children aged 1–4 (in Ecuador). The two causes account for most of the difference in IMRs between countries with high rates and those with low rates.

The above figures, however, are based on the information submitted by the countries and present only a partial view of

TABLE 10
Registered deaths in children under 1 from illnesses targeted by the IMCI strategy, by country and year,
according to estimated infant mortality rates in 1990–1995.

Country (year)	Total deaths from defined causes ^a	Illnesses included in the IMCI strategy								Other illnesses targeted by IMCI	
		Total		Diarrheal diseases		ARIs		Malnutrition			
		No.	% ^b	No.	% ^c	No.	% ^c	No.	% ^c	No.	% ^c
Countries with estimated infant mortality rates of 40 or more per 1,000 live births in 1990–1995											
Brazil (1992)	70,695	22,478	31.8	8,399	37.4	7,608	33.8	2,560	11.4	3,911	17.4
Dominican Republic (1985)	6,032	2,176	36.1	1,091	50.1	450	20.7	170	7.8	465	21.4
Ecuador (1995)	4,990	1,523	30.5	460	30.2	778	51.1	149	9.8	136	8.9
El Salvador (1990)	3,623	1,106	30.5	652	59.0	259	23.4	39	3.5	156	14.1
Guatemala (1984)	19,196	7,540	39.3	2,532	33.6	3,244	43.0	476	6.3	1,288	17.1
Honduras (1980)	2,437	1,428	58.6	875	61.3	223	15.6	25	1.8	305	21.4
Nicaragua (1994)	2,592	933	36.0	493	52.8	326	34.9	51	5.5	63	6.8
Paraguay (1994)	1,604	676	42.1	265	39.2	232	34.3	34	5.0	145	21.4
Peru (1989)	9,391	4,722	50.3	1,458	30.9	2,347	49.7	508	10.8	409	8.7
Countries with estimated infant mortality rates of less than 40 per 1,000 live births in 1990–1995											
Argentina (1993)	14,472	2,084	14.4	323	15.5	773	37.1	297	14.3	691	33.2
Canada (1994)	2,088	49	2.3	1	2.0	22	44.9	2	4.1	24	49.0
Chile (1994)	3,362	544	16.2	33	6.1	391	71.9	2	0.4	118	21.7
Colombia (1994)	10,501	2,627	25.0	958	36.5	1,084	41.3	163	6.2	422	16.1
Costa Rica (1995)	1,040	125	12.0	34	27.2	65	52.0	5	4.0	21	16.8
Cuba (1995)	1,375	308	22.4	34	11.0	102	33.1	3	1.0	169	54.9
United States (1994)	26,768	1,276	4.8	215	16.8	660	51.7	19	1.5	382	29.9
Mexico (1994)	48,113	14,125	29.4	3,925	27.8	7,689	54.4	1,454	10.3	1,057	7.5
Panama (1989)	981	174	17.7	66	37.9	49	28.2	24	13.8	35	20.1
Puerto Rico (1992)	808	35	4.3	—	—	20	57.1	3	8.6	12	34.3
Suriname (1992)	102	30	29.4	12	40.0	4	13.3	5	16.7	9	30.0
Trinidad and Tobago (1994)	266	23	8.6	3	13.0	14	60.9	1	4.3	5	21.7
Uruguay (1990)	1,079	171	15.8	35	20.5	74	43.3	22	12.9	40	23.4
Venezuela (1994)	13,418	4,377	32.6	2,417	55.2	1,023	23.4	383	8.8	554	12.7

^aTotal deaths from all causes, excluding those attributed to signs, symptoms, and ill-defined conditions.

^bPercentage of deaths from illnesses and problems targeted by the IMCI strategy in relation to total deaths from defined causes.

^cPercentage of deaths in relation to total deaths from illnesses and problems targeted by the IMCI strategy.

Note: The categories of the *International Classification of Diseases, Ninth Revision*, included in each group are: diarrheal diseases, 001–009; acute respiratory infections (ARI), 460–466, 480–487; malnutrition, 260–269. Other illnesses targeted by the IMCI: vaccine-preventable diseases, 032, 033, 037, 055; septicemia, 038; malaria, 084; and meningitis, 036, 320–322.

the problem. This is because of underregistration of deaths, as well as factors relating to medical certification of the cause of death. The use of estimates can more accurately approximate the countries' situation and better reveal differences in the health status of children.

The information available for some countries shows that the numbers of deaths of children under 1 and children aged 1–4 from prevalent childhood illnesses have greatly dimin-

ished in recent decades. The proportional contribution of prevalent childhood illness to total mortality decreased substantially, particularly in the countries with the highest infant mortality rates. In the countries with lower IMRs, the proportion of deaths from these causes among children under 1 year old remained relatively stable. Therefore, between 1980 and the present, there was a reduction in the gap that separated the countries with high infant mortality from those

TABLE 11
Registered death rates for children aged 1–4 from illnesses targeted by the IMCI strategy,
by country and year, according to estimated infant mortality rates in 1990–1995.

Country (year)	Total deaths from all defined causes ^a	Illnesses targeted by the IMCI strategy								Other illnesses targeted by the IMCI	
		Total IMCI		Diarrheal diseases		ARI		Malnutrition			
		No.	% ^b	No.	% ^c	No.	% ^c	No.	% ^c	No.	% ^c
Countries with estimated infant mortality rates of 40 or more per 1,000 live births in 1990–1995											
Brazil (1992)	11,096	5,093	45.9	1,145	22.5	2,088	41.0	609	12.0	1,251	24.6
Dominican Republic (1985)	1,760	1,170	66.5	398	34.0	281	24.0	221	18.9	270	23.1
Ecuador (1995)	2,274	1,120	49.3	480	42.9	492	43.9	51	4.6	97	8.7
El Salvador (1990)	927	512	55.2	254	49.6	117	22.9	68	13.3	73	14.3
Guatemala (1984)	10,616	8,708	82.0	3,912	44.9	2,556	29.4	812	9.3	1,428	16.4
Honduras (1980)	1,460	995	68.2	546	54.9	144	14.5	57	5.7	248	24.9
Paraguay (1994)	522	361	69.2	148	41.0	132	36.6	19	5.3	62	17.2
Peru (1989)	4,147	2,774	66.9	942	34.0	1,005	36.2	592	21.3	235	8.5
Nicaragua (1994)	615	374	60.8	169	45.2	139	37.2	30	8.0	36	9.6
Countries with estimated infant mortality rates of less than 40 per 1,000 live births in 1990–1995											
Argentina (1993)	2,250	610	27.1	96	15.7	198	32.5	136	22.3	180	29.5
Canada (1994)	487	30	6.2	1	3.3	16	53.3	—	—	13	43.3
Chile (1994)	646	111	17.2	3	2.7	71	64.0	2	1.8	35	31.5
Colombia (1994)	3,060	1,016	33.2	309	30.4	439	43.2	96	9.4	172	16.9
Costa Rica (1995)	183	32	17.5	15	46.9	9	28.1	1	3.1	7	21.9
Cuba (1995)	455	104	22.9	9	8.7	53	51.0	2	1.9	40	38.5
Mexico (1994)	10,326	4,093	39.6	1,495	36.5	1,669	40.8	606	14.8	323	7.9
Panama (1989)	266	118	44.4	50	42.4	26	22.0	24	20.3	18	15.3
Puerto Rico (1992)	114	11	9.6	—	—	6	54.5	1	9.1	4	36.4
Suriname (1992)	35	16	45.7	4	25.0	8	50.0	1	6.3	3	18.8
Trinidad and Tobago (1994)	60	12	20.0	3	25.0	6	50.0	—	—	3	25.0
United States (1994)	6,532	434	6.6	24	5.5	214	49.3	3	0.7	193	44.5
Uruguay (1990)	151	24	15.9	—	—	14	58.3	3	12.5	7	29.2
Venezuela (1994)	2,826	1,370	48.5	632	46.1	374	27.3	215	15.7	149	10.9

^aTotal deaths from all causes, excluding those attributed to signs, symptoms, and ill-defined conditions.

^bPercentage of deaths from all illnesses and problems targeted by the IMCI strategy in relation to total deaths from defined causes.

^cPercentage of deaths from this cause group in relation to total deaths from illnesses and problems targeted by the IMCI strategy.

Note: The categories of the *International Classification of Diseases, Ninth Revision*, included in each group are: diarrheal diseases, 001–009; acute respiratory infections (ARI), 460–466, 480–487; malnutrition, 260–269. Other illnesses targeted by IMCI: vaccine-preventable diseases, 032, 033, 037, 055; septicemia, 038; malaria, 084; and meningitis, 036, 320–322.

with low infant mortality in terms of the weight of mortality from prevalent childhood illnesses in children under 1 year of age. In children aged 1–4 years, proportional mortality from prevalent childhood illnesses declined more in the countries with lower IMRs than in the countries with higher infant death rates.

The trend of mortality from prevalent childhood illnesses can also be analyzed by looking at the pattern of estimated mortality from communicable diseases in the countries of the

Region of the Americas. Except for nutritional deficiencies, all the prevalent childhood illnesses are included in the group of communicable diseases. The ratio between infant deaths from childhood illness and infant deaths from communicable disease is between 96% and 98% in all the countries with an estimated IMR of more than 40. The estimated death rates from communicable disease declined, both in children under 1 year of age and in children aged 1–4 years, in all the countries for which information is available (3).

Most of the reduction in mortality from prevalent childhood illnesses was due to the sizable reduction in registered deaths from diarrheal diseases and acute respiratory infections. For example, in Brazil, the number of registered deaths from diarrheal diseases in children under 1 dropped from 32,704 in 1980 to 8,399 in 1992, a decrease of 74%. A similar reduction occurred in children aged 1–4 years; deaths declined from 4,082 to 1,145. Infant mortality from acute respiratory infections in Brazil declined during the same period by 60%, from 18,852 to 7,608. Mortality in children aged 1–4 fell by 56%, from 4,709 to 2,088.

Morbidity from Prevalent Childhood Illnesses

Prevalent childhood illnesses account for the largest proportion of health service visits and together are a major reason for hospitalization. While limited, the information available from the countries reflects the important role that prevalent childhood illnesses play in the normal activities of health care services.

Information from Peru shows that prevalent childhood illnesses were the reason for at least 9 out of every 10 consultations by children under 5 in first-level health care facilities. In 1992, acute respiratory infections (ARIs) and diarrheal diseases were the two most important individual causes of health service visits. ARIs accounted for more than half of the visits by children under 5 and diarrheal diseases accounted for between 20% and 30% (4). These data bear out what has been observed in other countries (Honduras 1985, Mexico 1990), in which prevalent childhood illnesses accounted for more than 60% of all health service visits in this age group.

Data from the health services, as well as from surveys conducted in several countries, show the high incidence of acute respiratory infections and diarrheal diseases in the early years of life. A survey conducted in Haiti in 1994 and 1995 found that up to 50% of the children had suffered a diarrhea episode within the 15 days before the survey visit. The figures were lower in surveys carried out in Bolivia (1994), Colombia (1995), and Guatemala (1987), but they were still as high as 30% (5). The incidence of ARIs was lower than that of diarrheal diseases in all the surveys conducted: between 20% and 30% of the children had suffered an episode of cough or difficult breathing in the 15 days before the survey (5).

In most cases of acute respiratory infection and diarrheal disease, children are not taken to a health service because the condition resolves itself with the care they received in the home. Such illnesses, however, may worsen, sometimes requiring hospitalization of the child. In the developing countries, prevalent childhood illnesses—especially acute respiratory infections and diarrheal diseases—are responsible for more than half of all hospitalizations of children under 5.

Control of Prevalent Childhood Illnesses

Although the health situation of children has improved markedly in recent decades, in many countries of the Region prevalent childhood illnesses continue to be an important cause of mortality and morbidity in children under 5. Control efforts in recent years have been geared mainly toward the implementation of specific strategies for the care and prevention of each illness, which has partly contributed to the reductions seen in children's mortality and morbidity rates. However, these strategies have been implemented and applied individually, without establishing the necessary linkages between the various interventions in order to provide an integrated approach to health care for children.

The lack of integrated management of child health problems has been associated with missed opportunities for vaccination and for the early detection and treatment of diseases that are not the principal reason for a consultation. Opportunities also have been lost to educate parents on providing better care for the child through breastfeeding and nutrition practices, as well as such preventive measures as vaccination and the promotion of child health through hygiene and stimulation. In this context, the integrated management of childhood illnesses strategy helps the health worker take advantage of a sick child's health service visit to assess the child's overall health status and identify any problems or disorders, regardless of the initial reason for the visit. The strategy also incorporates systematic preventive measures (monitoring of the child's immunization status) and health promotion (monitoring of growth and nutrition), as well as general health education.

The IMCI strategy has three components: (1) improving the treatment skills of health workers by providing locally adapted guidelines and training activities; (2) promoting effective management of childhood illnesses and delivery of good-quality care; and (3) strengthening family and community child-health practices. The objectives are to reduce mortality in children under 5, specifically deaths from diarrheal diseases, acute respiratory infections, malnutrition, measles, and malaria; to reduce the number and severity of cases of diarrheal disease, acute respiratory infection, and measles; to improve the quality of care for children in health services and reduce the inappropriate use of diagnostic technologies and treatments; to introduce health promotion and disease prevention measures into the child health care services; and to extend integrated care at the community level.

The IMCI strategy helps to ensure adherence to basic standards of care for children under 5, including correct assessment and treatment of the most frequent health problems. The implementation of this strategy thus helps to attain equity in health care, providing access to a standardized management of cases with high sensitivity and specificity.

High priority has been assigned to the implementation of the IMCI strategy in the countries that have the highest estimated infant mortality rates (over 40 per 1,000 live births) and where the group of diseases targeted by the strategy account for a large proportion of total deaths. In these countries, the strategy has been adapted to the epidemiological and operational situation, and initial areas for implementation have been selected, taking into account the magnitude of mortality and morbidity from these prevalent childhood illnesses.

The training of first-level professional health workers (physicians and nurses) in the application of the integrated management of childhood diseases strategy has been initiated in all the countries with estimated infant mortality of more than 40 per 1,000 live births, and follow-up activities are being carried out to verify that the personnel trained are applying the strategy effectively. Training will be extended to auxiliary personnel, especially in aspects relating to the education of parents on how to improve child care practices in the home and on the importance of complying with the recommended treatment, and to community health agents in order to extend the coverage of the strategy to population groups that lack access to institutional health services. The activities under way also include upgrading existing units that provide training in the control of acute respiratory infections and diarrheal diseases, so they can also provide training in the IMCI strategy, as well as the formation of professional and technical groups to conduct training and monitor trained personnel. The IMCI strategy has also been adopted in the countries with estimated IMRs of 20–40 per 1,000 live births, in which these diseases are the reason for the majority of health service visits and hospitalizations, although they account for a smaller proportion of deaths. In these countries, the components of the IMCI strategy are currently being adapted to the needs of both the population and health workers, and implementation of the strategy is scheduled to begin in 1998.

HEALTH OF ADOLESCENTS AND YOUTHS

A New Conceptual Model for Adolescent and Youth Health and Development

Until recently, the health of adolescents and youth was viewed and diagnosed through a conceptual framework that emphasized problems and risk behaviors. Studies on the development of problems have shown that underlying factors are related and that the same underlying conditions emerge time and again. Research has identified extreme economic deprivation, conflict in the family, a family history of behavioral problems, and a lack of a protective environment as common risk factors for most adolescent substance abuse,

delinquency, pregnancy, and dropping out of school (6). PAHO's Regional Plan of Action for Adolescent Health and Development, 1998–2001, proposes a conceptual framework that places adolescent development within the context of the family and the environment, and considers employment and income generation; education and the acquisition of necessary skills; social and political participation; and recreation, health, and well-being as the four critical components of the development process. This holistic approach is based on the view that fostering a healthy development in adolescents requires intersectoral interventions, involving such issues as health, education, employment, and economic development. Furthermore, adolescents are seen not merely as recipients, but also as effective partners and strategic actors in the process. The plan acknowledges the rights of adolescents and seeks their active participation and leadership in the political process to build new communities and societies and to develop and implement strategies for improving their health is essential (7).

The Organization's plan of action for adolescents mentioned above is being implemented along three key areas—the health of adolescents today (focused on services, counseling, and health education); adolescents promoting healthy futures (focusing on preadolescents in schools); and adolescents as agents of change in their families, communities, and societies (focusing on youth participation and empowerment) (7).

Selected Demographic Aspects

Population

The World Health Organization defines adolescents as persons between 10 and 19 years old and youth as persons between 15 and 24 years old; the term “young people” has been coined to include both groups (8).

In 1996, adolescents in Latin America and the Caribbean represented 21% of the total population; an analysis of the population structure showed that the median age in most countries was under 20 years old (9). Young people accounted for 30% of the total population, or 148 million, in 1996, and by the year 2000, this group is projected to reach 166 million (10). In Canada and the United States, young people account for approximately 20% of the total population. The growth of this population in the Region will place an increasing burden on the health care, educational, and employment systems of the countries.

The Region of the Americas has experienced a dramatic increase in urbanization. It is estimated that 75% of the Region's young people lived in urban areas in 1995, a figure that is expected to rise to 80% by the year 2000 (11). Many low-in-

come young people live in urban marginalized barrios, many of which have scanty medical and social services, insufficient housing, and inadequate sanitation. For these young people, extended family ties and a social support network are being eroded as a result of urban migration. Urban migration and inadequate educational attainment contribute to high levels of unemployment and violence that affect many of the Region's young people (12).

Education

Educational levels in Latin America and the Caribbean have improved dramatically over the last few decades. From 1990 to 1995, 73% of the Region's population had completed 5th grade, and 45% was enrolled in secondary education (13). In Central America, however, only 52% of adolescents are enrolled in secondary education, compared to 99% in the United States (9). Furthermore, Latin America, with an average 5.2 years of education for the adult population in 1995, lags behind its expected educational level given its level of development (12).

The percentage of illiteracy in the Region for those over 15 years of age is greater among females and in rural areas. Illiteracy rates vary greatly, from 0.7% among 15–24-year-olds in Trinidad and Tobago to approximately 49% in Haiti. Some of the greatest gender disparities within the age group 15–24 years old are found in Bolivia (8.3% in females and only 3.7% in males) and Peru (10.2% in females and only 3.5% in males) (14). The percentage of urban youth who have completed at least 10 years of schooling varies from a low of 46% in Honduras to almost 80% in Chile (11).

Class differences also play a significant role in the educational disparities seen in the Region. In Mexico, for example, 80% of urban youth in the highest socioeconomic strata complete at least 10 years of schooling, compared to 18% of those in the poorest (11).

In most countries of the Region, at least one in every ten young people enrolls in a university. It must be noted, however, that the increase in the functionally illiterate labor force in Latin America and the Caribbean over the last 45 years closely parallels the growth of the population living below the poverty line (12).

Educational attainment is a significant variable in most negative health outcomes in adolescents—such as early pregnancy, drug use, and violence—as well as in positive development outcomes—such as small family size and late age at marriage (15). A World Health Organization report on the Global School Initiative showed positive health outcomes through higher educational levels and literacy rates. It is estimated that for every average year of schooling added among women, the fertility rate would decrease by 5% to 10%, and a

10% increase in female literacy would reduce the infant mortality rate by 10% (16). The 1993 World Bank report underscored the importance of education for girls as one of the most cost-effective public health interventions (17).

Labor and Employment

In Latin America and the Caribbean, adolescents 15–19 years old make up between 40% and 50% of the economically active population, with men doubling the percentage of women (18). Recently, however, there has been an increase in the percentage of females in the work force, especially in urban areas (19). In Brazil and Paraguay, between 18% and 23% of poor, urban youth aged 12 to 14 years old were working (12). For adolescents 15 to 17 years old, rates increase dramatically, with some countries indicating that indigent, urban youth who work represent anywhere from one-fourth to one-half of this population group (12). It is estimated that approximately 10 million children under 14 years old work illegally in Latin America and the Caribbean, receiving no social security benefits, being paid low wages, and working under hazardous conditions (12).

The Region's youths and adolescents are particularly hard hit by unemployment and underemployment. Youth between the ages of 15 and 24 years living in urban areas are twice as likely as the total population to want or need employment, but are at a greater disadvantage for obtaining work. Youth unemployment rates throughout the Region vary from 36% to 66% (20). Despite educational improvements in the Region over the last 30 years, youth remain poorly prepared to compete in an increasingly globalized labor market (12).

Health Situation of Adolescents and Youth

Mortality

Adolescent mortality rates are low compared to those of other age groups. In 1993, the mortality rate for adolescents in Latin America and the Caribbean was approximately 70 per 100,000. In general, mortality rates in more developed countries are three to four times lower than those of developing countries, and this is most obvious in the population 10 to 14 years old (21).

Mortality among adolescents is mostly due to external causes, including accidents, homicides, and suicides. In 1993, external causes were responsible for more deaths in this group than infectious diseases, circulatory diseases, and neoplasms combined (22). In most countries of the Region, the largest contributing factor to mortality rates from external causes among this population continues to be traffic accidents (22).

A 1997 analysis of mortality rates in the Region shows that the principal causes of death for 10–14-year-olds are accidents, violence, malignant tumors, and infectious diseases. In the population 15 to 19 years old, the leading causes of death are accidents; homicides; suicides; malignant tumors; heart disease; and complications of pregnancy, childbirth, and the puerperium (23).

Statistics disaggregated by sex indicate that mortality is higher in adolescent males than in females. For example, mortality due to accidents is three times higher in men than in women, and homicides are six times higher in men than in women (24).

Pregnant adolescents are more likely than pregnant women aged 20 to 34 years to die from the four main causes of maternal mortality: hemorrhage, hypertensive diseases of pregnancy, infection, and abortion (25). The risks of maternal mortality can be substantially reduced through measures such as improving access to essential obstetric care and by preventing unsafe abortions (25).

Sexuality and Reproductive Health

Coping with their sexuality and protecting their reproductive health are among the greatest challenges for adolescents. Complex factors such as cultural influences play an important role in how successfully adolescents integrate their sexuality into their lives. Scarce data exist about positive indicators of sexuality in adolescence or what constitutes sexually healthy adolescents within their cultural environment (26).

Age at Marriage. Over the last two decades, the Region has experienced a shift away from marriage towards consensual unions and a delay in the age at marriage (14). The trend toward older age at marriage is linked to improvements in women's status in society and to their educational attainment. The average age at marriage in Latin America and the Caribbean currently hovers at approximately 22 years (27). Although age varies among and within countries, it can be said that, overall, 17% of the Region's female population aged 15–19 years old have been married (22). According to data from demographic and health surveys, in 1996 the percentage of women who were either married or in a consensual union by age 20 ranged from 38% in Peru to 56% in Guatemala (28).

Age at Sexual Initiation. Early sexual initiation among adolescents of both sexes is a common phenomenon in the Americas. In 1996, 40% to 60% of adolescents in North America were sexually active by age 16; in 1994, 40% of adolescents in El Salvador and Brazil had had intercourse by age 15. In 1996, it was estimated that 50% of adolescents under age 17 were sexually active in Latin America (25). In the seven countries covered in the demographic and health surveys, between

53% and 71% of women had had sexual relations before the age of 20 (Table 12). In Peru, the percent of women who had had sexual relations before age 20 increased from 45% in 1991–1992 to 53% in 1996. In Paraguay, women having sexual relations before age 20 rose from 61% in 1990 to 71% in 1995–1996 (28).

The combination of early sexual activity and low educational attainment often leads to higher birth rates. For example, the percentage of females aged 15–19 who have given birth increases as their education decreases (see Figure 1) (28). Early sexual initiation places adolescents at risk of pregnancy and contracting HIV and other sexually transmitted diseases. Yet, young people in the Region often do not protect themselves against pregnancy or treat STDs because of social norms, financial constraints, provider attitudes, lack of confidentiality, insufficient knowledge, and inadequate resources (27). The Southern Cone is experiencing a shift in the distribution of AIDS cases toward younger age groups. The median age of AIDS cases was 32 years between 1983 and 1989, dropping below 27 years between 1990 and 1992. This shift indicates that HIV infection is occurring at much younger ages, probably during adolescence (29).

Adolescent Fertility. Fertility rates for adolescent females aged 15 to 19 vary throughout the Region, and although adolescent fertility rates have decreased overall, they remain extremely high (30). The countries with the highest rates are Nicaragua (149 per 1,000), Honduras (127), Guatemala (123), Belize (117), El Salvador (105), and Venezuela (101). The countries with the lowest rates are Chile (56 per 1,000), Uruguay (60), Trinidad and Tobago (60), and Peru (63). Overall, Central American countries have significantly higher fertility rates (87 per 1,000) than Caribbean (78) or South American (75) countries (31).

Adolescent Pregnancy. Approximately 15 million women aged 15 to 19 give birth each year, accounting for 10% of all births worldwide (25). In the countries covered in the demographic and health surveys, an average of 38% of women had become pregnant before age 20 (see Table 12) (28). In most of the countries, between 15% to 25% of all babies are born to adolescents (32). The percentage of 19-year-olds who had had two or more children ranged from 6.4% in Colombia (1996), to 8.9% in Bolivia (1996), 11.7% in the Dominican Republic (1996), and 14.4% in Guatemala (1995) (28).

Maternal mortality remains one of the leading causes of death for adolescent women in developing countries, where septic abortions and labor complications of childbirth are common (33). The risk of dying from pregnancy-related causes is more than 50 times greater for an adolescent in Latin America than for an adolescent in the United States (34). Adolescent girls under age 20 suffer more pregnancy

TABLE 12
Reproductive health indicators of female adolescents aged 15–19 in selected countries in Latin America and the Caribbean.

Country/year	Percentage of women in union before age 20 ^a	Percentage of women who had sexual relations before age 20 ^b	Current use of modern contraceptives (%) ^c	Percentage of women who were pregnant before age 20 ^d
Brazil, 1996	39	61	13	35
Haiti, 1994–1995	45	62	2	36
Dominican Republic, 1996	53	59	8	41
Guatemala, 1996	56	61	2	45
Peru, 1996	38	53	5	26
Bolivia, 1994	43	57	2	44
Paraguay, 1995–1996	46	71	31	41
Colombia, 1995	42	62	8	39

^a Percentage of women aged 20–24 at the time, who were married or in union before age 20.

^b Percentage of women aged 20–24 at the time, who had had sexual relations before age 20.

^c Percentage of all women aged 15–19 who use modern methods of contraception (birth control pills, IUD, injections, vaginal tablets, spermicides, diaphragm, female sterilization, male sterilization).

^d Percentage of women aged 19 who are mothers or who are currently pregnant.

Source: Macro International, Demographic and Health Surveys, 1990–1996. Macro International, 1990–1996. Calverton, MD.

and delivery complications—such as toxemia, anemia, premature delivery, prolonged labor, vesico-vaginal fistula, cervical trauma, and death—than do women who bear children at age 20 or older (10).

Society's denial of adolescent sexuality limits prevention and increases the number of unsafe abortions (34). Because of the clandestine nature of their abortions and their lack of economic resources, adolescents experience the highest risk of complication from abortion (34). The procedure is illegal in most of the Region's countries.

Contraceptive Use. Contraceptive use is extremely low among this age group—estimates show that only 1 in 10 single and sexually active adolescents use contraception—and even if adolescents are knowledgeable about contraceptives, their perception of personal risk tends to be low (30). According to the demographic and health surveys, Bolivia, Guatemala, and Haiti, with 2% each, had the lowest rates of use of modern contraceptives (see Table 12). In Paraguay, there was a dramatic increase in the use of modern contraceptive methods among females aged 15 to 19, rising from 5% in 1990 to 31% in 1995/1996 (28).

It is essential to involve adolescent males in discussions about sexuality, reproductive health, and contraception, and to raise their consciousness that sexual responsibility must be shared by both partners. Historically, adolescent pregnancy has been viewed as a female problem, and males have been treated as silent partners. Today, plans and policies acknowledge the important role of males in preventing adolescent pregnancy and in providing emotional and financial support

to pregnant and parenting young women. The threat of HIV and other sexually transmitted diseases makes it even more imperative to involve male partners.

Homicide and Suicide

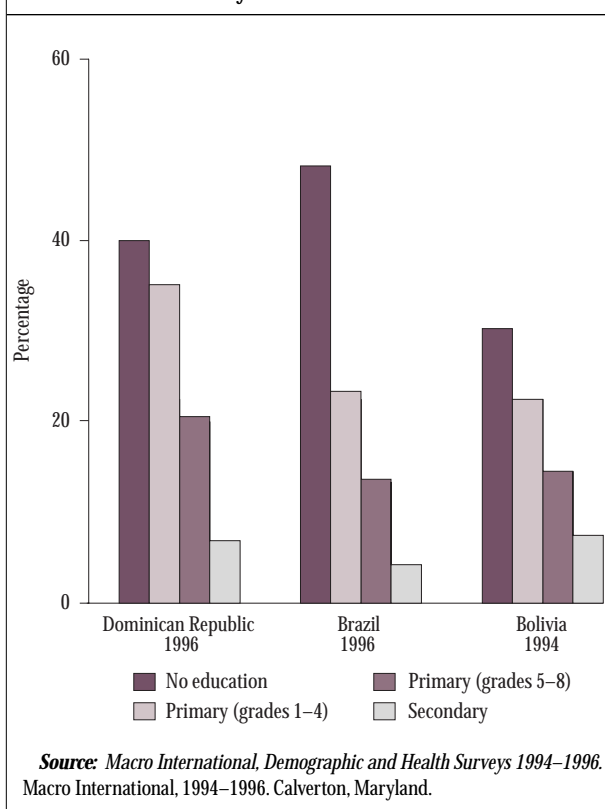
During the last few decades, violence in the Region of the Americas has reached epidemic proportions, becoming one of the most serious public health concerns (35). Adolescents and young people in the Region are particularly vulnerable to violence.

Of deaths due to homicides in the Region of the Americas, 28.7% are among adolescents between the ages of 10 and 19 years. Moreover, in 10 of the 21 countries with populations greater than one million, homicide is the second cause of death in the age group 15 to 24 years old and one of the five leading causes of death in 17 of these countries (23).

The highest mortality rates due to homicide occur in young males aged 15 to 24 (24). Some countries with high homicide rates in young males in this age group are Colombia (267 per 100,000), Puerto Rico (93), Venezuela (69), and Brazil (72). Countries with intermediate homicide mortality rates in males aged 15 to 24 are Mexico (41 per 100,000), the United States (38), Panama (32), Ecuador (26), Trinidad and Tobago (21), Cuba (18), and Argentina (11). Chile, Uruguay, Costa Rica, and Canada have low homicide rates in males aged 15 to 24 (23).

In Colombia, the United States, Puerto Rico, Trinidad and Tobago, and Venezuela, registered death rates due to homicide

FIGURE 1
Percentage of women between the ages of 15 and 19
who gave birth in 1994–1996,
by education level.



in males aged 15 to 24 are increasing. In Colombia, the homicide rate rose from 101 per 100,000 in 1985 to 267 per 100,000 in 1994. In Puerto Rico this rate increased from 45 per 100,000 in 1980 to 93 per 100,000 in 1992. In Venezuela and the United States the homicide rates doubled within the last 10 years (23).

The age group 20–24 years old has the highest homicide rate. In fact, the homicide rate doubles between the age groups 15–19 and 20–24 (24).

Countries with the highest suicide rates (more than 10 per 100,000) among males aged 15 to 24 are Canada, Cuba, El Salvador, Trinidad and Tobago, the United States, Uruguay, and Venezuela. Argentina, Brazil, Chile, Colombia, Panama, and Puerto Rico have intermediate suicide rates (6 per 100,000), and Costa Rica and Mexico have the lowest suicide rates (under 6 per 100,000) (24).

The premature death of young people due to violence takes a toll both economically and socially, and yet, this is only the tip of the problem. The World Health Organization estimates that for every child and adolescent that dies due to injury, 15 are left severely affected by the incident, and another 30 to 40

report damage requiring medical or psychological treatment or rehabilitation (36). Moreover, violence during adolescence is not limited to physical injury, but also encompasses sexual abuse, neglect, emotional and verbal abuse, threats, sexual assault, and other forms of psychological abuse (37).

High rates of sexual abuse and incidence of rape, especially among the youngest adolescent females, are only beginning to surface in the Region (15). Young people are increasingly being exploited sexually, because it is assumed that they are less likely to be HIV-positive or to have acquired any other sexually transmitted disease (37). Sexual abuse has been linked to other behavioral problems, including alcohol or other drug abuse, engaging in unprotected sex with multiple partners, and prostitution (37).

Substance Abuse

Drug Consumption. The use of tobacco, alcohol, and other drugs has short- and long-term consequences for young people. Cocaine use, particularly as base paste, and the use of inhalants is a serious problem among street children and adolescents (15). Drug use is a matter of concern both because of an increase in new drug users and because more potent forms of drugs are becoming available (15).

According to a drug-use survey conducted in Bolivia in 1996 among the population aged 12 to 17 years, 11% had consumed drugs at some time and 6% were using drugs at the time of the survey. Among the population aged 18 to 24, 15% had consumed drugs at some time and 4% were current users. Most Bolivian adolescents (54%) initiated drug use between the ages of 12 and 17, and an alarming 8% of children initiated drug use between the ages of 5 and 11 (38). A study conducted in four cities in Panama examined the prevalence of lifetime drug use in the population aged 12 to 24 years. Prevalence rates among the youngest group—those aged 12 to 14 years—were 34% for abuse of analgesics and 4% for inhalant and sedative use, demonstrating the need for early prevention efforts for these substances. Among those aged between 15 and 19 years old, the prevalence rate for analgesic abuse was 43%, and marijuana (4%) and hypnotics (3%) began to emerge at fairly low prevalence rates. The drug-use pattern varied somewhat between males and females, with females showing higher rates of abuse of analgesics and sedatives across all age groups (39).

A 1996 study of Chilean adolescents and youth aged 12 to 25 years old examined the lifetime prevalence of marijuana, cocaine, and base paste use. In those aged 12 to 18 years—the youngest age group—9% had used marijuana, 2% had used base paste, and 2% had used cocaine. Among those aged 19 to 25 years, the overall lifetime prevalence rate was twice as high, with 21% for marijuana, 3% for base paste, and 5% for

cocaine. Except for marijuana, women initiated drug use (cocaine and base paste) at younger ages than men—20% of females under 12 years old had already initiated drug use, compared to 2% of men in the same age group (40).

Although these studies did not all use the same methodologies, it can be concluded that drug use begins in early adolescence, underscoring the fact that prevention efforts must be focused on this age group. The consumption of illegal drugs often occurs with other high-risk behaviors such as alcohol consumption and tobacco use.

Alcohol Abuse. Excessive alcohol consumption among adolescents has been a problem for years. Although consumption rates are usually higher for males, in some countries, such as the United States, rates are quite similar for males and females (27). Alcohol is the most widely used drug in the United States; readily available and inexpensive, it is used by about 80% of adolescents by age 18 years. Alcohol abuse by youth and its link to motor vehicle accidents is a problem for many of the Region's more developed countries (41).

Tobacco Use. Latin America and the Caribbean have a high prevalence of smoking among adolescents. For example, 57% of 15–19-year-olds in Peru and 41% in Cuba smoke, compared to 17% in Canada and 15% in the United States (6).

Response to the Needs of Adolescents and Youth

In response to recommendations emanating from the International Conference on Population and Development (1994), the Fourth World Conference on Women in Beijing (1995), and PAHO's 1996 Regional Plan of Action for Adolescent Health many countries of the Region have begun to ensure that national plans, policies, and programs for the comprehensive health care of adolescents and youth are in place. A recent analysis of national adolescent and youth policies found that 8 out of 30 countries surveyed had established national adolescent health policies, and another five were developing them (42). According to a 1996 evaluation of national adolescent health programs, 26 countries had established national programs, most of which had been established under other government programs such as maternal and child health. In the countries surveyed, only 40% of the national programs had a specific budget assigned to adolescent health (42). Although most countries have national adolescent health programs, they vary in development and implementation, and many follow different conceptual frameworks. In addition, the quality of the national programs must be addressed.

Countries are training health professionals to address specific needs of adolescents, including providing information

about family planning and violence prevention and counseling after sexual abuse. Information and education campaigns follow a gender perspective and promote sexual responsibility and the prevention of unwanted pregnancies and sexually transmitted diseases (43).

Costa Rica has a successful national adolescent health program that focuses on health services and health promotion and prevention, and emphasizes youth participation and intersectoral collaboration. Other Latin American and Caribbean countries have used this program as a model, and Costa Rican staff have trained personnel in other countries (41).

PAHO, with support from the W.K. Kellogg Foundation and UNFPA, is promoting a plan of action to build capabilities to address the needs of adolescents and youth within institutions. This plan encourages the countries to develop policies and programs for adolescent health and development, build a critical mass in the health and social science fields, transmit health messages through social communication strategies, strengthen networks of institutions and persons working in adolescent health, and conduct research in specific areas. Future efforts will focus on improving the quality of national programs including conducting situational analyses, periodic evaluations, and increasing coverage of and access to existing programs.

HEALTH OF THE ELDERLY

Demographic Transition and Aging

The concept of demographic transition can be useful in describing the consequences of changes in a population's fertility and mortality patterns. This frame of reference traces the evolution from a stage of barely any population growth—as a result of high fertility and high mortality—to a stage of slow growth—due to a combination of low fertility and low mortality. In between, a drop in mortality and a subsequent drop in fertility give rise to rapid population growth, as experienced in the twentieth century. The changes induced by shifts in mortality and fertility greatly influence the population's structure by age and family size. The levels of fertility and mortality determine the relative weight of the different age groups and, hence, the degree of aging of the population as a whole.

Table 13 illustrates this process by using the available data from countries in the Region that had more than 1 million inhabitants in 1995. The figures document the magnitude of the aging index (AI), which is defined as the ratio of the population 60 years and older to the population under age 15, expressed as a percentage.

In 1995, Argentina, Canada, Cuba, Puerto Rico, the United States, and Uruguay already had passed or were very close to

TABLE 13
Aging index (AI) and percentage of population age
60 years and older in 1995 and 2020, in countries with
more than 1 million inhabitants in 1995.

Country	1995		2020	
	AI	60 years and older (%)	AI	≥ 60 years old (%)
Canada	79	16.1	146	25.2
United States	74	16.4	116	22.8
Uruguay	68	17.1	81	17.7
Cuba	55	12.4	130	21.0
Puerto Rico	54	13.7	92	19.3
Argentina	46	13.2	68	15.8
Chile	32	9.6	70	16.0
Trinidad and Tobago	29	8.8	67	15.0
Jamaica	28	8.9	53	12.0
Brazil	23	7.1	56	13.1
Panama	23	7.5	57	13.3
Costa Rica	20	7.0	46	12.4
Colombia	19	6.4	49	12.2
Peru	19	6.7	44	11.0
Mexico	18	6.3	47	11.6
Ecuador	18	6.5	43	10.9
Dominican Republic	17	6.1	48	11.8
El Salvador	17	6.5	34	9.0
Venezuela	17	6.1	44	11.4
Haiti	15	6.0	17	6.1
Bolivia	15	6.0	26	8.1
Paraguay	12	5.2	25	8.2
Guatemala	12	5.4	19	6.7
Honduras	11	4.9	24	7.4
Nicaragua	10	4.5	24	7.2

AI: (Population age 60 years and older/population under age 15) x 100.

Source: United Nations. *The sex and age distribution of world populations. 1996 revision*. New York: UN; 1997.

a level of 1 person 60 years old or older for every 2 persons younger than age 15 (AI = 50 or more). Chile, Costa Rica, Jamaica, and Trinidad and Tobago were in an intermediate position (AI = 20–32). Other countries showed lesser degrees of aging. In countries with larger populations, such as Brazil, Colombia, the Dominican Republic, Ecuador, Mexico, Peru, and, to a lesser degree, El Salvador, the index will increase considerably in the 1995–2020 period, and these countries will reach the levels seen today in Argentina, Cuba, and Puerto Rico (1 elderly person per 2 children). The group composed of Bolivia, Honduras, Nicaragua, and Paraguay will continue to exhibit similar values, and within 25 years will have an AI comparable to that exhibited by Jamaica and

Trinidad and Tobago today. Haiti, whose aging indicators are expected to vary only modestly during the same period, should change little. A comparison of the percentages of persons aged 60 and older in different countries in 1995 shows that Uruguay has the oldest population (percentage slightly higher than in Canada and the United States). Argentina, Cuba, and Puerto Rico constitute another distinct group, with values between 12% and 14%, as do Chile, Jamaica, and Trinidad and Tobago, with values between 8% and 10%, as well as the other groups of countries mentioned in relation to the AI data.

Consequences of Demographic Changes

In North America, the demographic transition occurred over several generations, but in other countries of the Region changes have come over a much shorter period and under different circumstances—only infrequently have they been able to anticipate the consequences. For example, the growing cohorts of persons reaching advanced years have little hope of remaining economically independent while living on their retirement pensions. In Latin America, social security has very limited coverage, often reaching only workers in the salaried urban sectors and excluding rural and informal-sector workers, the unemployed, and the underemployed. Moreover, social security coverage varies widely from country to country and among socioeconomic strata in each country. Because in many countries these systems have expanded only relatively recently, benefits do not reach the elderly population; those who are protected by retirement pension plans are in a minority. Despite the fact that the social security systems emphasize income redistribution and equity, pensions rarely manage to keep beneficiaries above the poverty level.

In addition to the social security that encompasses institutionalized health services and retirement pension plans that provide benefits tied to individual contributions, some countries have assistance programs for the elderly, such as noncontributory pensions, in-kind transfers (food, housing, homeless shelters), and community centers for elderly persons. The percentage of beneficiaries is very small, however. The ratio of pensioners to active social security contributors is only 5.1 in the Dominican Republic, 6.3 in Mexico, 8.2 per 100 in Colombia, and 14.4 in Peru; in Brazil, it has reached 42.8.

In traditional societies, especially agrarian ones, the family operates as an economic unit that both produces and consumes. The unit's members evolve from being net consumers to net producers, and back again to being net consumers in their old age. Without organized and universal protection plans, children represent the primary insurance against the vicissitudes of old age in these types of societies. When fertility and family size decrease, there are fewer children to care

for their parents, who are surviving to very advanced years in greater numbers.

The demands of the economy tend to curtail the work of older persons, who are edged out of the job market by an expanding young population. This explains, at least in principle, the sustained decrease of older workers' participation in economic activities, a phenomenon that has been observed in both developed and developing countries.

Because Latin American women have a limited participation in the formal labor market, they are less likely to obtain pension benefits in their own right. After their husbands die, economic dependency or failing health very often forces women to live with their children or other family members.

The informal sector is substantial in the economies of many Latin American countries, which allows children to make a significant contribution to their families. Nevertheless, in modern families children tend to be net consumers for a much longer time, which, in effect, reduces the frequency and magnitude of the support to their grandparents. The pattern of these intergeneration transfers, how older people confront their basic needs in the face of uncertainty, and the role played by an emerging social security are topics that should be studied in order to formulate policies for improving the quality of life of the elderly.

Marital status is one of the factors that affect the welfare and the living arrangements of the elderly. Table 14 shows the percentages of men and women aged 60 and older in Mexico who are married. These data include unmarried persons who are living together (44). The figures document the differential effect of aging by sex. The percentages of married women are much lower, a fact that reflects, among other factors, women's survival to older ages.

Morbidity and Mortality in the Elderly Population

Morbidity and mortality among the elderly differ from that in the rest of the population. Older persons tend to suffer more from noncommunicable, chronic, and degenerative diseases, such as cardiovascular disorders, malignant neoplasms, and diabetes, which are associated with greater physical and mental disability. The mortality situation is manifested both in the mortality structure and the number of years of potential life lost (YPLL) due to the different groups of causes of death. For the population as a whole, the percentage of YPLL for communicable diseases is 47.5%, but it is only slightly more than 10% among the population 60 and older. The YPLL due to noncommunicable causes is 34% for the population as a whole and more than 80% for people 60 and older (45).

As to the burden of noncommunicable diseases, when the level of disability is taken into account, neuropsychiatric con-

TABLE 14
Percentage of men and women age 60 years and older who are married, by age groups, Mexico, 1990.

Age	Men	Women
60–64	86.0	63.5
65–74	81.7	52.3
75–84	71.9	36.3
85 and older	58.5	25.0

Source: XI Censo General de Población y Vivienda, Mexico, 1990.

ditions are responsible for the greatest number of years lived with a disability: the figures exceed 20% for the total population, as well as for both men and women aged 45 years and older. Next in the group aged 45 to 59 years, are musculoskeletal diseases, digestive diseases, respiratory diseases, and cardiovascular diseases. For men 60 years and older, neuropsychiatric conditions are followed by cardiovascular diseases, sense organ diseases, respiratory diseases, and musculoskeletal diseases; for women in the same age group, the latter are in second place, followed by sense organ diseases and cardiovascular diseases (Table 15).

The data from Table 16 show that, in 14 of 27 countries, more than half the registered deaths were in persons 65 years and older; in 10 countries, more than 40% of deaths were in persons 75 years and older. These figures forecast a trend that is expected to be seen in most countries of the Region in the next decades.

Table 17 shows the differences between two elderly age groups with respect to mortality from diseases of the circulatory system, malignant neoplasms, and symptoms and ill-defined conditions. With advancing age, the percentage of deaths due to diseases of the circulatory system increases, while that of deaths due to neoplasms declines. It also is important to note that, in very old persons, the percentage of deaths from symptoms and ill-defined conditions increases.

Quality of Life Indicators

Table 18 illustrates some characteristics of the population aged 60 years and older. Comparability problems inherent to compilations of data across countries are aggravated when groups of the elderly are being compared. The national data on this population are frequently available for a single age category with no maximum limit—such as 60 years old and older—which hides large differences within the age group. The meaning and measurement of important concepts that affect an elderly person's quality of life (disability, basic activities of daily living, economic activity, degree of literacy) can

TABLE 15
Percentage distribution of years lived with a disability due to noncommunicable diseases, adjusted by severity of the disability, by cause group, total population and population 45 to 59 years and 60 years and older, by sex, Latin America and the Caribbean, 1990.

Group of causes	All ages	Men		Women	
		45–59	60 years and older	45–59	60 years and older
Neuropsychiatric conditions	51.5	25.9	20.6	23.7	22.2
Cardiovascular diseases	3.5	7.4	15.5	5.0	9.7
Sense organ diseases	2.0	3.1	12.9	3.8	14.1
Respiratory diseases	9.1	9.5	12.0	8.2	8.8
Musculoskeletal diseases	10.3	22.8	10.1	32.9	17.7
Digestive diseases	6.3	12.7	8.7	10.2	9.5
Malignant neoplasms	1.2	1.9	7.0	2.8	4.0
Diabetes mellitus	2.0	4.7	5.7	5.4	5.6
Oral conditions	3.5	1.0	2.4	1.0	2.7
Genitourinary diseases	1.9	8.0	2.1	1.6	1.6
Endocrine disorders	3.1	1.7	1.9	3.0	2.6
Congenital anomalies	4.2	0.0	0.0	0.0	0.0

Source: Murray C., López A, eds. Volume 1: *The Global Burden of Disease*. In: *Global Burden of Disease and Injury Series*. Cambridge, Massachusetts: Harvard University Press; 1996.

be difficult to quantify and vary greatly among countries. Other indicators that are important for policy design, such as income, place of residence, and retirement issues, have received relatively little attention in most countries.

In almost all the countries shown, the percentage of women 60 years old and older who know how to read and write is lower than that of men; exceptions are Argentina, Chile, Costa Rica, Panama, and the United States, where the numbers are about the same. The large percentage of women who are widows should be noted, in that it places older women in double jeopardy; not only do they have an unfavorable economic status, but they also must endure solitude.

Little information is to be had regarding the percentage of the elderly population who may need assistance carrying out activities of daily living. Nonetheless, it is known that the prevalence of disability increases with a population's longevity. In the United States, 12% of persons between 60 and 74 years of age, 28% of those between 75 and 84, and 70% of those 85 and older, need long-term care, either in the community or in institutions. Knowing the percentage of persons 75 years of age and older in the Region at present and projected to 2025 (Table 18) will help countries evaluate the advisability of creating an infrastructure that will permit families of the elderly to continue being the focal point for long-term care, and thus reduce the need to continue expanding institutional programs for the elderly.

Studies on the prevalence of Alzheimer's disease in Latin America indicate that between 8.4% and 19.7% of persons aged 60 and older may suffer from a cognitive problem or

dementia. Alzheimer's disease and other related dementias constitute the most disabling mental disorder of the elderly; their condition worsens over time and they eventually require permanent care, either from the family group or from the community.

Need for Information on Aging and Health, and Care of the Elderly

Morbidity and disability in old age translate into suffering and high costs, as well as persistent and progressive deterioration. Given the inadequacy of the social security and the health systems, most of the burden and the costs tend to fall on the family. Besides the material cost of dealing with an illness, the emotional burden and the socioeconomic disadvantages also affect the lives of the elderly, their families, and their social environment. The health system and the medical-care model must adapt to the growing incidence of chronic diseases and incorporate specific preventive measures, treatment, and long-term follow-up (46).

The changes in the demographic composition and in the causes of illness and death are some of the most profound transformations occurring in the Americas in this century. New preventive and curative health care requirements must be planned for. It is important to begin by recognizing the significance of the aging process and the need to have appropriate and timely information to adapt the health system and create prevention programs.

TABLE 16
Total deaths recorded and percentage in adults aged 65 years and older and adults 75 years and older, by country, circa 1995.

Country (year)	Total deaths	65 and over		75 and over	
		No.	%	No.	%
Antigua and Barbuda (1992)	425	278	65.4	186	43.8
Argentina (1993)	267,286	166,142	62.2	108,335	40.5
Bahamas (1995)	1,604	668	41.6	425	26.5
Barbados (1995)	2,500	1,878	75.1	1,434	57.4
Belize (1995)	931	406	43.6	248	26.6
Brazil (1992)	826,828	354,568	42.9	210,517	25.5
Canada (1994)	207,077	155,703	75.2	109,414	52.8
Chile (1994)	75,445	45,861	60.8	29,963	39.7
Colombia (1994)	168,568	70,251	41.7	42,942	25.5
Costa Rica (1994)	13,314	7,457	56.0	5,142	38.6
Cuba (1995)	77,937	52,494	67.4	37,744	48.4
Dominica (1994)	529	329	62.2	231	43.7
Ecuador (1995)	50,867	22,030	43.3	15,168	29.8
El Salvador (1991)	27,096	10,834	40.0	7,070	26.1
Guyana (1994)	4,304	1,583	36.8	849	19.7
Mexico (1994)	419,074	187,361	44.7	122,654	29.3
Nicaragua (1994)	13,094	4,476	34.2	2,886	22.0
Paraguay (1994)	15,667	7,700	49.1	5,067	32.3
Peru (1989)	85,259	30,263	35.5	20,818	24.4
Puerto Rico (1992)	27,397	17,027	62.1	11,711	42.7
Saint Kitts and Nevis (1995)	405	268	66.2	211	52.1
Saint Lucia (1995)	966	573	59.3	365	37.8
Suriname (1992)	1,901	859	45.2	514	27.0
Trinidad and Tobago (1994)	9,264	5,278	57.0	3,319	35.8
United States (1994)	2,278,994	1,662,573	73.0	1,178,904	51.7
Uruguay (1990)	30,225	20,679	68.4	13,891	46.0
Venezuela (1994)	98,991	40,740	41.2	24,812	25.1

Source: Pan American Health Organization. Mortality database, Technical Information System.

TABLE 17
Percentage of deaths of adults age 60 years and older due to symptoms and ill-defined conditions, neoplasms, and diseases of the circulatory system, by age group, circa 1993.

Country	Symptoms, ill-defined causes (%)			Neoplasms (%)			Circulatory system (%)		
	65–74	75–84	85 and older	65–74	75–84	85 and older	65–74	75–84	85 and older
Chile	4.1	6.9	12.0	29.6	22.6	13.4	33.6	39.6	43.4
Ecuador	15.0	9.7	28.0	24.2	20.2	12.5	29.3	36.1	41.5
El Salvador	18.3	28.9	40.5	14.6	11.5	8.0	33.7	39.5	40.0
Mexico	0.9	1.6	3.9	17.9	13.9	7.7	30.2	37.1	43.4
Trinidad and Tobago	0.9	1.9	7.9	15.7	14.1	9.2	47.5	48.7	53.0

Note: Percentages of deaths due to neoplasms and diseases of the circulatory system are based on total deaths from defined causes.

Source: Pan American Health Organization. Mortality database, Technical Information System.

TABLE 18
Some characteristics of the elderly population in some countries of Latin America and the Caribbean, 1997.

Country	Life expectancy at birth (years)		Widows and widowers aged 60 years and older (%)		Economically active adults 60 years and older (%)		Adults 60 years and older who can read and write (%)		Population 75 years and older (%)	
	Men	Women	Men	Women	Men	Women	Men	Women	1997	2025
Argentina	74	79	12	46	39	13	93	91	4.0	5.7
Bolivia	60	73	18	44	50	27	59	32	1.7	2.6
Brazil	65	72	13	47	51	21	59	54	1.6	4.2
Chile	75	80	13	39	40	11	83	82	2.4	5.8
Colombia	70	78	15	46	45	11	73	64	1.3	3.1
Costa Rica	76	78	12	34	41	6	79	78	1.8	3.4
Ecuador	71	79	12	33	71	16	72	61	1.7	3.2
Haiti	51	59	8	27	64 ^a	35 ^a	21 ^a	15 ^a	1.5	1.6
Honduras	65	66	9	29	72	19	39	33	1.2	2.1
Jamaica	75	80	13	38	49 ^a	23 ^a	62	73	2.8	3.8
Mexico	71	79	12	37	60	18	71	59	1.3	3.1
Panama	74	79	11	32	42	8	72	71	2.2	4.2
Trinidad and Tobago	70	74	16	41	23	10	90	78	2.7	5.0
United States	76	79	13	47	26	15	91	93	5.8	7.9

^aRefers to the segment aged 65 and older.

Source: US Bureau of the Census, International Statistical Programs Center. *International Data Base*. Washington, DC: US Bureau of the Census; March 1997.

WORKERS' HEALTH

The relationship between the work environment and the health status of people is a priority health policy concern for some governments, international organizations (47), and social agencies. In 1995, it was estimated that the economically active population (EAP) in the Region of the Americas numbered 357.5 million people (46.3% of the total population), of which 226.5 million lived in Latin America and the Caribbean (47.7%) and 131 million (44.9%) lived in North America (48). The EAP is expected to increase to 399 million by the year 2000. During the 1990s, it will grow by 25.9% in Latin America and by 11.1% in North America (49).

Recent studies have shown the importance of work as a risk factor in terms of mortality, years of potential life lost (YPLL), years of life lived with disability, and disability-adjusted life years (DALYs). In 1990, in Latin America and the Caribbean, work-related risk factors ranked seventh as a cause of mortality, second as a cause of years of life lived with a disability, and fourth in terms of years of potential life lost (Table 19). The magnitude of mortality attributable to occupational illnesses and accidents equaled that from tobacco use.

The International Labor Organization (ILO) estimates that the percentage of workers in the informal sector, as a proportion of total nonagricultural employment in Latin America as a whole, increased from 51.6% in 1990 to more than 56.7% in

1996. In individual countries, the proportion ranges from 38% to 64% (50).

Women's rate of participation in the labor force increased from 37% to 45% between the 1980s and the mid-1990s, while that of men remained stable (between 78% and 79%) (51). In some Latin American cities, one of every five young people under the age of 18 is part of the work force (52). In 1996, open unemployment ranged from 10% to 18% in Argentina, Colombia, Panama, Uruguay, and Venezuela, but underemployment—i.e., employment with pay below the established minimum wage in each country—was a serious problem (48% of the population was underemployed in Peru, and 14.7% was underemployed in seven metropolitan areas in Colombia). It is estimated that between 20% and 40% of the employed population in Latin America earns less than the minimum amount needed to cover the cost of a basic package of goods and services (53).

Globalization of the economy, regional integration and liberalization processes, adjustments and privatization, and modifications to social policies have accentuated some of the trends, such as changes in the nature of work and in the working population, in the types of occupational risks and occupational morbidity and mortality, and in the development of differentiated policies, programs, and instruments (legislation).

One of the most serious problems affecting workers' health is underdiagnosis, underregistration, and underreporting of

TABLE 19
Estimated figures on the impact of health risk factors in Latin America and the Caribbean, 1990 (in thousands).

Risk factor	Number of deaths	Years of potential life lost (YPLL)	Years of life lived with a disability	Disability-adjusted life years (DALYs)
Hypertension	242.5	1,674	134	1,808
Difficult access to drinking water, poor sanitation conditions	135.3	4,254	929	51,383
Alcohol consumption	136.1	3,319	6,201	9,520
Malnutrition	135.0	4,540	520	5,059
Physical inactivity	117.6	796	173	969
Tobacco use	99.4	952	388	1,340
Occupation	97.7	1,973	1,708	3,681
High-risk sexual behavior	73.9	2,003	1,642	3,645
Air pollution	33.6	377	98	476
Drug abuse	16.0	449	1,140	1,589

Source: Leigh J, et al. Occupational hazards. In: Murray CJL, López ED, eds. *Quantifying Global Health Risks: The Burden of Disease Attributable to Selected Risk Factors*. Cambridge, Massachusetts: Harvard University Press; 1996.

work-related morbidity and mortality, as a result of which the available data do not fully reflect traditional occupational health problems, much less emerging health and labor-related problems due to the application of new technologies. Nor do they reflect problems suffered by workers who are not covered by social security systems, those who work in the informal sector, child workers, workers in the agricultural sector, and the unemployed.

Changes in the Nature of Work and the Working Population

Since the middle of this century, the countries of the Americas have evolved from having economies based on primary industry, such as agricultural and extractive activities, to having economies characterized by relatively high levels of industrial development and growing commerce and service sectors, although this shift has varied in rate and degree from country to country (54, 55). Between 1991 and 1993, the proportion of the EAP employed in the agricultural sector declined 0.5% in 12 countries of the Americas, dropping from 13.1% to 12.6% of the total EAP (56). Latin America has experienced significant growth in the economy's informal sector, especially in the percentages of self-employed workers and small businesses (Table 20). Between and within countries, social and health inequities have been exacerbated by the emergence of an increasingly stratified work force, with personnel in large multinational and national companies occupying the top strata, small businesses and microenterprises making up the middle, and persons who work mainly in sub-

sistence activities occupying the poorest strata at the bottom.

Latin American companies are increasingly relying on flexible labor practices. This trend has been fostered by reforms to the labor laws and to legal and contractual requirements. These policies have jeopardized job stability, and variously affected the length of the workday and working hours, vacation time, and wages. Amid widespread instability, workers (particularly young people without training) are forced to accept extremely poor working conditions, and they run the risk of being fired if they attempt to unionize. As a result, they are exposed to greater risk of occupational accidents and illnesses (57). It is noteworthy that the percentage of unionized workers in Latin America is declining, which reduces the possibilities for improving their working conditions. The proportion of unionized workers of the total employed population ranges from 42.3% in Argentina to 7.8% in Peru and 2.9% in Guatemala (50).

Duty-free areas and the export processing and assembly industry have burgeoned in some of the Region's countries. It is estimated that in Mexico, assembly plants located along the border with the United States (*maquiladoras*) employ nearly 11% of the work force, including employing a million women of childbearing age per year. These companies enjoy several advantages, including low costs and reduced taxes. They also are often subject to less stringent safety and environmental protection standards than exist in their country of origin and they take advantage of cheap, unskilled labor. Psychosocial risk factors are often accentuated in this environment, and they can lead to health problems such as cardiovascular disorders (58), with the consequent problems of absenteeism and reduced productivity (59).

TABLE 20
Structure of nonagricultural employment in Latin America, 1990–1995 (percentages).

Year	Informal sector				Formal sector		
	Total	Self-employment	Domestic service	Small business	Total	Public sector	Large private companies
1990	51.6	24.7	6.7	20.2	48.4	15.3	33.0
1991	52.4	25.0	6.7	20.7	47.6	15.2	32.5
1992	53.0	25.6	6.7	20.8	47.0	14.6	32.3
1993	53.9	25.3	7.1	21.6	46.1	13.7	32.4
1994	54.9	25.8	7.0	22.1	45.1	13.3	31.8
1995	56.1	26.5	7.1	22.5	43.9	13.2	30.8

Source: ILO estimates based on information from household surveys and other official sources.

Work in the Informal Sector

The informal sector⁶ has become the principal source of job creation in Latin America, accounting for 84% of new jobs created between 1990 and 1995. The size of the informal sector varies from country to country, accounting for as much as 64% of nonagricultural employment in Bolivia and 38% in Uruguay (50). Informal employment is gaining importance within the framework of traditional economic activity, as evidenced by the growth of small businesses (which are sometimes linked to large and mid-sized companies) (60) and self-employment in virtually every sector of the economy. Psychosocial risk factors are compounded by the personal safety risk from working in the street or at home. In addition, informal activity exposes family members, whether they participate directly or indirectly in the work, to occupational risks.

Participation of Women in the Labor Market

Another trend observed in the countries of the Region is the growing participation of women in the labor market, especially in the informal sector. Between 1960 and 1990, the number of economically active women in Latin America jumped from 18 million to 57 million (in proportional terms, from 18.4% to 27.9% of the EAP). Women's labor situation compared with that of men differs from country to country (61), but in general women carry a double or even triple workload, which implies greater risk to their health (62, 63). In Latin America, women earn 71%, on average, of the

amount earned by their male counterparts (64). The proportion is significantly lower in traditional areas of activity (Panama: 55% to 60%). Female unemployment (21%) is double that for males (10.5%) (65). Moreover, in the *maquiladoras* and in sectors such as floriculture (66, 67), the occupational risk factors for women—in particular reproductive and ergonomic risk factors—are especially serious (51). Most clerical and domestic jobs are performed by women, with the resulting problems of stress, sight and hearing disorders, ergonomic and psychosocial problems, spinal injuries, fatigue, and accidents. Female workers in rural areas have the longest working days (up to 15 hours per day), owing, among other reasons, to lack of access to a network of social services that would lighten the burden of domestic tasks. In addition, like the rest of the working population, women may be exposed to chemicals (especially pesticides) and physical agents (heat, temperature, heavy weights) and to problems associated with temporary employment.

Participation of Children and Adolescents in the Labor Market

The proportion of children (persons under the age of 15) and adolescents (persons aged 15–18)⁷ in the work force is increasing in the countries of the Region. According to ILO data for 1996, one-half of the 15 million children who worked in Latin America were between 6 and 14 years of age, which is 20% to 25% of the total number of children in that age group, and these data do not take into account domestic work. Children make up slightly less than 5% of the EAP of the Region; this figure is more or less equivalent to the rate of open un-

⁶ There is no single definition of the informal sector. The definition used here is the one used by ILO in the publication *Panorama laboral 1996* (Geneva: ILO; 1996).

⁷ The ILO classification of age groups is used in this publication.

employment, which suggests that these child workers are playing the role of an “industrial reserve army” (52). In the United States, an estimated 4 million children work (68). In 1996, in several countries more than 10% of the population aged 10–14 was in the work force: Haiti (25.3%), Guatemala (16.2%), Brazil (16.1%), Dominican Republic (16.1%), Bolivia (14.4%), and Nicaragua (14.0%) (69).

Reports submitted to PAHO by the countries also reflect the magnitude of child labor: in Ecuador, in 1996, young people aged 8–18 years made up 38% of the labor force; in Argentina, in 1995, 200,000 children aged 10–14 worked; in Chile, in 1994, 14,912 children aged 12–14 years (2% of the total population in this age group) and 25,665 young people aged 15–17 years (3.6%) worked; in Colombia, in 1994, 50,145 young people aged 12–14 years (5.8%) and 392,043 of those aged 15–19 years (24.9%) worked; and in Venezuela, in 1996, 1.2 million minors worked in the informal sector of the economy. According to the ILO, in Latin America, between 60% and 70% of the children who work in urban areas and between 45% and 50% of those who work in rural areas are paid. Between 40% and 45% have unpaid jobs in family businesses, and a small proportion of children (10%–15%) work on their own.

When children work, their education and their social, physical, and mental development are threatened or hindered, and their chances of escaping poverty are reduced. They tend to work long hours and receive less pay than adults who perform the same work. Forced child labor also occurs in the Region (52, 68, 70). In addition to overall poverty-related health problems such as malnutrition, anemia, fatigue, and greater exposure to epidemics, children who work face additional risks deriving from poor health conditions in their workplaces.

Among the most intolerable forms of child labor are mining (Brazil, Colombia, and Peru) (71–73), farmwork on large plantations (Brazil, Haiti, and Peru), tanning operations in the informal sector, street vending (in almost all countries) (74), and domestic service. Children who work in the streets should not be confused with street children, who represent another social problem of considerable magnitude in the urban areas of many countries.

Occupational Risks and Occupational Morbidity and Mortality Profile

Availability of Data

The absence of general and specific data on occupational risk factors, accidents, and diseases is a major obstacle in determining the scope of the problem of occupational health in the Region. This lack of information is tied to a lack of coordi-

nation among sectors responsible for workers' health, which hinders the collection of uniform and standardized data at the national level. The absence or flaws in occupational health registries, lack of trained human resources in the various occupational health disciplines, changes in social security systems of some countries (in Argentina, according to the Department of Occupational Hazards, only 8,000 out of 400,000 companies affiliated with the new social security system submit annual reports on work-related accidents and diseases), the emergence of new and highly mobile labor groups who are not covered by occupational health services, and the difficulty of establishing etiological connections between exposure and the development of diseases with long latency periods also contribute to the paucity of information.

Deficiencies in data collection hinder the analysis of labor changes that occur in the wake of socioeconomic change, of new risks, and of technological innovation in addition to the analysis of traditional occupational risk factors. Differences between institutions and countries in classification criteria, diagnosis, and registration of occupational health problems, as well as frequent modification of the criteria, complicate the analysis of trends and make it difficult to detect inequities regarding occupational accidents and diseases or changes in the profile of occupational morbidity and mortality. In addition, there are disparities with regard to the definition of occupational accidents.

In the few cases in which epidemiological surveillance systems have been put in place, results have been striking. For example, in 1992, the province of Limón, Costa Rica, reported 1% of the cases of pesticide poisoning that occurred in the country (75); after a surveillance system was implemented through the Plagsalud project in 1996, the proportion of pesticide poisoning cases reported by this region jumped to 52%. A similar improvement was observed in Chile after an acute pesticide poisoning surveillance system was established in the country's health services in 1994, and reported cases increased from 344 in 1995 to 563 in 1996.

Risk Factors in the Workplace

WHO has called attention to the multiple risk factors to which workers may be exposed in the workplace. The major ones include mechanical risk factors, which affect 30% of the work force in developed countries and 50% to 70% in developing countries; biological risk factors (more than 200 agents); physical risk factors, which affect 80% of the work force in developing and recently industrialized countries; chemicals (more than 100,000 different substances are used in the various sectors of economic activity); and reproductive risks (especially mutagenic and teratogenic agents, which may affect the reproductive health of workers or lead to fetal

abnormalities). WHO also lists a variety of carcinogens that are prevalent in the workplace. In the United States alone, an estimated 16 million people are exposed to carcinogenic agents at their jobs. It is estimated that between 2% and 8% of all cancers are of occupational origin. Controlled studies of smokers show that between 10% and 30% of all types of lung cancer in men are attributable to occupational exposure (76).

Other studies⁸ have shown that dust and, to a lesser extent, gas and vapors are linked to an increase of 30% to 50% in chronic obstructive pulmonary disease. Toxic renal effects have been associated with exposure to lead, mercury, and organic solvents (77). Pesticides, heavy metals, and various organic solvents produce neurological disorders. It is estimated that the majority of the 3,000 allergenic agents are of occupational origin (49, 78).

Social conditions in the workplace and psychological stress are increasingly common occupational risk factors that affect practically all the EAP and cause an estimated 5% to 10% of cardiovascular morbidity and mortality. Those who are unemployed also suffer mental health problems from a lack of job security and income.

One of the most important and most widely studied occupational risk factors is pesticide use. The United Nations Environment Program (UNEP) estimates that accidental pesticide poisoning causes 20,000 deaths and 1 million cases of illness per year worldwide (79). Central America has the highest per capita use of pesticides in the world. In this subregion, whose economy is based on intensive agriculture, an average of 2.1 kg of pesticide per worker was used during the past decade. The average amount of pesticide used per cultivated hectare was 16 kg, and the trend is upward (80). In Argentina, 33.9 million kg (US\$ 116 million) of pesticide were produced in 1996, 37.5 million kg (\$361 million) were imported, and 28.5 million kg (\$315 million) were processed or packed. Another risk factor is the use of mercury for recovery of gold in the countries of the Amazon basin. In Brazil, more than 300,000 workers are exposed (81) and in Peru, some 30,000.

Occupational Accidents

Fatal Accidents

Although fatal occupational accidents are underreported, they are nevertheless the most frequently reported of all oc-

cupational accidents. Fatal accidents are usually reported by occupational insurance systems, which provide only partial coverage. Available data show an increase in the absolute numbers of fatal accidents in some countries, but generally speaking no clear trend can be discerned. In some cases, the base population (the number of people used for calculating occupational accidents and diseases in the countries) does not remain constant because of changes in the insured population; in addition, accident and disease statistics show marked underregistration. For example, the low number of accidents reported in Latin American countries contrasts with a higher number of fatal and nonfatal accidents in Canada and the United States. These logistical limitations hinder comparison among countries.

Fatal accidents occur mainly in activities that are considered high risk (mining, construction, fishing, electricity). There also has been a notable increase in the number of fatal accidents in service activities, which is attributable to outsourcing of high-risk jobs to contractors.

In Peru, the average mortality rate from occupational accidents in the mining sector was estimated at 166 per 100,000 workers during the 1980s; between 1993 and 1996, this rate rose from 143 per 100,000 to 247. In the United States, mortality from occupational accidents decreased from 9.4 per 100,000 in 1975 to 5.0 in 1995. This reduction occurred in all demographic groups and in all sectors of the economy. The most important decline in the leading causes of death was seen in mortality from electrocution, owing to regulatory changes and establishment of the Occupational Safety and Health Administration.

Nonfatal Accidents

In Chile, the average accident rate among workers covered by mutual insurance funds was 12.5 per 100 workers in 1992; the sectors with the highest accident rates were construction (23.1 per 100), industry (16.2 per 100), agriculture (15.6 per 100), and mining (14.3 per 100). In Colombia, the Occupational Hazards Administration of the Social Security Institute, which covers almost 80% of the workers insured for occupational risks in the country, reported 1,085 cases of some type of occupational disability per year. There are more than 20 insurance funds in the country, but none provides data on occupational accidents; this fact, coupled with underreporting, makes the available data unreliable. In Colombia, among the 10 most important economic activities in 1995, agriculture and construction accounted for the highest percentages of all reported accidents (24.6% and 9.1%, respectively, for a total of 43,200 accidents). The highest accident rates were registered in the mining sector (27 per 100 in extraction of metallic minerals and 18.7 per 100 in coal mining). Accident

⁸See Leigh J et al. Occupational hazards. In: Murray CJL, López ED, eds. *Quantifying global health risks: The burden of disease attributable to selected risk factors*. Cambridge, Massachusetts: Harvard University Press; 1996, and Murray CJL, López AD. Quantifying the burden of disease and injury attributable to ten major risk factors. In: Murray CJL, López ED, eds. Volume 1: *The global burden of disease*. Cambridge, Massachusetts: Harvard University Press; 1996:295–324.

figures and rates for other countries are as follows: Paraguay, 4,097 (2.9 per 100) in 1993; Puerto Rico, 75,823 (7.2 per 100) in 1994; and Guyana, 3,848 (1.4 per 100) in 1994. In the United States, the nonfatal accident rate has not changed significantly in the past six years (82).

Occupational Diseases

In Latin America and the Caribbean, only 1% to 5% of the cases of occupational illness are reported (49). The extent of underdiagnosis and underreporting makes these diseases less reported than occupational injuries. In general, occupational diseases are reported only when they cause some disability for which an insurance claim is submitted.

New risk factors and the poor quality of life to which workers are exposed have led to the emergence of work-related disorders such as stress and cardiovascular diseases. The most frequently reported occupational diseases in the countries of Latin America and the Caribbean are hearing loss, pesticide poisoning, skin diseases, and respiratory infections.

In Colombia, 64% of the occupational diseases reported in 1995 were cases of hearing loss. In Argentina, of all the cases of poisoning recorded in 1993 (3,361), 1994 (7,763 cases), and 1995 (10,354), acute pesticide poisoning accounted for 33%, 10%, and 9.8%, respectively. Of the consultations in six toxicology centers in 1991, 18% were for this cause. In Costa Rica, 305 cases of acute pesticide poisoning were reported in 1992, 978 cases in 1995, and 792 in 1996, an increase that reflects better reporting. In Nicaragua, the rate of occupational pesticide poisoning increased significantly between 1991 and 1996, jumping from 41.2 per 100,000 population to 81.4 per 100,000; of the 2,163 cases of pesticide poisoning reported in 1995–1996, 51% were related to the work environment and 64% came from exposure in the field. More than 60% of the cases were associated with the use of two groups of pesticides: organophosphates and carbamates. The Ministry of Health of El Salvador reported that 19% of pesticide poisoning cases in 1996 were of occupational origin and that pesticide poisoning was the seventh leading cause of hospital mortality in 1996 (197 deaths, 1,176 admissions, and a case fatality rate of 16.8%). In the Dominican Republic, of 888 cases of occupational disease registered by the largest national hospital of the Dominican Social Security Institute (IDSS), the most frequent were lead poisoning (51%).

In Colombia, skin diseases represented 15% of all occupational diseases reported in 1995. Cuba has a high incidence of contact dermatitis (among workers who handle cement, chromates, and dichromates), folliculitis, and acneiform dermatitis (from handling petroleum derivatives). Dermatologic disorders were also the most frequently reported occupational diseases in Chile.

In Bolivia a study conducted among 15,000 miners showed a 1.4% prevalence of silicotuberculosis and an 8% prevalence of silicosis (during the 1980s, when the decline of traditional mining began, the rates were higher). Peru also reported a high prevalence of pneumoconiosis, which is aggravated by work at high altitudes (70% of the miners in the country work at over 2,500 m above sea level) (57).

In Colombia, the highest rates of occupational disease were registered among workers employed in extraction of non-metallic materials (54.8 per 10,000 workers) and in the basic metallurgy industries (31.1 per 10,000). In Chile, the rate of occupational disease reported in 1992 averaged 21.7 per 10,000 workers. In Peru, among the population covered by the occupational accident and disease registry system and the Peruvian Social Security Institute (IPSS), 7,902 occupational diseases were diagnosed in 1991 and 8,422 in 1995. In Mexico, 55% of the occupational diseases detected in one study were accompanied by irreversible sequelae (83). In the United States, on the basis of an analysis of national and state data, it was estimated that an average of 862,200 cases and 60,300 deaths from work-related diseases occur annually; over the past 25 years, the general trend of mortality from selected occupational diseases has been downward (82).

It is estimated that in the United States, in 1992, between 5% and 10% of morbidity from cancer, cardiovascular diseases, and cerebrovascular and chronic obstructive respiratory disorders among persons aged 25–64 (of a total of more than 3.4 million cases) was attributable to occupation (84). That country has also seen a rise in occupational dermatitis since 1986, with a rate of 82 per 100,000 (approximately 60,000 cases in 1992). It is estimated that the actual number is 10 to 50 times greater than the reported number (82). The number of cases of pneumoconiosis declined in the 1980s and early 1990s; at the same time, however, osteomuscular disorders due to repetitive activities (excluding lumbar problems) increased from 100 cases per 100,000 in 1987 to 368 per 100,000 in 1992. These problems are most frequent among workers in the food industry (82) and are related to changes in the design and organization of work.

Cost of Occupational Accidents and Diseases

Information on the cost of occupational accidents and occupational diseases comes from workers' insurance systems and includes the costs of health care and pensions for disability or death. The cost to workers and their families, companies, or the State for occupational accidents and diseases in segments of the population not covered by such insurance is unknown.

In Costa Rica, where only the National Insurance Institute provides coverage for occupational risks and covers 56% of

the country's work force (EAP) and 84.3% of the salaried population, the annual direct costs (care and indemnity for occupational accidents and diseases) plus administrative costs for 1995 totaled US\$ 50 million—close to 0.6% of the gross domestic product (GDP). This amount does not take into account indirect expenditures or loss of added value, nor does it include costs relating to accidents or diseases suffered by noncovered workers.

Estimates reveal losses due to occupational accidents and disease equivalent to 9.8% of the GDP in Bolivia (84) and 11% of the GDP in Panama (85). In Peru, the amount of subsidies paid out by the Peruvian Social Security Institute (IPSS) for occupational accidents and diseases increased 21.8% between 1995 and 1996 and the amount of disability pensions rose 57%.

Nevertheless, the highest costs are the societal and family costs associated with occupational accidents and diseases, and these are very difficult to quantify. The ILO estimates that the cost of occupational accidents is as much as 10% of the GDP of some developing countries (49); if these countries could reduce this cost by just 50%, they could pay off their foreign debt (86). In the United States, the direct cost (US\$ 65,000 million) plus the indirect costs associated with work-related accidents and diseases total an estimated \$171,000 million. The cost of accidents is \$145,000 million and that of diseases is \$26,000 million, although both amounts are believed to be underestimates.

Policies, Programs, Legal Instruments, Services, and Human Resources for Workers' Health

Development of Policies, Programs, and Legal Instruments

The development of policies, programs, and legal instruments for workers' health has taken different forms in the various countries and subregions, owing to differences in policies on social reform (87). The Declaration of Principles adopted at the Summit of the Americas affirms that free trade and increased economic integration are key factors for improving the working conditions of people in the Americas and better protecting the environment.

The agreements for the creation of free trade areas to facilitate the flow of business, goods, and services—such as the North American Free Trade Agreement (NAFTA) and other integration groupings, including MERCOSUR and the Andean Pact—open up new, though limited, possibilities for developing workers' health within companies (88, 89). NAFTA, which initially focused on the economic ties between the signatory countries, subsequently incorporated an agreement for cooperation in the labor sphere that includes provisions relating to occupational health and safety and prevention of occupa-

tional injuries and diseases. To date, no such provisions have been adopted in the framework of other integration processes.

MERCOSUR has not incorporated any agreements concerning safety and health, but individual member countries have carried out their own initiatives (90). In 1996, Argentina enacted the Law of Occupational Risks, which establishes a mandatory joint liability insurance plan for occupational accidents and diseases, administered by private entities. In Brazil there has been a major social movement to promote workers' health; recent legislative changes include establishment of regulatory standards under the Occupational Health and Monitoring Program (PCMSO) and the Program for Prevention of Environmental Risks (PPRA), in which businesses are required to participate, regardless of their degree of risk. In Uruguay, the Tripartite National Board seeks to prevent injuries to construction workers. Companies throughout the Region, out of concern for their competitiveness in the international market, are showing greater acceptance of the ISO 9000 standards (international standards for quality management and assurance and guidelines for their selection and use).

In the governmental sphere, several countries have developed policies over the past four years that have led to new legislation for the protection of workers and improvement of care for sick or injured workers, with an emphasis on implementing specific programs and increasing training of human resources. In Panama, by resolution of the Ministry of Labor, an Interinstitutional Technical Committee on Occupational Health, Hygiene, and Safety was formed in April 1997. In Venezuela, the National Workers' Health Plan, adopted in 1995, is oriented toward the protection of children, women, and temporary workers. Colombia and Chile also have occupational health plans and programs. In Chile, the Ministry of Health is carrying out the Program for Improvement of Occupational Health, and occupational health is included as one of the country's 16 health priorities for the period 1998–2000.

In the Caribbean, most of the countries have developed plans and policies for workers' health. Barbados created a commission to develop the National Workers' Health Plan. In Jamaica, a resolution on workers' health provided the impetus for a plan to improve and promote the growth of production and social progress. The Government of Saint Lucia is stressing the design and evaluation of policies related to occupational health in the formal and informal sectors through the application of a plan that will continue until the year 2003. In Guyana, policies on workers' health find expression in a plan that has goals aimed at sensitizing the population to the importance of safety in the work environment, establishing an information system, and implementing a chemical safety program. Cuba has a National Workers' Health Pro-

gram designed to maintain the workers' health in the face of changes in the country's economic structure and labor profile.

Workers also have made progress in promoting their own health. Training experiences and participatory research are under way in virtually all the countries, including the Unified Confederation of Workers (CUT) in Brazil and the Association of Trade Unions in Peru (91). There are also important movements in specific sectors, such as health and mining. The International Federation of Chemical, Energy, Mine and General Workers' Unions (ICEM) is mounting an international campaign to promote ratification of the Safety and Health in Mines Convention (ILO Convention No. 176). Various groups of workers, together with universities and nongovernmental organizations, are carrying out other important initiatives in this area (92).

Development of Services

In most of the countries, social security systems provide coverage to workers who are affiliated with these systems. In some cases, the social security institute is solely responsible for workers' health, but in Colombia, Chile, Argentina, and Peru private entities have also begun to provide coverage for workers. Costa Rica has an institute that administers and provides occupational health services and pensions.

In both social security systems and private insurance it is important to differentiate between health coverage and coverage for occupational risks (work-related accidents and occupational diseases) and pensions (mainly retirement); it is also necessary to distinguish between the population that is insured directly and family members who are insured indirectly (93). The services provided to the population covered by an occupational risk insurance system are mainly oriented toward medical care, with little emphasis on prevention. However, this orientation has begun to change in some countries, including Peru and Colombia, where prevention and health promotion activities are being strengthened. In addition to the occupational health services provided by social security systems and private insurers, companies sometimes have their own services, especially large and multinational companies, although their approach is generally more curative than preventive.

As an example of the extent and distribution of occupational risk coverage in the Region, in Chile, 72% of the working population (5.2 million) is covered by health services (17% by social security, 48% by mutual insurance funds, 1% by authorized insurance administration companies, 3% by health insurance plans for public employees, and 2% by the Armed Forces Health System). These proportions vary substantially among countries.

In Mexico, the Mexican Social Security Institute (IMSS) has established a worker's health department, which has integrated health promotion and preventive services with health and economic benefits under a national strategic plan for the 1996–2000 period. Since 1993, Colombia has had a new social security system, created by Law 100, which modified the previous occupational risk system. In response to the notable development of private insurance for workers, social security systems, utilizing their comparative advantages, have become the primary insurers and providers of occupational health services (they cover 80% of the total population of workers who are insured for occupational risks). In Peru, in 1996, the IPSS created an Office of Occupational Health, to which it has allocated substantial resources (the office has recently incorporated 180 new professionals).

Development of Human Resources in the Field of Workers' Health

The availability of training for human resources in occupational health has increased considerably in several countries of the Region. In Colombia, in response to greater demand for specialists, more than 20 postgraduate training programs were organized. In Chile, the number of occupational health specialists in public health services increased from 29 professionals in 1990 to 46 in 1995. Brazil has nearly 20,000 physicians who have received specialized training in occupational medicine. In Cuba, of 28,350 family doctors, 1,542 practice in workplaces; in addition, there are about 200 physicians who specialize in occupational health, 2,081 technicians in health and epidemiology, and more than 100 specialties related to occupational health.

Another important indicator of progress in this area is the increase in scientific output. A PAHO report on studies conducted between 1995 and 1997 in Latin America and the Caribbean contained accounts of 132 projects relating to occupational and environmental health issues.

HEALTH OF INDIGENOUS PEOPLE

Analyses of the health and living conditions of indigenous peoples⁹ are based on indicators related to demographics; socioeconomic; mortality; morbidity; and health services resources, access, and coverage that do not make it possible to discern the individual and collective potential of certain peo-

⁹The concept of a people refers to the set of traits that characterize a human group in territorial, historical, cultural, and ethnic terms and give it a sense of identity (94).

ples who live under adverse circumstances. Among the Region's indigenous peoples, survival mechanisms have been forged by cultural, linguistic, organizational, and leadership characteristics, along with adherence to a community ethos based on reciprocity, respect, and ancestral knowledge (95). Several of the country reports included in Volume II of this publication detail information on this subject.

Different countries have referred to their indigenous peoples by various names, depending on social and historical context: the language spoken, ancestry, self-identification, and geographic concentration or territoriality (96). Consequently, available data are not always comparable. In addition, the epidemiological data available on living and health conditions among the Region's indigenous peoples do not come from homogeneous sources. Few countries regularly gather and analyze vital or health service statistics by ethnic group, nor do they present data broken down according to ethnic group and sex. This variability makes it difficult to obtain data with which to adequately assess the health situation, living conditions, and health services coverage of indigenous groups. There are, however, several studies that support the need for renewed efforts to deal with the serious inequities that exist (97).

National institutions involved in indigenous health generally lack specific information to analyze the situation of this population sector. In Bolivia, for example, of 30 documentation centers identified as belonging to official agencies, academic institutions, and indigenous and nonindigenous non-governmental organizations, 40% have no information on the subject, and, if they do, the information is not correctly recorded or filed (98–102).

Socioeconomic, Political, and Social Context

Available figures on the number of indigenous peoples in the Americas as a whole and in each of the countries vary depending on whether they are drawn from official or nonofficial sources, such as indigenous organizations. According to existing estimates and data, 42 million indigenous people, belonging to more than 400 different groups, constitute 6% of the total population of the Region and nearly 10% of the population of Latin America and the Caribbean (103).

Approximately 80% of the indigenous peoples live in Central America and the central Andes, most of them in Mexico (12 million), Guatemala (5.3 million), Peru (9.3 million), Bolivia (4.9 million), and Ecuador (4.1 million). The remaining 20% might be considered a dispersed population living in different environments, especially along the banks of the Orinoco-Amazonas-Paraná river system and in the United States and Canada (103, 104). In Latin America, 27% of the rural population is indigenous (105).

TABLE 21
Estimated indigenous population, by country, circa 1992.

Country	Indigenous population (millions)	Percentage of total population
Bolivia	4.9	71
Guatemala	5.3	66
Peru	9.3	47
Ecuador	4.1	43
Belize	0.029	19
Honduras	0.70	15
Mexico	12.0	14
Chile	1.0	8
El Salvador	0.4	7
Guyana	0.045	6
Panama	0.14	6
Suriname	0.03	6
Nicaragua	0.16	5
French Guiana	0.004	4
Paraguay	0.10	3
Colombia	0.60	2
Venezuela	0.40	2
Jamaica	0.048	2
Canada	0.35	1
Costa Rica	0.03	1
Argentina	0.35	1
United States	1.6	0.65
Brazil	0.3	0.20

Sources: Inter-American Development Bank, Preliminary Project for the Creation of the Development Fund for the Indigenous Peoples of Latin America and the Caribbean, Washington, DC, 1991; Instituto Indigenista Interamericano, Data Bank, Mexico, 1992, in PAHO/WHO, SILOS-34, 1993.

The percentages of indigenous population presented in Table 21 must be considered in context. For example, in the case of Mexico, 14% amounts to no less than 12 million persons. In other cases, as in Brazil and Colombia, despite the low percentages, the indigenous population has a significant national and political presence (106, 107).

The indigenous population is generally a young population. In the United States, according to the 1990 census, 33% of the indigenous population was under age 15 and 6% was older than 64, compared with 22% and 13%, respectively, of the national population (108). According to the 1993 Census of Indigenous Communities of Peru, in the 18 indigenous communities surveyed, the indigenous group from age 0 to 14 years represented 50%, compared with 37% for the national population (102). The census also shows a masculinity ratio

of 108.8 men for every 100 women, probably due to high rates of migration and high levels of maternal mortality (486 deaths for every 100,000 live births, compared with 261 deaths for every 100,000 live births nationally) (102).

In addition, differences are noted among the indigenous populations of each country. In Honduras, life expectancy at birth of the *pech* and *lenca* indigenous groups is 39 and 47 years, respectively, for men and 42 and 57 years, respectively, for women (100), compared with 65.4 years for men and 70.1 years for women nationwide (109). In Chile, according to 1993 data, life expectancy for both sexes among the *aymara*, *mapuche*, and *rapa nui* peoples is 63.3, 67.5, and 72.7 years, respectively, compared with 72 years nationally (99, 109). In Brazil, it was reported in 1996 that life expectancy for both sexes was 66.3 years for the national population (109), 42.6 years for the indigenous population in general, and 24.5 years among the indigenous inhabitants of the Javari Valley (17). Some indigenous peoples such as the *yámana* of Tierra del Fuego, Chile, are threatened with extinction (110).

The social, economic, and cultural changes of the past decade have had an obvious effect on the health and welfare of the populations of most countries. Indigenous peoples form part of the dynamics of the Region and, therefore, their problems depend on the historical, social, cultural, political, and economic reality of society as a whole.

In the absence of policies that take into account the Region's cultural diversity, certain population groups have become marginalized—among them indigenous populations. This marginalization is reflected in alarming rates of poverty, low salaries, high unemployment levels, high illiteracy and school dropout rates, and high levels of unmet basic needs (112). In view of this reality, various national and international conventions, declarations, agreements, and laws have been promulgated. Some agreements such as the Declaration of Human Rights (1948), the Earth Summit Agreements (1992), and the Americas Summit Resolution (1994) are general in nature; others are specific, such as ILO Convention 169 on Indigenous and Tribal Peoples (1989), the Convention Establishing the Development Fund for the Indigenous Peoples of Latin America and the Caribbean (1992), the International Decade of the Indigenous Populations of the World (1994), Resolution CD37.R5 of PAHO/WHO (1993), the Declaration on the Compromise between the Indigenous Parliament of America and PAHO (1995), and the resolutions from the advisory workshop in preparation of the Declaration of the Rights of Indigenous Peoples (1996). Various countries have proposed Constitutional reforms (Bolivia, Colombia, Ecuador, Mexico, Nicaragua, Paraguay) and others (Bolivia, Chile, Colombia, Guatemala) have issued laws and reforms in favor of their indigenous populations (112, 113). Indigenous peoples are relying on international and national legal mechanisms to de-

TABLE 22
Percentage of population below the poverty line^a among indigenous and nonindigenous populations of Bolivia, Guatemala, Mexico, and Peru, circa 1989.

Country	Indigenous population	Nonindigenous population
Bolivia	64.3	48.1
Guatemala	86.6	53.9
Mexico	80.6	17.9
Peru	79.0	49.7

^aMonthly incomes of US\$ 60 and US\$ 30, with a purchasing value similar to that of 1985, correspond to the base poverty line and the extreme poverty line, respectively.

Source: Psacharopoulos G, Patrinos HA. *Indigenous People and Poverty in Latin America: An Empirical Analysis*. Washington, DC: World Bank; 1994:207. (World Bank Regional and Sectorial Studies).

mand equality, the elimination of all forms of discrimination, territorial lands, and respect for their identity.¹⁰

As a result of worldwide economic growth, poverty has declined in many areas of the world. However, the social and economic inequities among countries, as well as within countries, are alarming (115, 116). The rates of poverty reported for indigenous populations reflect their status among the societies of the Region. Table 22 presents some of these data.

Poverty and ethnicity are directly tied to one another. In Mexico, cities with less than 10% indigenous population have a poverty rate of 18%, but in cities with indigenous populations between 10% and 40%, 46% of the population is poor; and in cities with indigenous populations of greater than 70%, more than 80% of the population is poor. In Bolivia, being indigenous increases the chances of being poor by 16% (96).

The effects of poverty are aggravated by high rates of illiteracy, migration, and unemployment. In Nicaragua, according to the Diagnosis of the Development of the Indigenous Peoples of Nicaragua, in 1995 approximately 66% of the indigenous population had no access to education, and the school dropout rate exceeded 40% (117). Among the indigenous communities on the Atlantic coast, in 1995 unemployment reached 70% in the Southern Atlantic Autonomous Region and 90% in the Northern Atlantic Autonomous Region. These figures are magnified when the fact is taken into account that in these regions, which lie far from urban centers and are dif-

¹⁰According to the Inter-American Human Rights Institute (IIDH), the term *territory* refers to a geographic area under the cultural influence and political power of a people, and the term *land* refers to the portion within this area that can be appropriated by an individual or legal entity. The first is a collective right of peoples and the second an individual right of persons. The first creates the possibility of exercising control and authority over all resources and over social processes found there. The second creates the possibility of using the soil for productive purposes without interference from other persons (114).

TABLE 23
Educational level of women of childbearing age, by selected characteristics, Guatemala, 1995.

Characteristic	Education			
	None	Primary	Secondary	Higher
Urban	14.2	42.8	36.4	6.6
Rural	39.2	50.5	9.1	1.2
Indigenous	53.4	41.6	4.6	0.4

Source: INE et al. Encuesta Nacional de Salud Materno Infantil. Guatemala, 1995.

difficult to reach, the cost of living is very high compared with the rest of the country (117). In Bolivia, the chance that a family will be poor increases 45% when the head of the household is unemployed (96).

In Peru, according to the IX National Population Census and the IV Housing Census of 1993, the national level of illiteracy is 12.8%; this percentage is 6.7% in urban areas, 29.8% in rural areas, and 33.1% among the indigenous population. Among the population in the Peruvian Amazon, 7.3% has no education, compared with 32% in the indigenous communities in the same area (102). In Ecuador, about 30% of the indigenous population is uneducated, 53% has a primary school education, and 15% has a secondary education (118). In Peru and Ecuador, for example, in various indigenous rural areas and urban areas with a high percentage of migrant indigenous people, most school curricula do not consider the native languages or the social and cultural characteristics of these peoples.¹¹

Illiteracy among indigenous women is alarmingly high. In Mexico, the more indigenous population a city has, the higher its rate of illiteracy among women. In cities with fewer indigenous people, the difference in illiteracy between men and women is only 2%, whereas in cities with a high indigenous population it can go as high as 16% (96). Table 23 shows the educational level of indigenous women of childbearing age in Guatemala compared with women nationwide.

Migration, particularly seasonal migration, is increasing among the Region's indigenous peoples, with its consequent factors of high school dropout rates and the difficulty migrants face in receiving preventive and curative health care because of their transient lives. In many cases, this seasonal migration becomes permanent. In Ecuador, this phenomenon has become more prevalent for the past eight years, further taxing these groups with changes in cultural norms, poverty,

and having to resort to begging, primarily among indigenous women and children (120). In Chile, the highest concentration of indigenous people is found in the Santiago metropolitan area. According to the 1992 census, 43.4% of all the indigenous people in Chile reside in the country's capital as a result of the accelerated process of migration that occurred in the second half of this century (99). Most urban indigenous people are scattered and marginalized, and join the ranks of the urban poor. Studies on the survival strategies of the indigenous population residing in Guatemala City indicate that, as one way to survive, indigenous migrants in the cities live in groups, with an average of 7.5 people per household (121).

Other factors that contribute to worsen the lot of indigenous peoples, as compared with other population groups in the countries, include armed conflicts, illegal activities such as drug trafficking, the presence of transnational companies, colonization, and the building of development projects. In the Peruvian forest, for example, indigenous communities have been exposed to political and social violence, as well as to an intense expansion of colonization and exploitation of their natural resources. Depredation and subsequent changes to their way of life have affected their settlement patterns and cultural values, leading to a precarious existence (102). In the state of Roraima, Brazil, the presence of small-scale miners in settlement areas of the *macuxi*, *wapixana*, *ingariko*, *taurepang*, *wai-wai*, *trombeta/mapuera*, and *yanomami* indigenous peoples, especially since the 1980s, has eroded the social and environmental fabric of the area. Particularly harmful consequences include the mercury poisoning of rivers and soil and subsequent mercury poisoning, violence, and the spread of such diseases as malaria, tuberculosis, and sexually transmitted diseases (122).

Living Conditions and Health Status

Although the mortality and morbidity profile of the indigenous population varies according to socioeconomic conditions, it generally conforms to that of the most underprivileged socioeconomic groups.

In the United States, chronic diseases are among the primary causes of death for both minority and nonminority persons aged 45 years and older. Minorities (blacks, hispanics, Native Americans, Asians, and Pacific Islanders), however, are responsible for a disproportionate share of deaths, disease, disability, and adverse health conditions. Commonly used health indicators such as life expectancy at birth and infant mortality rates show that the inequality in health between minorities and the white majority is increasing, and that poverty is the major contributing factor.

In Chile, 1992 data indicate that the infant mortality rates among the indigenous population were 40 points higher than the national average and that life expectancy was 10 years lower in the case of the *aymara* people; the Swaroop rate

¹¹The implementation of intercultural bilingual education programs has sought to remedy the high rates of illiteracy in some sectors of the indigenous population in countries such as Bolivia, Colombia, Ecuador, Guatemala, Mexico, and Peru, among others. In Mexico, the incorporation of bilingual professors (indigenous language/Spanish), the development of teaching and training materials in indigenous languages, and the involvement of different social participants are included as strategies in the national program to combat poverty (119).

equaled that of Chile in the early 1980s (99). In Panama, the figures for the provinces with predominantly indigenous populations indicate greater disadvantages. In the province of Bocas del Toro, an area with settlements of the *ngobe buglé*, *bokota*, and *teribe* peoples, mortality rates due to diarrhea in the past four years are five times higher than the national rate. In 1995, the mortality rate nationwide due to diarrhea was 6.4 per 100,000 population, whereas in Bocas del Toro it was 34.4 for every 100,000 population (123).

With respect to basic sanitation services, in Mexico, on a national level 87.5% of households have electricity, 79.4% have water, and 63.6% have sewerage services; in cities with a high percentage of indigenous people, 54.3% of households have electricity, 38.1% have piped water, and 15.7% have sewerage services (124).

Morbidity

Malnutrition and its effects are shared by many indigenous communities. In Venezuela, the percentages reported in 1995 for malnutrition among children younger than 2 years were higher than the national average (13.8%) in the states of Delta Amacuro (21.3%), Apure (17.5%), Amazonas (16.9%), and Trujillo (16.4%). In Delta Amacuro, Apure, and Amazonas, the indigenous population is in the majority; basic needs are unmet in all four of these states (125). In 1993, among the *garífuna* and *misquito* peoples of Honduras, 78% and 96%, respectively, of children under the age of 12 suffered from malnutrition (100). In 1995, school-aged Mayan children in Belize showed greater delayed growth, compared with children from other ethnic groups (126). In Brazil in 1995, 34.25% of the country's indigenous population had difficulties securing food almost continuously or during specific periods of the year (127).

The incidence and prevalence of tuberculosis and other communicable diseases have slowly declined in the Region. In 1996, however, Paraguay reported that tuberculosis continued to be a health problem that particularly affected rural and indigenous populations with incidence rates 10 times higher than the national average (128).

The indigenous population residing in tropical and subtropical areas suffers the ravages of vector-borne diseases. In 1993, according to statistics from Peru's Ministry of Health, 98,557 cases of malaria were reported; 48.95% of these cases were in the departments of Madre de Dios and the subregion of Jaén-Bagua, areas inhabited by indigenous peoples (99).

Mortality

Mortality from chronic diseases, accidents, and violence is predominant among indigenous people in the United States

and Canada. In the United States, the age-adjusted mortality rate from diabetes has increased among the indigenous population, from 210 deaths per 100,000 in 1980 to 537 in 1995 (129). In addition, the mortality rate from accidents and violence among indigenous peoples between 15 and 24 years of age was two to three times higher than in other groups of the national population (130). In Canada, the age-standardized rate for deaths from accidents and violence for the indigenous population in 1990 was 81 per 100,000 inhabitants, compared with 46 per 100,000 for the general population (131).

Alcoholism is a serious health and social problem among indigenous adults and young people. In the United States, between 1991 and 1993, the mortality rate from alcohol-related causes among the indigenous population from 15 to 24 years of age was 5.2 deaths per 100,000, compared with 0.3 for the same age group nationwide (130). In 1992, this rate among the total indigenous population of the United States was 38.4 deaths per 100,000 inhabitants, or 5.6 times the national average (6.8 deaths per 100,000) (108).

In the indigenous population of the remaining countries in the Region, the primary causes of mortality are communicable, parasitic, and vector-borne diseases. In Brazil, malaria (25.4%) is the leading cause of death among the indigenous *yanomami* in the state of Roraima, followed by pneumonias (11.6%), external causes (10.0%), and tuberculosis (6.6%) (132). These diseases, most of which are preventable, are associated with malnutrition, unhealthy environments, and low coverage of basic services.

Suicide among the *guaraní-kaiowa* people of Mato Grosso do Sul and the *tikuna* of Alto Solimoes in the Brazilian Amazon has risen so as to become a public health problem. In 1994, 27 cases of suicide were reported and the age of the victims ranged from 12 to 68 (133). The determining factors for such high levels of suicide are complex and little known, and derive from social and cultural fragmentation, the disorganization of productive systems, and an intense struggle for survival (122).

The leading causes of infant mortality among indigenous children in the United States are sudden infant death syndrome and congenital defects (130), but in most Latin American countries the primary causes are infectious intestinal and respiratory diseases.

In Bolivia, according to data reported in 1993, 20% of indigenous children die before their first birthday and 14% of those who survive die before they reach school age (134). In 1990 in Mexico, 12.8% of the mortality in the indigenous population occurred among preschool children (1 to 4 years old) compared with 4.8% nationally (124). In Panama, infant mortality is 3.5 times higher among indigenous children (135); among Honduras's *tolupanes* or *xicaques*, 6 of every 10 children born live die before they reach 1.5 years of age (100).

As noted previously, there are no national data on the living and health conditions for indigenous women. Information available suggests, however, that their health profile is similar

to that of women in marginalized sectors of the population. To a great extent this is due to their twofold subordination both in their relationship with a partner and in their relationship to the dominant sectors of local and national society. In addition to the diseases described for the indigenous population in general, indigenous women also suffer from problems associated with their reproductive function, are exposed to sexual abuse and violence, and face specific occupational risks from their labor in agriculture, the urban informal or services sector, and industry (103). In the city of Chenalho, a predominantly indigenous area in the highlands of Chiapas, Mexico, maternal mortality ranks second as a cause of death, and measles and malaria are among the first 10 causes of death (136). In Guatemala, the percentage of indigenous women who are abused is 31% (95).

The maternal mortality rate among the indigenous population in Guatemala, according to data reported in 1994, is 83% higher than the national rate (137). In the city of Chenalho, Mexico, of a total of 38 deaths among women of reproductive age between 1988 and 1993, 16 were maternal deaths. These data were found to be 45% underreported, so that for every two maternal deaths reported there was a third that was not reported (136).

The high fertility rates among the indigenous population are generally associated with high infant mortality rates. In Peru, according to the 1993 census, the *campa-ashaninka* had a fertility rate of 8.1 children per woman and an infant mortality rate of 99.0 per 1,000 live births. The same situation was observed among the *machiguenga* of Cuzco and Madre de Dios, with 8.4 children per woman and an infant mortality rate of 100 per 1,000 live births (102).

Response of the Health System

Several international and national agreements are designed to solve the problems of indigenous peoples, and strategies have been defined in a search for equity and solutions to their problems. Some strategies are highly targeted, and others are more comprehensive.

In Peru, the Government has identified areas for intervention in health, education, and agriculture, as part of its strategy to combat poverty and support the indigenous communities living along border areas (138). In Panama, the health problems of the indigenous population are considered within the 21st Century *Municipios* program, and in the 1994–2000 National Development Plan, which is intended to guide public policies and society's actions to enhance women's rights and welfare, funds have been committed to support peasant and indigenous women (139).

Although human resources for health have increased in the countries of the Americas, there are inequities in how

these resources are distributed. In Peru, according to statistics from the Ministry of Health, in 1992 there were 2.77 physicians for every 10,000 inhabitants nationwide, compared with 4.75 in Lima and 0.9 in the department of Amazonas, a predominantly indigenous area (102). In the reports on the 3rd Evaluation of the Goals of Health for All by the Year 2000, Bolivia, Ecuador, Honduras, Nicaragua, Panama, Paraguay, Peru, and Venezuela suggested that the major obstacles to achieving the goals were geographic and cultural barriers. The predominantly rural location of the indigenous peoples in most countries is directly related to the limited availability and accessibility of basic resources and services. Shortfalls in the coverage of formal health services are obvious. In Bolivia, in the areas with *aymará* settlements, except for the departmental capitals (Murillo in La Paz and Cercado in Oruro), 11% to 15% of the population uses official services, and the population in the northern part of La Paz uses them least (98). In Durango, Mexico, 1995 data indicate that only 7 of the Secretariat of Health's 597 physicians provide health care for the indigenous population (79% of the state's population); this amounts to 1% of all the physicians assigned to the state (101).

As a way to help resolve the problems of health service access and coverage for indigenous peoples, various ministries of health have established units or developed guidelines and plans. Some of these ongoing initiatives involve the government sector, nongovernmental organizations, indigenous leaders, and, less frequently, traditional healers.

In the United States, the Indian Health Service, which is part of the Public Health Service, is responsible for providing health services to the country's indigenous population. The Service aims to improve indigenous peoples' health status by ensuring equity, availability, and accessibility of high-quality medical care. As of October 1995, the Indian Health Service administered 38 hospitals, 61 health centers, 4 school-health centers, and 47 health stations. In that same year, 76 of the 144 basic administrative units of the Indigenous Health Service were operated by the indigenous peoples themselves (130).

In the central Chaco in Paraguay, as part of the program to eradicate Chagas' disease, a joint project was carried out in 1995 by the Association of Indigenous Mennonites, the Hospital of Yalve Sanga, and the Institute for Health Sciences Research. The project brought together 5,300 indigenous peoples from 11 indigenous groups from this area. With the participation of indigenous leaders, volunteers were trained to spray insecticides and take blood samples for serological diagnosis. From July to September 1995, 100% of households were sprayed and blood samples were taken. This activity will make it possible to lower the risk of contracting Chagas' disease among the indigenous communities of the central Chaco (128).

In Ecuador, the Federation of Indigenous People and Peasants of Imbabura (FICI) coordinates and administers the actions of the *Jambi Huasi* (Quechua words meaning “house of health”). This center provides medical care in Quechua and Spanish, combines western medicine and indigenous medicine in health care, and has indigenous professionals and traditional healers. Since 1994, it has received financial and technical support from the United Nations Population Fund and has coordinated specific activities with the Ministry of Health. In addition to medical care, it organizes health training and promotion activities in coordination with assemblies, *hualhua huasis* (day care centers), nursery schools, and indigenous community schools. Its work emphasizes care for and strengthening of indigenous women (140).

A Complementary Response to Health Problems: Traditional Health Systems

Strictly medical actions to provide health services are not only insufficient, they also have been inadequate for confronting the highly complex and difficult to resolve epidemiological profile in the Americas (103). The search for complementary services and the development and strengthening of strategies designed to establish national health systems that respond to the characteristics of the beneficiary population is a valid way to improve the health of both indigenous and nonindigenous populations (141–143).

In 1985, when faced with a serious scarcity of medications during the war, Nicaragua turned to its herbal traditions. In that year, a department was established in the Ministry of Health to “develop popular and traditional medicine as a way to arrive at a self-sufficient response to the difficult economic, military and political situation” (144). As a result, an array of medicines to treat a wide range of diseases—including respiratory, skin, and nervous system diseases, as well as diarrhea, diabetes, and other diseases—was produced at accessible prices (145). In Panama, the University of Panama participates in the study of medicinal plants (139).

Several countries with considerable indigenous populations (Bolivia, Ecuador, Guatemala, Peru) include traditional medicine in their reports when they describe the institutional organization and coverage of their health systems (139). Bolivia reports that the preference for indigenous medicine is high, particularly in the provinces of the north of Potosí, Charcas (85%), A. Ibáñez (70%), Bilbao (69%), and Chayanta (52%).

In fact, since ancestral times the Region's indigenous peoples have developed highly complex and well-structured practices and knowledge (112). Their age-old relationship with nature has given indigenous peoples a thorough understanding of the classification, composition, uses, and protection of plants in their habitats. Plants are an integral part of the cul-

ture and daily life;¹² their categories and uses are interwoven with magical and religious elements of the indigenous world view (107). This set of practices and knowledge, generally grouped under the term “traditional medicine/indigenous medicine,” are called traditional health systems/indigenous health systems (112). Thus, the traditional health system is a type of local health system whose “conceptual core” or world view is based on balance, harmony, and inclusiveness (107).

Although traditional healers are the experts in this medical knowledge,¹³ the community has an understanding of the standards and general concepts of indigenous medical systems. Its practices and therapies can be administered at any time within the family environment.¹⁴ In this context, the nuclear family, the extended family, and the circle of neighbors and close friends become the main settings for providing health care. In this settings, women play a predominant role in providing health care to the community, and in preserving the culture and, within it, traditional medical knowledge.¹⁵ The recovery of indigenous knowledge and the research into and better understanding of the context and practices of traditional health systems/indigenous health systems will benefit the users of different health systems.

Health Initiative of the Indigenous Peoples of the Americas

The ongoing struggles of the indigenous peoples for their rights, the formulation and later ratification by various countries of the ILO's Convention 169,¹⁶ the 500 years move-

¹²When discussing traditional health systems, it must be recognized that the subject of medicinal plants merits a special place within traditional health systems and thus within the culture of the indigenous populations.

¹³As in the western medical system, in traditional health systems, each illness has an etiology, a clinical history, a set of symptoms, an instrumental physical examination of the patient—diagnosis and differential diagnosis—and a prognosis and treatment (107, 146–149), as well as preventive and health promotion practices. The presence of harmful practices, for example, the use of contaminated substances or “instruments” in open wounds, poor medical practice, the collateral effects of the medications, iatrogeny, are aspects that must be considered in both traditional and western medical systems.

¹⁴Anastasio Ferreira states: “We have power within the home through the power of Nanderuvusu—the power of the remedy from the mountain—and from the *oporaíva* who receive in dreams the remedies to produce a cure” (150).

¹⁵According to a survey of the community of Saraguro, Ecuador, for the illnesses occurring in 140 families in the course of a year, women were consulted 86% of the time and were the sole practitioner in 76% of the cases. This included mothers and grandmothers in particular (151, 152).

¹⁶On June 7, 1989, Convention 169 on the Indigenous and Tribal Peoples in Independent Countries of the International Labor Organization (ILO) was approved. This is the first document that takes up the notion of a people considered collectively, whose principal collective right is territory. It is understood as all the natural, geographic, cultural, mythical, and religious resources that make up its world view and ensure its survival (60).

ments,¹⁷ the UN's proclamation of the "International Year of the Indigenous Peoples," which would later become the "Decade of the Indigenous Peoples of the World,"¹⁸ and the Nobel Peace Prize awarded to Rigoberta Menchú¹⁹ came together to underscore the need to promote a joint and coordinated working process in favor of the Region's indigenous peoples. In response, and as a result of the joint efforts of the Region's governments, nongovernmental organizations, indigenous organizations, and the indigenous peoples of the Americas themselves, the Health Initiative of the Indigenous Peoples of the Americas began in September 1993 (103). PAHO's Member Governments, through Resolution CD37.R5, ratified five principles for working with indigenous communities. These principles guide the work, provide monitoring criteria, and establish the bases for evaluation at the end of the decade, in 2004. These principles are the need for a comprehensive approach in health, the right of indigenous peoples to self-determination, the right to participation in the system, respect for indigenous cultures and their revitalization, and reciprocity in relationships.

As a result of the work done in the early years of the Initiative, the PAHO/WHO 1995–1998 Action Plan to promote the Health Initiative of the Indigenous Peoples of the Americas was prepared. To date, the work has focused on strengthening capabilities and developing alliances; collaborating with PAHO Member Governments to set in motion national and local activities and projects; formulating projects in priority program areas; and producing and disseminating scientific, technical, and public information. Increased participation from the indigenous peoples and their organizations is an important challenge for the future.

Based on the experience gained in the period 1993–1996, four areas of work have been proposed for 1997–1998: strategic planning and management; priority programs; organization and provision of health services in multicultural com-

munities; and production and dissemination of scientific, technical, and public information.

Implementation of the Health Initiative of the Indigenous Peoples encourages the countries to uncover and monitor inequities based on belonging to an ethnic group, as well as to implement programs and initiate processes leading to improvements in the health situation and the access to health services of these peoples.

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¹⁷1992 marked 500 years since Christopher Columbus's arrival in the Americas. For this reason, the indigenous peoples, their organizations, and organizations and institutions allied with their struggle sponsored various events, in particular the I Continental Encounter: Five Hundred Years of Indigenous Resistance," held in 1990 in Quito, Ecuador, and the Continental Campaign for 500 years of Indigenous, Black and Popular Resistance held in Estelí, Nicaragua, in October 1992.

¹⁸In 1993, thanks to the efforts of the indigenous peoples themselves who promoted human rights, the conservation of the environment, development, education, and health, the United Nations General Assembly declared the year 1993 the "International Year of the Indigenous Peoples of the World." In 1994, in Vienna, during the United Nations Conference on Human Rights, it was recommended that the International Year become the "International Decade of the Indigenous Populations of the World" (1994–2004) and it was proposed that a permanent forum be established on the subject.

¹⁹In 1992 the Nobel Peace Prize was awarded to Rigoberta Menchú, an indigenous woman of the Quiché people—one of the 22 indigenous peoples of Guatemala—in recognition of her fight for the human rights of her people.

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III. DISEASES OR HEALTH IMPAIRMENTS

VECTOR-BORNE DISEASES

Malaria

Between 1993 and 1996, 39.2% to 37.9% of the population of the Region of the Americas lived in areas with ecological conditions favorable for the transmission of malaria.

Since malaria parasite species and transmission intensity varies throughout the Region, no single control measure can be effective in every area of every country. Therefore, in 1992 the countries of the Region adopted the Global Malaria Control Strategy as a substitute for large-scale programs of house-spraying with insecticides. The strategy aims at preventing mortality, decreasing morbidity, and reducing social and economic losses from malaria by progressively improving local and national health sector capabilities. Its four basic principles are the early diagnosis and prompt treatment of cases; planning and implementation of selective and sustainable preventive measures, including vector control; early detection, containment, or prevention of epidemics; and the strengthening of local capabilities in basic and applied epidemiological research assessment.

There still is active malaria transmission in 21 of the Region's countries and territories. Of these, only Ecuador and Mexico follow control programs outside the principles of the Global Malaria Control Strategy; Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, the Dominican Republic, El Salvador, French Guiana, Guatemala, Guyana, Haiti, Honduras, Nicaragua, Panama, Paraguay, Peru, Suriname, and Venezuela have brought their programs in line with the strategy.

Case detection rates for the Region in the 1992–1996 period improved, going from a low of 132.99/100,000 slides examined in 1993 to 168.2/100,000 in 1995. The case detection rate among the population living in areas propitious for transmission also increased, rising from 339.64/100,000 in 1993 to a high of 523.3/100,000 in 1995.

In order to more accurately understand the disease's distribution, the countries of the Americas have categorized their original malarious areas into low-, moderate-, and high-risk areas, according to level of exposure to malaria transmission.¹

Risk of exposure varies depending on such factors as population movement, social and demographic stability, and the adoption of individual and collective attitudes and behaviors that prevent malaria and protect against contact with vectors. These factors are further influenced by immediate access to appropriate diagnosis and treatment.

In 1996, of the total population of 452 million who lived in the 21 countries with active malaria transmission, 218 million (48.2%) lived in areas with some risk of transmission. However, 130 million of them lived in areas of low or very low risk of malaria transmission; in these areas, only 50,412 malaria cases were detected, for a case detection rate of 38.6/100,000 or an annual parasite index of 0.4 cases/1,000 exposed persons per year. The remaining 88 million people (19% of the total population of these 21 countries) lived in areas exposed to moderate and high risk of transmission. This population still suffers a relatively high malaria morbidity, with annual parasite indices ranging from a low of 0.96/1,000 in El Salvador to a high of 265/1,000 in Suriname. Overall API is 12.4 per 1,000 inhabitants in those areas (Table 1).

An analysis by subregion indicates that Brazil reported the greatest absolute number of malaria cases (39.1%), together

¹ Risk criteria:

Nicaragua-Low risk, annual parasite index $>1<10.0$; moderate risk, $>10<17$; high risk >17 .

Venezuela-Low risk annual parasite index $>1<5$; moderate risk annual parasite index $>5<10$; high risk annual parasite index >10 .

Brazil-Low risk annual parasite index $>1<10.0$; moderate risk annual parasite index $>10.0<50.0$; high risk annual parasite index $>50.0<1,000$.

Mexico-Low risk, traditional "consolidation phase;" moderate risk, traditional "maintenance phase;" high risk, traditional "attack phase."

All other countries-Low risk annual parasite index $\leq 1/1,000$; moderate risk annual parasite index $>1/1,000 \leq 10/1,000$; high risk annual parasite index $>10/1,000$.

TABLE 1
Epidemiological status of 21 countries with active malaria programs, 1996.

Countries by geographic subregion	Population in malarious areas ^a (in thousands)	Persons at risk		Parasite species					
		Examined	Positive	Annual parasite index	<i>P. falciparum</i> and mixed infection	Annual <i>P. falciparum</i> infection index	<i>P. vivax</i> infection	Annual <i>P. vivax</i> infection index	<i>P. malariae</i>
Mexico	34,599	1,731,396	6,189	0.18	85	0.00	6,104	0.18	0
Belize	150	32,285	6,323	42.15	424	2.83	5,899	39.33	0
Costa Rica	805	143,359	5,112	6.35	59	0.07	5,053	6.28	0
El Salvador	5,746	133,288	5,524	0.96	0	0.00	5,524	0.96	0
Guatemala	7,302	96,253	20,229	2.77	111	0.02	20,118	2.76	0
Honduras	3,960	232,436	73,020	18.44	870	0.22	72,150	18.22	0
Nicaragua	4,115	407,519	72,108	17.52	2,647	0.64	69,461	16.88	0
Panama	211	154,169	386	1.83	23	0.11	363	1.72	0
Haiti ^b	7,329	69,853	18,877	2.58	18,877	2.58	0	0.00	0
Dominican Republic	20	113,154	825	41.25	825	41.25	0	0.00	0
French Guiana	14	34,007	4,326	309.00	3,694	263.86	577	41.21	55
Guyana	...	...	...	...	...	...	...	...	...
Suriname	55	68,674	14,604	265.53	13,604	247.35	986	17.93	14
Brazil	6,988	1,706,214	426,510	61.03	127,539	18.25	297,372	42.55	1,599
Bolivia	3,326	158,320	63,093	18.97	4,252	1.28	58,841	17.69	0
Colombia	5,464	405,662	134,561	24.63	36,558	6.69	97,968	17.93	35
Ecuador	1,460	46,175	7,176	4.92	1,062	0.73	6,114	4.19	0
Peru	4,798	1,121,424	208,543	43.46	49,962	10.41	158,458	33.03	123
Venezuela	687	198,801	17,505	25.48	3,343	4.87	14,116	20.55	46
Argentina	262	7,707	1,533	5.85	0	0.00	1,533	5.85	0
Paraguay	...	...	...	...	...	...	...	...	...
Total	87,291	6,860,696	1,086,444	12.45	263,935	3.02	820,637	9.40	1,872

^a Moderate and high-risk areas only.

^b Haiti's entire population recorded as malarious area.

with all the Andean Subregion, with 39.5%. However, the greatest risk of transmission was seen in the subregion that includes Guyana, French Guiana, and Suriname (API = 322/1,000), followed by portions of Brazil's rainforest (API = 61.6/1,000), part of Peru (API = 43.5/1,000), and Belize (API = 42.1/1,000).

The epidemiological distribution of malaria in the Americas has changed: prevalence of *Plasmodium falciparum* malaria has decreased in Brazil, but has increased in the Andean subregion's rainforest. The intensive occupation of new vital spaces by a relatively large number of susceptible individuals who originally came from nonmalarious areas, is creating a propitious condition for the establishment of malaria epidemics in this subregion. Local health services, with significant support from volunteer health collaborators from the community, detected this prevalence increase, which could mean that the countries in the subregion have brought their control programs in line with the Global Malaria Control Strategy.

In recent years, the epidemiological stratification of malaria in the Americas has been coupled with efforts to integrate case finding, diagnosis, and immediate treatment into the local health services. The results of parasitoscopic examinations of 8.6 million suspected cases in 1996 show that local health services have a high diagnostic efficiency, confirming 16.4% of suspected cases, up from 10.5% in 1993. Active surveillance, on the other hand, continues to show a low diagnostic efficiency and high operational cost in most countries, confirming only 2.1% of "recent fever" cases.

The availability of treatment per diagnosed case ranged from 0.5 to 321 first-line treatments in 1996. Improvements in the availability of second- and third-line therapy in Bolivia, Colombia, Peru, and Venezuela, in 1996, compared with that of 1993 also may be the result of further consolidation of the Global Malaria Control Strategy, which stresses the optimal clinical management of the disease. On the other hand,

Guyana, Suriname, and Brazil are still reporting less than one treatment for each diagnosed case of *P. falciparum* (the reporting does not take into account the unlicensed commercial distribution of antimalarial drugs).

Resistance to *P. falciparum* malaria varies widely throughout the Region. Although this variability is related to the parasite reservoir (population) movement, some population groups are more affected by parasite resistant strains. At greatest risk are two population categories, both of which have difficult access to prompt diagnosis and immediate treatment: indigenous peoples, hunters, and gatherers and those who work in subsistence agriculture, gold and gems mining, and timbering. (See Table 2).

Of the population exposed to highest risk of transmission in the Americas (46.3 million, or 5.9% of the total population) the group highly exposed to *P. falciparum* increased from 9.8 to 12.1 million between 1994 through 1996. This increase resulted in an

extremely high incidence rate, greater than 1,900 cases per 100,000 exposed population. Table 3 presents the geopolitical location and the demographics of high risk areas, the causes of exposure, and the control measures implemented.

Major Challenges and Constraints

There are three major issues regarding malaria control in the Americas. First, the public health perception that malaria control is achieved through insecticide spraying and that this can only be done by a major operational institution must change. Bolivia, Brazil, Colombia, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and Peru have experienced significant advances in implementing new approaches and in expanding coverage and Venezuela has made major strides in reorienting its national control program. Second, drastic

TABLE 2
***Plasmodium falciparum* in the Americas, 1994–1996.**

Country	Year	Total population at high risk (%)	<i>P. falciparum</i> cases	Deaths from malaria	Resistance to chloroquine since:	Resistance to sulfa and pyrimethamine since:	<i>P. falciparum</i> drug policy (in order of therapeutic lines)
Bolivia	1994	0.5	4,700	...			1) chloroquine + primaquine
	1996	29.7	4,200	14	1982	1986	2) quinine + tetracycline
Brazil	1994	2.3	172,000	413	1961	1984	1) quinine + tetracycline
	1996	1.9	127,000	225			2) mefloquine 3) artemisine
Colombia	1994	8.4	31,000	81	1961	1982	1) amodiaquine + pyrimethamine
	1996	9.5	36,000	...			2) sulfa + pyrimethamine 3) quinine
Ecuador	1994	7.6	10,000	...	...	...	1) chloroquine + primaquine
	1996	6.1	1,000	...	...	...	2) sulfa + pyrimethamine
French Guiana	1995	6.2	41,000	0	1986	1992	1) quinine + tetracycline 2) mefloquine/halofantrine
Guyana	1994	6.5	22,000	150	1962	...	1) chloroquine + primaquine
	1996	...	...	...	...	...	2) sulfa + pyrimethamine 3) quinine + tetra
Peru	1994	9.1	21,000	39	1993	focalized (1994)	1) chloroquine + primaquine
	1996	9.9	49,900	46			2) sulfa + pyrimethamine
Suriname	1994	7.6	4,300	20	1972	...	1) chloroquine + primaquine
	1996	9.3	13,600	14		...	2) sulfa + pyrimethamine 3) quinine
Venezuela	1994	0.7	3,000	...	1982	focalized (1968)	1) chloroquine + primaquine
	1996	0.8	3,300	...			2) sulfa + pyrimethamine 3) quinine + tetracycline
Total 1994		1.3	268,000				
Total 1996		1.5	235,000				

budgetary reductions undertaken as part of the decentralization of the health services is a serious constraint for the implementation of the Global Malaria Control Strategy. National budget funds and other monies allocated to malaria control programs have steadily dropped over the last four years, going from US\$ 185.4 million in 1993 to US\$ 85.7 million in 1996. Moreover, the per capita expenditures for control in malarious areas decreased to US\$ 0.65 per person in malarious areas of the 14 countries that reported. These budget cuts leave the local health service system incapable of handling the decentralized malaria control program, leading to an almost unmanageable situation at the local level. Finally, there is a need for an effective vector control/vector interception tool to follow the successful prevention of mortality and reduction of morbidity programs.

Clearly, although reductions in morbidity and mortality are desirable and welcome program results, the reduction of incidence also is an attainable objective in the Region. To this end, several alternatives for "selective vector control" methods and tools are being used in the Region, such as source reduction of breeding sites; personal, family, and community protection measures; intramural residual insecticides; insecticide spraying; biological control of breeding sites; and the utilization of insecticide impregnated bed nets. However, all of these options are still experimental. Source reduction is still expensive for municipal budgets; personal, family, and community protective measures are dependent on successful education methodologies outside the control of the health sector; intramural residual spraying is increasingly opposed by environmentalists; insecticide space spraying/fogging is expensive and its effects short-lived; biological control of breeding sites requires constant seeding to sustain effectiveness; and impregnated bed nets can be unpopular, and may cause allergic reactions. Consequently, knowledge for the sustainable application of these technologies is still needed.

American Trypanosomiasis

Infection with *Trypanosoma cruzi*, the causal agent of American trypanosomiasis (Chagas' disease), affects poor rural and periurban residents whose socioeconomic situation forces them to live in inadequate housing. Data from the 1980s indicated that about 15,849,000 people in Latin America were infected with *T. cruzi* and that some 88,987,000 inhabitants were at risk of contracting the disease. These numbers did not include the estimated infected populations in Belize, French Guiana, Guyana, Mexico, and Suriname. In 1990 WHO estimated that the total infected population numbered 16 to 18 million and the at-risk population, 100 million. Since 1990, the countries' reported case estimates have declined (2,333,000 in Argentina; 1,960,000 in Brazil; 142,000 in Chile; and 800,000 in Venezuela).

Persons who acquire *T. cruzi* from a vector usually become infected before age 20. Depending on the geographic area, between 15% and 30% of infected individuals suffer from the heart lesion or enlarged visceral organs that characterize the chronic form of the disease. Although the prevalence of infection is similar in men and women, chronic chagasic myocardiopathy is more common in males. The annual number of deaths from Chagas' disease in the Region was estimated at 23,000 by the World Bank in 1990 and at 43,000 by WHO in 1995.

There are three main routes of infection: transmission by vector, by blood transfusion, or from mother to child. The most common is vectorial transmission, which is responsible for the majority of human infections. The vectors of the disease are hematophagous insects (the triatomines). Of the dozens of triatomine species, only a few are important in the epidemiology of the human. The vector is *Triatoma infestans* in the countries of the Southern Cone and the south of Peru; *Rhodnius prolixus* in Colombia, El Salvador, Guatemala, Honduras, Nicaragua, and Venezuela; *Triatoma dimidiata* in Costa Rica, Ecuador, El Salvador, and Nicaragua; and *Rhodnius pallescens* in Panama. Three vectors exist in Mexico: *Triatoma dimidiata*, *Rhodnius prolixus*, and *Triatoma barberi*.

Southern Cone Initiative for the Elimination of *T. infestans*

Although activities to control the vector of Chagas' disease have been under way in Argentina and Brazil since the 1950s and in the other Southern Cone countries (Bolivia, Chile, Paraguay, and Uruguay) since 1980, for the most part these efforts were narrowly focused and not sustained over time. In July 1991, the Ministers of Health of Argentina, Bolivia, Chile, Paraguay, and Uruguay, meeting in Brasilia within the framework of the Southern Cone Initiative, created an intergovernmental commission charged with preparing a subregional program and plan of action to eliminate *T. infestans* from dwellings and to interrupt the transfusional transmission of *T. cruzi*.

The objectives of the subregional program and plan of action were to eliminate the vector *T. infestans* from houses and their environs in known or probable endemic areas, to reduce and eliminate household infestations of other triatomine species that occur in the same areas as *T. infestans*, and to interrupt transfusional transmission of *T. cruzi* by strengthening the blood bank network and improving the process of blood donor selection. In 1997, an intermediate objective was added, namely, to interrupt vectorial transmission before *T. infestans* was eliminated. Technologies to make possible the control of both vectorial and transfusional transmission have been available for many years.

In 1996 the percentage of dwellings that had been sprayed with insecticide stood at 27.4% in Paraguay, 45.4% in Bolivia,

TABLE 3
Malarious areas at high risk of transmission, and control priorities, 1996.

Countries	Population	Km ²	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
Mexico						
Campeche	129,121	15,550	89	House spraying, larvacide, and aerial spraying;	<i>A. albimanus</i>	Significant migration of agricultural workers from the south.
Chiapas	1,092,683	24,000	1,539	individual and mass radical treatments;	<i>A. vestitipennis</i>	Poor housing conditions.
Guerrero	426,911	9,407	74	entomological studies; and	<i>A. pseudopunctipennis</i>	Vector resistance in small dispersed areas.
Michoacán	558,801	8,596	341	promotion of environmental management.		Population engages in outdoor activities in the evening hours.
Oaxaca	933,348	17,584	1,051			
Quintana Roo	141,156	7,552	141			
Sinaloa	482,643	11,618	1,516			
Tabasco	259,546	4,932	199			
Subtotal	4,024,209	99,239	4,950	API ^a = 1.23/1,000		
Belize^b						
Corozal	30,809	1,390	345	Spraying and drug therapy.	<i>A. albimanus</i>	Limited residual spraying
Orange Walk	33,207	1,256	211	Case treatment		No compliance to treatment
Belize	61,733	701	282			Unsupervised spraying
Cayo	40,800	3,585	2,246			
Stann Creek	19,575	1,289	1,495			
Toledo	18,877	2,190	2,006			
Subtotal	205,001	10,411	6,585	API = 32.12/1,000		
Costa Rica						
Cantón Los Chiles	21,293	1,358	567	Radical treatment, focal spraying and aerial spraying.	<i>A. albimanus</i>	Border areas with heavy illegal population movements.
Cantón Limón	78,032	1,766	1,065	Social education and programs.		Poorly timed control measures with little interagency coordination.
Cantón Talamanca	27,858	2,810	638	Epidemiologic stratification of areas		Poor community participation.
Cantón Matina	24,210	773	655			Environmental degradation.
Subtotal	151,393	6,707	2,925	API = 19.32/1,000		
El Salvador						
Pacific Coast	5,428,293	4,754	5,121	Spraying, drug therapy, larvicides, structural works, mosquito bednets.	<i>A. albimanus</i>	Poor housing conditions. Unhealthy environment.
Hyperendemic area				API = 0.9/1,000		Migratory movement. Lack of education. Poverty. Ideal vector habitat. Types of crops.

Guatemala					<i>A. albimanus</i>	Uncontrolled internal migration. Poor housing conditions. Difficult access to services. Insecticide resistance.
El Petén		35,854		Uncoordinated house spraying; low		
Poptún	20,704		1,411	diagnostic and treatment coverage		
Dolores	26,741		921			
San Benito	15,639		722			
San Marcos		3,791				
Ocos	30,654		515			
Malacatón	39,960		457			
Tecún Umnán	17,115		364			
Alta Verapaz		8,656				
Chisec	41,752		840			
Cobán	42,719		767			
Fray Bartolomé	35,814		649			
Subtotal	271,098	48,301	6,646	API = 24.51/1,000		
Honduras					<i>A. albimanus</i>	Presence of rice crops. Increase in the at-risk population due to creation of industrial parks and rice farming. Migrant populations. Lakes and large ponds used as watering holes for cattle. Note: <i>A. darlingi</i> is present only in Region VI
Health Region II	565,209	10,049	10,416	Integrated measures implemented; drug treatment;		
Health Region III	1,504,379	14,328	7,345	different spraying methods for physical and		
Health Region IV	...	...	17,215	larval control; and community participation.
Health Region VI	604,354	15,512	16,178			
Health Region VII	356,810	23,821	13,169		<i>A. darlingi</i>	
Subtotal	3,030,752	...	64,323	API = 21.22/1,000		
Nicaragua					<i>A. albimanus</i>	Decentralization process under way. Poor SILAIS coverage. Highly mobile population.
Rio San Juan	70,875	7,473	1,978	...		
Chinandega	348,971	4,926	8,802		<i>A. pseudopunctipennis</i>	High unemployment. Urban epidemic. Internal migration. Inaccessibility.
León	330,168	5,107	14,382			
Jinotega	214,070	9,755	6,462			
Matagalpa	364,790	8,523	7,027			
Nueva Segovia	151,324	3,123	4,420			
RAAN	175,405	32,159	2,578			
Managua	1,056,702	3,672	19,702			
Subtotal	2,712,305	74,738	65,351	API = 24.1/1,000		

TABLE 3 (continued)

Countries	Population	Km ²	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
Panama ^a						
Pinogama	15,838	4,790	36		<i>A. albimanus</i>	Nomadic migration of indigenous groups to the south.
Las Palmas	23,552	2,560	55			
Bocas del Toro	23,280	2,123	61			
Changuinola	70,110	2,281	68			
Chepigana	31,172	7,700	21			
San Blas	38,268	2,823	96			
Tole	30,552	3,203	70			
Subtotal	232,772	25,480	407	API = 1.75/1,000		
Haiti ^b
Dominican Republic						
Pepillo Salcedo	8,735	16,295	103	Prophylactic treatment of immigrants, medicinal barriers, spraying in house and surrounding areas, cleanup of canals, fish farming, <i>Bacillus thuringiensis</i> var <i>israelensis</i> treatment of breeding sites.	<i>A. albimanus</i>	Cross-border migration. Trade. Rice farming. Extensive use of immigrant labor in country-side and construction.
Castañuelas	12,159	7,858	146			
Subtotal	20,894	24,153	249	API = 11.9/1,000		
French Guiana						
Camopi/T-Sauts	746	1,003	91		<i>A. darlingi</i>	Precarious housing. Border areas with intense migratory movement.
Bas Oyapock	1,605	340	161	API = 464.6/1,000		
Moroni	6,793	2,512	3,996	AFI ^c = 452.1/1,000		
Subtotal	9,144	3,855	4,248			
Guyana	145	...	4,724	API = 449.3/1,000 AFI = 224.6/1,000	<i>A. darlingi</i>	Natural resources exploitation in the rain forest.
Suriname						
Para	6,250	1,150	1,342	House spraying with pyrethroids	<i>A. darlingi</i>	Poor coverage of primary health care services. Gold mining exploitation. High circulation of people to/from coastal districts.
Brokopondo	4,176	3,000	2,463	Primary health care treatment of clinical cases.		
Sipaliwini	44,336	132,525	15,075			
Subtotal	54,762	136,675	18,880	API = 344.8/1,000 AFI = 247.3/1,000		

Brazil

States (No. municipalities at risk/total municipalities)

Acre (7/27)	59,768	...	7,383	Low coverage of integrated control	<i>A. darlingi</i>	All of the epidemiological risk factors that determine malaria transmission in ecological areas of rain forests with remote farms, mining areas, and internal migration.	
Amazonas (2/62)	447,582	...	45,855	due to difficult access and low			
Amapá (10/16)	127,951	...	13,418	stability in decentralization process.			
Marañhao (2/136)	41,160	...	2,735	Lack of coordination between			
Mato Grosso				administrative and financial policies.			
(18/117)	358,314	...	34,017				
Pará (37/128)	1,146,618	...	123,065				
Rondonia (23/42)	640,365	...	93,302				
Roraima (7/8)	259,283	...	34,994	API = 82.68/1,000			
Subtotal	3,081,041		354,769	AFI = 35.30/1,000			
Bolivia							
Beni							
Riberalta	53,700	34,000	10,767	Supervised case finding and treatment chemical	<i>A. darlingi</i>	Lack of clear and straightforward policy decision. Permanent migration to areas bordering Brazil and, in the south, Argentina. Internal resistance to change to the new strategies. Insufficient financial support. Note: Population at risk of <i>P. falciparum</i> , 88,200 persons only in Beni.	
Guayaramerín	34,500	22,434	10,007	control, physical control of breeding sites through	<i>A. pseudopunctipennis</i>		
Tarija				petroleum applications. Health education on			
Yacuiba y Bermejo	51,947	12,073	22,331	prevention and control.			
Santa Cruz							
Plan 3000 and							
Prov. Andrés Ibáñez	450,000	83,322	8,255	API = 87.03/1,000			
				AFI = 47.21/1,000 only for the population of			
Subtotal	590,147	151,829	51,360	Riberalta, Guayaramerín			
Colombia ^b							
Bajo Cauca-Uraba	1,027,202	55,000	63,864	House spraying, physical control.	<i>A. albimanus</i>	Sociopolitical factors. Mining. Antimalarial drugs and supplies. Migrant settlements. Illegal crops. Vector behavior unknown. Drug resistance.	
Orinoquia	605,818	90,063	47,076	Impregnated bed nets, topical repellents.	<i>A. nuneztovari</i>		
Pacifico	1,114,582	80,000	6,881		<i>A. darlingi</i>		
Amazonia	466,342	110,000	17,317	API = 42.05/1,000	<i>A. punctimacula</i>		
Subtotal	3,213,944	335,063	135,138	AFI = 14.69/1,000			

TABLE 3 (continued)

Countries	Population	Km ²	Reported cases	Control measures applied in different areas	Main vectors	Causes of persistence of transmission
Ecuador ^b						
Esmeralda	394,485	14,597	5,555	House spraying.	<i>A. albimanus</i>	Low operational coverage of national program.
El Oro	425,503	302	1,364			Lack of political commitment to resolving labor problems in the old centralized structure.
Los Rios	564,372	1,992	1,748			
Manabi	1,093,830	4,015	3,534			
Canar	37,047	349	...			
Cotopaxi	37,924	233	...			
Loja	195,281	610	...			
Sucumbios	81,275	2,049	1,579			
Pastaza	14,208	24,160	822	API = 3.2/1,000		
Guayas	2,702,074	...	3,599	AFI = 0.3/1,000		
Napo	112,860	542	...			
Subtotal	5,658,859	48,849	18,201			
Peru				Diagnosis and treatment through general health services. Very limited	<i>A. pseudopunctipennis</i>	Delay in implementing the Global Malaria Control Strategy.
Ayacucho	570,000	43,814	9,017	residual spraying, aerial spraying,	<i>A. benarrochi</i>	Implementation began in 1994.
L. Castillo	642,817	15,238	9,034	environmental sanitation.	<i>A. rangeli</i>	Lack of coverage of population at risk.
Loreto	796,694	368,851	94,856		<i>A. darlingi</i>	Migration.
Jaén-Bagua	553,713	44,409	22,048			Rice cultivation.
Junín	1,133,345	44,409	26,840			
San Martín	647,175	51,253	13,074			
Ucayali	366,877	102,410	5,885	API = 37.19/1,000		
Madre de Dios	53,810	85,182	1,243	AFI = 18.42/1,000 only for the population of		
Pasco	243,863	25,319	4,264	Piura, L. Castillo, Jaén, San Martín, and Loreto		
Subtotal	5,008,294	780,885	186,261			

Venezuela						
Amazonas	55,717	179,441	1,365	Spraying and fogging, use of larvicides. API = 4.9/1,000 AFI = 1.7/1,000	<i>A. darlingi</i>	Uncontrolled mining areas in the jungle.
Bolivar	900,310	238,000	2,977		<i>A. aquasalis</i>	Border migration.
Sucres	679,595	11,800	3,797		<i>A. nuneztovari</i>	Transient workers
Subtotal	1,635,622	429,241	8,139			
Argentina				Epidemiological surveillance and spraying.	<i>A. pseudopunctipennis</i>	Heavy internal and international migration.
Attack phase	24,741	11,275	1,550			Limited access due to climatic factors. Economic and financial constraints on activities.
Paraguay						
Caaguazú	435,461	11,474	214	Case detection and treatment, house spraying.	<i>A. darlingi</i>	Increase in the number of breeding sites. Migratory movements. Indigenous groups. Temporary workers.
Alto Paraná	562,216	14,895	263			
Aambay	...	...	...
Canindeyú	128,935	14,667	119			
Subtotal	1,126,612	41,036	596			

^a API = Annual parasitic index.

^b Differences with preceding tables are based on variations according to criteria outlined in Table 1.

^c AFI = Annual index of *P. falciparum* infection.

and 92% to 100% in Chile and Uruguay, while surveillance for the vector was carried out in 62% (Bolivia) to 100% (Chile, Uruguay) of houses. The control activities were evaluated periodically by experts from the countries participating in the Initiative. As of 1997, program evaluations had been carried out in Argentina (1996), Brazil (1995, 1996), Chile (1995, 1996, 1997), Paraguay (1996, 1997), and Uruguay (1994, 1995, 1997).

The activities undertaken as part of the Southern Cone Initiative strengthened the vector control work that had begun some 10 to 30 years earlier in different countries. In Brazil, the number of infested municipalities fell from 711 in 1975 to 83 in 1996. In addition, entomological surveillance led to a modest but constant decrease in *T. infestans* populations in the municipalities that remained infested: in 1992, 5,580 specimens of *T. infestans* were collected from 98 infested municipalities, while in 1996 only 1,304 were collected from 83 infested municipalities. By 1995, the vector was not found in 6 of the 10 departments in Uruguay where infestations had occurred between 1972 and 1990.

Studies have shown that insecticide spraying has an immediate impact on vector populations and keeps them under control. The success of vector control activities is reflected in the reduced serologic prevalence of *T. cruzi* infection in various population groups. In Argentina, serologic studies in male military recruits 18 to 20 years of age showed that the prevalence of *T. cruzi* infection decreased from 5.8% in 1981 (subjects born in 1963) to less than 2% in 1993 (subjects born in 1975). In Chile, serologic surveys carried out in 1995–1996 in children under 10 years old showed reduced prevalence of *T. cruzi* infection compared with the results of studies in the same age group in 1982. The findings were similar in Uruguay upon comparison of infection prevalence rates in 1985 and 1994 among children aged 6 to 12 years in three departments.

The impact of the Southern Cone Initiative has been enhanced by the countries' investment of resources: US\$ 3,766,000 in 1991, US\$ 9,402,000 in 1992, and US\$ 36,658,000 in 1993. The collective investment of the Southern Cone countries in vector control exceeded US\$ 232 million between 1991 and 1997.

Although transmission of *T. cruzi* by the vector *T. infestans* is declining in most of the Southern Cone countries, only Chile and Uruguay will be able to interrupt transmission completely by the year 2000.

To combat transfusional transmission, the six Southern Cone countries have enacted laws and decrees that regulate the collection and provision of blood and mandate the testing of donors for *T. cruzi*. The final country to pass such a law was Bolivia, in 1996. The percentage of the blood supply protected by serologic testing has been increasing gradually since 1993; however, up to 1996 Uruguay and Venezuela were the only countries screening 100% of donated blood for *T. cruzi*.

With respect to congenital transmission, tests show that between 3% and 7% of the children of mothers with *T. cruzi* are born infected. However, only Argentina, Paraguay, and Uruguay have programs to diagnose and treat children infected this way.

Other countries of Latin America also are taking action to control Chagas' disease. In 1997 Peru undertook activities to eliminate *T. infestans* in the departments of Arequipa, Moquegua, and Tacna. In addition, the Andean and Central American countries have expressed the political will to carry out coordinated measures to eliminate the species—*Rhodnius prolixus* and *Triatoma dimidiata*—that are the principal vectors in those geographic areas.

Schistosomiasis

Brazil, Cuba, and Venezuela reported cases of schistosomiasis in the 1994–1997 period. In Brazil the endemic area covers 18 states, and the non-endemic area covers nine. Case detection in the endemic area is the responsibility of the regular health care units and is carried out through both active and passive search; in the non-endemic area, only passive detection is used. The epidemiologic surveillance system that is being implemented tracks every severe clinical case in all 27 states, as well as all clinical forms in the five states with focal transmission and low infection prevalence. The cases in the endemic area are classified as either autochthonous or imported; in the nonendemic area all cases are imported.

Between 1987 and 1996 more than 1,500,000 stool specimens were analyzed using the Kato-Katz method. The number of positive specimens was 203,207 (for a positivity rate of 8.6%) in 1992, 274,084 (11.6%) in 1993, 283,369 (11.1%) in 1994, 300,484 (11.1%) in 1995, and 181,659 (9.9%) in 1996.

In Cuba all the cases of schistosomiasis diagnosed in 1995 and 1996 were imported. The seven cases diagnosed in 1995 (four caused by *Schistosoma haematobium*, one by *Schistosoma mansoni*, and one by *Schistosoma intercalatum*) were contracted in Angola, Mozambique, and Yemen; the six cases in 1996 (one caused by *S. haematobium*, four by *S. mansoni*, and one for which the agent was unknown) came from Angola, Ethiopia, and Yemen.

In Venezuela the work of the Schistosomiasis Control Program in the 1993–1997 period centered on the endemic area around existing foci in the states of Aragua and Carabobo. Epidemiologic surveillance is supported by the Kato-Katz microscopic method, which is complemented by the ELISA and circumoval precipitating tests. Prevalence rates of under 2% have been found. Of the specimens examined with ELISA between 1990 and 1996, 2,387 (16.8%) were positive. The circumoval precipitation method identified 344 positive specimens (21.4%) in Aragua, Carabobo, and Lara. However,

currently there are only limited foci in four localities in two states (Aragua and Carabobo).

Chemotherapy consists of 600-mg tablets of praziquantel administered at a rate of 40 mg per kg of body weight. The same regimen is used for mass treatment. Like other countries, Venezuela inspects watercourses and bodies of water to determine whether they are suitable habitat for the intermediate host, the snail *Biomphalaria glabrata*. A minimal dose of one part per million of molluscicide (25% Baylucid) is used to control the host, and this method is complemented by sanitary engineering works and health education. Of the snails collected in the control areas, the percentage infected with cercaria of *S. mansoni* was calculated only for *B. glabrata*, *B. straminea*, and *B. prona*; these snails' geographic distribution has been correlated with that species of schistosome.

VACCINE-PREVENTABLE DISEASES AND VACCINE RESEARCH AND DEVELOPMENT

Immunization programs continued to play a major role in reducing the morbidity and mortality of vaccine-preventable diseases in the Americas. In 1994, the Western Hemisphere became the first Region in the world to officially be declared free of indigenous transmission of wild poliovirus. Coverage for children under 1 year old for diphtheria, tetanus, and pertussis (DTP); poliomyelitis (OPV); measles; and tuberculosis (BCG) have reached levels above 80% (see Figure 1), which confirms that the vast majority of Latin American and Caribbean children are protected against these diseases. The high priority that national governments have given to immunization programs and the broad support achieved through the Expanded Program on Immunization (EPI) in each country for the past 20 years are responsible for much of this success (1). EPI has functioned as the major mechanism in the Region in reducing the morbidity and mortality of vaccine-preventable diseases (2). These gains also reflect the degree of managerial development reached at the operational level, and the use of different and complementary strategies for vaccination, such as the routine vaccinations provided by public health services.

In fact, the culture of prevention that has come about as a result of EPI successes has stimulated the introduction of new vaccines into routine national immunization programs, although the cost of some of these vaccines is a major obstacle for their inclusion. By 1997, 80% of the countries in Latin America and the Caribbean were using vaccines against measles, mumps, and rubella (MMR). All countries that have identified areas and population groups at high risk for hepatitis B have introduced a vaccine: Brazil, Colombia, Costa Rica, Cuba, and the Dominican Republic have universal vaccination with hepatitis B vaccine. Chile and Uruguay have introduced the vaccine for *Haemophilus influenzae* type b.

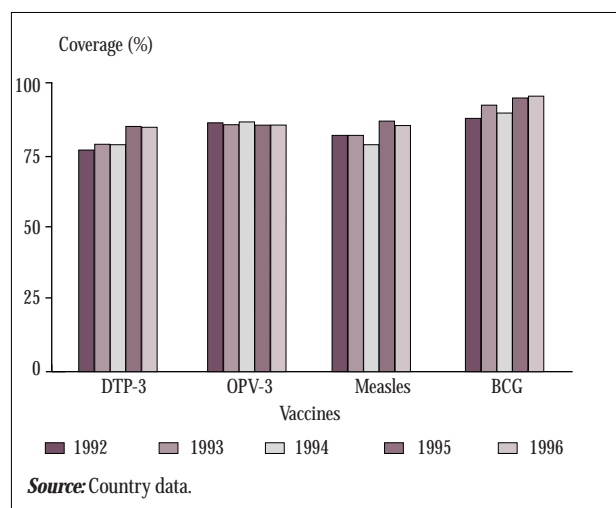
During the period under review, immunization programs in the Americas focused on their effectiveness and sustainability, and on reaching the remaining 20%–30% of unvaccinated persons in the Region.

Access to immunization services remained an important consideration. In 1995 and 1996, 93% of the population received the DTP1 vaccine; 97% and 98% of the population received the BCG vaccine in 1995 and 1996, respectively. Evaluations of several countries show that the population's access to EPI is between 80% and 90%, indicating that health workers at the primary health care level can successfully carry out immunization activities and reach specific objectives. It also demonstrates the population's degree of acceptance of preventive programs offered by the health services, especially those targeted to the infant population.

Efforts have intensified to reduce the number of districts with excessively low vaccination coverage (see Table 4). Some countries have targeted high-risk areas, thereby intensifying vaccination activities among priority population groups and, in turn, allowing for a better distribution of resources. Effectiveness was measured by the capability of vaccination programs to reduce drop-out rates and missed opportunities to vaccinate. Drop-out rates derive from the number of children who received the first dose of DTP and are missing the third dose, and the number of DTP1 doses applied compared to the number of doses of measles vaccine applied in children between 9 and 12 months of age (Figure 2). The latter indicator may change depending on the measles vaccination schedule used in each country.

Emphasis also was placed on reducing missed opportunities to vaccinate in the countries by advocating stronger rou-

FIGURE 1
Vaccination coverage of children younger than 1 year, Latin America and the Caribbean, 1992–1996.



tine vaccination services. Several countries have carried out studies and are implementing follow-up investigations on missed opportunities. A 1987 study and a 1995 follow-up investigation carried out in Nicaragua showed a reduction of missed opportunities to vaccinate children under 2 years old from 66% to 21%. Similarly, in Peru a 1990 study and a 1996 follow-up show a reduction from 52% to 13%. These reports reveal that a common cause of missed opportunities to vaccinate has to do with the failure of health staff to ask about immunization status when the child visits a health facility for reasons other than vaccination. This points to the need for addressing health workers' attitudes (3).

The sustainability of immunization programs was measured by the degree of support they had from national governments, as well as by the countries' enactment of legislation to finance recurrent costs of vaccination programs (1). As shown in Figure 3, national contributions for immunization have steadily increased, from 79% of recurrent costs of vaccination programs during 1987–1991, to 91% for 1992–1996; they are projected to be around 92% for the 1997–2001 pe-

riod. The remaining costs associated with routine immunization programs will be covered by external sources. Legislation is being proposed to create specific budget lines that cover recurrent costs of vaccines and other inputs. So far, Ecuador and Venezuela have won congressional approval for a Vaccine Law (4). Indicators have been added to measure the participation of new partners such as nongovernmental organizations and the private sector in surveillance activities and in the delivery of services (5).

National vaccination programs have stimulated decision-making and program implementation at the local level. The polio eradication campaign was instrumental in enhancing these aspects through the development of local surveillance systems and mop-up operations. The social mobilization campaigns organized during the polio initiative also stimulated the community's participation (2).

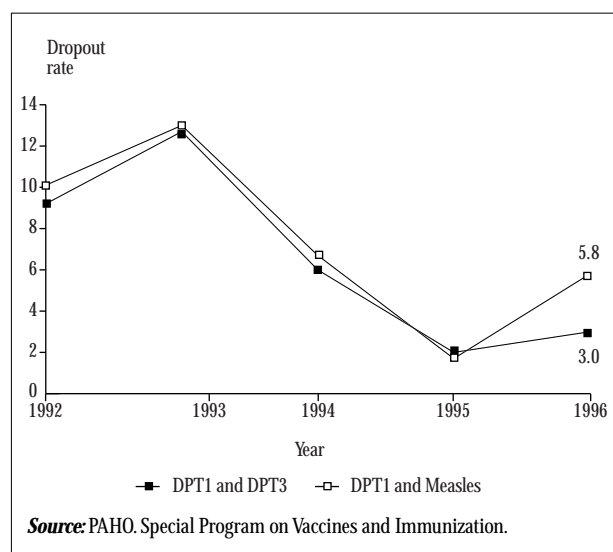
Adequate surveillance has effectively measured the success of national immunization programs in terms of reducing diseases and identifying areas and population groups in need of additional interventions. Epidemiological surveillance has

TABLE 4
Number of districts and range of coverage with OPV3, selected countries of Latin America and the Caribbean, 1996.

Country	Districts with < 50% coverage		Districts with 50%–79% coverage		Districts with ≥ 80% coverage		Total no. of districts
	No.	%	No.	%	No.	%	
Argentina	12	2.07	137	23.62	431	74.31	580
Belize	0	0.00	0	0.00	6	100.00	6
Bolivia	43	15.64	84	30.55	148	53.82	275
Brazil	69	1.38	581	11.64	4,340	86.97	4,990
Chile	8	2.38	70	20.83	258	76.79	336
Colombia	131	12.37	400	37.77	528	49.86	1,059
Costa Rica	3	3.70	22	27.16	56	69.14	81
Cuba		0.00		0.00	169	100.00	169
Dominican Republic	8	6.20	98	75.97	23	17.83	129
Ecuador	12	6.56	68	37.16	103	56.28	183
El Salvador	1	0.38	39	14.89	222	84.73	262
Guatemala	50	15.11	132	39.88	149	45.02	331
Haiti	...	...	...	...	...	...	...
Honduras	1	0.34	43	14.68	249	84.98	293
Mexico	0	0.00	10	0.42	2,394	99.58	2,404
Nicaragua	1	0.66	29	19.08	122	80.26	152
Panama	0	0.00	17	25.00	51	75.00	68
Paraguay	24	11.01	81	37.16	113	51.83	218
Peru	115	6.55	342	19.46	1,300	73.99	1,757
Uruguay	0	0.00	6	2.24	262	97.76	268
Venezuela	124	20.77	183	30.65	290	48.58	597
Total	602	5.26	2,342	23.41	11,214	71.34	14,158

Source: Country reports.

FIGURE 2
Dropout rates for DTP1 and DTP3, DTP1 and measles,
in 14 countries, Latin America, 1992–1996.



improved notably, both in the collection of information at health facilities and in collaboration with laboratories. The number of reporting units has increased, and some countries are incorporating reporting units from the private sector and insurance groups (6).

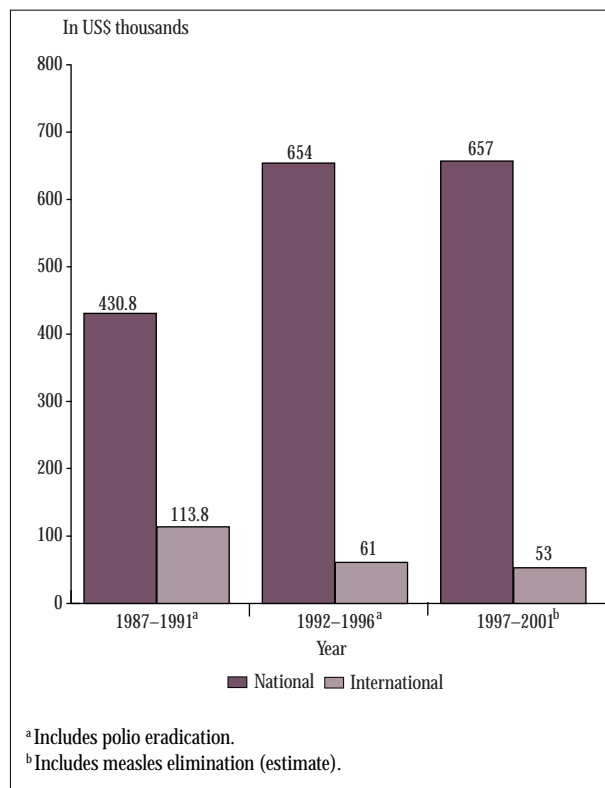
Additional efforts also are being made to improve the timely reporting of cases, including increasing the sensitivity of case investigation data, incorporating alternative reporting sources, and strengthening laboratory support (7). The timely investigation of suspected cases requires a solid infrastructure and trained health workers who can quickly respond to outbreaks. Epidemiological surveillance units within the ministries of health exchange information with laboratories (7, 8, 9), and in some countries, such as Nicaragua, this communication is handled through a computer network.

The following material presents an overview of vaccine-preventable diseases. An operational case definition is included for neonatal tetanus, poliomyelitis, and measles; definitions for other diseases are based on standard clinical criteria.

Whooping Cough

Following a steady decline, the incidence of whooping cough is now at an all-time low (see Figure 4). Vaccination levels are generally satisfactory, and there has been a marked reduction in the drop-out rates between the first and the third dose of DTP. To maintain this trend, routine immunization

FIGURE 3
Expended and projected national and international
allocations for immunization programs
in the Americas, 1987–2001.



should be reinforced to achieve and maintain $\geq 90\%$ DTP3 coverage.

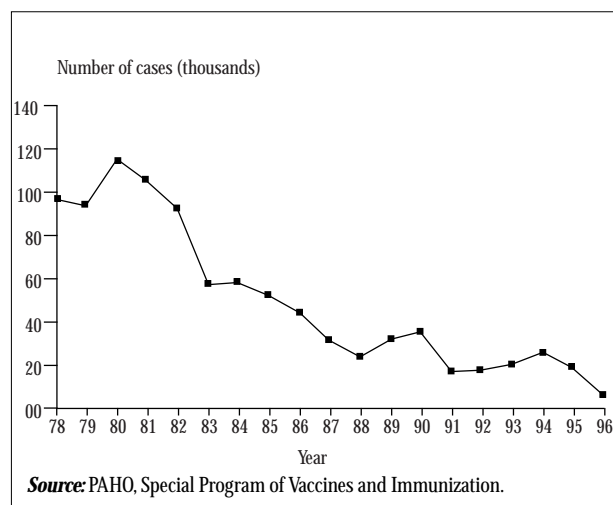
Diphtheria

Diphtheria is steadily declining, as shown in Figure 5. The last outbreaks occurred in Quito, Guayaquil, and Machala, in Ecuador, in 1994 and 1995. During those two years, 724 cases were reported, of which 84% were in persons over 15 years old (10). The cause for these outbreaks is not fully understood. Use of diphtheria toxoid (Td) instead of tetanus toxoid (TT) for vaccination of older children and adults whenever tetanus toxoid is indicated should reduce the risk of future outbreaks (11).

Tetanus

Intensive vaccination in all groups has resulted in a downward trend in the frequency of tetanus cases other than

FIGURE 4
Reported cases of pertussis, Region of the Americas,
1978–1996.



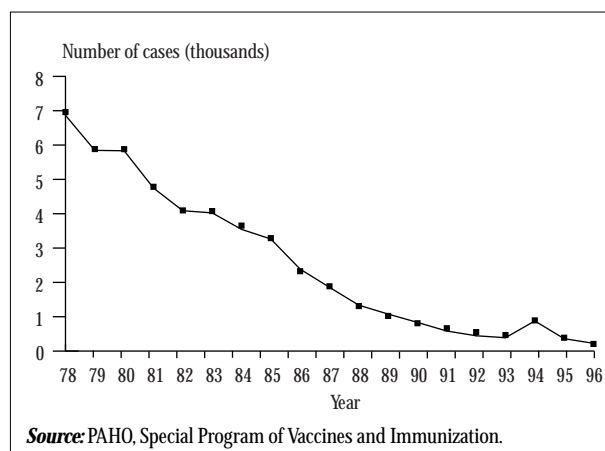
neonatal (ICD-9, 037 or ICD-10, A35). Tetanus toxoid (TT) vaccine is administered to infants and children under 5 years old through a triple vaccine covering diphtheria, tetanus, and pertussis (DTP). TT alone is applied to women of childbearing age, school-aged children, and male adults who are at risk due to their professions. The vaccination of these last two groups has been irregular. The remaining groups of females or males 49 years and older have not received special attention in terms of TT vaccination. Vaccination coverage data are not available for groups older than 1 year.

Neonatal Tetanus

A confirmed case of neonatal tetanus (NNT) is defined as a child with a history of all three of the following: normal feeding and crying for the first 2 days of life; onset of illness between 3 and 28 days of life; and inability to suck (trismus), followed by stiffness (generalized muscle rigidity) and/or convulsions (muscle spasms) (12).

In 1988 activities designed to eliminate NNT in the Americas began to accelerate. The health services initiated active surveillance of NNT with a retrospective search of cases to 1985. For many years, only pregnant women and males at high risk were vaccinated with TT; in 1988, women of childbearing age who live in high-risk areas were added. In 1989, the World Health Organization adopted a resolution to eliminate neonatal tetanus as a public health problem, setting an incidence rate of under 1 case per 1,000 live births in each municipality as a goal (13). In 1990, the World Summit for Children set a goal that no districts in any country should

FIGURE 5
Reported cases of diphtheria, Region of the Americas,
1978–1996.



present a rate of more than 1 case of neonatal tetanus per 1,000 births by the year 2000 (14).

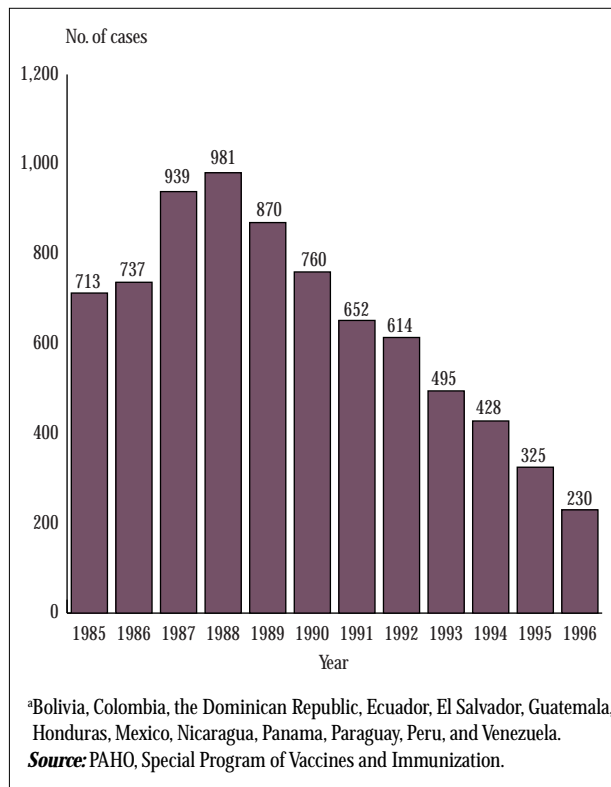
NNT is endemic in 16 of the Region's countries: Argentina, Bolivia, Brazil, Colombia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Venezuela. The total population in these countries is approximately 450 million, of which an estimated 100 million are women of childbearing age; there are an estimated 10 million live births per year.

Vaccination coverage of women of childbearing age has increased in high-risk areas in 14 countries where data are available. The annual number of cases in the Region has decreased from 1,470 in 1988 to 312 in 1996, and the number of districts with multiple cases of NNT also has decreased.

NNT occurs more frequently among children born to mothers who are poorly educated, over 20 years old, and multiparous (15, 16). Based on this profile, PAHO encouraged countries with limited resources to prioritize vaccination of women older than 20 years. While the vaccination of only easy-to-reach populations, such as schoolgirls or women working in industries, appealed to local health authorities because vaccination coverage levels would soar, this strategy would have delayed the effect on the disease, however, as less accessible, high-risk populations were by-passed. Another factor to consider, given the scarcity of resources, is the number of cases occurring in each district, in order to better target vaccination activities.

Districts have been classified as high-risk according to the number of cases that occur there (17). The strategy of vaccinating all women of childbearing age who live in high-risk areas is followed until NNT is eliminated as a public health problem in those areas. High-risk areas are defined using flexible criteria that are based on the current epidemiological

FIGURE 6
Neonatal tetanus cases, 13 selected countries, 1985–1996.^a

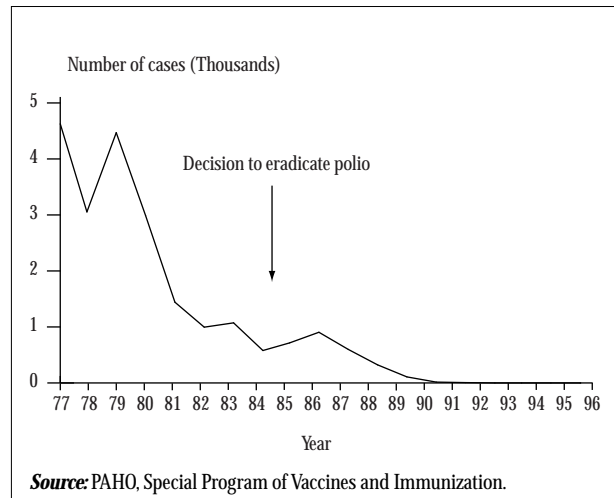


situation. As NNT is brought under control in most districts at risk, small, rural, and economically depressed areas considered “at risk” undergo intensive scrutiny.

In the Americas, high-risk areas were initially defined as areas that had an incidence of neonatal tetanus greater than the national average in any of the preceding three years. As NNT control was achieved, other areas that presented either one or more cases, or recurrent cases in any given year also were considered to be high-risk areas.

In 1996, evaluations were carried out in 13 of the 16 endemic countries. Findings from these studies show a declining trend in the number of women of childbearing age who live in high-risk areas and require intensive immunization services—51% of this population group in these countries was considered to have controlled NNT, or to have achieved the WHO goal of under 1 case of NNT per 1,000 live births per municipality. Figure 6 shows a steady decline in the annual number of cases in the 13 countries, from 981 in 1988 to 230 in 1996. Immunization with TT will now be delivered through routine vaccination services. Consistent with the elimination strategy, most of the 13 countries evaluated are now targeting new, “hard-to-reach” populations, primarily in small districts.

FIGURE 7
Number of poliomyelitis cases, Region of the Americas, 1977–1996.



Poliomyelitis

During the years under review, the countries in the Americas embarked on the final phase of the initiative to eradicate clinical paralytic polio and the indigenous transmission of wild poliovirus. The initiative was launched in May 1985 at the XXI Meeting of the Directing Council of the Pan American Health Organization. It received unanimous support from the Region's countries and from the major international organizations.

The impressive reduction in the number of cases in the Americas by 1985, due to higher levels of vaccination coverage through routine services, paved the way for the initiative to eradicate the indigenous transmission of wild poliovirus in the Western Hemisphere (see Figure 7). The polio eradication strategy mainly relied on identifying infected areas by isolating wild poliovirus from cases of acute flaccid paralysis, rather than on individual immunity. It was built upon the lessons learned during the global smallpox eradication in 1979, and was based on the knowledge about the disease, the vaccine, and effective methods for the control of polio. A confirmed case of polio is one presenting acute paralytic illness with or without residual paralysis and where there is isolation of wild poliovirus from the stools of either the case or its contacts (18).

The polio eradication strategy followed several key approaches. Immunization activities were intensified as national vaccination days and house-to-house “mop-up” campaigns were conducted in high-risk areas, and coverage levels were monitored at the smallest geopolitical level. The surveillance of acute flaccid paralysis was enhanced, and

cases were rapidly investigated, including collecting stool samples from cases and contacts of cases. Whenever necessary, aggressive outbreak control was conducted to stop transmission. Finally, monitoring was carried out at the community level, to ensure absence of the virus in human populations and in the environment.

The oral polio vaccine (OPV) was the vaccine of choice, because it induces antibodies against polio in the blood and intestines, an effect that is enhanced when the vaccine is administered to entire communities through national immunization days. OPV also protects unimmunized children when the live, attenuated virus in the vaccine spreads from vaccinated children to unvaccinated children, inducing immunity against polio in the unvaccinated child.

As a by-product of the campaign to eradicate polio in the Americas, national immunization programs were strengthened. Social mobilization in support of immunization programs also advanced significantly. This was especially important for disadvantaged populations, which are always the most difficult to reach.

Intensification of the Polio Eradication Strategy

Countries were classified as either polio-endemic or polio-free, depending on whether or not they had had any polio cases reported in the preceding three years. Countries classified as polio-endemic were encouraged to hold two national immunization days at least four weeks apart to vaccinate as many children under 5 years of age as possible, regardless of previous vaccination status. The delivery of multiple antigens during national immunization days was carried out to supplement and strengthen the overall delivery of other childhood vaccines.

Following these mass vaccination campaigns with OPV, countries in the Americas experienced a dramatic decrease in the number of cases of polio, with many attaining or approaching zero incidence within a few years of initiating the mass campaigns. By 1988, fewer than 200 of more than 12,000 districts in endemic countries (Brazil, Colombia, Ecuador, El Salvador, Guatemala, Haiti, Mexico, Paraguay, Peru, and Venezuela) had circulation of wild poliovirus, compared to more than 400 in 1987 and more than 600 in 1986. These reductions confirmed that the problem was confined to a few high-risk areas and to children under 5 years old, who were the main source of transmission. These countries still had pockets of unvaccinated people in urban and periurban high-risk areas where cases had previously been identified and that had low vaccination coverage, and in population groups who lacked access to health centers (18).

All endemic countries introduced a special procedure called "mop-up" operations to eradicate the remaining foci of wild polio transmission. Mop-up operations were carried out

in two rounds and held one to two months apart, and involved intensive house-to-house vaccination campaigns designed to reach and immunize children under 5 years of age who were at high risk of infection.

By 1991, despite investigations of more than 4,000 stool specimens, wild poliovirus transmission was documented only in Colombia and Peru. Civil unrest had made Peru's health infrastructure weak, and the polio eradication campaign could only use mop-up operations to immunize children. Peru also was hit by a cholera epidemic that same year, which spread throughout the country and into Ecuador and Colombia. As children in critical need of special vaccination programs were targeted through mop-up operations, vaccinators also provided cholera prevention information to all the homes visited. The last confirmed case of polio in Peru—and in the Western Hemisphere—was recorded in the town of Pichinaki, in the department of Junín. In Colombia, eight cases of polio were confirmed, all occurring in the tropical area of the country's Atlantic coast. Colombia's Ministry of Health targeted and implemented a mop-up vaccination campaign along the country's Atlantic and Pacific coasts.

Initially, surveillance work included all health facilities where most acute flaccid paralysis cases had occurred, including neuro-pediatric clinics, hospitals, and rehabilitation centers. The facilities were asked to report weekly, even in the absence of cases of acute flaccid paralysis (negative reporting). As the number of cases decreased, more reporting units were added. During the last years, the most comprehensive surveillance system that has ever existed in the Americas was put into operation, with the participation of more than 22,000 health units, covering 100% of districts in the Americas. This network is now being used to include other vaccine-preventable diseases and has enhanced the capacity of the health sector to respond to new emerging infectious diseases.

To support adequate laboratory diagnosis, PAHO organized a regional network of 10 laboratories to support virus isolation, develop analytical approaches for virus characterization, and train laboratory workers (7).

By 1992, as countries began to certify polio eradication, they faced the challenge of ensuring that two adequate stool specimens were properly collected within 15 days of the onset of paralysis from every acute flaccid paralysis case and their contacts (18). Without this information, there could be no certainty that poliovirus had been stopped. The International Commission for the Certification of Poliomyelitis Eradication (ICCPE) was formed, and it defined four basic components that were critical for certification: surveillance of acute flaccid paralysis; surveillance of wild poliovirus; active search for acute flaccid paralysis cases; and mop-up vaccination campaigns in high-risk areas (18). Countries were considered ready for certification only if they had been free of polio for at

least three years in the presence of adequate surveillance. Each country formed a national commission to review and oversee the certification process.

In September 1994, following an extensive review of surveillance information (about 45,000 analyzed stool specimens from individuals with acute flaccid paralysis and their contacts), the ICCPE declared that transmission of wild poliovirus had been interrupted in the Americas (19).

During 1995, most countries complied with the four surveillance indicators for acute flaccid paralysis. Since 1996, however, a downward trend in surveillance is apparent in some countries. Countries have been urged to ensure that good surveillance remains in place in order to detect importations. In 1993, wild poliovirus was imported from the Netherlands into Canada (20), but adequate surveillance detected the importation quickly, control measures were instituted, and the outbreak was contained. In March 1996 another importation of wild poliovirus was detected in Canada, this time from India (21). This marked the second time that an importation of wild poliovirus had been identified in the Americas since the last case of indigenous polio occurred in August 1991, and the first time since the Region had been declared as polio-free.

In 1997, the global eradication program set for the year 2000 progressed, and the number of cases continued to decline. Until complete global eradication is achieved, however, the threat of importations continues to jeopardize the Region's polio-free status. Given the substantial deterioration in surveillance in some countries of the Americas, there is concern that future importations of wild poliovirus might be missed. The level of surveillance that existed in 1994 must be maintained in all countries until polio is certified as having been eradicated from the world and vaccination can be stopped (22).

Measles

Despite the availability of an effective vaccine, it is estimated that approximately 42 million cases of measles occur worldwide, contributing to approximately 1.56 million deaths (23). Most of these deaths occur among children living in developing countries. Globally, the disease accounts for more than 10% of deaths among children under 5 years old, and it is especially lethal for infants under 1 year of age. Children die from acute measles infection or from its sequelae, which include encephalitis, pneumonia, diarrhea, and malnutrition. The disease thrives in cities, especially in poor areas where crowding, poor sanitation, and low vaccination coverage ensure that the virus continues to circulate.

Rather than detecting every possible measles case, the primary purpose of measles surveillance is to detect, in a

timely manner, all areas in which the measles virus is circulating. Health care workers are asked to report all patients in whom they suspect a possible measles virus infection. Suspected measles cases are carefully investigated, including collection of an adequate blood specimen for serologic analysis, and then are classified as being either discarded or confirmed.

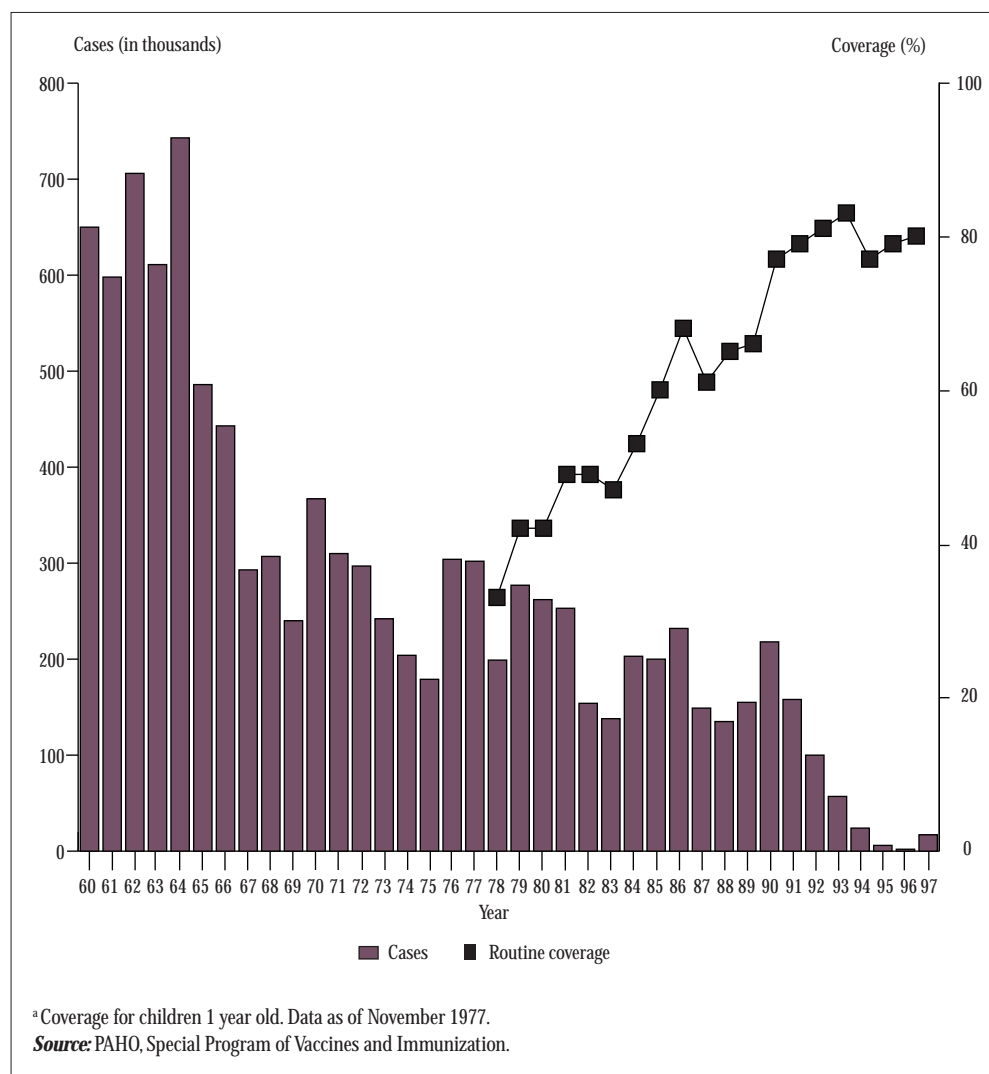
Suspected measles cases represent a broad category that is intended to provide health workers at the most primary level with an early warning of the possibility that measles virus may be circulating in the area. A patient in whom a health care worker suspects the possibility of measles virus infection is, for surveillance purposes, considered to be a suspected measles case. A health care worker should suspect measles virus infection when a patient presents fever, maculopapular rash, and cough, coryza, or conjunctivitis.

Confirmed cases can be laboratory-confirmed or clinically confirmed; the total number of confirmed measles cases is the sum of these categories. A laboratory-confirmed measles case is a suspected measles case that after complete investigation satisfies at least one of the following criteria: laboratory confirmation of measles virus infection or epidemiologic linkage to another laboratory-confirmed measles case. A suspected measles case is considered to be laboratory-confirmed if measles-specific IgM antibodies are detected using the enzyme immunoassay (EIA) IgM capture technique in a blood specimen collected from the patient. A clinically confirmed case is a suspected measles case without a complete epidemiologic investigation. Since an epidemiologic investigation is not conducted and measles virus infection cannot be confirmed or excluded, clinically confirmed cases are considered to be failures of the surveillance system.

The decision to eradicate measles in the Americas followed Cuba's successful experience in interrupting measles virus circulation (9). Cuba developed a national measles vaccination strategy in 1986, using an attenuated measles vaccine. A mass measles vaccination campaign was conducted, targeting all children between 1 and 14 years of age, regardless of measles history or vaccination status. Following the campaign, surveillance was strengthened, and the reported number of confirmed measles cases rapidly decreased to record-low levels. Between 1989 and 1992, fewer than 20 confirmed measles cases were being reported annually. To prevent the accumulation of susceptible preschoolers, another mass vaccination campaign was conducted in 1993, targeting all children from 2 to 6 years of age, regardless of prior vaccination or measles history.

In 1994, the Ministers of Health of the Americas adopted a resolution during the XXIV Pan American Sanitary Conference calling for the eradication of measles transmission from the Western Hemisphere by the year 2000 (24). This target re-

FIGURE 8
Reported measles cases and routine vaccination coverage, Latin America, 1960–1997.^a



quires the achievement and maintenance of 95% measles vaccine coverage in all municipalities or districts in every country of the Region, with complementary periodic vaccination campaigns aimed at preventing the accumulation of susceptibles among preschoolers. To this end, emphasis is placed on training health workers for effective program operations, conducting rigorous fever and rash surveillance to detect suspected measles cases, and undertaking intensive social mobilization to enhance the community's role in the prevention of the disease.

In 1997, measles incidence continued to show a sharp decline in the Americas, and measles transmission was absent in large geographic areas in the Region (see Figure 8).

Vaccination Strategy

To achieve the goal of measles eradication, PAHO developed an enhanced measles vaccination strategy similar to the highly successful polio eradication strategy (9). Through periodic vaccination campaigns, which complement routine vaccination services, the strategy aims to achieve and maintain high measles immunity among pre-school-age and school-age children.

The measles eradication strategy has three essential vaccination components. First, to rapidly increase immunity over a wide age group of children and reduce ongoing chains of measles transmission, a one-time national "catch-up" vac-

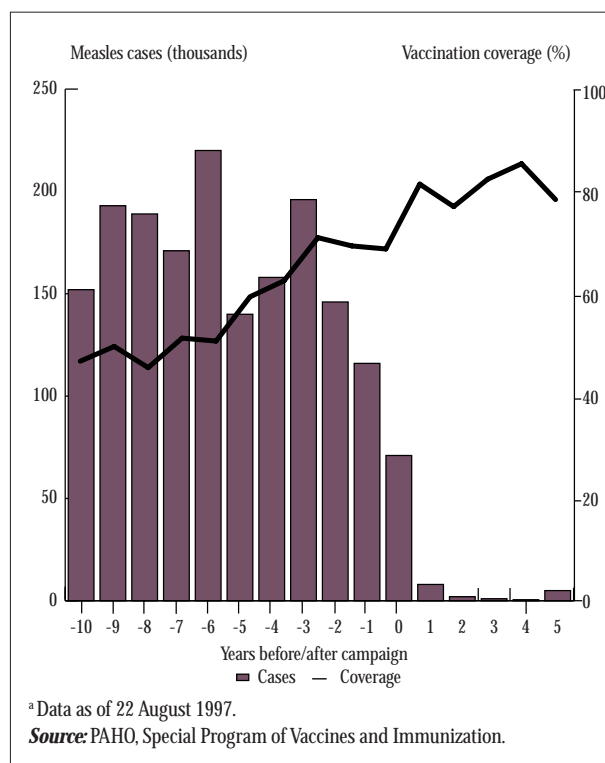
cination campaign is conducted, targeting all children between 1 and 14 years of age, regardless of disease or vaccination history (9). From 1987 to 1995, all of the Region's countries except for the United States and several French and Dutch Caribbean islands conducted measles catch-up campaigns.

The impact of catch-up campaigns is evident when regional annual measles routine vaccination coverage data and incidence data are analyzed according to years before and after the campaigns (see Figure 9). Three years prior to a campaign, the combined measles routine vaccination coverage is approximately 80%, and yet, nearly 200,000 measles cases are reported. Following the campaign there is an immediate marked reduction in the number of cases reported. Comparing the number of cases reported two years after the campaign with those reported one year before the campaign, a nearly 99% reduction in the number of reported cases is observed. Moreover, aggregate vaccination coverage increases in the years following the campaign, and measles incidence remains low.

The second component in measles eradication requires efforts to strengthen routine vaccination services and to vaccinate at least 90% of infants in each successive birth cohort. Since the risk of an infant being exposed to measles virus is low following the catch-up campaign, the age of routine measles vaccination can be safely increased from 9 months to 1 year of age, thus providing an increase in vaccine effectiveness (9). The achievement and maintenance of high vaccination coverage among infants through routine health services is a key component of the strategy and has been referred to as "keep-up" vaccination.

Since measles vaccine is less than 100% effective and universal vaccination coverage is rarely achieved, over time an accumulation of susceptible infants and children will occur, thus increasing the risk of a measles outbreak should the virus be introduced. To prevent the number of measles-susceptible pre-school-age children from reaching dangerous levels, the third component of the measles eradication strategy is implemented. This involves periodic follow-up vaccination campaigns, targeting children 1–5 years of age, regardless of previous disease or vaccination history (9). The interval between follow-up campaigns varies, depending on vaccination coverage obtained among infants vaccinated through the routine health services; the higher the routine coverage obtained, the longer the interval between follow-up campaigns. As a general rule, these campaigns are conducted when the number of estimated susceptible pre-school-age children born since the last vaccination campaign approaches the number of children in an average annual birth cohort; in practice, these campaigns are conducted every 3 to 5 years. Follow-up measles vaccination campaigns have been conducted in many countries of the Region since 1994.

FIGURE 9
Impact of *catch-up* campaign on measles incidence, Region of the Americas.^a



Measles Surveillance

Given the low number of measles cases being reported, a sensitive and aggressive epidemiological surveillance system for suspected measles cases is critical to the successful completion of the measles eradication strategy (9).

A key aspect of surveillance is the laboratory confirmation of suspected measles cases. A Regional Network of Reference Laboratories has been developed to facilitate and promote technical cooperation among institutions. The network, comprised of 11 laboratories in the Region, including Canada and the United States, is charged with monitoring progress toward measles eradication.

Progress

During 1996, 12,253 suspected measles cases were reported from the countries of the Americas. Of the total suspected cases reported, 10,144 (83%) were completely investigated, including negative laboratory results for the measles IgM antibodies, and discarded as not being measles, and 2,109 (17%) cases were classified as "confirmed" measles

cases (25). Of the total confirmed cases, 1,184 (56%) were confirmed as measles on clinical grounds alone, without laboratory investigation, and 925 (44%) had laboratory confirmation of measles virus infection. The United States and Canada together accounted for 39% of the total confirmed cases and 88% of the laboratory-confirmed cases in the Western Hemisphere during 1996. There were no measles-related deaths reported in the Region during 1996.

There were no laboratory-confirmed measles reported from the countries of the English-speaking Caribbean, Cuba, the Dominican Republic, or Haiti. However, in late 1996 an outbreak was reported from the French Department of Guadeloupe, and a total of 12 laboratory confirmed cases were reported between November and December. Most cases occurred in unvaccinated school-age children. Molecular analysis of measles virus isolated from the outbreak found that the virus circulating in Guadeloupe was very similar to recent isolates obtained from Western Europe.

Other outbreaks occurred in Brazil. In 1996, 25 confirmed measles cases were reported between September and December in Santa Catarina state. Cases ranged in age from 6 months to 32 years. Prior to this outbreak, Santa Catarina had been free of measles for three years. The majority of the cases occurred in persons who were not documented as having received measles vaccine. The source case was not detected, but genomic analysis of isolated measles virus from the outbreak found that the virus circulating in Santa Catarina was very similar to that circulating in Europe. In São Paulo state, the outbreak started between October and December 1996. Highest age-specific attack rates are in infants under 1 year of age, followed by adults 20–29 years old and children 1–4 years old. As of mid-October 1997, there were 9,781 confirmed cases, all among people who were born either too early for routine measles vaccination or too late to have been exposed to measles. Contributing factors to the Brazilian outbreaks include the many susceptible children due to low coverage with the two-dose vaccination schedule, a large number of susceptible adults, and high population density. The source of this outbreak was believed to be from the Santa Catarina state outbreak. So far, this is the largest outbreak in recent years in the Americas. As of mid-September 1997, of the 5,332 confirmed cases of measles in the Region, 4,491 (84%) occurred in Brazil, primarily during the São Paulo outbreak. Six measles-related deaths have been reported during this outbreak (1996–1997); five of them occurred in infants under 1 year of age.

In Canada, an outbreak with more than 300 cases was reported from the province of British Columbia during early 1997. Most cases occurred among post-secondary school students and young adults, most of whom had previously received one dose of measles vaccine. Spread from this outbreak was reported from several other Canadian provinces. Of the

total cases reported in Canada during the first six months of 1997, 42% were in persons age 20 years or older (26, 27).

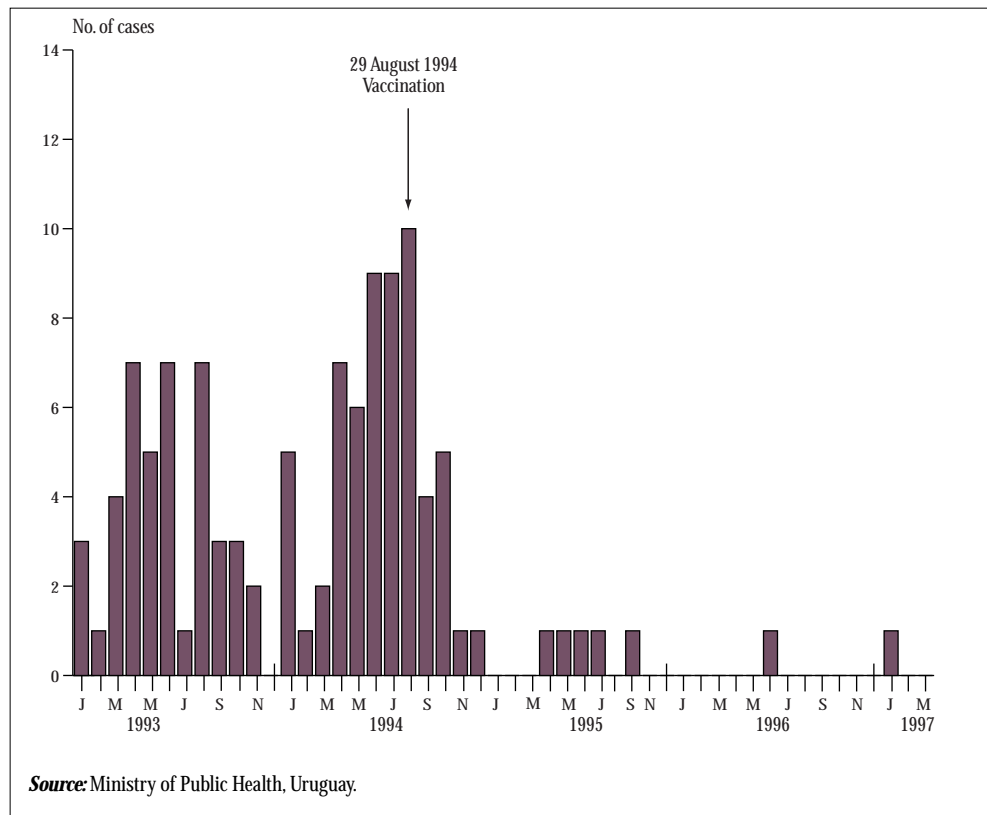
Despite the impressive reduction in the level of measles virus circulation in the Americas, there remain at least three serious obstacles to achieving the goal of measles eradication by the year 2000. The first is the accumulation of susceptible children over time. Even in a country with a strong routine immunization program, there will be many children who are vaccinated but who have not yet become immune to measles. These children, as well as those who escape vaccination, will combine to create a large pool of nonimmune or susceptible children. Over time, the size of this unprotected population will grow, and the risk of a measles outbreak will increase (28). The second obstacle to measles eradication is the ongoing circulation of measles virus in other parts of the world. While the reported incidence rate in the Americas was only 0.7 cases per 100,000 population in 1995, the rate in Africa was 83 times higher, and the rates in Europe and the Western Pacific regions were 13 and 10 times higher, respectively. The third obstacle to measles eradication is the ready availability of rapid transportation. A child can be infected today in Europe, Asia, or Africa, arrive in any country in the Americas, develop prodrome and rash 12–14 days later, and reintroduce measles into the Region. If a large population of susceptible children exists and the right contacts are made, then a large measles outbreak may result. Measles virus travels readily and does not respect national borders.

Rubella

Since the implementation of the Regional Action Plan for the Elimination of Measles, the recording of cases of rubella has increased in the countries of the Americas. Data on the real impact of rubella and congenital rubella syndrome (CRS) are still scarce, however. In 1996, 88,606 cases of rubella were reported in the Americas, with the greatest incidence in Argentina, Mexico, and Venezuela. Through August 1997, 379 cases of rubella have been recorded. In 1995–1996, the Caribbean Epidemiological Center (CAREC) confirmed the circulation of rubella virus in the population of seven countries, including pregnant women. Four countries in the Caribbean selected as pilots for CRS surveillance in 1996 found eight confirmed cases (six in Jamaica and one each in Barbados and Trinidad) (29, 30).

In Mexico there were 51,157 cases of rubella reported in 1995 and 26,286 cases in 1996. Mexico's Ministry of Health, however, has estimated that there may be as many as 2 million cases annually in children under the age of 15 years. In Colombia, an average of 7,000 rubella cases have been reported annually since 1985. The most affected populations are children under the age of 5 (76 cases per 100,000 popula-

FIGURE 10
Meningitis caused by *Haemophilus influenzae*, by month, Uruguay, 1993–1997.



tion), followed by those between the ages of 5 and 14 (29 per 100,000). In Colombia, congenital malformations are among the leading five causes of death in the 0–4-year age group; congenital cardiopathies compatible with CRS represent between 59% and 62% of all the congenital anomalies that occurred in the 1992–1994 period.

Many countries are including the MMR vaccine for routine infant immunization and for use in the measles follow-up campaigns. While this will surely reduce the circulation of rubella virus, it will not prevent CRS. To prevent CRS, all women of childbearing age need to be protected against rubella infection. New vaccination strategies are needed to effectively eliminate rubella and CRS. The availability of quality surveillance data will help greatly in developing targeted and effective rubella vaccination strategies (29, 30).

Hepatitis B

It has been estimated that there are between 140,000 to 400,000 new cases of acute hepatitis B occurring annually in the Americas. Two-thirds of them are believed to occur in

South America, primarily in Pacific Coast areas of Colombia and in the Amazon basin (Brazil, Colombia, Peru, and Venezuela).

Hepatitis B still lacks an adequate surveillance system, and its irregular notification does not allow a determination of the real incidence of the disease in the Region. There also is lack of adequate laboratory support for final diagnosis. Furthermore, since hepatitis B virus infection is largely asymptomatic among young children, disease surveillance has a limited role in monitoring the hepatitis B vaccination programs. Rather, vaccination programs must be monitored through mechanisms of process indicators (e.g., proportion of children or workers vaccinated) and through studies of asymptomatic hepatitis B virus infection (i.e., serologic studies).

Haemophilus influenzae Type b

Uruguay incorporated the *Haemophilus influenzae* type b (Hib) vaccine into its Expanded Program on Immunization in August 1994, and by 1996, the number of meningitis cases caused by Hib had dropped sharply (31). In 1995, *H. influenzae*

was isolated only in five reported cases of meningitis, and in 1996, only one case was reported, in a child who had not been immunized (Figure 10). A 1996 epidemiological surveillance study of respiratory infections among children under 5 years of age conducted at two Montevideo reference hospitals identified no *Haemophilus* in 520 reported cases that had had a complete bacteriological study (blood and/or pleural fluid culture).

Chile incorporated Hib vaccination into its EPI schedule in July 1996. Studies carried out in the metropolitan region, where 40% of the country's population lives, show that invasive infection caused by Hib had an incidence of 39.5 per 100,000 children under 5 years of age, for a fatality rate estimated as 16% and meningeal sequelae above 30%. A decrease in Hib cases among children under 1 year old was observed during 1997, as more children were fully vaccinated with three doses of Hib vaccine (32).

The Cayman Islands and the Netherlands Antilles also have recently introduced Hib vaccine into their routine immunization programs, and other countries are now considering including Hib vaccination.

Vaccines

Vaccine Production

During the 1994–1997 period, the dependence on imported vaccines increased slightly in the Region, as a result of either an increase in vaccine demand by national immunization programs and/or a failure of local producers to manufacture enough vaccines. Vaccine producers in the Region must compete with high quality and low cost vaccines available in the international market. These vaccines are offered to national immunization programs by several international private manufacturers; some are certified by the World Health Organization to supply vaccines to United Nations agencies.

All vaccine-producing laboratories in the Region are publicly owned, which means that they depend on government allocations. Several of these laboratories are being reorganized to make them more competitive.

Cuba, Brazil, and Mexico have invested heavily in modernizing their vaccine production facilities. Cuba increased its capacity for producing recombinant hepatitis B vaccine at the Center for Biotechnology and Genetic Engineering and *Neisseria meningitidis* groups C and B vaccines at the Finlay Institute. Brazil has inaugurated new facilities for the production of diphtheria and tetanus toxoids, pertussis antigen, and hepatitis B vaccine at the Butantan Institute. Two laboratories for bacterial vaccines (Bio-Manguinhos/FIOCRUZ and TEC-PAR) are moving into new facilities and adding new equipment. Mexico is modernizing its bacterial vaccine production

plant and has inaugurated a new facility for the formulation and filling of vaccines at the National Hygiene Institute. In 1997 the country amended the legal status of the Division of Biologicals and Reagents to allow the private sector to have a 49% share in its operations. A technical and economic viability study designed to evaluate the actual and potential capacity for vaccine production will be used to set a strategy for strengthening vaccine production and to provide updated information to prospective investors.

As soon as these new vaccine production facilities begin to operate, the Region should become self-sufficient in terms of vaccines for their basic immunization schedule (DTP, DT, TT, measles, OPV, and BCG). It also is expected that the production of other vaccines, such as those against hepatitis B, yellow fever, *N. meningitidis* groups A and C, triple viral (measles, mumps, rubella), and rabies, will be able to absorb regional demand.

Vaccine Quality Control in the Region

PAHO is conducting a certification program of vaccine producers in Brazil, Mexico, and Chile, but none of them has undergone a complete certification process. See Table 5 for a list of vaccine-producing countries, laboratories, and vaccines produced in the Region.

A quality-assured vaccine is one that complies with established specifications and has been produced using WHO's Good Manufacturing Practices. Although they are at different stages of development and testing capabilities, all the countries producing vaccines in the Americas have established a National Quality Control Laboratory, which is now part of a Regional Network of Quality Control Laboratories. The network ensures that full implementation of the licensing of vaccines, clinical evaluation, lot release systems, lot testing, good manufacturing practice inspections, and post-marketing surveillance will be promoted and stressed among the vaccine-producing countries.

Vaccine Research and Development

Major advances in vaccine science throughout the world have led to the improvement of existing vaccines and the development of new ones. Several new vaccines have been licensed (DTP combined with Hib; DTP combined with hepatitis B; hepatitis A; varicella) and a dozen others are in the pipeline (phase II and III). This new breed is less reactogenic, more potent, technologically more complex, and protected by various intellectual property and patents rights. Their higher cost, however, has become the major obstacle for their inclusion in routine national immunization programs in developing countries.

TABLE 5
Vaccine production in Latin America and the Caribbean.

Country	No. of laboratories	Bacterial vaccines	Viral vaccines
Argentina	3 ^a	BCG, DTP, DT, TT	Argentine hemorrhagic fever ^a
Bolivia	1		Human and canine rabies
Brazil	5 ^b	BCG, DTP, DT, TT, <i>N.meningitidis</i> A/C	Measles, human and canine rabies, yellow fever, OPV ^c
Chile	1	DTP, TT	Human and canine rabies
Colombia	1	BCG, DTP, DT, TT	Yellow fever
Cuba	2	<i>N. meningitidis</i> B/C	Hepatitis B (recombinant)
Dominican Republic	1	DPT, TT, freeze-dried BCG	Human and canine rabies
Ecuador	1	Liquid BCG, freeze-dried BCG	
Mexico	2 ^d	BCG, DTP, DT, TT	Measles, OPV, human and canine rabies
Peru	1	—	Human and canine rabies
Uruguay	1	Liquid BCG	
Venezuela	1	DTP, TT	Human and canine rabies

^a The Institute of Human Virus Research "Julio Maiztegui" is scheduled to finish construction of the facilities for producing Argentine hemorrhagic fever vaccine, Pergamino.

^b Includes anti-toxic and anti-snake serum production.

^c Formulation and filling from imported bulk.

^d The Division of Biologicals and Reagents coordinates the activities of the National Institute of Hygiene and the National Institute of Virology.

Source: Country reports.

Vaccine-producing countries in Latin America and the Caribbean must participate in these new technological developments. Emphasis has been placed on strengthening key areas of vaccine quality control and production, as well as on fostering a product-oriented research and development culture among vaccine-producing laboratories. Much remains to be done, however, particularly at the political level. Governments must realize that long-term investments, adequate management practices, and coordinated vaccine research and development initiatives are necessary to maintain the viability of this field.

In order to accelerate the incorporation of new vaccines into national immunization programs, reliable data on the epidemiological impact of important vaccine-preventable diseases must be gathered, and there has to be collaboration with vaccine-producing countries to establish or strengthen a vaccine development infrastructure. As a way to maximize existing capabilities of the Region's countries, a multi-institutional and multi-country projects approach is being used. Some such projects already are under way.

An example of this multi-institutional approach is the epidemiological surveillance network that began in 1994 to monitor invasive *Streptococcus pneumoniae* in children under 5 years old. To date, Argentina, Brazil, Colombia, Chile, Cuba,

Mexico, and Uruguay are participating, and the Dominican Republic, Guatemala, and Peru are expected to join. The network aims to determine the regional serotype distribution of *S. pneumoniae* in order to formulate an appropriate polysaccharide-protein conjugate vaccine. It also is designed to monitor the antimicrobial susceptibility of the isolates. This network will be expanded to include other countries and to cover other vaccine-preventable diseases, such as those due to *H. influenzae* and *N. meningitidis*.

CHOLERA AND OTHER INTESTINAL INFECTIOUS DISEASES

Cholera

The detection of *Vibrio cholerae* O1 in patients from a Peruvian coastal village in January 1991 signaled the arrival of the seventh pandemic of cholera to Latin America. Cholera, a devastating diarrheal disease, has extended throughout Latin America since 1991 and continues to spread. Almost 1.2 million cases and 12,000 deaths were registered in Latin America by July 1997, but due to the natural history of the disease, i. e., the presence of several asymptomatic infections, as well as to

underreporting and inefficient surveillance systems, these represent only a fraction of the actual number of infections.

As the epidemic enters its seventh year in the Hemisphere, cholera has become established in a number of countries, serving as a stark reminder of deficiencies in water quality, sanitation, and hygiene that will continue to challenge governments and health agencies into the next century. While attempts to stop the spread of cholera have not been totally successful, there have been major achievements in decreasing mortality. This success can be attributed to early efforts made to strengthen case management training in national diarrheal disease control programs, mobilization of international and bilateral funds in support of country intervention and prevention projects, and interagency collaboration with countries.

Project support for essential aspects of epidemiological surveillance, laboratories, correct case management training, disinfection of water, and social communication and education was coordinated with Ministries of Health, PAHO Country Representatives, and the international community. The investments in water, sanitation, and health services needed to eliminate the risk of cholera in the Region are estimated to exceed US\$ 200 billion over the next several years.

Cholera is a disease of global importance that has lasted for almost 200 years, since the first pandemic began in 1817. In early January 1991, cholera reappeared off the western coast of Peru in a small town called Chancay, near Lima. The cause was confirmed to be toxigenic *Vibrio cholerae* O1 El Tor Inaba. Within a matter of days the epidemic spread, peaking with over 20,000 cases per week at the end of March. The direct and indirect costs of this cholera epidemic on Peruvian tourism, exports, fisheries, and certain other activities were estimated to exceed US\$ 150 million.

The epidemic then spread to Ecuador, to a town called Bañoalto in El Oro province. The Ecuadorian index case was a fisherman who had recently visited Peru. The spread of the epidemic to other countries continued rapidly, reaching Colombia initially along the southern Pacific coast, crossing the Andean Mountains to reach the waters of the Amazon River, and spreading into the rainforest within months. Brazil was first infected in April 1991 at the point where the Amazon River enters the country from Peru and Colombia. A small community in central Mexico was infected in June 1991. From there, the disease spread southeast to Central American countries. Bolivia did not detect cases until August 1991. In Chile, it was believed that cholera was spread by the consumption of uncooked vegetables irrigated with raw sewage. By the end of 1991, cholera had infected 15 countries with transmission extending from Mexico to Chile. Nearly 4,000 deaths and 391,000 cases had been reported to PAHO by the end of 1991, more cases than reported worldwide during the previous five years.

Since the onset in Latin America, the cholera epidemic has

progressed across the continent in waves. Reported cholera cases peaked in 1991 in Peru, Ecuador, and Colombia. In 1992, countries bordering the first three had their peak number of cases, and in 1993, cholera cases peaked in countries bordering the "second wave" countries. In Guatemala, cases peaked in 1993, followed by other Central American countries and Mexico in 1994 and 1995. From 1995 to 1997, cholera was still reported in previously affected Latin American countries. Since the beginning of the outbreak, all countries of the Region, except Uruguay, Canada, and the Caribbean islands, have reported cases of cholera.

In Peru and in some Central American countries a persistent pattern of cholera seems to have emerged, suggesting that the infection has become endemic. Peru has registered the highest number of cases up to 1993, and, until 1996, the highest cumulative incidence (2,757 per 100,000 population). Reported cases in Brazil represent approximately 25% of all cases reported in the Region. More than 90% of these cases are concentrated in the northeastern Brazilian states of Ceará, Paraíba, Pernambuco, and Rio Grande do Norte.

Based on country epidemiological reports sent to PAHO from January 1991 to July 1997, 21 countries in the Western Hemisphere reported a cumulative total of 1,199,804 cases of cholera including 11,875 deaths (Table 6). The Region reported a 28% decrease in cholera cases in 1996 compared with 1995. Although the incidence of cholera in the Americas continued to decline, the continent accounted in 1995 for the largest proportion of all reported cases worldwide (including Africa and Asia), but the lowest case-fatality rate (1.0%).

The number of reported cases from 1991–1996 estimated a cumulative cholera incidence rate for the Region of 266 per 100,000 persons (not including the United States). Annual cholera incidence rates for affected countries have decreased from a peak of 89 cases per 100,000 persons in 1991 to 5 cases per 100,000 population in 1996. Cumulative cholera incidence rates calculated from 1991 through 1996 range from a low of 0.14 per 100,000 in Paraguay to a high of 2,757 per 100,000 in Peru.

The countries with cumulative cholera incidence rates greater than 20 per 100,000 persons are concentrated in a band extending from Mexico to the northern border of the Southern Cone countries. The Andean countries in South America, and Guatemala and Nicaragua in Central America had the highest cumulative incidence rates from 1991 through 1996. Cumulative incidence rates were lowest for Chile, Paraguay, and the United States. In 1996, the overall Latin American cholera case-fatality rate (deaths/cases), which had been 1% or less since 1991, was 1.70%.

Although several countries reported cholera outbreaks in 1996 and 1997, the evolution of cholera in the Americas is on the decrease. In 1996, Mexico reported a sharp drop in the number of reported cholera cases for the first time since the

disease reappeared in the country five years before. As of 27 July 1996, 742 cumulative cases had been reported in 1996, compared with the first six months of 1995, when 4,715 cases and 66 deaths were reported. Mexican officials have carried out extensive education campaigns around the country, encouraging people to wash their hands before handling foods and to avoid raw seafood.

In the last week of May 1996, Nicaragua reported an outbreak of cholera in the towns of Boaco and Bocay. Within two weeks, 45 and 53 cases were reported for these towns, respectively. In Costa Rica, four cases were reported in at the beginning of July 1996 in Upala. These cases were reported as imported cases from San Carlos, Nicaragua, near the Costa Rican border. In early 1996, Chile reported one cholera case, which was imported from Bolivia, for the first time since December 1994.

In early 1996, a cholera outbreak was detected in the province of Imbabura in Ecuador, 100 km from the Colombian border. A total of 416 cases and 4 deaths were reported in January, of which 71% (297 cases) corresponded to the Otavalo canton. The majority of cases were reported from the indigenous communities surrounding the city of Otavalo. Cholera cases reported in Imbabura province in January 1996 represented 89% of the total country cases.

In the first half of 1996, 3,285 cases and 16 deaths were reported in Peru. The Departments of Lima and Lima-Callao reported almost 75% of total cases in the country. It is noteworthy that in the 1 January to 22 June 1996 period, the country reported a cumulative total of 3,209 cases compared with 20,449 cases for the same period in 1995, representing a reduction of 84%. The country attributes this reduction to increased epidemiological surveillance and health education. Nevertheless, there were 15,283 cholera cases (with a fatality rate of 0.89%) reported in the first three months of 1998, at least 50% of those from areas directly affected by severe weather phenomena. These figures are 25 times greater than those observed from the same period in 1997 and 3 times the annual country figures for 1996.

The number of reported cholera cases in the United States has jumped markedly in the past five years, mostly brought in by travelers from foreign countries. From 1992 through 1995, 199 cases were reported to the U.S. Centers for Disease Control and Prevention (CDC). This was up significantly from the 136 cases reported in the previous 27 years (1965 through 1991).

During the first five months of 1996, Argentina experienced an epidemic of cholera that peaked in February and was concentrated mainly in Salta Province. The epidemic was responsible for 422 cases and 5 deaths in 1996, with the last case reported on 25 May. In October there was another outbreak of the disease, which raised the cumulative total for the year to 474 cases, or 2.5 times the total for 1995, when 188

cases were reported. The epidemic continued in 1997, peaking in January. As of 15 February 1997, Argentina reported 405 cases, the majority of them (95%) in Salta and Jujuy, along the Bolivian border.

Bolivia reported a total of 2,847 cases and 68 deaths in 1996. In October, the country began its sixth cholera outbreak. The municipalities most affected are Tarija, Beni, Chuquisaca, Santa Cruz, and Cochabamba. Yacuiba, on the border with Argentina, was declared an emergency zone. Between 29 December 1996 and 16 January 1997, Tarija reported 482 cases and 1 death. Street sales of food and beverages were suspended in that municipality due to the suspicion that this practice was responsible for the outbreak. In the first two months of 1997, 946 cases and 7 deaths were reported.

In 1996, Colombia was struck by a cholera epidemic that chiefly affected the Atlantic Coast and the mid-Magdalena region; endemic behavior persisted on the Pacific Coast and outbreaks and isolated cases occurred in the Amazon and Andean regions. There were no cases in the departments of Arauca, Vichada, and Guainía, which border Venezuela, however, the departments of Guajira, Cesar, and Norte de Santander were affected. During February 1996, there was an outbreak in a military base in Guajira that affected 30 soldiers. The department of Guajira accounted for 32% of the cases and 54% of the deaths from cholera in Colombia in 1996. The drought, the migration of salt workers (in June), and above all, the lack of safe drinking water and critical excreta disposal facilities were the main causes of the epidemic in that department. Colombia reported a total of 4,428 cases and 70 deaths in 1996, a 130% increase in cholera cases over 1995.

In September 1996, after a two-year hiatus, cholera was reported in Venezuela in the municipality of Páez in the state of Zulia. This outbreak was associated with the consumption of raw seafood and initially involved 9 people. The epidemic reached the Federal District late in the year, causing 16 cases. At the end of 1996, Venezuela reported a total of 268 cases and 9 deaths. As of the end of October 1997, the country reported 2,190 cases and 50 deaths. The State of Zulia has reported the most cases (711), followed by Mérida (335 cases) and Delta Amacuro (315 cases). The Mérida outbreak started in February 1997 in the southern zone of Lake Maracaibo, adjacent to the state of Mérida. National authorities presumed that the origin of the outbreak was related to the consumption of contaminated fish originating in the state of Zulia. Authorities in neighboring states of Tachira and Trujillo declared an epidemiological alert.

A potential problem in the Region is that the clinical illness associated with *V. cholerae* O139 is reported to be indistinguishable from that caused by *V. cholerae* O1. This newly emerging O139 serogroup has been recognized in the United States, India, and Bangladesh and is likely to spread further,

TABLE 6
Reported cases of and deaths from cholera in the Americas, by country and year, 1991–1997.^a

Country	Cases (deaths) 1991	Cases (deaths) 1992	Cases (deaths) 1993	Cases (deaths) 1994	Cases (deaths) 1995	Cases (deaths) 1996	Cases (deaths) 1997	Total cases (deaths) ^a 1991–1997
South America								
Argentina	0 (0)	553 (15)	2,080 (24)	889 (15)	188 (1)	474 (5)	636 (12)	4,820 (72)
Bolivia	206 (12)	22,260 (383)	10,134 (254)	2,710 (46)	3,136 (86)	2,847 (68)	1,601 (16)	42,894 (865)
Brazil ^b	2,103 (33)	37,572 (462)	60,340 (670)	51,324 (542)	4,954 (96)	1,017 (26)	2,167 (27)	159,477 (1,856)
Chile	41 (2)	73 (1)	32 (0)	1 (0)	0 (0)	1 (0)	... (0)	148 (3)
Colombia	16,800 (291)	13,287 (170)	609 (11)	996 (14)	1,922 (35)	4,428 (70)	1,082 (25)	39,124 (616)
Ecuador	46,284 (697)	31,870 (208)	6,883 (72)	1,785 (16)	2,160 (23)	1,059 (12)	... (0)	90,041 (1,028)
French Guiana	1 (0)	16 (0)	2 (0)	... (0)	... (0)	... (0)	... (0)	19 (0)
Guyana	0 (0)	556 (8)	66 (2)	0 (0)	0 (0)	0 (0)	... (0)	622 (10)
Paraguay	0 (0)	0 (0)	3 (0)	0 (0)	0 (0)	4 (0)	0 (0)	7 (0)
Peru	322,562 (2,909)	210,836 (727)	71,448 (575)	23,887 (199)	22,397 (171)	4,518 (21)	1,308 (...)	656,956 (4,602)
Suriname	0 (0)	12 (1)	0 (0)	0 (0)	0 (0)	0 (0)	... (0)	12 (1)
Venezuela	13 (2)	2,842 (68)	409 (10)	0 (0)	0 (0)	268 (9)	2,190 (50)	5,722 (139)

Central America and North America

Belize	0	159	135	6	19	26	0	345
	(0)	(4)	(3)	(1)	(0)	(0)	(0)	(8)
Costa Rica	0	12	13	38	24	36	1	124
	(0)	(0)	(0)	(0)	(0)	(1)	(0)	(1)
El Salvador	947	8,106	6,573	11,739	2,923	182	0	30,470
	(34)	(45)	(14)	(40)	(5)	(2)	(0)	(140)
Guatemala	3,664	15,861	30,821	16,779	7,970	1,568	551	77,214
	(50)	(227)	(306)	(156)	(95)	(14)	(0)	(848)
Honduras	17	407	4,013	5,049	4,717	708	51	14,962
	(0)	(103)	(102)	(102)	(77)	(14)	(2)	(400)
Mexico	2,690	8,162	10,712	4,059	16,430	1,088	77	43,218
	(34)	(99)	(193)	(56)	(137)	(5)	(1)	(525)
Nicaragua	1	3,067	6,631	7,881	8,825	2,813	447	29,665
	(0)	(46)	(220)	(134)	(164)	(107)	(7)	(678)
Panama	1,178	2,416	42	0	0	0	0	3,636
	(29)	(49)	(4)	(0)	(0)	(0)	(0)	(82)
United States of America	26	102	18	34	20	5	...	205
	(0)	(1)	(0)	(0)	(0)	(0)		(1)
Total cases	396,533	358,169	210,964	127,177	75,685	21,042	10,234	1,199,804
(deaths)	(4,093)	(2,617)	(2,460)	(1,321)	(890)	(354)	(140)	(11,875)

^aData are provisional; 1997 figures include data reported up to July 26.

^bReviewed and updated country data for 1993–1996.

Source: Country reports.

especially in areas with poor water supply and inadequate sanitation. Although the strain has not been reported in Latin America, it could have pandemic potential, emphasizing the need to strengthen surveillance in the Region.

The Pan American Health Organization monitors countries reporting cholera in order to: 1) provide an official, comprehensive regional database to follow trends, 2) prepare for the endemic nature of cholera, and 3) provide an official reporting system for the possible arrival of *V. cholerae* O139. Reports are submitted by the Ministries of Health to PAHO through the PAHO Country Representations. Surveillance yields information needed to provide prompt international aid to those countries affected.

From the beginning of the epidemic in the Americas, country surveillance was found to be incomplete. Although country efforts to standardize case definitions and reporting format are improving, there is still little uniformity in the method or regularity of reporting, and in the format or content of the data sent by the countries. Many of these inconsistencies surround the definition of what constitutes a case of cholera.

The disease has a clinical spectrum ranging from mild, nonspecific diarrhea to severe purging with dehydration. PAHO has developed two sets of cholera case definitions for international reporting. One is for areas with no known cholera and the other is for areas affected by an epidemic. The use of a uniform cholera case definition which is simple, does not require an excessive use of resources, and can be applied with an acceptable degree of consistency would prevent fluctuations in data collection and reporting and allow for better quality data.

Since the beginning of the epidemic, the countries of the Region and PAHO intensified support for country projects. Projects were financed by the Organization of Petroleum Exporting Countries Fund for International Development; the Governments of Sweden, Italy, Netherlands, and Germany; the U.S. Centers for Disease Control and Prevention (CDC); and the PAHO Director's Cholera Emergency Fund. The largest mobilization of financial resources was established with the Inter-American Development Bank (IDB). With support from the international community, many country activities and long-lasting solutions were accomplished in these two areas. During the 1991–1996 period, financial assistance for the prevention and control of cholera in the Region of the Americas reached almost US\$ 12.0 million.

Prevention and control measures implemented since 1991 have led to a very encouraging downward trend in the reported incidence of cholera, but the disease continues to spread, causing preventable morbidity and mortality and economic impact in countries. *V. cholerae* of the El Tor biotype is now endemic, showing seasonal patterns in many countries of Latin America with no signs of retreat. This pattern will persist in many countries unless substantial improvements

are made in water distribution and sewerage treatment systems, education is provided in proper food preparation and hygiene, and improved vaccines are developed to control the spread of cholera.

Recently, considerable attention has been given to the serious threat posed by new, emerging, and reemerging diseases, including antimicrobial drug resistance. This is perhaps one of the most alarming of the problems presented by emerging infections. There is an urgent need to strengthen surveillance systems already in place for cholera, to set up surveillance for antibiotic resistance, to prepare plans and timetables, and to establish coordinating mechanisms for surveillance of infectious disease. Resistance is spreading among Latin American strains of *V. cholerae* and high level resistance could be anticipated to develop in the near future. PAHO, in collaboration with the Government of Canada's Laboratory Center for Disease Control, embarked on a regional research project to enhance laboratory and epidemiological infrastructure and expertise for the surveillance of targeted enteric pathogens in eight countries of the Region (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, and Venezuela). Participating countries will improve their capability for surveillance of *V. cholerae* (as well as for *Salmonella* and *Shigella*).

Other Intestinal Infectious Diseases

Intestinal parasitic diseases caused by helminths chronically affect about one-third of the world's population. The inhabitants of developing countries, particularly tropical countries, tend to be most affected, reflecting their social and economic situation. Ascariasis, trichuriasis, and hookworm infections have been reported in 150 of 208 countries worldwide. In 1993, the World Bank estimated the global burden of disease by quantifying the effects of loss of a healthy life resulting from disability or premature death. In the Americas, intestinal helminthic infections represent a burden of disease estimated at 2.4 million disability-adjusted life years (DALYs) lost. Average figures for helminthic infections indicate that they affect between 20% and 30% of the general population. Prevalence is estimated as high as 60%–80% in some highly endemic areas.

Efforts have been made for years to control helminthic infections in Latin America. The most successful control programs treat children periodically with appropriate medicines, train health workers in laboratory analysis, and provide health education and social communication activities in the community. In this way, the intensity of helminthic infestations can be reduced to levels that will cause little, if any, disease, and at the same time reduce the risk of infection. A study carried out in Mexico from October 1993 to February 1995 showed a reduction of over 90% of the worm burden in

the sentinel population after five quarterly treatments in a population of 12 million preschool and school-aged children.

In 1996, a regional meeting was held in Honduras to define the basis for interagency and intercountry cooperation and develop a standardized protocol for the Elimination of Intestinal Parasites in Children (PEPIN) in four Central American countries (El Salvador, Guatemala, Honduras, and Nicaragua). PEPIN aims to reduce morbidity from geohelminths through targeted chemotherapy and improved health education, social communication, and environmental practices. At this meeting it was decided that: 1) quantitative parasitological studies would be carried out to determine the intensity of infection and to support follow-up studies; 2) the purpose of country programs should not be to cure every case of helminthic infection but to reduce prevalence progressively until low rates of transmission are achieved; and 3) a single dose of antihelminthic drug (mebendazole 500mg) would be administered every four to six months for a minimum of two years in children 2 to 15 years of age. Results from stool examinations would be used to calculate assessment indicators for the control program, compare results before and after treatment, and measure the degree of program success.

The Pan American Health Organization, in coordination with ministries of health, is working with several nongovernmental organizations in this effort. Representatives from CARITAS International, the Catholic Medical Mission Board, and Catholic Relief Services are cooperating to distribute drugs to local schools, health clinics, and community centers in targeted communities and to provide health education and materials in support of issues such as nutrition, health services, and environmental sanitation.

Implementation of PEPIN has had promising results. In El Salvador, intervention areas covered 149,791 children and diagnostic studies were carried out in 417 children. Study results showed high prevalence of *Ascaris lumbricoides* (above 30%) and a smaller prevalence of *Trichuris trichiura* (20%) and hookworm (12.5%). In Guatemala, 170,179 cases of soil-transmitted helminthiases were reported for all ages from January to September 1994 and 118,345 cases in children under age 15. The country plans to treat 1,500,000 children between 1996 and 1998. In 1996, the intervention area in Guatemala was defined with 342,000 children. Subsequently, a survey carried out at the community level in 932 children under 15 years of age indicated a high prevalence of *Ascaris lumbricoides* (31.7%), *Trichuris trichiura* (23.3%), and hookworm (39.5%).

In Nicaragua, the First National Health Day in 1996 had an enormous impact on reducing the prevalence of helminths in the district of Granada: prevalence dropped from 58.6% to 32.0% in children under age 15. In Managua, the impact was less dramatic, dropping from 43.3% to 40.1%. In the district

of Chontales, the measured rates actually rose, from 51.8% to 52.8%. As expected, a correlation was observed between the effective reduction of helminths and the percentage of children who received treatment in each district. In Granada, 83% of children were treated compared with Managua and Chontales, where coverage was only 38% and 44%, respectively. Reductions in the average parasitic load were observed in all cases. In Granada the average load of *Trichiuris* was estimated at 362 eggs per gram (epg) before National Health Day, and was 194 epg after the administration of mebendazole. In the same district, the reduction in the average parasitic load of *Ascaris* was even greater, falling from 3,785 epg to 526 epg. In Chontales the average parasitic load for *Trichiuris* dropped from 263 epg to 158 epg, and for *Ascaris* it dropped from 858 epg to 525 epg.

The current tools for the control of intestinal helminthic infections are adequate to achieve a substantial impact on the health of the population through parasite-specific control programs and through integration with existing country programs (e.g., environmental sanitation and improvement, prevention and control of diarrheal diseases and acute respiratory infections, maternal and child health, nutrition, and health education and mass communication). The PEPIN component will be included as part of the Regional Integrated Management of Childhood Illness strategy to prevent and control helminthic infections in children from 2 to 14 years old.

CHRONIC COMMUNICABLE DISEASES

Tuberculosis

Even though tuberculosis is both preventable and curable, it remains an important public health threat in the Region of the Americas. Despite effective medicines, treatments, and control measures that have been available for decades, the disease is becoming more common worldwide—a situation that led the World Health Organization to declare tuberculosis a “global sanitary emergency” in 1993.

Several factors, including the HIV pandemic and population growth, have aggravated the tuberculosis problem in some countries of the Region. The prevailing socioeconomic situation, whereby needs far outweigh the resources available to meet them, has intensified poverty in several countries, leading to greater inequity in the provision of health services to the people. In addition, the increase of the marginalized population in large urban centers and more population shifts in search of a better life, combined with the weakening of control programs as a result of economic readjustments, have made treatment more erratic. In response to irregular treatment, the causative agent has become resistant to antituberculous medications.

Incidence

In 1995, 244,381 cases of tuberculosis were reported to WHO and PAHO from 32 countries and 6 territories in the Region of the Americas (a rate of 31.5 cases per 100,000 population). These cases represented about 7.5% of the more than 3.2 million cases reported to WHO worldwide (33). Data submitted by the Region's countries to PAHO for 1996 show that reported cases totaled 253,867 (32.2 per 100,000 population), a figure similar to that of the previous year.

Between 1986 and 1996, the annual number of cases reported to PAHO generally ranged from 230,000 to 250,000, with an incidence rate of 31 to 35 per 100,000 population. The fact that there was no clear-cut trend in incidence at the regional level is attributable to several factors, primarily to problems with the quality of registration and information systems in many of the countries. If incidence rates in individual countries are examined, widely varying trends can be seen; a few countries, such as Chile, Cuba, and Uruguay, show a clear decline. Table 7 presents the number of reported cases and the incidence rates in the countries of the Region between 1994 and 1996. PAHO estimates that close to one-third of the new cases in the Region are not reported, and some of these cases are probably never diagnosed. This situation fosters increased morbidity, mortality, and disease transmission.

Based on study results and estimates of tuberculosis prevalence in the Region, together with estimates of health system coverage and the quality of tuberculosis diagnostic services, PAHO calculated that more than 50,000 people in the Region died of tuberculosis in 1995 and that more than 400,000 new cases were contracted, over half of them in Brazil, Mexico, and Peru. The mortality number is more conservative than the 84,000 deaths estimated by WHO, the World Bank, and Harvard University in a global study of the burden of disease, while the estimate of new cases is close to the latter study's figure of 381,000 (34). In nine countries (Bolivia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Paraguay, and Peru) the incidence rates of tuberculosis are considered severe (more than 85 per 100,000); some of these countries have reported or estimated case rates similar to those found in the African and Asian countries that are hit hardest by tuberculosis.

After several decades of declining incidence, tuberculosis re-emerged in the United States of America between 1988 and 1992, with a 16% increase in case notification and the occurrence of multi-drug-resistant outbreaks. Several factors contributed to this re-emergence, among them the reduction in resources aimed at maintaining health services infrastructure, surveillance, and community participation and the rise of the HIV/AIDS epidemic. The increase in the number of tuberculosis cases was particularly great among

high-risk population groups in large cities (HIV-infected people, drug addicts, and the homeless). Political and financial commitment, as well as the use of "directly observed treatment, short-course" strategy (DOTS), helped bring about a renewed decline in incidence rates of active tuberculosis, beginning in 1993. A similar response has been seen in Peru since 1991, when an effective case-finding program produced a reduction in transmission, leading to decreased incidence.

In Canada, after declining for decades, the incidence rate of tuberculosis has been essentially level since 1987. Of the active cases reported in 1995, 58% were in individuals from other countries.

Information from countries that have age-specific and sex-specific data on tuberculosis incidence rates reveals that most reported cases (55% on average) occur in persons 25–54 years of age. The current distribution by sex of reported cases is around 60% in males and 40% in females. The case distribution by sex shows modest variations in the Region, although the age- and sex-specific rates follow the general patterns seen in other regions and described in the literature. The rates in males are higher in all age groups except children (and, in some countries, the group 15–24 years old), and the difference is greatest in the older age groups.

Tuberculosis Associated with HIV Infection

A 1994 study of the HIV/AIDS and tuberculosis epidemics in Latin America and the Caribbean calculated that more than 330,000 people were co-infected with *Mycobacterium tuberculosis* and HIV (35). Based on current estimates from WHO, as well as prevalence studies carried out in the Region to gauge the intensity of both HIV and *M. tuberculosis* infection and the likelihood of a disease crisis in each country, between 3% and 5% of all the new tuberculosis cases in the Region are attributable to co-infection with HIV. For example, in the city of Buenos Aires deaths from tuberculosis rose 76% (from 45 to 79) between 1982 and 1992; almost all the deaths were of young adults. In the same time period the number of tuberculosis patients who were seropositive for HIV rose from 4 (3%) to 177 (21%) (36). In Brazil, if observed trends continue each year for the next decade, it is predicted that the HIV pandemic will give rise to a "surplus" of tuberculosis cases equal to 10% of the total number expected (37).

Control and Treatment Programs. The strategy known as "directly observed treatment, short-course" (DOTS) is one of the most cost-effective and feasible interventions against tuberculosis in poor countries. The five elements that are critical to the success of this global strategy are government com-

TABLE 7
Number of reported cases and incidence rate per 100,000 population of tuberculosis, Region of the Americas, 1994–1996.

Subregion and country	1994				1995				1996			
	Smear+		Total		Smear+		Total		BK+		Total	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Total	142,338	18.7	242,309	31.8	139,825	18.1	244,385	31.6	126,492	16.0	253,867	32.2
Latin America	127,761	27.4	215,065	46.1	131,483	27.7	218,892	46.1	126,203	26.1	229,909	47.6
Andean Area	56,774	57.7	81,495	82.8	54,899	54.7	78,236	78.0	48,872	47.9	73,538	72.1
Bolivia	6,905	95.4	9,431	130.3	7,010	86.8	9,614	119.1	6,949	91.5	10,194	134.3
Colombia	6,532	18.9	8,901	25.8	7,530	21.5	9,912	28.2	7,572	20.8	9,702	26.6
Ecuador	6,674	59.5	9,685	86.3	5,236	44.3	7,893	66.8	4,356	37.2	6,327	54.1
Peru	33,925	145.4	48,601	208.3	32,096	134.6	45,310	189.9	26,800	111.9	41,739	174.3
Venezuela	2,738	12.8	4,877	22.8	3,027	14.1	5,507	26.6	3,195	14.3	5,576	25.0
Southern Cone	8,901	15.9	20,337	36.4	8,645	15.3	19,981	35.3	8,587	14.9	20,284	35.1
Argentina	5,696	16.7	13,683	40.0	5,698	16.6	13,433	39.2	5,787	16.4	13,397	38.0
Chile	1,951	13.9	4,138	29.5	1,851	13.0	4,150	29.2	1,480	10.3	4,038	28.0
Paraguay	873	18.1	1,850	38.3	748	15.3	1,773	36.2	894	18.0	2,148	43.3
Uruguay	381	12.0	666	21.0	348	11.0	625	19.6	426	13.3	701	21.9
Brazil	39,167	24.6	75,759	47.6	45,650	28.3	88,109	54.6	44,501	27.6	87,254	54.2 ^a
Central American Isthmus	9,102	28.3	14,829	46.1	9,922	30.0	15,314	46.3	7,780	23.5	13,675	41.2
Belize	36	17.1	59	28.1	22	10.5	61	29.0	20	9.1	53	24.2
Costa Rica	230	6.9	325	9.7	219	6.4	321	9.4	122	3.5	162	4.6
El Salvador	2,144	38.0	3,901	69.2	2,241	38.9	2,422	42.0	965	16.6	1,686	29.1
Guatemala	1,944	19.3	2,676	25.9	2,368	22.3	3,368	31.7	2,308	21.1	3,496	32.0
Honduras	2,385	41.1	4,291	78.1	2,438	40.9	4,984	83.5	1,739	29.9	4,176	71.8
Nicaragua	1,615	37.8	2,750	64.3	1,568	35.4	2,842	64.1	1,722	40.6	3,003	70.9
Panama	748	28.9	827	32.0	1,066	40.1	1,316	49.5	904	33.8	1,099	41.1
Mexico ^b	9,726	10.6	16,353	17.8	9,220	9.8	11,329	12.1	8,495	9.2	20,722	22.2
Latin Caribbean	4,091	13.9	6,292	21.4	3,147	10.5	5,923	19.8	7,968	26.6	14,436	48.2
Cuba	914	8.3	1,681	15.3	834	7.5	1,607	14.5	835	7.6	1,579	14.3
Dominican Republic	3,177	40.9	4,337	55.8	2,187	27.6	4,053	51.2	3,609	45.3	6,006	75.4
Haiti	...	...	...	...	...	...	...	...	3,524	48.5	6,632	91.4
Puerto Rico	...	...	274	7.5	126	3.4	263	7.1	NA	NA	219	5.9
Caribbean	231	3.1	809	10.8	327	4.3	699	9.3	289	4.4	781	11.8
Anguilla	...	...	...	...	...	...	2	25.0	...	...	...	...
Antigua and Barbuda	...	...	...	...	...	...	...	...	2	3.0	5	7.6
Aruba	...	...	...	...	...	...	...	...	...	...	...	...
Bahamas	41	15.1	78	28.7	37	13.7	57	21.2	26	9.2	59	20.8
Barbados	...	...	...	...	...	...	...	...	3	1.1	3	1.1
Cayman Islands	...	...	...	...	...	...	3	9.1	...	...	...	...
Dominica	8	11.3	12	16.9	5	7.0	8	11.3	7	9.9	10	14.1
French Guiana	...	...	28	25.2	...	...	...	...	...	...	...	...
Grenada	3	3.3	3	3.3	2	2.2	2	2.2	...	...	...	...
Guadeloupe	...	...	41	10.0	...	...	...	...	...	...	...	...
Guyana	61	7.4	266	32.2	85	10.2	296	35.5	71	8.5	314	37.5
Jamaica	61	2.5	109	4.5	91	3.6	109	4.3	75	3.0	121	4.9
Martinique	...	...	54	14.4	...	...	...	...	...	...	...	...
Montserrat	...	...	...	...	...	...	...	...	...	...	...	...
Netherlands Antilles	...	...	...	...	...	...	...	...	...	...	...	...
Saint Kitts and Nevis	2	4.9	2	4.9	4	9.8	4	9.8	2	4.9	3	7.3
Saint Vincent and the Grenadines	...	...	...	...	13	11.6	24	21.4	...	...	...	...
Saint Lucia	...	...	24	17.0	12	8.5	12	8.5	...	...	...	...
Suriname	...	...	53	12.7	...	...	...	...	39	9.0	53	12.3
Trinidad and Tobago	55	4.3	129	10.0	76	5.8	178	13.6	59	4.5	205	15.8
Turks and Caicos Is.	...	...	...	...	...	...	...	...	...	...	...	...
Virgin Islands (US)	...	...	10	9.6	2	1.85	4	3.7	5	4.7	8	7.5
North America	14,346	5.0	26,435	9.2	8,015	2.7	24,794	8.5	NA	...	23,177	7.7
Bermuda	...	...	...	...	2	3.2	4	6.3	...	...	...	...
Canada	...	...	2,074	7.4	...	...	1,930	6.5	NA	...	1,840	6.2
United States	14,346	5.5	24,361	9.4	8,013	3.05	22,860	8.7	NA	...	21,337	7.9

Smear+: Pulmonary case with bacteria present in sputum. NA: Not applicable (diagnosed by culture).

^a Includes partial data for São Paulo.

^b Mexico 1994–1995: data from the Secretariat of Health; 1996: data on BK+ cases from the Secretariat of Health; the case total includes other institutions.

mitment to the tuberculosis control program; detection of cases, especially in persons who come to the health services with respiratory symptoms; standardized short-course directly observed treatment of all cases with a positive microscopic sputum examination; a steady supply of medicines; and a registration and information system (38).

Using DOTS, some countries of the Region, such as Chile, Cuba, and Uruguay, now detect more than 70% of the new cases with positive microscopy and have surpassed the goal of an 85% cure rate. Other countries, such as Nicaragua and Peru, have made major advances in the past five years in implementing efficient control programs for the detection and treatment of cases. The United States has used DOTS successfully during the past five years, reversing the trend of the epidemic. Bolivia, Guatemala, Mexico, and Venezuela also use the revised control strategy, having expanded it from demonstration areas and emphasizing case detection and the supervised treatment of patients. Argentina, Belize, Brazil, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Haiti, Honduras, Panama, and Paraguay have recognized DOTS as a basic element in their control strategy and have taken steps to incorporate it, including guaranteeing a sufficient supply of medicines to treat all reported cases and preparing training plans for health personnel. However, despite all the advances, most countries still need to speed up this process, recognize the severity of the tuberculosis situation, and dedicate resources to the essential activities of control programs.

The countries of the English-speaking Caribbean have been hindered from carrying out a coordinated set of interventions to control tuberculosis by the absence of formal control programs and by limitations inherent to the public health infrastructure. Several of these countries have begun to organize programs and set control standards.

Throughout the Region, the ministries of health supply most of the resources to operate control programs, including medicines; however, budgets have been reduced considerably in the past two decades and other public health priorities consume most of the resources. Nevertheless, in recent years several countries with high incidence rates of tuberculosis have managed to secure external funds from bilateral cooperation agencies and nongovernmental organizations. Some countries have targeted more funds from the national treasury toward the purchase of medicines and supplies for tuberculosis control programs.

Short-course treatment for tuberculosis lasts six to eight months in most of the Region's programs and consists of a therapeutic regimen of four essential drugs in the initial phase. Studies have demonstrated clearly that if pill taking is not supervised, patients tend to abandon treatment long before it is scheduled to end or to take their medicines sporadically. A great advantage in the Americas, unlike other

regions, is that the majority of national control programs adopted supervised treatment at least 10 years ago. In many countries of the Region with a widely scattered rural population that lives far from health establishments (for example, Bolivia and Guatemala), volunteers or community health aides are being trained to administer this therapy. Nevertheless, patients often are given some or all of their medicine to take home with them, and, as a result, the cure rate in many countries is only 70% of those registered for treatment. It is imperative, therefore, that more countries strive to achieve complete compliance with DOTS standards and procedures.

Although DOTS is not yet in use in the English-speaking Caribbean, the health authorities offer short-course treatment with hospitalization during the first four to six weeks. This regimen probably limits transmission and allows for the sputum to convert to negative.

The vast majority of the control programs in the Region depend on their national governments for the acquisition of needed drugs. Few countries have sufficient reserves, and delays in authorizing purchases or in transferring funds often translate into a scarcity of medicines. Finally, in many countries rifampicin and other antituberculous drugs are sold without prescription. International organizations, ministries of health, pharmaceutical companies, and medical and pharmaceutical associations need to carry out joint studies on the best ways to promote the rational use and control of these drugs.

Case-Finding and Laboratory Capacity

The identification of persons with symptoms (mainly cough and expectoration) and their examination using low-cost techniques is critical for the detection and diagnosis of tuberculosis cases. Although there are limitations in some countries of the Region, most of them have reasonably good coverage of medical examination services and of laboratories capable of carrying out a microscopic sputum examination. Most cases of infectious tuberculosis can be found by these means. Nevertheless, in many countries an average of a single diagnostic sputum exam is performed for each patient with respiratory symptoms, which means that 25% or more of the infectious cases that present at the health services are being missed. The English-speaking Caribbean countries do not have an adequate number of laboratories that perform sputum microscopy. In Canada, the United States, and some Caribbean countries, diagnosis is based on bacterial culture because of the greater availability of that method. Quality control of microscopic sputum exams and adequate access to tests for drug sensitivity are other aspects that need to be improved in most countries.

Program Follow-Up and Evaluation

In order for tuberculosis to be effectively controlled, there must be uninterrupted surveillance of the disease and its changing characteristics through case notification, as well as monitoring and evaluation of programs. The analysis of treatment outcomes in cohorts of registered patients is most important. One strength of the control programs in the Region is the existence of guidelines for the routine notification of cases. Most countries compile annual statistics on reported cases and perform analyses based on indicators of process, production, and results. Many Latin American countries also have begun using the treatment registers recommended by WHO and PAHO. However, data coverage and quality are still flawed in many programs, and analysis at the local level can be inadequate.

In 1997, 25 countries and territories in the Region issued reports analyzing the results of treatment of cohorts of patients who had positive microscopic exams in 1995. The 11 countries and one territory using DOTS reported a total of 53,149 such cases. At the end of the short-course treatment, 67.7% of the cases met the criteria for cure (negative microscopic sputum exam), and 76.3% for cure and complete treatment. Taking into account only the evaluated cases that were within the total number registered, the success rate rises to 84%. A different situation was seen in the 13 countries and territories that reported cases but did not comply completely with the DOTS strategy. Those countries reported 72,705 cases, but the cure rate was only 11.8%; it rose to 29.8% by adding cases who completed treatment but did not meet bacteriologic criteria. The success rate in this group was 72.9% when only the evaluated cases were considered within the total registered. These results underscore the need for all countries in the Region to adapt the DOTS strategy fully.

Surveillance of Drug Resistance

Experience in many countries has shown that insufficient or inadequate treatment of tuberculosis, along with unregulated access to antituberculous medications, promotes selection and propagation of drug-resistant strains, making tuberculosis much more difficult and costly to treat and cure.

As part of a Global Project coordinated by WHO and the International Union against Tuberculosis and Lung Disease (IUATLD), 11 countries (Argentina, Bolivia, Brazil, Chile, Cuba, Dominican Republic, Mexico, Nicaragua, Paraguay, Peru, and United States of America) have completed or are conducting national surveys of the drug resistance of tuberculosis in representative population samples. Table 8 shows the results of these studies. In most of the countries involved, multi-drug resistance (defined as resistance to rifampicin

TABLE 8
Primary resistance to antituberculous medications in selected countries of Latin America and the Caribbean, based on national surveys carried out between 1994 and 1997.

Country	Isoniazid %	Rifampicin %	Streptomycin %	Ethambutol %	PR ^a %	MDR ^b %
Argentina	7.8	5.1	7.6	3.1	12.5	4.6
Bolivia	10.2	6.0	9.8	5.0	23.9	1.2
Brazil	5.9	1.1	3.6	0.1	8.6	0.9
Cuba	2.0	0.9	6.9	0.0	8.3	0.7
Peru	7.5	4.6	8.7	1.6	15.4	2.5
Dominican Republic	19.8	16.2	21.1	3.6	40.6	6.6

^aPR: Primary resistance to one or more medications.

^bMDR: Multi-drug resistance (resistant to isoniazid and rifampicin).

Source: World Health Organization. *Anti-tuberculosis drug resistance in the world*. Geneva: WHO; 1997. (Document WHO/TB/97.229).

and isoniazid) is already present, although so far it exists in only a small percentage of new tuberculosis cases. Data are not yet available to establish how rapidly or widely drug resistance is spreading.

Leprosy

Leprosy could be eliminated as a public health problem in the Americas through mass use of multidrug therapy (MDT), as recommended by PAHO in 1981. There has been considerable progress toward meeting this goal since the Conference to Eliminate Leprosy in the Americas was held in Mexico in 1991. The Regional Action Plan for the Elimination of Leprosy in the Americas, which PAHO implemented in March 1992, enabled countries to come up with national plans to eliminate the disease. By the end of 1995, those plans were being carried out in every Latin American country where leprosy is endemic. Some countries also developed and carried out subnational plans, thanks to a management training program on leprosy for technical staff from various levels of the health systems. The program began in 1992 and is ongoing. The process of development, execution, follow-up, and evaluation of these plans is carried out with the technical cooperation of the Regional Program for the Elimination of Leprosy [LEP-PAHO].

The following analysis is limited to Latin American countries, because the areas in the Americas where leprosy is endemic do not include Canada, Chile, and the United States, and the problem is not significant in Guyana, Suriname, and the English-speaking Caribbean countries.

TABLE 9
Status of leprosy in Latin America, 1996.

Country	Recorded cases	Prevalence per 10,000 people	New cases	Detection rate per 10,000 people	MDT coverage (%)
Argentina	3,294	0.94	565	0.16	100.0
Bolivia ^a	716	0.94	32	0.04	...
Brazil ^a	105,744	6.43	39,792	2.42	89.0
Colombia	4,262	1.19	709	0.20	100.0
Costa Rica	158	0.45	26	0.07	48.1
Cuba	626	0.56	270	0.24	99.7
Ecuador	579	0.49	82	0.07	100.0
El Salvador	29	0.05	9	0.02	100.0
Guatemala	77	0.07	1	0.00	75.3
Haiti ^a	114	0.16	72	0.10	...
Honduras	86	0.15	1	0.00	100.0
Mexico	3,565	0.38	562	0.06	63.3
Nicaragua	205	0.45	26	0.06	49.8
Panama ^a	38	0.14	3	0.01	...
Paraguay	957	1.88	384	0.75	100.0
Peru	264	0.11	92	0.04	100.0
Dominican Republic	486	0.61	283	0.35	92.2
Uruguay	59	0.18	15	0.05	94.9
Venezuela	2,859	1.28	534	0.24	97.0
Latin America	124,118	2.69	43,458	0.94	89.2

^a Preliminary estimates.

Sources: PAHO, Regional Leprosy Program. Information System on Leprosy, WHO, Regional Leprosy Program. *Health Conditions in the Americas: Basic Indicators 1995*. Washington, DC: 1997. (OPS/HDA/97.02).

During the 1991–1996 period, the prevalence of leprosy in Latin America declined from 8.1 to 2.7 per 10,000 population, a reduction of 66.7%. The average annual decrease was 13.3%. Until 1991, leprosy continued to be a public health problem in 12 countries, but by 1996 that number was reduced to 4. The overall prevalence rate for the Americas was reduced from 4.8 per 10,000 population in 1991 to 1.6 in 1996.

By the end of 1996, prevalence rates in most Latin American countries were consistent with elimination of the disease (Table 9). In the past three years, Argentina, Cuba, the Dominican Republic, and Mexico have reached the goal of eliminating leprosy. Colombia, Paraguay, and Venezuela have levels slightly over 1 per 10,000, and only Brazil maintained a rate over 6 per 10,000, which nevertheless represented a 65% decrease during the 1991–1996 period.

Reduction in the prevalence of leprosy during the 1991–1996 period is tied to expanded MDT coverage, which increased from 23.9% to 89.2% (a 65.3% increase). In 1996,

coverage was higher in most countries (Table 1), all of which received, free of charge through LEP-PAHO, enough medicine to administer MDT to anyone needing it. However, in some countries treatment is irregular and the treatment dropout rate is high.

Although prevalence rates are clearly declining, there still is no significant change in detection of new cases, which have maintained similar numbers and rates in most Latin American countries (Table 9). This can be explained by the unfavorable interaction of epidemiological and operational factors that influence detection of new cases. In terms of epidemiology, MDT affects transmission of leprosy by eliminating the sources of infection, but, because the disease usually has a prolonged incubation period, that effect is not evident for about 10 years. The operational factor refers to reorganization of local- and intermediate-level health services, which occurs as soon as the new therapeutic regimen begins and which improves the effectiveness of activities related to timely diagnosis of cases.

Execution of the Regional Plan for the Elimination of Leprosy and widespread expansion of MDT have made early diagnosis of leprosy possible, with the resulting reduction in disabilities from the disease. The benefit of this development still cannot be quantified, because data for previous years are not available. Nevertheless, disabilities continue to be the most serious consequence of leprosy: 23.1% of patients who were diagnosed and evaluated in 1996 showed some degree of disability at the time of diagnosis, and 7.2% of them suffered deformities.

In consideration of decentralization efforts affecting large portions of the health systems in Latin American countries, one of the Regional Plan's strategies involves focusing on the geographic stratification of leprosy based on epidemiological and operational criteria. Interventions will be most effective if the *municipios* or districts in large cities where the problem is most serious are identified and efforts and resources are concentrated in those areas. In addition, identifying geographic areas where the disease is not a problem but that border areas where incidence is high has made it possible to identify high-risk populations by residence.

In some countries of the Region where leprosy is endemic, the BCG vaccination is used as a primary prevention mechanism. The rationale is based on results of clinical trials of the antileprosy vaccine carried out recently in Venezuela and Malawi. This intervention is not universally accepted, nor is it recommended by PAHO because of its unsuitable cost-benefit ratio, limited acceptance by patients, operational problems, and contraindications for people who are HIV-positive. Because specific primary prevention measures recommended by PAHO are not available, the recommended interventions are based on secondary prevention through early diagnosis and treatment with MDT.

The LEP-PAHO Regional Program supports subregional initiatives in groups of countries or in regions of several countries that have been designed according to the geographic distribution of the disease and other factors. The objectives of this strategy are to promote cooperation among countries in conducting epidemiological surveillance along border areas; to designate focal points for coordinated action at the local level; to identify areas that are candidates for special projects related to application of MDT in people who have limited access to health services or who have hidden incidence of the disease; and to improve the logistics of distribution of drugs specifically for MDT, particularly among smaller countries. Such initiatives are currently under way in Central America, the English-speaking Caribbean, the Southern Cone, and the Amazon region. The principal sources of financing for this work, excluding provision of drugs for MDT, are national health budgets, which account for 70% to 80% of the funds needed. Specialized national and international nongovernmental organizations provide be-

tween 20% and 35% for each country, and the LEP-PAHO Regional Program provides approximately 5%.

ZOONOSSES

The zoonoses and communicable diseases common to humans and animals continue to show high incidence rates in the Region's countries. These diseases cause considerable human morbidity and mortality and produce significant economic losses in the livestock sector.

In the last 15 years, the countries of the Americas have modified their agricultural and stock-raising practices in order to produce more on less land. As a result, the populations of almost all species of domestic animals have increased, especially those whose products are most accessible to the population, such as poultry. For example, since 1992 the consumption of chicken has risen 170%. These changes in animal production patterns and the population's eating habits have been accompanied by alterations in the transmission of zoonotic infections and in the distribution and types of environmental contaminants.

The eradication of some zoonoses has had a substantial impact on international trade in animals and animal products in the Americas, generating expectations that the countries will garner a greater share of the international market. Subregional initiatives and the creation of the World Trade Organization (WTO) have helped strengthen regulations on international commerce in foods and products of animal origin and also have prompted the countries to improve their production and manufacturing systems. The effect has been that higher quality and safety standards are maintained, not only for export products but also for those used domestically.

In general, zoonotic and parasitic infections are more prevalent in rural areas, where the morbidity level often is high and affects productivity, leading to substantial economic losses. Nevertheless, the incidence and prevalence of zoonoses in urban areas have risen, and as infected persons migrate to cities from rural areas, transmission of zoonoses is promoted and the burden on health services is increased.

Despite technological and scientific advances of recent years, the strategies and methods employed for surveillance, prevention, and control of zoonoses continue to be inadequate.

Rabies

Rabies remains a public health concern, in spite of the countries' efforts to eliminate rabies transmission by dogs. Although the regional initiative for the elimination of rabies in

TABLE 10
Human rabies. Number of cases by subregion and country, Latin America and the Caribbean, 1970–1997.

Subregion and country	Annual average			Year		
	1970–1979	1980–1989	1990–1994	1995	1996	1997
Andean Area	52	93	81	63	94	29
Bolivia	3	12	13	8	3	7
Colombia	12	18	6	9	3	3
Ecuador	18	23	22	20	65	8
Peru	12	34	39	21	19	7
Venezuela	7	6	1	5	4	4
Southern Cone	11	7	3	4	7	2
Argentina	8	1	0	0	0	1
Chile	1	0	0	0	1	0
Paraguay	2	6	3	4	6	1
Uruguay	0	0	0	0	0	0
Brazil	100	84	55	31	25	19
Central America	23	37	23	17	21	10
Belize	1	1	0	0	0	0
Costa Rica	1	0	0	0	0	0
El Salvador	10	17	11	7	12	7
Guatemala	4	9	9	8	8	3
Honduras	4	7	1	2	0	0
Nicaragua	2	3	1	0	1	0
Panama	1	0	1	0	0	0
Mexico	62	65	41	31	22	26
Lain Caribbean	7	7	5	4	10	4
Cuba	2	0	1	1	0	0
Dominican Republic	3	4	1	1	3	1
Haiti	2	3	3	2	7	3
Total	255	293	208	150	179	90

Sources: PAHO. Análisis de situación de la rabia en América Latina 1990–1994. IX Reunión Interamericana de Salud a Nivel Ministerial (RIMSA). Washington, DC: April 1995; Country reports to the VI Meeting of Directors of National Rabies Programs. Quito, Ecuador; April 1997.

the largest cities of Latin America was launched in 1983, the strategies of the national control programs were not solidified until 1990. Since then, a decline in the number of human rabies cases in the Region has been observed. The countries and territories of the English-speaking Caribbean remain free of human rabies cases.

The average annual number of cases fell from 293 in the 1980s to 208 in the five-year period 1990–1994. The overall downward trend was interrupted in 1996 when Ecuador experienced an outbreak that produced 36.3% of the total number of human rabies cases in the Region. However, the following year (1997) was the first in which fewer than 100 cases were reported (Table 10). The specific mortality rate, which in 1980 was 1.3 cases per million population, was reduced to 0.2 in 1997. The trend is not consistent in all countries. While Mexico and Brazil have experienced a sustained decline in

case numbers, other countries have seen the numbers fluctuate (39, 40).

In recent years, dogs have become less significant as transmitters of rabies to humans, thanks to ongoing and effective national control programs. At the same time, insectivorous and hematophagous bats have become more of a threat, as destruction of forest ecosystems has caused more bats to move into rural areas and even cities, carrying with them the infection and the risk of its transmission to human populations.

Information on the source of the infection is available for 1,117 of the 1,372 cases of human rabies recorded in Latin America in the 1990–1996 period. During this period, dogs continued to be the main source (in 80.6% of cases), followed by bats (11.3%), cats (4.3%), and other species (3.8%), among them raccoons, foxes, and coyotes (39, 40).

TABLE 11
Number of reported cases of canine rabies, by subregion and country, Latin America and the Caribbean, 1990–1996.

Subregion and country	Average 1990–1994	Year	
		1995	1996
Andean Area	2,654	1,758	1,864
Bolivia	1,116	362	207
Colombia	167	83	71
Ecuador	708	736	1,115
Peru	574	406	310
Venezuela	90	171	161
Southern Cone	336	398	549
Argentina	61	15	8
Chile	1	0	1
Paraguay	274	383	540
Uruguay	0	0	0
Brazil	686	1,047	809
Central America	623	456	541
Belize	1	4	6
Costa Rica	0	0	0
El Salvador	92	124	234
Guatemala	144	194	256
Honduras	342	112	9
Nicaragua	44	22	37
Panama	0	0	0
Mexico	4,803	1,387	856
Latin Caribbean	107	60	58
Cuba	28	25	39
Dominican Republic	28	14	19
Haiti	51	21	...
Total	9,209	5,106	4,677

Sources: INPPAZ. Vigilancia epidemiológica de la rabia en las Américas, 1995; Country reports to the VI Meeting of the Directors of National Rabies Programs. Quito, Ecuador; April 1997.

Canine rabies is the most sensitive indicator of the level of success of urban rabies control programs. Continuous and appropriate interventions to control rabies in dogs have a direct impact on the stability of the transmission cycle. In 1995–1996, 18 countries reported cases of canine rabies: 5,106 in 1995 and 4,677 in 1996, which represent a reduction of 18.8% compared to the 1993–1994 biennium (Table 11) (39, 40).

Between 1994 and 1997, approximately 3.2 million people were attacked by animals, and 1,440,117 of them (45%) began treatment against rabies; of that group, 78% completed treatment. Mexico recorded the highest percentage of treatment abandonment (43.3%). Most rabies deaths (92.8%) occurred because people did not seek treatment from the health services or did so too late (39, 41).

One of the fundamental strategies of the regional program to eliminate rabies transmitted by dogs in Latin America has been to carry out massive campaigns to vaccinate dogs against rabies, thereby impeding the infection's spread and preventing human exposure. Twenty-one countries in Latin America and the Caribbean used 30.1 million and 31.5 million doses of canine rabies vaccine in 1995 and 1996, respectively, surpassing by nearly 3 million doses the amount used annually in prior years. Most of this vaccination effort took place in Mexico and Brazil.

The coverage of canine rabies vaccination in 1996 varied widely; for example, it was 9.6% in Haiti, 10.5% in the Dominican Republic, 55.2% in Bolivia, and 89.1% in Brazil. Post-outbreak vaccination in Ecuador achieved a coverage of 75.2% of the estimated total canine population (39, 40).

The global availability of canine rabies vaccine has improved over time. In 1996, Latin America and the Caribbean had a supply of 44.0 million doses—including both locally produced and imported vaccine—and used 39.9 million, for a surplus of 4.1 million doses. The same year, 4.2 million doses of human rabies vaccine were produced, most (97.6%) in suckling mouse brain; 1.7 million of those doses were used (39, 40).

Unlike the situation in Latin America and the Caribbean, in Canada and the United States wild animals constitute the main source of rabies infection in humans. In the period 1995–1996, eight cases of human rabies were reported in the United States and none in Canada. There were 15,005 reported cases of animal rabies in the United States and 764 in Canada (42–44), with wild animals accounting for 92.0% and 76.0%, respectively, of those cases. Of the four human cases in the United States in 1996, two were acquired locally and caused by variants of the virus associated with insectivorous bats; the other two were acquired outside the country (43, 44). Both Canada and the United States have undertaken major efforts to control sylvatic rabies. Since February 1995, the Texas Department of Health has distributed 7 million doses of recombinant oral rabies vaccine, and rabies in coyotes and dogs declined from 166 cases in 1994 to 15 in 1996 and only 3 in 1997 (45).

Foot-and-Mouth Disease

As of mid-1997, activities carried out under the Hemispheric Plan for Eradication of Foot-and-Mouth Disease, which was launched in the late 1980s, had eliminated foot-and-mouth disease from the entire Southern Cone. This subregion includes Argentina, Chile, Paraguay, Uruguay, and southern Brazil (the states of Paraná, Rio Grande do Sul, and Santa Catarina), an area of 5.4 million km² with 95 million head of cattle in 1.2 million herds. The situation also has im-

proved in the states of central Brazil (Mato Grosso do Sul and Goiás), where June 1997 marked more than two years without a case of foot-and-mouth disease. If French Guiana, Guyana, Suriname, and the Chocó region of Colombia are added, some 6.2 million km² in South America, containing 140 million bovines and 1.5 million herds, are free of the clinical disease.

Nevertheless, foot-and-mouth disease continues to harm agriculture in some parts of the continent. Such is the case in the Andean Area, where the ability of government veterinary services to manage administrative and public health activities has deteriorated dramatically, hampering foot-and-mouth disease control programs. This problem is gradually being corrected in some countries, with the participation of the private sector.

Among the many benefits of the elimination of foot-and-mouth disease are the opening of markets, such as the United States and several Asian countries, to meat from Argentina and Uruguay; the South American countries' improved image in international markets, resulting from greater credibility and openness regarding their epidemiologic situation; the intensified drive toward integration of the countries' health activities, which is helping to consolidate subregional markets, especially in the MERCOSUR countries; the involvement of the community in health programs, which helps improve their management; and the acknowledgment by various social sectors that they must work alongside the official veterinary services in control and eradication programs.

Bovine Tuberculosis

In the United States, where the control program dates from the beginning of the century, the prevalence of bovine tuberculosis has been reduced from 5% to less than 0.002%; out of 52 states and territories, 43 are free of the disease and 9 are at an advanced stage in the eradication process. In Canada, where the bovine tuberculosis eradication program began in 1987, no tuberculous lesions have been reported since 1994. Mexico established guidelines for a national program to control bovine tuberculosis in 1996 and strengthened its surveillance and control activities. During that year, 3,555,841 tuberculin tests were performed, and 0.48% of the cattle were found to be reactors. In slaughterhouses, the prevalence of lesions characteristic of tuberculous granulomas was 0.41%.

In general, the frequency of cases of bovine tuberculosis is low in the Region of the Americas, especially in countries that have carried out systematic control programs (Canada, Costa Rica, Cuba, Jamaica, Panama, the United States, and Uruguay). In 1997 bovine tuberculosis reappeared in Panama for the first time since 1982; the provinces affected were Bocas del Toro and Chiriquí.

The majority of data about bovine tuberculosis in the countries comes from routine diagnostic procedures, unstructured surveys using tuberculin tests, and cases found during the standard inspection process in slaughterhouses. Although this information is insufficient to allow the countries to be stratified accurately with respect to the prevalence of the disease, it does permit them to be grouped into three categories. The first includes countries that are free of the disease or where the prevalence is less than 0.1%. These countries, which contain about 38% of the total estimated bovine population of the Region of the Americas, are Belize, Canada, Colombia, Cuba, Panama, the United States, Uruguay, Venezuela, and the countries of the Caribbean, with the exception of Haiti and the Dominican Republic. The second category is made up of countries where the prevalence is over 0.1%: Argentina, Brazil, Chile, Costa Rica, the Dominican Republic, Guatemala, Mexico, and Paraguay, which together account for about 58% of the total bovine population. The third category consists of countries in which the national prevalence of bovine tuberculosis is not known, as the official data are either scarce or out of date. These countries are Bolivia, Ecuador, El Salvador, French Guiana, Guyana, Haiti, Honduras, Nicaragua, Peru, and Suriname.

Leptospirosis

Leptospirosis, a bacterial zoonosis that causes various clinical syndromes in both humans and animals, is widely distributed in the Region of the Americas. However, most countries do not have epidemiologic surveillance programs for the syndromes caused by leptospirosis and few have diagnostic laboratories to identify it. Therefore, the notification of cases and outbreaks is sporadic and incidental, and case-finding is frequently based on serology.

A survey carried out by PAHO in 1997 revealed that during the 1992–1996 period, 23,007 human cases and 329 deaths were recorded in 11 countries of the Region (Brazil, Cuba, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay). Brazil reported the most cases (42.4% of the total), followed by Cuba (38.3%), Nicaragua (10.9%), and Mexico (7.4%) (46). In Achuapa, Nicaragua, in 1995, more than 400 cases and 13 deaths were reported. At the beginning of the outbreak, the disease was mistaken for dengue and dengue hemorrhagic fever, but dengue virus infection was ruled out by serologic studies, the polymerase chain reaction (PCR) test, and the absence of the vector mosquito *Aedes aegypti* in the area. The victims probably acquired the disease through direct contact with water and soil contaminated by infected urine, following a period of intense rains and flooding (47, 48). In 1992 an outbreak in Cuba affected 79 persons, most of them sugarcane cutters who were

exposed to wet terrain infested with high rodent populations. No deaths were reported (49).

In 1996, the state of Rio de Janeiro, Brazil, experienced a leptospirosis outbreak that caused 1,425 cases and 22 deaths. The majority of the cases occurred in the municipality of Rio de Janeiro, especially in areas with new settlements, where sanitary conditions and general quality of life were poor. People 15–49 years of age accounted for 73.8% of the cases, and 61.0% occurred in males (50).

According to data obtained in the PAHO survey mentioned above (51), in the period 1992–1996 there were 29,190 reported cases of bovine leptospirosis and 9,195 deaths in the nine countries that provided information (Cuba, Ecuador, El Salvador, Honduras, Mexico, Panama, Paraguay, Peru, and Uruguay).

AIDS AND OTHER SEXUALLY TRANSMITTED DISEASES

AIDS and HIV Infection

As of 10 December 1997, a total of 1,736,958 cases of AIDS had been reported worldwide. Of that total, 808,540 (47.5%) were in the Region of the Americas; PAHO estimates that the actual figure for the Region is double that number. It is estimated that more than 30 million persons worldwide are infected with the human immunodeficiency virus (HIV), including 1 million individuals under the age of 15. Over 90% of the infections have occurred in Asia, Africa, Latin America, and the Caribbean.

The HIV/AIDS epidemic in Latin America and the Caribbean has been classified as “concentrated,” because it occurs mainly in high-risk groups and has a low prevalence in the general adult population. Nevertheless, the behavior, patterns, and transmission routes of the epidemic vary widely among and within the more than 40 countries and territories affected. Together, they have a population of 499 million and are characterized by cultural, racial, geographical, and social differences.

One factor in common is the concentration of the epidemic in the most socially vulnerable population groups of persons with little education or limited economic or social resources. Contracting and spreading sexually transmitted infections, including HIV, is clearly associated with poverty and the lack of access to education and basic public health services. Another common element in the HIV epidemic in the Americas has been the shift from transmission predominantly between homosexual males toward transmission mainly among the heterosexual population, particularly in the countries of the Caribbean and Central America. In other subregions (Mexico and the Andean Area), homosexual transmission still predominates. Epidemiological findings continue to show the

emergence of the epidemic in the youngest population groups and in rural areas.

HIV Transmission

Genetic Variation. Human immunodeficiency virus type 1 (HIV-1) subtype B continues to be the causative agent in the majority of AIDS cases in Latin America and the Caribbean. Subtypes A, C, D, E, F, G, H, I, and O have also been detected in the Americas. Subtypes B, F, and C have been observed in Argentina; B and F in Bolivia; B, F, C, and D in Brazil; A, B, C, and D in the Caribbean; B in Chile, Ecuador, Honduras, Mexico, Paraguay, Peru, and Venezuela; and B, F, and E in Uruguay. In addition, some cases of HIV-2 infection have occurred in the Region. Since subtypes of HIV-1 and HIV-2 can circulate and affect the epidemiology and prevention of AIDS in the Americas, studies are being conducted to learn how the different groups or risk factors are associated.

Transmission Mechanisms for HIV Infection. Transmission through blood or its components and HIV-infected tissues or organs is very efficient, over 90%. The principal risk factor associated with this type of transmission is sharing needles for drug use. The risk of accidental transmission to health workers is only 0.005%, because the amount of contaminated blood to which they are exposed is very small, even with needle pricks. HIV transmission through blood or blood products is responsible for between 5% and 10% of all the infections worldwide and 2.5% of the infections in Latin America and the Caribbean.

The probability of perinatal transmission in Latin America and the Caribbean is 25%. Prophylactic use of zidovudine (ZDU) in infected pregnant women and newborns, a practice that is being adopted by a growing number of countries, could significantly reduce perinatal transmission of HIV in the Region.

In Latin America and the Caribbean, the progression from HIV infection to AIDS takes from 4 to 10 years, and the evolution from AIDS to death, roughly 2 years. The new combinations of protease inhibitors with other antiretroviral drugs, which have a positive impact on patient survival and morbidity, may significantly alter AIDS mortality patterns when those medications are available to people of the Region. Antiretrovirals are now prescribed in Brazil, Costa Rica, and Mexico.

Epidemiology of AIDS and HIV in the Americas

The annual incidence rate of AIDS cases is an expression of the general population's risk of contracting HIV. Between 1991 and 1996, AIDS incidence in the Region generally in-

TABLE 12
Annual incidence rates of AIDS in the Americas, by subregion, 1991–1996.

Subregion	Rate per million					
	1991	1992	1993	1994	1995	1996
Andean Area	22.3	27.1	26.0	34.5	28.5	29.0
Brazil	69.8	87.2	97.3	100.5	101.3	100.2
Central America	32.1	44.0	61.0	61.5	64.3	80.5
English-speaking Caribbean	142.3	160.2	184.1	204.2	247.1	246.2
Latin America	42.4	52.0	60.2	62.4	61.1	62.5
Latin Caribbean	33.7	50.2	25.6	27.0	31.3	24.9
Mexico	36.5	36.4	56.2	44.8	46.0	44.2
North America	217.8	280.9	276.8	243.8	215.5	126.9
Southern Cone	18.6	26.1	32.4	43.9	37.1	46.7

Source: Pan American Health Organization. *Vigilancia del sida en las Américas: informe trimestral, actualización al 10 de diciembre de 1997*. Washington, DC: PAHO; 1997. (PAHO/HCA/98.001).

creased (Table 12), especially in the English-speaking Caribbean and Central America. However, a steady downward trend has been observed in North America since 1992.

The ratio of men to women for reported cases in 1996 was 3.2 in Latin America and 1.7 in the Caribbean; in 1991 the figures had been 4.9 and 2.0, respectively. This trend was also found in the subregions between 1991 and 1996. In the Andean Area the ratio dropped from 12.8 to 5.1; in the Southern Cone it went from 11.4 to 4.6, and in Brazil from 5.0 to 2.6. This phenomenon has been called the “feminization” of the epidemic.

The epidemic has been occurring in younger and younger population groups. Among men, the majority of AIDS cases are in the 30–34 and 25–29 age cohorts; among women, the majority of cases are in the 25–29-year-old age bracket, followed by the 30–34-year age group.

In Latin America and the Caribbean, unprotected sexual contact is the main transmission mechanism for AIDS. In Latin America the risk factor is homosexual or bisexual contact in 45% of cases; in the Caribbean the predominant risk factor is heterosexual contact (75% of cases). In the Andean Area, the chief transmission mechanism among men continues to be unprotected homosexual contact, accounting for 60% of reported cases. Among women, the principal risk factor (90% of the cases) is heterosexual transmission. In roughly 50% of reported AIDS cases the category of exposure is not specified.

In Brazil, 42.3% of cases among men stem from homosexual relations, and 54.9% of cases among women stem from heterosexual relations. Some 26.4% of the cases among men and 27.5% among women are related to illegal intravenous drug use. The epidemic is increasingly taking on a heterosexual profile and is occurring more frequently among young persons and in rural areas.

In the Caribbean, heterosexual transmission is the main mechanism of infection for both sexes (66.2% for men and 88.9% for women), followed by male homosexual contact, blood-borne transmission, and, in some countries, intravenous drug use. In addition, the percentage of cases where children were infected by their mothers (7.1%) is the highest in the Region.

In the Southern Cone, the main transmission mechanisms are unprotected homosexual relations between men (46%) and the sharing of needles (28.3% for men and 34.6% for women). This subregion has the highest percentage of cases related to intravenous drug use; Argentina accounts for 77% of these reported cases.

In Central America, where the epidemic began late (1985), the most common means of transmission for both sexes is heterosexual contact (62.6%), and the cases are concentrated in the most populated urban areas. This subregion has the highest percentage of cases of children infected by their mothers, 3.5% of the cases diagnosed. Honduras has the highest number of reported cases.

The main risk factor in Mexico continues to be male homosexual contact (55.8%); however, cases of heterosexual transmission in the southern border zones and in rural areas are on the rise. Transmission through intravenous drug use is not widespread; it is found mostly in northwestern Mexico. Blood-borne transmission has fallen to less than 2% of the reported AIDS cases.

As of 30 June 1997, 627,179 cases of AIDS had been reported in North America (Canada and the United States)—85% in men, 14% in women, and 1% in children under 13. Men who engage in homosexual relations account for the largest proportion of AIDS cases in Canada (78.4%) and the United States (38%). In the United States in 1996, for the first

time, there was a decline in the estimated number of persons diagnosed with AIDS or associated opportunistic infections, as well as in the number of deaths from AIDS.

By late 1996, 6,911 cases of the epidemic had been diagnosed in children under age 14 in the Region. Of those cases, 5,095 (74%) were perinatal. The available data as of 1995 showed that the countries and territories with the highest percentage of pediatric cases were located in the Caribbean: 18.2% in the British Virgin Islands, 9% in French Guiana, 8.8% in Antigua and Barbuda, 8.4% in the Bahamas, and 7.2% in Trinidad and Tobago.

HIV Infection

Studies with selected "sentinel" populations and estimates of the prevalence of HIV infection in the general population furnish relevant information to evaluate patterns and present a more up-to-date overview of the status of the epidemic than information obtained through the monitoring of AIDS cases and the number of deaths. PAHO is constantly working to improve HIV surveillance in the Region, in collaboration with national programs and the Joint United Nations Program on HIV/AIDS (UNAIDS).

In Brazil, the prevalence of HIV among pregnant women has remained stable since the late 1980s (1% to 4%) in the largest urban areas, with the highest rate of infection found in women between 20 and 29 years of age. Among sex workers, the figures range between 6% and 11% in some large cities. Infection rates for sex workers are on the rise. In 1992, the prevalence for this group was 5% in the largest urban areas. Prevalence among intravenous drug users (IDUs) has been high since the late 1980s; 50% of users in two localities in Santos were HIV-positive in 1989. Since 1990, one third of IDUs in the largest urban areas have been HIV-positive. Among male patients at clinics for sexually transmitted diseases, the prevalence was 5% in Porto Alegre in 1992 and 18% in Rio de Janeiro in 1995.

In the English-speaking Caribbean, the prevalence of HIV infection among women receiving prenatal care services is $\leq 1\%$ or even 0% in the Bahamas, Grenada, the Cayman Islands, Jamaica, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago. However, some studies show higher rates in Guyana (7% in 1992) and the Bahamas (between 3% and 4% in 1990–1993). Among sex workers, the rate is between 3% and 25% in urban areas in Guyana, Jamaica, Suriname, and Trinidad and Tobago, although in Jamaica the figures come from less cosmopolitan areas. The prevalence of sexually transmitted diseases ranges from 6% to 4% in Jamaica (between 1989 and 1991) and 14% in Trinidad and Tobago (between 1990 and 1991).

In the Latin Caribbean, Haiti has the highest prevalence of HIV among women receiving prenatal care services (from 8% to 9% between 1986 and 1993 in urban areas and from 3% to 4% in rural areas between 1986 and 1990). In the Dominican Republic the figures ranged from 1% in 1991 to 2% in 1995. In Cuba, this population still shows no signs of infection. Prevalence among sex workers has been rising over the course of the epidemic. In Haiti, from 42% to 53% of this population group in the largest urban areas is infected; in the Dominican Republic, the figures were 11% in 1993 and between 5% and 6% in 1994–1995. Among male patients at clinics for sexually transmitted diseases in Haiti, the prevalence was 25% in 1992, and in the Dominican Republic, it was 4% for the 1984–1989 period.

In the Southern Cone, Argentina has the highest prevalence among women receiving prenatal care (between 1% and 3% in 1994–1995); Chile, Paraguay, and Uruguay have prevalence rates under 0.1%. The prevalence of HIV among sex workers was between 6% and 11% in the urban areas of Argentina during 1988–1991; outside those areas, it was 2% in 1987 and 8% in 1993. Paraguay and Uruguay continue to have rates under 1%. In Buenos Aires, 90% of intravenous drug users were HIV-positive in 1990, and that figure was also high outside the urban areas (41% in 1996). In Uruguay, the prevalence was 45% in 1993 and 11% in 1996.

Among male patients in Argentina with sexually transmitted diseases, 20% were HIV-positive.

For women receiving prenatal care in Central America, Honduras has the highest prevalence of HIV, 4% for 1994–1995. The rest of the countries in the subregion have prevalence rates of 1% for this population. Among sex workers, prevalence ranges from 0.1% to 2.2%; however, in some health posts in Honduras, rates between 13.0% and 20.5% were found for 1991–1995.

In Mexico, the prevalence of HIV among women receiving prenatal care was 0% in 1991–1995; however, it rose to 0.09% in 1996. In men who engage in homosexual acts, the prevalence is 15.5%, although a rate of 37.6% was observed in the Federal District and in Guadalajara, the second largest city. The average prevalence among sex workers is 13.6%, and there are studies from 18 states indicating rates of between 0.0% and 5.2% for sex workers.

In the United States, HIV cases are monitored in 29 states. As of June 1997, 86,972 cases of infection had been reported among persons in all age groups.

Prevalence of HIV in the Population between 15 and 49 Years of Age

Since the start of the epidemic, various estimates have been made of the number of AIDS cases, the prevalence of

TABLE 13
Estimated number of HIV-infected adults 15 to 49 years
old, by subregion, 1994.

Subregion	HIV-infected adults
Andean Area	123,000
Brazil	550,000
Central America	95,500
English-speaking Caribbean	36,500
Latin Caribbean	191,300
Mexico	200,000
Southern Cone	77,600
Total Latin America and the Caribbean	1,273,900
North America	650,000–900,000 ^a

^a United States, 1992.

Source: GPA/WHO. Working Group on Global HIV/AIDS and STD Surveillance, WHO/UNAIDS.

HIV infections, and the patterns of the epidemic over time. Table 13 shows the estimated HIV infection rates in 1994 for the population from age 15 to 49 in North America, the Andean Area, Brazil, the English-speaking Caribbean, the Latin Caribbean, the Southern Cone, Central America, and Mexico. The WHO/UNAIDS Working Group on Global HIV/AIDS and STD Surveillance, together with national programs, are preparing up-to-date estimates of HIV infection that will be published at the end of 1998.

Tuberculosis and AIDS

There is a critical interaction between HIV and tuberculosis. While 2 out of every 1,000 persons with initial tuberculosis infection develop the disease, up to 80% of HIV-positive individuals may contract tuberculosis. Higher levels of HIV prevalence have been found in patients diagnosed with active tuberculosis in a number of countries. In Brazil, the difference was 3.3%; in the United States, between 0% and 46.3%; in Haiti, 39%; and in Mexico, between 0% and 5%. Moreover, tuberculosis is one of the opportunistic illnesses of AIDS patients, in whom a tuberculosis prevalence of some 7.7% to 50% has been observed in Mexico, 8% to 40% in Brazil, 13% in the Dominican Republic, 18.8% in Argentina, and 18.5% in Colombia.

Studies conducted in metropolitan Buenos Aires in 1992 showed that 52% of the 79 patients who had died of tuberculosis also suffered from AIDS. In Paraguay, one of the countries in the Region with the lowest incidence of AIDS cases, 19% of patients diagnosed with AIDS as of September 1993

also suffered from pulmonary or extrapulmonary tuberculosis. The prevalence of HIV among tuberculosis patients was 1.65%.

In Brazil pulmonary and extrapulmonary tuberculosis have been found in 59.5% and 79% of a diverse series of AIDS cases treated in different regions of the country. In Cuba, as of July 1994, 50 cases of tuberculosis in HIV-infected persons had been reported, but cases of multiple-drug-resistant tuberculosis had not been detected up to that point. In Haiti, the seroprevalence of HIV infection is over 40% among hospitalized tuberculosis patients and 30% among those treated on an outpatient basis. Similarly, from 15% to 25% of HIV-positive patients had tuberculosis as the underlying indicator that led to the diagnosis of AIDS.

Mortality and Socioeconomic Impact of AIDS

Between the onset of the epidemic and June 1997, there were 468,065 deaths from AIDS in the Region. Of that total, 88,420 (19%) occurred in Latin America and 6,566 (1.4%) in the Caribbean. The actual numbers may be higher, due to underreporting or inappropriate certification of the cause of death, often attributed to inadequate diagnostic resources.

HIV/AIDS chiefly affects individuals between the ages of 20 and 44. One way to assess the disease's impact is by looking at the "disability adjusted life years" (DALYs) indicator. This measurement approach takes into consideration mortality and the number of years of potential life lost (YPLL), as well as the social and economic costs to families and to health care systems.

In 1990, HIV/AIDS infection in Latin America and the Caribbean accounted for 1.1% of the total DALYs for the Region and 6.3% of those were attributable to infectious and parasitic diseases. It is estimated that by the year 2000 the DALYs attributable to HIV/AIDS infection will increase to 4.2% of the total for Latin America and the Caribbean and 27.2% of the DALYs will be attributable to infectious and parasitic diseases. These DALY figures are the highest of any of the communicable diseases—including diarrheal ones—and approximately four times higher than the figure for all the other STDs combined. PAHO estimates that the direct cost of caring for AIDS patients in Latin America and the Caribbean in 1999 will exceed US\$ 2 billion, plus the indirect economic and social costs from the loss of income and productivity and the disruptions in family and community life.

Antiretroviral drug therapies and other discoveries could dramatically alter the effects on mortality and morbidity from this disease in the Region provided problems are resolved relating to access to the drugs; the criteria for administering them; and side effects, intolerance, resistance, and adherence to treatment.

Sexually Transmitted Diseases

The epidemiological trend of sexually transmitted diseases is changing throughout the world and is related to the level of development. In industrialized countries, curable bacterial STDs (gonorrhea, syphilis, and chancroid) are relatively under control. For viral diseases, educational and preventive measures have been put in place that protect minority groups at the lowest socioeconomic levels and reduce the overall incidence of these diseases. In developing nations, in addition to the failure to control treatable and curable STDs, there is an epidemic of viral STDs, with serious consequences for health and the economy.

The WHO Office of HIV/AIDS and Sexually Transmitted Diseases estimated that in 1996 new cases of curable STDs in the various subregions of Latin America and the Caribbean totaled 36.2 million (Table 14). This figure, which is based on studies of prevalence, efficiency of transmission, natural history, at-risk populations, and other factors, differs from the available official data. For example, in Brazil an average of 40,000 cases of STDs are reported annually; however, epidemiological and marketing studies indicate that in São Paulo and other Latin American cities, the vast majority of individuals with STDs purchase antibiotics without a prescription or seek medical help outside the public sector. Therefore, fewer than 10% or even 1% of such cases are officially registered. In Mexico, an average of 24,000 cases of syphilis and gonorrhea are reported annually, or approximately 1.5% of the number WHO estimates for a population of almost 48 million men and women between the ages of 15 and 49.

Prevalence

In studies conducted in 1994 and 1995, the prevalence of STDs in the state of São Paulo, Brazil, was 38% for hepatitis B,

12% for syphilis, and 3% for chlamydiosis among 89 homosexual males, and 26% for HIV, 14% for syphilis, 5.2% for hepatitis B, and 1.8% for chlamydiosis among 57 prisoners. Among patients seen in family planning clinics, 14.5% of the women had bacterial vaginosis. STDs were diagnosed in 10.9% of the 1,294 pregnant women and in almost 49% of the 2,470 women who were seen for vaginal discharge.

Studies conducted in 1995 on STDs among 1,389 sex workers in Mexico City found a prevalence of 42.6% for bacterial vaginosis, 10% for trichomoniasis, 8% for chlamydiosis, 1.2% for gonorrhea, 1% for syphilis, and 0.14% for HIV. An examination of 108 men and 80 women in a rural area in the Mexican state of Jalisco (mostly sex workers) found a prevalence of 2.7% for syphilis, 3.3% for hepatitis B, and 0.55% for HIV.

Among Haitian migrant workers living in the bateyes, or sugarcane plantations, of the Dominican Republic in 1995 there was a prevalence of 20% for trichomoniasis, 9.6% for chlamydiosis, 5.7% for HIV, and 1.6% for gonorrhea. In Jamaica, a 1995 study of 316 women (76 sex workers, 100 patients at STD clinics, and 140 pregnant women) found a prevalence of 41%, 23%, and 9%, respectively, for hepatitis B and 9%, 2%, and 0.7%, respectively, for HIV.

In Guatemala, from 1991 to 1994 the presence of other STDs was studied in 222 HIV/AIDS patients. Among the 162 men examined, 21% had syphilis, 16% had hepatitis C, and 3.1% had hepatitis B. Among the 60 women, the prevalence was 8.3% for syphilis, 3% for hepatitis C, and 0% for hepatitis B.

Just as with HIV infection, STDs affect vulnerable indigenous populations exposed to the advances and intrusions of modern society. For example, a 1994 study of 69 men and 106 women in the Kaiapo tribe in the Brazilian Amazon found genital ulcers, abnormal urethral or vaginal secretions, and other syndromes suggestive of STDs in 58% of the males and 72% of the females.

TABLE 14
Estimated new cases of sexually transmitted diseases in Latin America and the Caribbean, 1996, in thousands.

Subregion	Syphilis	Gonorrhea	Chlamydiosis	Trichomoniasis	Total
Andean Area	263	1,478	2,088	3,682	7,511
Brazil	439	2,464	3,481	6,139	12,523
Central America	79	443	626	1,104	2,252
English-speaking Caribbean	20	115	162	286	583
Latin Caribbean	79	443	626	1,104	2,252
Mexico	242	1,359	1,920	3,386	6,907
Southern Cone	145	812	1,147	2,022	4,126
Total	1,267	7,114	10,050	17,723	36,155

Source: PAHO. Division of Disease Prevention and Control, Regional Program on AIDS and STDs.

EMERGING DISEASES

The reappearance of several infectious diseases and the emergence of new ones in the last 20 years have distressed the scientific community and have been cause for serious worry in the countries' public health sectors (52-56). These diseases, among them many zoonoses, fall into four categories:

- Recently identified diseases whose etiologic agent is new to science.
- Known diseases that had been dormant but have suddenly reappeared, causing outbreaks or epidemics.
- Diseases whose rising incidence rates are linked to factors such as deforestation, overpopulation, poverty, and environmental deterioration.
- Diseases caused by microbial agents resistant to antibiotics and other drugs.

Recently Identified Diseases

Infection by Human Immunodeficiency Virus and Human T-Lymphotropic Virus

Human immunodeficiency virus (HIV) infection, recognized only 15 years ago, is probably the best example of an emerging disease. The discovery of HIV led to the identification of the causal agents of other viral infections with similar means of transmission, such as human T-lymphotropic virus (HTLV-I and II), which causes myelopathy and tropical spastic paraparesis (57). In addition, HIV infection highlighted the importance of a group of parasitic zoonoses that were identified as opportunistic infections in immunodeficient individuals. This group includes diseases produced by *Pneumocystis carinii*, *Cryptosporidium* sp., and *Toxoplasma gondii*.

Legionellosis

Two syndromes are known to be caused by infection with *Legionella pneumophila*: "legionnaires' disease," characterized by acute pneumonia; and the extrapulmonary form. The latter consists of a febrile process secondary to bacteremia, which may or may not be associated with pneumonia, that evolves to produce endocarditis, pericarditis, peritonitis, or localized abscesses. Although the disease was described more than 20 years ago, it is still considered an emerging entity since it occurs sporadically. The best known outbreaks have been in tourist areas and have been linked to the growth of *Legionella* in wastewater that condensates from air conditioning units, cooling towers, and dehumidifiers, as well as water

used in hotel heating units. In 1996 three cases were reported among English tourists, who contracted the infection in a hotel in Antigua. Retrospective studies carried out since 1990 show that the disease has occurred among groups of European travelers returning from the Bahamas, Barbados, Belize, Cuba, and the Dominican Republic (58).

Hemolytic Uremic Syndrome

Most of the cases and outbreaks of this disease are caused by food contaminated with toxigenic strains of *Escherichia coli*. The most commonly seen strain, and the one that causes the most severe disease, is serotype O157:H7. Hemolytic uremic syndrome has been recognized since 1980, although the importance of serotype O157:H7 was not known until 1993, when it was associated with an outbreak in the United States that affected 500 people and caused 4 deaths among children who had eaten hamburgers from a chain of fast-food restaurants (56, 59). *E. coli* O157:H7 is an emerging infectious agent that causes a broad spectrum of symptoms, including mild diarrhea, hemorrhagic diarrhea, and hemolytic uremic syndrome, which may lead to acute renal insufficiency and death. The infection is associated with the consumption of undercooked meat or unpasteurized milk contaminated with cow fecal material; it can also be transmitted from person to person via the fecal-oral route (54, 60).

Hantavirus Pulmonary Syndrome

In 1993 an outbreak of a disease previously unknown in the Region occurred in the State of New Mexico, United States of America. An intensive epidemiologic and laboratory investigation revealed elevated levels of hantavirus antibodies. The etiologic agent was definitively identified by genetic sequencing of the virus through amplification of RNA obtained from autopsy specimens (61). Up to July 1997, 173 cases had been reported from 28 states in the United States, including 20 cases whose onset preceded the outbreak. Between 1993 and October 1997 there were 366 confirmed cases of hantavirus pulmonary syndrome in the Region of the Americas (Table 15); the case-fatality rate varied between 35% and 60%. In Latin America, cases of hantavirus infection have been reported in Argentina, Brazil, Chile, Paraguay, and Uruguay.

Several wild rodent species serve as reservoirs of hantavirus (61). In the United States, the predominant species are mice of the genus *Peromyscus* and the rat *Sigmodon hispidus*. In Argentina, hantavirus infection has been found in *Oligoryzomys flavescens*, *Oligoryzomys longicaudatus*, *Akodon azarae*, and *Bolomys obscurus*. In Paraguay, *Calomys laucha* has been implicated as a possible reservoir. It is believed that most peo-

TABLE 15
Cumulative number of reported and confirmed cases of
hantavirus pulmonary syndrome in the Region of the
Americas, to 3 October 1997.

Country	Number of cases	Percentage
Argentina	111	30.3
Brazil	6	1.6
Canada	20	5.5
Chile	20	5.5
Paraguay	34	9.3
United States	173	47.3
Uruguay	2	0.5
Total	366	100.0

Source: National departments or ministries of health.

ple become infected by inhaling aerosols from dried or fresh urine or saliva of infected rodents or by coming into direct contact with these secretions. The infection can also be acquired from a rodent bite. During the epidemic outbreak in 1996 in Neuquén, Argentina, person-to-person transmission may have occurred, but the transmission mechanism in that outbreak has still not been established. Genetic differences have been noted among the various hantavirus strains isolated in the United States (Sin Nombre, Bayou, Black Creek Canal, New York), Argentina (Andes, Lechiguara, Pergamino), Brazil (Juquitiba), and Paraguay (Laguna Negra).

Cryptosporidiosis

Human infection caused by *Cryptosporidium* sp. was documented for the first time in 1976 (62). Since then, the infection has been reported with increasing frequency, especially in immunodeficient individuals. Humans have the closest contact with the bovine reservoir, in which the parasite causes diarrhea in newborn calves, especially in conjunction with rotavirus infection. The source of human infection is water, since *Cryptosporidium* often is found in untreated or unfiltered water and is highly resistant to chlorination. The largest recorded outbreak to date occurred between February and April 1993 in the United States, when around 403,000 people contracted cryptosporidiosis in Milwaukee, Wisconsin. Almost 44,000 people required medical attention, and some 4,400 were hospitalized (56, 59, 63). The outbreak was probably promoted by a variety of factors, including intense rain, snow melt, and the release of fecal material from nearby dairy farms. All of these circumstances increased the concentration of the parasite's cysts in rivers that flow into Lake Michigan, which is the source of Milwaukee's drinking water supply.

Re-emerging Diseases

Cholera

From 1991, when the epidemic began in Peru, through December 1996, cholera spread to 21 countries in the Americas, which together reported 1,189,553 cases and 11,734 deaths caused by *Vibrio cholerae* O1 (64). The cholera situation is described in more detail in a separate section of this publication.

Plague

Plague is a disease of rodents, and its causal agent, *Yersinia pestis*, is transmitted to humans by fleas. The disease is found in natural foci of infection in limited geographic areas. The sporadic epizootics that occur among susceptible wild rodents can expand the disease's range and expose other animal populations and human residents in the area to infection.

In the Americas, natural foci of *Yersinia pestis* exist in Bolivia, Brazil, Ecuador, Peru, and the United States. The infection survives in its natural rodent reservoirs in rural and wild areas; the species of rodents involved vary with topography and climate. Many flea species have been associated with transmission of plague. In Latin American countries, *Xenopsylla cheopis* is the common vector in the wild cycle and the source of infection for humans. Plague can also be transmitted from person to person via the airborne route, giving rise to the pneumonic form.

Poor sanitation, particularly the accumulation of garbage, favors rodent reproduction. In rural areas, the combined availability of grain and agricultural waste leads to high populations of wild and peridomestic rodents (65). The two latest outbreaks in Peru underscored that natural phenomena such as El Niño produce environmental conditions that favor the growth and dissemination of rodent populations.

In the past 10 years, bubonic plague has been reported only in Bolivia, Brazil, Peru, and the United States, but its occurrence is probably underreported in those countries and may go unreported in others in the Region. The known natural foci of plague in the Americas and the areas in which cases and outbreaks have been recorded are concentrated in the states of Bahia, Ceará, Minas Gerais, Pernambuco, Piauí, Rio Grande do Norte, and Paraíba in Brazil (66, 67); the departments of Piura, Cajamarca, Lambayeque, and La Libertad in Peru (68); the department of La Paz in Bolivia (69); and the states of Arizona, California, New Mexico, Nebraska, Texas, Colorado, Montana, and Wyoming in the United States (70, 71). An estimated 16,160,000 people live in the endemic areas. Table 16 shows the numbers of cases and deaths reported by the countries during the period 1994–1997.

TABLE 16
Reported cases and deaths from plague, Region of the Americas, 1994–1997.

Country	1994		1995		1996		1997	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Bolivia	0	0	0	0	26	4	1	0
Brazil	0	0	0	0	1	0	0	0
Peru	1,122	51	97	2	23	0	39	0
United States	13	1	8	1	5	0	4	1
Total	1,135	52	105	3	55	4	44	1

Source: National departments or ministries of health.

In Brazil and the United States, human infection commonly occurs as sporadic cases in wild areas. In Peru, the pattern of occurrence is more characteristic of an outbreak, since the majority of cases are transmitted within households (65, 72).

Bubonic plague re-emerged in northern Peru in 1992 and spread to 122 localities in 31 districts in the departments of Piura, Cajamarca, Lambayeque, and La Libertad. During that outbreak, 1,972 cases and 91 deaths were recorded (68, 72). In spite of the efforts of the public health services, by 1994 the disease threatened to spread into urban centers and the port cities along the Pacific coast. In June 1995, the Pan American Health Organization and Peru's Ministry of Health, with financial support from the European Community Humanitarian Office (ECHO), put together an emergency project to combat plague in the four affected departments, giving priority to Cajamarca, which was most affected by the disease. The strategies against plague consisted of preventing the spread of the sylvatic cycle to human households, detecting human cases early and treating them promptly and effectively, and encouraging community participation.

The common rodent species that were potential reservoirs of the disease were identified, and their habits and behavior were investigated. In addition, studies were carried out to evaluate the risk of plague in the cities of Chiclayo, Cajamarca, Trujillo, Chimbote, Lima, and Callao and the ports of Salaverry and Santa Rosa (68, 72). Laboratory services were strengthened by improving the installations and equipment, and training was provided to laboratory personnel in Cajamarca, Chiclayo, Trujillo, Jaén, Piura, Sullana, and Chimbote, with the collaboration of the Centers for Disease Control and Prevention (CDC) of the United States. Personnel of the National Health Institute received training in the production of the biological reagents needed to diagnose plague, so that diagnostic activities could continue uninterrupted.

One of the most important prevention and control activities was the treatment of dwellings with insecticide (carbamates) to reduce the population of fleas carrying the infection. Every house was treated in known plague foci or in areas with risk factors, such as increased populations of rodents

and fleas, especially the principal vector, *X. cheopis*. Some 15,470 dwellings were systematically treated, which protected a population numbering 269,466 (68, 72).

In Bolivia, cases and outbreaks of plague have historically been reported in two endemic areas encompassing 75 communities: one area located in the southern part of La Paz Department and the other in the departments of Tarija, Chuquisaca, and Santa Cruz. However, no cases had been seen in the country since 1988 until an outbreak occurred in December 1996 in the San Pedro area of Apolo municipality in the department of La Paz. In a period of 33 days there were 26 cases and 4 deaths (all in the same family). The case-fatality rate was 14.8% and the attack rate was estimated at 11%. Persons in the 15–49-year age group were affected most often (73% of the cases), and women accounted for 46% of the cases (69). The outbreak was preceded by the death of rats in San Pedro and surrounding areas. Control measures consisted of treating patients and their contacts with antibiotics and applying insecticide in houses.

Yellow Fever

Despite the availability of a highly effective and safe vaccine, yellow fever remains an important cause of morbidity and mortality in several tropical countries of the Americas. Official figures do not reflect the disease's true incidence, however, because studies conducted during outbreaks have shown marked underreporting. Since 1942, when the last case of urban yellow fever was reported in the Americas, only cases of the jungle form of the disease have been notified.

Yellow fever remains confined mainly to the forested areas of the Amazon, Orinoco, and Magdalena river basins, where it affects unvaccinated persons. The main forest vectors are mosquitoes of the genus *Haemagogus*, and several species of the genus *Sabethes* are considered secondary vectors. *Haemagogus* are day-biting mosquitoes that are found predominantly in the forest canopy, although they can descend to the forest floor; occasionally they bite man outside or inside houses located

near forests. Although monkeys are considered to be the main vertebrate hosts for the virus, it is thought that marsupials also may act as hosts in some areas. In the enzootic areas of South America, the virus is believed to move in waves through populations of susceptible monkeys, with periodic invasions of other areas such as Central and Southern Brazil and northern Paraguay and Argentina (73). Interestingly, the virus may reappear in certain areas after long periods of dormancy, as documented in Sierra Nevada, Colombia, in 1979 (74) and in Rincón del Tigre, Bolivia, in 1981, where the disease re-emerged after 20 years of absence (75).

Jungle yellow fever occurs sporadically. In some outbreaks, hundreds of cases have been reported, but serologic surveys suggest that thousands of persons may become infected in certain epidemics. Most outbreaks occur during the rainy season in the first half of the year, probably because of higher densities of *Haemagogus* mosquitoes at this time. It is conceivable, however, that outbreaks observed during the first months of the year may be associated with increased rural and forest labor practices carried out by susceptible populations in areas where yellow fever is enzootic. The seasonal distribution of cases differs from country to country, depending on latitude and other factors affecting the onset of the rainy season.

Most cases occur among young adults between 15 and 40 years of age, and males are affected four times more often than females. This age and sex pattern is explained by occupational exposure to forest activities such as hunting, lumbering, or clearing the forest for agricultural activities. In certain outbreaks, however, a significant number of children under 10 years old are being affected, and the male/female ratio can be 1:1.3. These differences may be explained by the fact that children and women in these areas play a significant role in agricultural practices or because they live along the forest fringe. Unvaccinated colonists who migrate from non-endemic to endemic areas constitute a high-risk group.

Surveillance of human yellow fever in the Americas continues to rely upon a passive system of collection of liver samples from fatal febrile cases for histopathological examinations. Liver fragments are preserved in formalin and sent to laboratories for examination. Since the early 1990s, immunohistochemical analysis has been used for the demonstration of yellow fever antigen in formalin-fixed, paraffin embedded, human liver (76). In recent years, an IgM capture immunoassay (MACELISA) for detection of yellow fever antibodies in the sera has been utilized and proved very useful. Virus isolation also can be performed when well preserved serum samples taken during the first days of the illness or autopsy tissues are available. The use of polymerase chain reaction (PCR) for detection of virus RNA in clinical samples may be useful under certain circumstances, but it requires high quality reagents and good laboratory experience. Surveillance of

monkey populations in enzootic areas also may be useful if deaths are found, but meaningless if they are not, since yellow fever transmission can easily escape detection. Placing caged monkeys in forests at a height of 8–10 meters may be useful to detect yellow fever virus activity, but this method requires considerable resources. Likewise, monitoring yellow fever neutralizing antibodies among non-human primates requires great efforts and has limited usefulness, except in selected areas.

Vaccination is the sole means of prevention of sylvatic yellow fever, and fixed and mobile vaccination units are employed. Vaccination of migrant laborers, who are the most vulnerable population group, remains a logistical problem. Several countries in the Americas (Trinidad, Brazil, Peru) are incorporating or planning to incorporate the vaccine in national vaccination programs targeting children and other age groups.

The analysis of reported cases of yellow fever since 1950 shows a marked decrease in the incidence of disease in the 1960s (905 cases), compared to the previous decade (2,918 cases). Since the 1960s, however, there was an increase in the number of reports: 1,212 cases in the 1970s and 1,625 cases in the 1980s. In the 1990s (up to 1996) 1,298 cases were reported. Since the 1980s most cases have been reported by Bolivia and Peru: 83% during the 1980s and 84% during the 1990s (73).

Since 1981, only five countries have reported cases of yellow fever—Bolivia, Brazil, Colombia, Ecuador, and Peru. During the 1993–1996 period, a total of 940 cases were reported of which 411 (44%) were fatal; Peru alone reported 743 (79%) (see Table 17). In 1995, yellow fever re-emerged in Peru after a five-year period of relative quiescence, with the highest incidence of the disease ever recorded in the country: 10 departments and 19 provinces were affected during the epidemic, but most reports came from the departments of Junín, Huánuco, Amazonas, San Martín, Puno, and Pasco. A factor that probably contributed to the occurrence of the 1995 outbreak was the increased migration of susceptible persons from nonendemic to yellow fever enzootic areas for agricultural work. In 1997, 106 cases were reported by four countries (provisional figures, as of September 30, 1997).

The rapid dissemination of *Aedes aegypti*, the urban vector of yellow fever, to many urban centers that lie within enzootic areas raises a serious concern about the urbanization of yellow fever. This threat was notable during the 1995 yellow fever epidemic in Peru, when many persons were hospitalized with yellow fever in towns infested with *A. aegypti*. This problem is further aggravated by the presence of *A. albopictus* which is gradually approaching enzootic areas of yellow fever in Brazil. This mosquito efficiently transmits the virus under laboratory conditions and, given its capacity to infest both urban and forested areas, it could serve as a bridge between the syl-

TABLE 17
Number of cases of and deaths due to yellow fever notified to PAHO for the 1993–1996 period.

Country	1993		1994		1995		1996 ^a	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Bolivia	18	14	7	7	15	15	30	21
Brazil	66	17	18	5	4	2	15	13
Colombia	1	1	2	2	3	3	8	8
Ecuador	1	-	-	-	1	1	8	4
Peru	89	47	61	25	499	192	86	34
Total	175	79	88	39	522	213	155	80

^aProvisional data.

vatic and urban settings. Due to rapid transportation means, it is conceivable that a person in the incubation period of the disease could arrive in a distant urban center infested with *A. aegypti*, thus making it possible to infect the mosquito and initiate an urban epidemic. The fact that two foreign tourists were presumably infected in forests near Manaus, Brazil, in 1996, and died after returning to their countries, highlights the importance of vaccination for travelers who visit enzootic yellow fever areas.

Equine Encephalitides

Equine encephalitides are viral zoonoses transmitted by mosquitoes. They occur seasonally as outbreaks in horses and, less frequently, in humans. The causal agent is an *Alphavirus* of the family *Togaviridae*. Three viruses of this genus cause disease in equines as well as humans: eastern equine encephalitis (EEE), western equine encephalitis (WEE), and Venezuelan equine encephalitis (VEE). Each of these viruses has a sylvatic cycle that includes other vertebrates and several mosquito vectors, primarily in the genera *Culex*, *Aedes*, *Psorophora*, and *Mansonia*. Of these three types of encephalitis, the most troublesome one is VEE, which has caused large-scale outbreaks in the Americas and produced significant morbidity and mortality in humans.

In recent years, policies designed to reduce public spending have resulted in the elimination of surveillance and prevention programs for these diseases, which are frequently considered to have low priority. However, they re-emerge whenever ecological conditions are favorable, particularly when there are no ongoing programs for diagnosis, surveillance, and prevention. The last activity focuses on vaccination of equines (horses, mules, and donkeys).

An epidemic of VEE occurred in Venezuela in 1995 and within five months had spread to La Guajira, Colombia. In May 1995 the presence of a syndrome compatible with equine encephalitis was reported in Cacique, Manaure, and Mon-

señor Iturriza in the state of Falcón, located in northern Venezuela. The outbreak spread, and by the end of October it had affected seven states: Zulia, Falcón, Lara, Yaracuy, Carabobo, Cojedes, and Guárico (77, 78).

VEE appeared in Mayapo, Manaure, and El Pájaro in the department of La Guajira, Colombia, the first week of September 1995. A significant number of patients with fever, headache, prostration, and vomiting were reported in the affected areas. From there, it spread to the southwest along the Caribbean coast.

Cases and deaths in horses preceded the epidemic of febrile cases in humans. From the time the epidemic began to 31 October 1995, health authorities in Venezuela notified 11,390 human febrile cases compatible with equine encephalitis, among which there were 16 deaths. The disease was confirmed through virus isolation or the hemagglutination inhibition (HI) test. Close to 500 clinical cases and 465 deaths were also reported among horses, mules, and donkeys (77, 78).

In Colombia, 14,156 human cases compatible with Venezuelan equine encephalitis were notified by 31 October 1995. Of those cases, 1,258 required hospitalization and 26 died from the disease. The attack rates ranged from 13%–18% in Riohacha, the capital of La Guajira department, to 57% in the city of Manaure (77–79).

In both Colombia and Venezuela the virus isolated was subtype IC. Genetic characterization studies showed it to be identical to the IC virus isolated in an outbreak that occurred in Venezuela in 1963 (80).

Control measures consist of vaccinating houses, mules, and donkeys, controlling vectors in urban areas through larvicide application and fumigation, restricting the movement of equines within and outside affected areas, and providing medical treatment for victims to prevent deaths.

In June 1996 Venezuelan equine encephalitis appeared in Mexico in the municipalities of Matías Romero, Chahuítes, and Tapanatepec in the state of Oaxaca. The disease affected 32 animals, 10 of which died. Venezuelan equine encephalitis

was confirmed by histopathologic examination, viral isolation, and serology; viral subtype IE was identified. Control activities consisted of vaccinating 61,265 animals in the affected area as well as the neighboring states of Chiapas, Veracruz, and Guerrero (81).

In July and August 1996 several episodes of eastern equine encephalitis (EEE) occurred in Belize's Orange Walk and Cayo districts. The epizootic was controlled by vaccinating horses. In October 1996 in Mexico the presence of EEE was reported in the municipality of Aldama in the state of Tamaulipas. The disease affected 106 animals, killing 92 within a 15-km radius (81).

The foregoing discussion points to the existence of numerous endemic areas of equine encephalitides that should be kept under continuous surveillance. In the last four years the countries and the Pan American Health Organization have been striving to improve national epidemiologic surveillance systems and diagnostic services. Diagnostic technology, along with knowledge of the diseases' ecology, has improved considerably, providing the countries with new tools for preventing outbreaks and epidemics.

Diseases with Increasing Incidence Rates

Dengue and Dengue Hemorrhagic Fever in the Americas

Historical Background. In the late 1940s, a highly successful, Hemisphere-wide campaign nearly eradicated the *Aedes aegypti* mosquito from the Americas. By 1962, 18 mainland countries and several Caribbean-island nations had eliminated this vector. Over time, eradication programs failed to marshal sufficient political support, however, and budgetary cuts gave way to inadequate management and a scarcity of health personnel. And, as *A. aegypti* became resistant to chlorinated insecticides and the cost for materials, equipment, and wages rose, gains made in controlling the vector were further eroded. Water supply problems led many people in the Region to store water in containers at home, greatly contributing to the increase of vector densities and favoring transmission. The rapid population growth and urbanization in Latin America and the Caribbean, as well as better transportation and increased travel, also facilitated the dissemination of dengue viruses.

By 1997, every country in the Americas except for Canada, Chile, and Bermuda had been reinfested.

Re-emergence of Dengue Fever. During 1993, Costa Rica and Panama—the last two tropical Latin American countries that had been free of dengue for several decades—reported indigenous transmission of dengue. The serotype was dengue-1, and its introduction in Costa Rica was associated with se-

vere outbreaks in 1993 and subsequent years. After more than a decade of absence since it was last isolated in Puerto Rico, dengue-3 was detected in Panama and Nicaragua in 1994, and it was associated with a nationwide epidemic of dengue and dengue hemorrhagic fever in the latter country. In 1995 it spread to other Central American countries and to Mexico, causing many dengue epidemics. The introduction of dengue-3 in Mexico coincided with an increase in the number of dengue hemorrhagic fever cases, although only dengue-1 and, particularly, dengue-2 were isolated from those patients. It should be noted that this dengue-3 strain belongs to the genotype that has caused major epidemics of dengue hemorrhagic fever in Sri Lanka and India. As of August 1997 dengue-3 has not been isolated outside Central America and Mexico.

In 1995, dengue activity in the Americas reached its peak since 1981, with a total of 316,187 cases reported (of which 9,136 were dengue hemorrhagic fever cases) and 113 deaths. Brazil reported 39% of the dengue cases and Venezuela 59% of the dengue hemorrhagic fever cases reported. The 1995 dengue/dengue hemorrhagic fever outbreak in Venezuela was the largest in the country's history, with almost 30,000 dengue cases and 5,380 cases of dengue hemorrhagic fever. Virtually all Central American countries were affected by explosive and severe epidemics, leading to a state of emergency being declared in several of them. In response, PAHO prepared an emergency plan that received financial support from the governments of England, Finland, and Spain. In addition, PAHO procured insecticides, sprayers, and drugs and conducted one course on clinical diagnosis and patient management and two on vector control. By 1996, the incidence of dengue had abated slightly, with 276,758 cases being reported, 63.5% of them from Brazil.

Emergence of Dengue Hemorrhagic Fever. In 1981, Cuba reported the first major outbreak of dengue hemorrhagic fever in the Americas. Prior to this, suspected cases of dengue hemorrhagic fever or fatal dengue cases had been reported only by Curacao, Honduras, Jamaica, Puerto Rico, and Venezuela, but only a few of them fulfilled WHO's criteria for diagnosis of dengue hemorrhagic fever/dengue shock syndrome, and most were not laboratory-confirmed. During the epidemic in Cuba, 344,203 cases of dengue were notified, of which 10,312 were classified as severe (WHO grades II-IV) and 158 were fatal; a total of 116,143 patients were hospitalized, most of them during a three-month period.

The outbreak of dengue hemorrhagic fever/dengue shock syndrome in Cuba is the most important event in the history of dengue in the Americas. Subsequent to it, in every year except 1983, confirmed or suspected cases of dengue hemorrhagic fever have been reported in the Americas.

Between 1981 and 1996, 42,246 cases of dengue hemorrhagic fever and 582 deaths were reported by 25 countries in

the Americas; 22,170 (53%) of the reports originated from Venezuela. Excluding Cuba and Venezuela, the number of cases by country during the period varied from 1 to 3,929. Colombia, Nicaragua, and Mexico each reported more than 1,000 cases, most of them during the 1992–1996 period. About 76% of Colombia's cases were notified during 1995–1996, whereas 97% of Mexico's cases were reported during 1995–1996. In Brazil, four fatal cases exhibiting fever, hemorrhages, and shock occurred during 1986–1987, and were associated with dengue-1; confirmation was obtained by virus isolation or by antigen detection. In 1990–1991 an outbreak of dengue hemorrhagic fever was recorded in Rio de Janeiro, Brazil, and in 1994, 24 cases and 11 deaths occurred in the State of Ceará. In 1997, dengue/dengue hemorrhagic fever re-emerged in Cuba after 16 years of absence, affecting the municipality of Santiago de Cuba. As of 18 August 1997, Cuban health authorities reported 2,946 cases of dengue, 205 cases of dengue hemorrhagic fever, and 12 deaths, all among adults, and declared that the epidemic had been brought under control and that no dengue transmission was occurring in Cuba.

Studies of dengue hemorrhagic fever cases in the Americas revealed that patients in the Region exhibited similar clinical manifestations as did those in Asia, although the incidence of gastrointestinal hemorrhages observed in Cuba and Puerto Rico seemed higher than that seen in children in Thailand. Liver necrosis was described in 70% of 72 children who died of dengue hemorrhagic fever in Cuba in 1981, similar to findings observed in Thailand. Severe neurological manifestations, renal failure, and myocarditis have been occasionally reported in the Americas.

In the outbreaks in Cuba and Venezuela the disease affected all age groups, although children under 15 years of age comprised about two-thirds of fatalities. Studies in Brazil of dengue hemorrhagic fever cases that fulfilled WHO's criteria showed a modal age range of 31–45 years. Observations in Puerto Rico showed a clear age-distribution pattern in cases that fulfilled WHO's criteria: in 1986, two-thirds of the cases were under 15 years of age, but during 1990–1991, the mean age of patients was 38 years. In Southeast Asia, young children were predominantly affected, although the number of dengue hemorrhagic fever cases in persons older than 15 years old has increased in the Philippines and Malaysia in recent years. Cuba reported no significant predominance of cases in women, a finding that contrasts with observations from Asia.

The epidemics in Cuba and Brazil were clearly associated with dengue-2 virus. In both countries, dengue-1 had been introduced four years prior to the epidemic, after a period of several decades of absence of dengue virus circulation. Cuba suffered a major epidemic, however, while only relatively small outbreaks were observed in Brazil. Peru and Ecuador

experienced a similar sequence of dengue infections with these serotypes, but recorded no dengue hemorrhagic fever epidemics. A distinct epidemiological pattern was observed in Venezuela in 1989–1990 and in French Guiana in 1990–1991, where dengue had been endemic for more than 20 years before the emergence of their first dengue hemorrhagic fever epidemics. Dengue-2 was predominant in Venezuela and in French Guiana, and it was the only serotype found in the tissues of fatal cases in Venezuela. The factors that trigger dengue hemorrhagic fever are very complex. Studies in Cuba suggest that individual risk factors for dengue hemorrhagic fever include chronic diseases such as bronchial asthma, diabetes mellitus, and sickle cell anemia, and that race also seems to be important, since dengue hemorrhagic fever/dengue shock syndrome was more prevalent in white than in black persons.

Overall, the case-fatality rate of dengue hemorrhagic fever in the Americas is 1.4%, but it varies markedly from country to country. For example, in 1995, the case fatality rate ranged from 8.3% in Puerto Rico to 0.8% in Venezuela, a variation that could be explained by such factors as reporting criteria, viral strain, case management, and host genetic factors.

Surveillance. A laboratory network has been established in the Americas to support the epidemiological surveillance of dengue and dengue hemorrhagic fever. Its main functions include monitoring endemicity levels, warning of epidemics early, identifying circulating dengue virus serotypes, detecting the introduction of new virus serotypes/genotypes, conducting serological surveys, and supporting clinical and other special studies. A survey conducted in 1996 revealed that more than 60 dengue laboratories were operating in the Americas, all of them conducting serological diagnosis of the infection (mainly by MACELISA) and many also able to isolate and identify dengue viruses. Virtually every Latin American country affected by dengue or infested with *A. aegypti* has a dengue laboratory, and several have their own network. The fact that two laboratories detected the introduction of dengue-3 virus in Panama and Cuba in 1994—a serotype that had been absent from the Americas for 16 years—illustrates the importance of the network's contribution.

Prevention and Control. The high numbers of dengue and dengue hemorrhagic fever cases, the fact that all four dengue virus serotypes are circulating in the Region, and the vector's extensive range call for an intensification of prevention and control activities.

A vaccine against dengue is not available for general use, but a live attenuated tetravalent vaccine developed in Thailand looks promising. At the same time, efforts are under way to develop a genetically engineered vaccine, but it may take 5 to 10 years to have a safe and efficacious vaccine in hand. Vec-

tor control, therefore, is currently the only approach for combating dengue and dengue hemorrhagic fever. Despite the presence of *Aedes albopictus* in several countries of the Americas, this mosquito has not been clearly implicated in dengue transmission in infested countries so far, and *A. aegypti* is considered the main dengue vector in the Region.

Evaluations of national programs point to many weaknesses. Several countries did not have programs devoted to combat dengue and its vector, and control activities were carried out as part of malaria programs. The lack of financial resources also was evident: in six Central American countries, for example, the average annual per capita spending on dengue control in 1994 was under US\$ 0.08, an amount that is totally inadequate to maintain an efficient dengue control program; similar situations are observed in other countries affected by dengue. According to a survey conducted by PAHO, spending on dengue control in 23 countries in the Americas in 1995 amounted to approximately US\$ 100,000,000, of which Brazil represented about 60% and Cuba around 20%. Studies on the costs of dengue programs conducted in four states in Brazil showed wide variations in per capita spending on dengue, and, interestingly, there was no correlation between spending and the results achieved in terms of dengue control.

The frequent outbreaks of dengue fever and the increase of dengue hemorrhagic fever in several countries demonstrate that control programs have not been well organized nor effective and that emergency measures have had limited impact. Rather than relying on emergency as the basis for response to this disease, countries must now concentrate on establishing coordinated prevention and control programs. In 1997, the Pan American Health Organization and its Member Countries drew up a hemispheric plan to combat *Aedes aegypti* in the Region, a step that should soon begin to make progress in the battle against dengue.

Lyme Disease

Lyme disease is a zoonosis caused by *Borrelia burgdorferi* and transmitted by the tick *Ixodes dammini*. Its reservoirs are field mice and deer. Humans usually become infected during the summer, developing a characteristic lesion that later is accompanied by muscle and joint pains. Enzootic foci depend on conditions that favor survival of the vector and reservoirs of *B. burgdorferi*.

Lyme disease is considered an emerging disease because of the rise in its incidence in the United States. This increase is especially due to the transformation of agricultural and stock-raising lands into construction sites for suburban housing, which displaces deer and their ticks and fosters the geographic spread of enzootic foci.

In the United States, where the disease has been found in 47 of the 50 states, more than 65,000 cases were reported between 1982 and 1996. In that last year alone, more than 16,000 cases were notified in the East (from Maryland to Massachusetts), the Midwest (Wisconsin and Minnesota), and the West (California and Oregon). Lyme disease was also reported in Canada, primarily in Ontario and British Columbia (82, 83).

Diseases Caused by Organisms Resistant to Antibiotics and Other Drugs

The resistance to antibiotics of various bacteria that used to be sensitive to them significantly increased in the 1980s and 1990s. Only *Streptococcus pyogenes* continues to be sensitive to penicillin, even though that drug has been widely used against disease. Some bacterial isolates are resistant *in vitro* to all the antibiotics now in use. Therefore, infections caused by Gram-positive bacteria (staphylococci, pneumococci) or Gram-negative bacteria (enterobacteria) now require treatment with several antibiotics in succession, and sometimes hospitalization; even with these measures the patient may die (84). Methicillin-resistant *Staphylococcus aureus* is a frequent cause of hospital infections. In general, the strains that are resistant to methicillin are resistant to other antibiotics as well, with the exception of vancomycin (85). *Escherichia coli* and *Streptococcus faecium*, common causes of nosocomial infection, are also resistant to several of the latest antibiotics, and the isolation of vancomycin-resistant *S. faecium* has been reported (86, 87).

Streptococcus pneumoniae has developed resistance to various antibiotics. There are now several multi-drug-resistant strains (insensitive to penicillin, erythromycin, tetracycline, chloramphenicol, and trimethoprim-sulfamethoxazole), and in some countries strains with resistance to third-generation cephalosporins have been detected (88). The current problem of bacterial resistance to antibiotics is severe, given the rapidity with which the resistance genes are spreading from country to country. In fact, penicillin-resistant *S. pneumoniae* is now present throughout the world, and the same expansion is occurring with multi-drug-resistant *Salmonella* spp. and *Shigella* spp. and β -lactamase producing *S. aureus*. In addition, *S. faecalis* capable of producing the enzyme β -lactamase has been detected in South America, Europe, and the United States so far.

Another factor in the development of resistance is the widespread and uncontrolled use of antibiotics in livestock production to promote animal growth, prevent diseases, or treat infections. This overuse of antibiotics has led to an increase in the prevalence of resistant bacteria in animals, the transfer of resistant pathogenic microorganisms to humans

through direct contact with animals or through consumption of contaminated food or water, and the transfer of resistant genes to bacteria in humans. This situation merits a coordinated intersectoral surveillance of antibiotic-resistant bacteria in foods of animal origin and in livestock.

Mycobacterium tuberculosis is another bacteria whose resistance is reflected in a rise in morbidity and mortality from tuberculosis. This is especially true in immunodeficient patients, among whom the case-fatality rate for the disease may reach 80%. Several epidemics caused by resistant bacilli have been identified, especially in prisons and hospitals. A strain called W was found in more than 100 patients in New York City, United States; it is resistant to isoniazid, rifampicin, streptomycin, ethambutol, and, sometimes, kanamycin and ethionamide (89). In the Dominican Republic, primary multi-drug resistance (to rifampicin and isoniazid) was found in 5% of new patients with positive microscopic sputum examinations and 13% of those who had received treatment previously (Weil D, personal communication, 1997). Although this phenomenon is increasing, in most cases the drugs continue to be reasonably effective *in vivo*, despite the presence of *in vitro* resistance. Therefore, decisions on changes in drug therapy must also take into account effectiveness and cost considerations.

Drug-Resistant Malaria Caused by Plasmodium falciparum

In the 21 countries of the Americas with active malaria control programs, 1,090,718 cases were notified in 1996; in 263,945 of the cases, the etiologic agent was *Plasmodium falciparum*. The area in which this parasite is resistant to chloroquine, to sulfadiazine-pyrimethamine, or to both treatments encompasses the Amazonian region of Bolivia (the country's border with Brazil), Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, and Venezuela (90). In these areas the drugs of choice for treatment of malaria are quinine by itself or in combination with sulfadiazine-pyrimethamine; if resistance to those drugs is already present, mefloquine or artemisin is used. Resistance *in vitro* of *P. falciparum* to quinine and mefloquine has been demonstrated.

NUTRITIONAL DISEASES AND DISEASES OF METABOLISM

Protein-Energy Malnutrition

Anthropometric parameters are the most commonly used indicators to assess the magnitude of protein-energy malnutrition in young children—weight in relation to age, height in relation to age (or length in relation to age for children under

2 years of age), and weight in relation to length or height. Low length/height-for-age (“stunting”) generally is an indicator of long-standing undernutrition. Low weight-for-height (“wasting”) generally indicates current undernutrition. Weight-for-age is a combined indicator, but it does not determine whether undernutrition is current or long-standing. WHO recommends –2 standard deviations below the median reference values of each of those indicators as a cut-off point below which undernutrition is likely to exist. Table 18 shows the available data on anthropometry from surveys carried out since 1991; 14 of the 15 countries had conducted national studies.

Most surveys in the Region show a low prevalence of low weight-for-height among children under 5 years of age. This indicates that, on the whole, undernutrition is not an acute problem in the Americas. Rather, there is a long-standing process of moderate undernutrition that is reflected in slow linear growth, as demonstrated by the high prevalence (over 10%) of stunting in most countries.

In terms of weight-for-age, the national prevalence of underweight varies from 0.9% in Chile to 19.3% in Honduras. The differences in prevalence are not only among countries, but also within countries. In every case where urban and rural data are available, the prevalence of underweight is considerably higher in rural than in urban populations, sometimes twice as high as in El Salvador (14% vs. 7.2%), Honduras (23.2% vs. 12.4%), and Nicaragua (15.5% vs. 8.6%). Even within rural areas certain population groups are more prone to undernutrition than others; for example, an indigenous community in Honduras is almost 11% higher in underweight than the country's rural population, and shows a prevalence of stunting of 70.5% versus 47.2% for the rural population.

Despite the Region's many social and economic problems over the last two decades, undernutrition has improved. For example, the Dominican Republic showed an undernutrition rate of 12.5% in 1987, compared to 10.4% in 1991; El Salvador's figures were 15.2% in 1988, compared to 11.2% in 1993; and Honduras', 20.6% in 1987, compared to 19.3% in 1991–1992.

Unfortunately, only very few countries have secular data that are comparable enough to allow for an accurate trend analysis. However, it can be estimated that in 1995, 6 million Latin American and Caribbean children under the age of 5 (11% of the population in that age group) were suffering from protein-energy malnutrition (91).

The World Summit for Children held in New York in 1990 set a mid-decade goal of a 20% reduction from 1990 levels of low weight-for-age among children under 5 years old and a year 2000 goal of a 50% reduction of severe and moderate malnutrition among children under 5 years old. Clearly, although the overall protein-energy malnutrition situation in the Region has

TABLE 18
Percentage of preschool children in the Americas who fell below the cut-off point^a of weight-for-height, height-for-age, and weight-for-age, by country and year of survey.

Country	Scope of survey	Year	Sample size	Weight-for-height	Height-for-age	Weight-for-age
Argentina	National	1994	5,296	1.1	4.7	1.9
Bolivia	National	1992	NR	...	...	11.7
Chile	National ^b	1994	NR	0.3	2.6	0.9
Costa Rica	National ^c	1992	176,935	...	...	2.3
Cuba	Havana	1993	1,300	0.4	2.6	1.4
Dominican Republic	National	1991	2,884	M 1.2 F 0.9	M 20.9 F 17.8	M 11.2 F 9.6
El Salvador	National	1993	3,483	1.3	22.8	11.2
	Metropolitan	1993	734	0.3	13.6	7.2
	Rural	1993	1,824	1.8	28.1	14.0
Guyana	National	1993	581	...	...	18.3
Haiti	National	1994/1995	2,794			27.5
	Urban		...			22.1
	Rural		...			29.8
Honduras	National	1991/1992	6,166	1.5	39.4	19.3
	Urban			1.3	26.3	12.4
	Rural			1.6	47.2	23.2
	Indigenous community	1992	147	0.7	70.5	34.0
Jamaica	National	1993	663	3.5	9.6	10.2
Nicaragua	National	1993	3,301	1.9	23.7	11.9
	Urban			1.6	15.6	8.6
	Rural			2.2	32.7	15.5
Panama	National	1992	853	2.7	9.9	6.1
Peru	National	1991/1992	7,035	1.4	36.5	10.8
Venezuela	National ^b	1993	244,142	3.1	12.8	4.6

NR = Not reported; M = male; F = female

^a Cut-off point < -2 sd.

^b National Surveillance System < 5 years.

^c National Surveillance System < 6 years.

improved, the reduction still falls short of the Summit goals. The interventions for eliminating undernutrition as a public health problem must focus on increasing food security at the household level and targeting population groups at risk, primarily infants and children under 2 years old.

Micronutrient Deficiencies

For many years—when goiters were visible among large groups of population and signs of hypovitaminosis A, including ocular manifestations, were common—iodine and vitamin A deficiency received considerable attention. However, fortification of salt with iodine and other foods with vitamin

A (particularly sugar in the Central American countries) reduced these problems considerably.

In the late 1960s and 1970s nutrition activities focused on protein-energy malnutrition. The general opinion was that by preventing and treating protein-energy malnutrition, vitamin and mineral deficiencies would automatically be taken care of. It became increasingly clear, however, that even after reductions in severe forms of protein-energy malnutrition, there was still a high prevalence of stunted children in many countries. By the 1980s, micronutrient malnutrition in Latin America and the Caribbean was once more reaching levels comparable to those found in the surveys carried out by the United States Interdepartmental Committee for National Defense in the 1960s. Furthermore, careful research demonstrated that

TABLE 19
Prevalence of goiter, median urinary iodine concentration, and percent of population with urinary iodine level <10 µg/dl in selected countries.

Country	Year	Prevalence of goiter (%)	Urinary iodine	
			Median concentration (µg/dl)	% population <10 µg/dl
Belize	1994	...	18.4	15.6 ^a
Bolivia	1994	4.7	22.3	19.5
Colombia	1994	6.8	...	...
Dominican Republic	1993	5.3	...	85.8
Ecuador (5 sentinel sites)	1995	19.5	31.5	6.25 ^b
Guatemala	1995	...	...	...
Rural				21.1
Urban				24.8
Haiti	1992			
Central plateau		10.5	10.0	...
Paraguay	1994			
Misiones		32.4	...	48.1 ^c
Venezuela				
Merida	1993	64.7	...	47.5
Tachira	1995	65.9	...	29.9
Trujillo	1994	59.6	...	37.7

^a Value < and not 10 µg/dl.

^b % between 5 and 9.9 µg/dl.

^c <5 µg/dl.

subclinical deficiencies of vitamin A, iodine, and iron caused severe public health problems, including increased morbidity and mortality and interference with physical and mental development of children and other population groups.

Iodine Deficiency

Iodine deficiency in a population results from consuming an iodine-poor diet, either because food is grown in iodine-depleted soil or because goitrogenic agents in some foods, such as cassava, bamboo shoots, sweet potato, millet, and cabbage, alter iodine metabolism. Lack of iodine produces goiter (among other disorders), which is the most visible manifestation of this deficiency. In addition, the effect of iodine deficiency on pregnant women, particularly during the first four months of pregnancy, results in increased fetal mortality, cretinism, and severe mental deficiency. Even mild or moderate deficiency produces disorders such as deafness and some degree of mental retardation.

To assess the situation and for surveillance purposes, the determination of the prevalence of goiter, particularly in schoolchildren, and the analysis of urinary iodine levels are sufficient. Table 19 presents prevalence of goiter, urinary io-

dine concentration, and percent of population with iodine levels under 10 µg/dl for selected countries of the Americas. It shows that goiter remains as a public health problem (i.e. >5% prevalence) in some regions in certain countries, particularly in the Andean subregion and in the north of Central America.

It should be noted that countries are collecting information on iodine deficiency disorders in areas that have historically presented endemic goiter, so the prevalence shown in the table is not representative of the countries as a whole. Urinary iodine has been shown to be a more reliable indicator for identifying the current status of iodine deficiency disorders than is goiter. Thanks to the programs of salt fortification with iodine, Latin American countries have achieved sound success in the fight against iodine deficiency disorders. Those countries where urinary excretion of iodine is expressed in median concentration, such as Belize, Bolivia, Ecuador, and Haiti, have acceptable values of urinary iodine (over 10 µg/dl) or are close to it. However, prevalence data show that in some areas a high proportion of the population has a urinary iodine level below 10 µg/dl, and so are still at risk of iodine deficiency disorders.

In the last few years, Bolivia, Ecuador, and Peru, countries where iodine deficiency has been traditionally endemic, have

achieved remarkable success in increasing iodine intake among the population at risk. In Ecuador, information available in 1992 showed levels of urinary iodine above 10 µg/dl in 80.8% of the communities living in the mountains; along the coast, 98.5% had levels over 10 µg/dl and in the Amazon region, 98.9% had levels over 10 µg/dl.

Results from a survey completed in early 1995 confirmed that iodine deficiency disorders are still a problem in certain areas of Cuba. A total of 3,027 urine samples from children in 25 municipalities distributed among 11 provinces were analyzed. The median was 9.5 µg/dl, but in mountainous areas, values below 2 µg/dl were found (92). Another study carried out in Brazil in 1994 showed that 35.4% of 15,303 children presented values below 10 µg/dl, and out of 401 municipalities, the medium excretion was under 10 µg/dl in 21.2% (93).

Data on fortification of salt with iodine is fairly up to date, showing that Argentina, Bolivia, Brazil, Chile, Costa Rica, El Salvador, Mexico, Peru, and Uruguay have achieved coverage levels of more than 90% of the population with iodized salt. Not all salt contains the recommended amounts of iodine, however, and there still are population pockets where iodized salt is not available or where local customs lead to the consumption of non-iodized salt.

Vitamin A Deficiency

In contrast with iodine deficiency, the origin of vitamin A deficiency is mainly dietary. Milk produced by mothers who are vitamin A deficient also is deficient, resulting in an inadequate supply of vitamin A to the lactating infant. Infections also may play a role, by accelerating the urinary loss of vitamin A (94, 95).

Disorders resulting from vitamin A deficiency include growth retardation, alterations of the epithelial tissues, and an increase in the prevalence and duration of infectious episodes. The eye is the organ that presents the most visible evidence of vitamin A deficiency, leading to xerophthalmia (night blindness). A deficiency also can interfere with iron metabolism, resulting in anemia (96). The administration of vitamin A increases hemoglobin levels and, together with iron supplements, reduces anemia (97, 98).

Low serum or plasma retinol is widely accepted as a valid indicator of the presence and magnitude of vitamin A deficiency in the population (99); a prevalence greater than 10% of values <0.35 µmol/l (<20 µg/dl) indicates a public health problem (100).

The prevalence of vitamin A deficiency shows marked contrast in different socioeconomic and geodemographic groups—it is higher in rural than in urban settings, in indigenous than in nonindigenous communities, and in low than in high socioeconomic status. The lowest prevalence

of vitamin A deficiency in Latin America and the Caribbean was found in Panama, 6.1% (Table 20). Among indigenous children in Panama, however, the figure was 13%, compared to only 5% among nonindigenous children (101). Nicaragua reported an overall prevalence of 31.3%, but, as expected, it was higher among children from low socioeconomic status (39%). In Ecuador, serum retinol levels were positively associated with the mother's education (children from illiterate mothers were three times more likely to have low serum retinol), as well as with persons living in rural areas (rural inhabitants have a rate of 21.9%, as opposed to urban dwellers, who have a rate of 12.9%) and with socioeconomic status. The national Guatemalan survey found a prevalence of low serum retinol of 15.8%; higher among children consuming brown sugar (22.4%) than among those consuming white sugar (15.1%), most of which is fortified (102). In Mexico in 1994, 29.5% of 219 children living in rural areas and 4.8% of 270 living in urban communities had low retinol levels (103). In Peru it was 5% in urban Lima, and 24% in the shantytowns ("pueblos jóvenes") surrounding Lima (104).

A three-country study on β-carotene, vitamins A and E, and iron status was conducted in the English-speaking Caribbean in 1996 (105). The cut-off point for marginal or deficient vitamin A status was 25 µg/dl. The prevalence of low values was 11.7% in children 1 to 4 years of age in Antigua and Barbuda; 10.7%, 1.2%, and 2% in preschool children, schoolchildren, and pregnant women, respectively, in Dominica; and 6.2%, 1.1%, and 2.5%, respectively, in Saint Vincent and the Grenadines.

Iron Deficiency

Anemia is a public health problem both in developing countries, where prevalence is estimated to be above 35%, and in industrialized nations. Pregnant women and children under the age of 2 years are the most affected. In fact, it is believed that more than half of pregnant women and more than 40% of children under the age of 2 years in developing countries suffer from anemia, in most cases due to iron deficiency (106).

The causes of anemia are multiple and complex. The major causes are poor iron absorption or intake, excessive loss of blood in women during menstruation and childbirth, low intake of other food and nutrients that promote iron bioavailability, parasitic infestations, chronic or recurrent infections, and AIDS (107).

Studies have shown that, compared to nonanemic children, anemic children have deficiencies in neuromotor maturation, cognitive and affective processes, attention span, learning, and information processing. These effects are greater the

TABLE 20
Serum retinol levels^a in selected countries of the Americas.

Country	Year	Sample size	Group	Mean g/dl	% < 20 µg/dl
Argentina					
Tierra del Fuego	1995	NR	Pregnant	...	8.7
Bolivia	1991	801	12–71 months	32.3	...
Rural highlands					11.3
Dominican Republic	1993	1,516		27.6	...
		765	Preschoolers		22.7
		751	Schoolchildren		15.0
Ecuador	1993	1,232	12–59 months	27.6	20.0
Rural					21.9
Urban					12.9
Guatemala	1995	1,576	12–59 months	15.8	15.8
Rural					17.1
Urban					15.6
Guatemala City					10.4
Mexico	1994	NR	Preschool	...	...
Urban					4.8
Rural					29.5
Nicaragua	1994	1,451	12–59 months	...	31.3
Panama	1992	1,103	Preschool	...	6.1
Peru					
Lima	1993	225	<4 years	...	24.0
Libertadores/Wari	1993		<4 years	...	...
Coast		94			21.0
Highlands		74			24.0

NR = Not reported

^a Cut-off point 20 µg/dl.

more severe and long-standing the anemia, and persist after the anemia has been corrected (108, 110).

The magnitude of the intellectual deficit in affected individuals may be small, but its effect is greatly magnified when considered in terms of the intellectual level of the population as a whole (111).

There is abundant evidence demonstrating that anemia during pregnancy is associated with increased maternal mortality and fetal wasting, and that it can be associated with premature delivery or low birthweight for gestational age (112). Iron-deficiency anemia also impairs functional activity and working capacity. Some studies show that the productivity in a population can increase at least 30% when iron-deficiency anemia is corrected (113).

WHO has established cut-off points for determining the existence of anemia: 11 g of hemoglobin per deciliter of blood in pregnant women and children under 5 years old and 12 g in school children, adults, and non-pregnant women. Some countries, however, have decided to adopt different cut-off

points, and the hemoglobin level below which anemia is present has not been established for populations living at different altitudes.

It is not easy to assess the Region's iron deficiency anemia situation. There are several problems related to existing sources of information; in most cases, data come from limited studies or from health services, and do not reflect the national situation.

Wide variations persist among countries and within countries. In Santiago, Chile, the prevalence of anemia is 1.2%, and in Lima, Peru, it reaches 54.6%. In Bolivia's plains it is twice as high as in the valley. Undoubtedly, these great differences are partly due to variations in the population groups examined (see Table 21).

Iron deficiency has received comparatively less attention than iodine and vitamin A deficiencies, and yet it is the most widespread of the three micronutrient deficiencies under consideration. Although iron deficiency's clinical features are more subtle and less dramatic than overt cretinism or the oc-

TABLE 21
Prevalence of anemia in pregnant women^a in selected countries in Latin America and the Caribbean.

Country	Region	Year	Sample size	%	Source of data
Belize	National	1995	4,661	51.7	HC
Bolivia ^b	National	1993	3,606	50.5	HC
Chile	SE Santiago	1993	342	0.9 ^c 1.9	HC
Cuba ^d	Sentinel sites ^e	1993	NR	25.0–35.0	LS
Guatemala ^b	National	1993	NR	35.4 ^f	NS
Nicaragua	National	1993	NR	33.6 ^g	NS
Paraguay	National	1993	385	26.2	HC
Peru	Lima	1992	NR	54.6	LS

Note: HC, data from health centers; LS, local survey; NS, national survey; NR, not reported.

^a Cut-off point Hb <11 g/dl.

^b Adjusted for altitude.

^c First trimester.

^d Havana and Pinar del Rio.

^e Second and third trimesters.

^f Women 18–44 years old, pregnant or not.

^g Adult women, pregnant or not.

ular manifestations of vitamin A deficiency, its consequences are potentially just as devastating for the Region's human and social development.

Most countries have relied on the supplementation of pregnant women with iron to control iron deficiency; no supervision or follow-up has been provided, however, and very little compliance has been reported. The fortification of a target food with iron is increasingly being acknowledged as an adequate solution, even though the impact of this intervention can only be measured in medium to long term. Currently, 18 countries are fortifying at least one product for mass consumption (114).

Obesity among the Poor: An Emerging Problem in the Region

As a result of the economic difficulties that Latin America and the Caribbean experienced in the 1980s, vast segments of the population migrated from rural to poor urban areas and from poor to less poor countries in search of employment. These massive movements, which have substantially changed these groups' living conditions and lifestyles, have coincided with changes in epidemiological profiles and in dietary and physical activity patterns in the Region. As part of this transition, many countries are experiencing a decrease in mortality from infectious diseases, a reduction in the prevalence of protein-energy malnutrition, and a marked increase in the prevalence of overweight and obesity² and chronic diseases. For example, in Chile the percentage of children below one standard deviation from the median reference value is 3.7%, while the proportion above one standard deviation is 21.6% (115).

In São Paulo, Brazil, a study of 535 families in a marginal urban population found that 30% of the children had a relative height deficit, and that overweight associated with that condition was present in 5.8% of boys and 6.8% of girls. In addition, 9% of the families showed obesity in adults, coupled with low weight and height in children. These findings demonstrate the coexistence of malnutrition and obesity.

Results from Peru's 1990–1992 ENDES survey, which looked at 4,675 women who had given birth to at least one child in the preceding five years, showed an average body mass index³ (BMI) of 26.3 kg/m². Furthermore, it was estimated that 17.5% had a BMI of between 26 kg/m² and 28.9 kg/m² and that 13.2% were above 29 kg/m². The average BMI in metropolitan Lima was 27.2 kg/m². In another study conducted in community kitchens in poor neighborhoods in a Lima district, a 32.6% prevalence of overweight and a 13.1% prevalence of obesity were observed in women.

In Uruguay a greater proportion of obesity was found in women of low socioeconomic status (37.6%) compared to

² Obesity is an excess of body fat; consequently, its identification implies measurement of body composition. For simplicity, however, in this chapter the terms "obesity" and "overweight" are used interchangeably.

³ Body mass index is the ratio of weight (kg) over height ²(m).

women of high socioeconomic status. The greatest gender differences also were reported in the low-income strata. Based on information obtained during a 15-year period by the PAHO-Kellogg Multicenter Project, "Diet and Health in Latin America and the Caribbean," the proportion of obese adults rose in both Costa Rica and Panama (116).

The association of poverty with malnutrition and infectious diseases, and of affluence with obesity and chronic non-communicable diseases is no longer valid in the high-income countries, and is increasingly less so in the Region's poor countries (117). Obesity among the poor may differ from the obesity found among the more affluent groups within a single country or in the more developed nations. A number of factors may be instrumental in determining these differences, such as genetic-adaptive factors, dietary factors (increase in fat and sugar consumption, the cheapest source of energy, and a reduction in fiber consumption), and sociocultural factors (such as lack of systematic physical activity among poor, sedentary populations). The inequities governing access to promotional messages, health education, and adequate health services result in the public's lack of awareness about the importance that behavioral changes have in achieving healthier lifestyles.

If gender-related factors are taken into account, the gap between the "two obesities" is even more marked: women face greater opportunity limitations, heavier social burdens, and an undervalued image of their bodies. Furthermore, they traditionally have been socially subordinated to men, making them even more susceptible to this complex set of negative influences.

Importance of Breast-Feeding

In 1997, the Pan American Health Organization sent questionnaires to 34 countries of the Region, to assess breast-feeding practices and activities as part of the implementation of the International Code of Marketing of Breast Milk Substitutes and the "baby friendly" hospital initiative. Twenty of the 25 countries that responded to the questionnaire have formally adopted the International Code, either as legislation or by Ministerial decree, but many have not yet put implementation and monitoring plans in place. Twenty-two of the countries reported that they had established a national breast-feeding committee, and "baby friendly" hospital initiative committees are in place in 17 countries.

Nongovernmental organizations play an active role in the promotion of breast-feeding in 20 of the countries. Twenty-two have written breast-feeding norms that are disseminated to all health personnel. Eighteen countries have a plan of action to implement the "baby friendly" hospital initiative. A

total of 981 hospitals have been designated as "baby friendly" and another 921 are reported to have a certificate of commitment to become "baby friendly." Only six of the responding countries have no such designated hospital. All the countries have shown efforts to prohibit the distribution of free or low cost breast-milk substitutes.

All of the countries reported having a training program on lactation management, and 18 reported having a training program for baby friendly hospital evaluators. Educational programs to promote breast-feeding to the public have been implemented in 22 countries, and mass media is used to promote breast-feeding in 18.

A minimum of 12-week paid maternity leave has been legislated in all countries, and in 18 of them this legislation includes at least two half-hour breast-feeding breaks in an eight-hour workday to new mothers. In most countries, however, women working in the informal sector are not covered by these laws.

Data from national demographic and health surveys or other surveys show that breast-feeding initiation rates exceed 90% in all countries, ranging from 90% in Belize to 98% in Brazil. In contrast to the high rates of breast-feeding initiation, women breast-feed exclusively (defined as giving breast milk as the sole source of food or liquid) only for extremely short periods. The median duration of exclusive breast-feeding ranges from 0.3 months in Paraguay to 2 months in Ecuador. These short periods of exclusive breast-feeding are of particular concern, because exclusive breast-feeding offers the greatest protection against infant morbidity and mortality (118–120). Moreover, the greatest decline in the proportion of infants that are breast-fed exclusively is during the first 2 months of life, the very age when breast-feeding offers the greatest protection against diarrheal and respiratory infections.

For example, in Belize, Colombia, Costa Rica, Nicaragua, and Paraguay, the median duration of breast-feeding is about one year, and the period of peak diarrheal incidence is generally between 9 and 12 months of age. During diarrheal illness, infants decrease their intake of other foods, but continue to consume breast milk. Continued breast-feeding during this period, therefore, is critical to buffer the negative effects of diarrhea on nutritional status. Inasmuch as breast-feeding cessation tends to be permanent, the period between the first week and first month after deliver is the ideal time to try and extend the duration of the practice. Recent evidence shows that when constraints to breast-feeding are removed and women hospitalized for childbirth are given support and information, the duration of exclusive breast-feeding can be considerably lengthened (121). Hospital-based promotion of breast-feeding also is extremely cost-effective (122).

CARDIOVASCULAR DISEASES

Cardiovascular diseases include a group of conditions affecting the circulatory system, particularly ischemic heart disease, cerebrovascular disease, and hypertension. The first two represent the most frequent causes of circulatory morbidity and mortality, and, together with hypertension and atherosclerosis, share common risk factors that can be identified early and treated with positive results, thus facilitating their prevention and control.

It is estimated that in the year 2000 the number of deaths from circulatory causes in Latin America and the Caribbean will be 1,100,000, or almost 50% of deaths from noncommunicable diseases and approximately 31% of deaths from all causes (123). In addition, deaths from cardiovascular diseases will continue to account for nearly 50% of deaths from noncommunicable diseases until the year 2020, but their percentage will rise to 34% of total deaths in the year 2010 and 38% in the year 2020.

In the absence of information on morbidity and risk factors, age-adjusted mortality rates have been the traditional method for expressing and comparing the magnitude of health problems within a country or territory. However, these rates do not take into account the social, health, and economic implications of these deaths, especially if one considers the value that society places on health and the efforts made to prevent death in the early and most productive years of life.

For cardiovascular diseases, the use of premature mortality indicators is of interest for other reasons. Because these diseases occur more frequently in older persons, it would be unreasonable to expect that they could be prevented; rather, their onset could be postponed and their death delayed. Thus, the concept of premature mortality takes on a preventive connotation, since most deaths occurring before a given age can be considered indicative of deficiencies in both the prevention and clinical treatment of cardiovascular diseases. In this context, premature mortality can be interpreted as the consequence of lost opportunities for prevention. The comparison of premature mortality—between geographic areas and over time—can reflect the uneven influence of the determinants of a population's health and health promotion, and inequity in access to health services.

The rate of years of potential life lost (YPLL) from birth to age 64, based on recorded mortality, has been selected as an indicator of premature mortality. To avoid excessive variations in smaller countries and to smooth out variations in the trends analysis, these rates are presented as the annual average for each five-year period from 1960 to 1994. In addition, the five-year average rates of YPLL presented here—which will be called YPLL rates in the remainder of this section—

represent countries that have mortality figures recorded for at least two years in each five-year period, are age-adjusted using the standard world population, and are expressed per 100,000 population.

Extent of Premature Mortality

Premature mortality from cardiovascular diseases varies substantially from one country to another. The country with the highest YPLL rates due to cardiovascular diseases for both men and women is Argentina. There, the high percentage of deaths coded as cardiac arrest contributes substantially to the country's high rate, and this could indicate questionable medical certification of deaths due to cardiovascular diseases. Argentina is followed by two Caribbean countries, Trinidad and Tobago and Suriname, as well as by Brazil and Venezuela, for men, and by Trinidad and Tobago, Brazil, and El Salvador, for women. The countries with the lowest rates for both men and women are Canada, Chile, and Costa Rica.

Three Caribbean countries—Trinidad and Tobago, Suriname, and Cuba—and another country with a Caribbean coast, Venezuela, show the highest YPLL rates from ischemic heart disease for both men and women, while Ecuador and Chile have the lowest rates. It should be pointed out that the rates for women are generally low in many countries.

The highest YPLL rates due to cerebrovascular disease for both men and women occur in Brazil, Argentina, and Trinidad and Tobago, followed by Barbados and El Salvador for men and by Suriname and Colombia for women. In the case of hypertension, the highest rates are found in Trinidad and Tobago, Brazil, Venezuela, and Colombia for both men and women, and in Suriname which has the highest rate for men.

Premature Mortality Trends

In conducting the trends analysis, 13 of the 16 countries with information available for the 1990–1994 five-year period have been included. In these countries, it has been possible to calculate the YPLL rates due to cardiovascular diseases in at least six of the seven five-year periods since 1960–1964. In regards to ischemic heart disease, the information is somewhat less complete in Argentina, Colombia, El Salvador, and Trinidad and Tobago. For each cause, the average five-year change in the three following indicators is presented: the YPLL rate, the ratio between the YPLL rate in the 15–44-year age group and the rate in the 45–64-year age group, and the ratio between the YPLL rates for men and women.

All Cardiovascular Diseases

Table 22 shows the average five-year change in the YPLL rates per 100,000 population over the course of the 35-year period, by country and by cause, the standard error of this change, and the probability that this change will be other than zero. Of the 13 countries selected, 7 show a statistically significant decline in YPLL rates. Only El Salvador shows an increase in the rate. In the other five countries, no statistically significant changes are seen, although the rates tend to decline in all of them. Sharp and statistically significant declines are seen in the rates for Mexico, starting in the 1970–1974 five-year period, and for Argentina, starting in the 1975–1979 period; the decline seen in Mexico is the highest experienced in any of the countries over the same period.

In four of the seven countries with declining YPLL rates for all cardiovascular diseases—Chile, Colombia, Costa Rica, and Trinidad and Tobago—the decline occurred more rapidly among people in the 15–44-year age group than among those in the 45–64-year age group (Table 23). In Barbados, Canada, and the United States, however, the decline was similar in both age groups. Of the country YPLL rates that began to drop later in the period studied, Mexico's fell more rapidly among those older than 45, while Argentina's declined equally among those older and younger than 45. The explanation for this phenomenon of relative compression of premature mortality toward ages closer to 65 in some countries, requires a detailed cohort analysis of these diseases' incidence and death rate that is beyond current capabilities, due to insufficient available data.

In general, the change in YPLL rates for all cardiovascular diseases has been greater among men than among women. Except in Argentina, Barbados, Canada, and the United States, the ratio between the YPLL rates for all cardiovascular diseases in men and in women has become statistically significant (Table 24). In Colombia, Costa Rica, El Salvador, Mexico, and Nicaragua this ratio was close to 1 at the beginning of the periods under study, but recently has been significantly higher than 1. These countries tend to have YPLL rates that did not decline or, if they did, the initial rates were relatively low in comparison with those of the other countries.

Ischemic Heart Disease

In most of the Region's countries there is a trend toward a decline in cardiovascular diseases. Few countries have seen a decline in YPLL rates due to ischemic heart disease, however. In 4 of the 13 countries analyzed (Argentina, Canada, Chile, and the United States) these rates have declined significantly (see Table 22), while in Mexico and Nicaragua they have increased. The remaining countries showed a slight but not

statistically significant tendency toward increase in the rates.

In Mexico, the increase occurred primarily in the 45–64-year age group, while the rates declined in the 15–44-year age group; this can be considered an absolute compression of premature mortality toward the older age groups (Table 23). However, in Nicaragua, there was an increase in the YPLL rates for all age groups. In countries with declining YPLL rates, the decrease occurred equally in all age groups, except in Chile, where there was a relative compression of premature mortality toward the 45–64-year age group. Other countries with similar compression are Colombia and Costa Rica. In Colombia there was an increase in YPLL rates in all age groups until the 1975–1979 period, when the rates began to decline in the younger groups but remained steady among people aged 45 to 64. In Costa Rica, premature mortality rates have declined slightly in the groups under age 45. This is offset by a slight increase in the 45–64-year age group, which explains why the overall rate has remained stable. This is known as a small-scale relative compression.

YPLL rates are substantially higher among men than women. In effect, the predominance of premature mortality among men is attributed to premature deaths due to ischemic heart disease, which occurs three to five times more frequently among men than women in most of the countries. This difference has not only continued over time but has increased significantly in 6 of the 13 countries analyzed. Although the masculinity ratio of YPLL rates has declined in Canada and the United States, these rates continue to appear among the highest rates on the continent (Table 24).

Cerebrovascular Disease

In most of the countries, YPLL rates due to cerebrovascular disease have declined significantly except in Cuba, El Salvador, and Venezuela (Table 22).

The contribution of each age group to the YPLL rates has varied in five countries: Canada, Colombia, Cuba, Mexico, and Nicaragua (Table 23). The rates for the 15–44-year age group have declined in all five countries, and in Colombia, Mexico, and Nicaragua the decline has been more rapid than in the 45–64-year age group. In Canada, however, the decline in the rate for the younger group was not as rapid as that for the 45–64-year age group. In Cuba this latter rate increased, offsetting the declining rate among the younger group. In the remaining countries, the age distribution of the YPLL rates has remained more or less stable over time.

The masculinity ratio of YPLL rates for this disease has remained stable during the seven five-year periods studied, except in Cuba and the United States (Table 24). In these two countries, there has been a relative increase in the rates for men, which was more marked in Cuba, one of the few coun-

TABLE 22
Average five-year change in rates of years of potential life lost (YPLL), by country and by cause of death, 1960–1994.

Cardiovascular diseases				Ischemic heart disease				Cerebrovascular disease				Hypertension			
Country ^a	Change ^b	SE ^c	p ^d	Country	Change	SE	p	Country	Change	SE	p	Country	Change	SE	p
Trinidad and Tobago	-156.9	15.9	0.00	United States	-76.0	8.6		Trinidad and Tobago	-75.8	9.8	0.00	Trinidad and Tobago	-27.7	4.0	0.00
Colombia	-131.7	4.1	0.01	Argentina	-50.5	5.7	0.00	Chile	-36.4	1.7	0.00	Barbados	-26.5	2.8	0.00
Canada	-127.7	9.9	0.00	Canada	-49.8	11.5	0.01	Barbados	-34.5	13.1	0.04	United States	-9.3	3.7	0.04
Chile	-127.7	9.9	0.00	Chile	-22.5	2.1	0.01	Colombia	-23.5	8.3	0.04	Cuba	-7.7	1.7	0.01
Barbados	-124.7	15.3	0.00				0.00	United States	-23.0	2.5	0.00	Chile	-7.5	0.8	0.00
United States	-109.6	7.7	0.00					Mexico	-21.0	4.7	0.01	Argentina	-7.1	1.6	0.01
Costa Rica	-92.9	17.7	0.00					Costa Rica	-17.2	5.0	0.02	Canada	-4.7	0.9	0.00
								Canada	-15.0	1.5	0.00	Costa Rica	-4.5	0.6	0.00
								Nicaragua	-11.8	1.8	0.00				
								Argentina	-9.2	1.9	0.01				
Mexico ^e	-80.2	45.7		Trinidad and Tobago	-27.7	9.4	0.06	Cuba	-4.8	3.5		Colombia	-4.0	2.2	0.15
Nicaragua	-43.6	30.4	0.14	Colombia	-11.3	5.6	0.13	Venezuela	-0.4	3.2	0.24	Venezuela	-2.0	1.6	0.27
Cuba	-23.5	11.7	0.22	Barbados	2.6	12.6	0.85	El Salvador	3.7	3.5	0.91	Mexico	-0.4	0.9	0.64
Venezuela	-17.2	10.4	0.11	Costa Rica	3.7	2.2	0.16				0.37	El Salvador	-0.2	0.2	0.24
Argentina ^f	29.9	36.2	0.16	Venezuela	8.5	5.1	0.16								
			0.46	Cuba	9.7	5.3	0.14								
				El Salvador	30.3	12.2	0.13								
El Salvador	74.3	12.2	0.03	Mexico	7.2	2.8	0.04					Nicaragua	4.7	1.5	0.04
				Nicaragua	14.3	1.7	0.00								

^a Countries are arranged in three groups, according to whether the change is a statistically significant decline ($p < 0.05$), a statistically insignificant change, or a statistically significant increase, and, within each group, according to the size of the change.

^b Number of years of potential life lost for every 100,000 population that have increased or decreased average YPLL rates in each five-year period.

^c Standard error of the change in the average five-year YPLL rate.

^d Probability that the change in the average five-year YPLL rate will be other than 0.

^e Since the five-year period 1970–1974 the change is -211.8; $p = 0.00$.

^f Since the five-year period 1975–1979 the change is -114.4; $p = 0.01$.

TABLE 23
Average five-year change in the age ratio^a of the rates of years of potential life lost (YPLL), by country and by cause of death, 1960–1994.

Cardiovascular diseases				Ischemic heart disease				Cerebrovascular disease				Hypertension			
Country ^b	Change ^c	SE ^d	p ^e	Country	Change	SE	p	Country	Change	SE	p	Country	Change	SE	p
								Canada	–8.4	3.0	0.04				
Canada	–2.1	2.3	0.40	El Salvador	–30.1	12.7	0.14	Barbados	–48.1	33.8	0.21	Nicaragua	–29.4	36.5	0.47
United States	–0.9	2.7	0.75	Nicaragua	–3.7	4.8	0.49	Costa Rica	–3.7	4.8	0.48	El Salvador	–3.6	8.7	0.69
Argentina	0.1	1.1	0.90	Cuba	–0.5	7.1	0.95	Argentina	–3.7	1.8	0.10	Cuba	2.8	6.5	0.69
El Salvador	0.3	2.6	0.93	Barbados	0.1	31.5	1.00	Venezuela	–2.7	1.1	0.06	Venezuela	3.3	4.1	0.46
Barbados	3.0	4.2	0.51	Canada	0.9	2.9	0.76	United States	–1.4	1.7	0.44	Trinidad and Tobago	11.0	9.3	0.29
Venezuela	3.8	3.1	0.27	Argentina	2.0	5.2	0.74	El Salvador	3.0	2.0	0.23	Costa Rica	12.4	5.8	0.08
				United States	6.4	3.1	0.10	Chile	4.5	1.9	0.07	United States	12.6	8.0	0.18
				Venezuela	9.2	8.8	0.35	Trinidad and Tobago	12.5	7.5	0.16	Barbados	19.6	38.9	0.64
Nicaragua	5.9	1.3	0.01	Mexico	13.7	3.0	0.01	Mexico	11.4	1.3	0.00	Mexico	14.7	2.4	0.00
Costa Rica	12.6	1.5	0.00	Costa Rica	17.8	3.2	0.00	Nicaragua	11.4	3.6	0.03	Argentina	15.5	2.4	0.00
Cuba	13.6	1.3	0.00	Colombia	29.0	4.6	0.01	Colombia	14.9	1.6	0.00	Colombia	17.8	3.1	0.00
Mexico	14.8	1.9	0.00	Chile	45.4	3.1	0.00	Cuba	15.0	1.7	0.00	Canada	28.1	10.1	0.04
Trinidad and Tobago	16.8	3.2	0.01	Trinidad and Tobago	61.9	7.2	0.00					Chile	30.3	8.2	0.01
Colombia	18.3	1.7	0.00												
Chile	18.9	1.8	0.00												

^a Age ratio = Average five-year YPLL rate in the 45–64-year age group / Average five-year YPLL rate in the 15–44-year age group.

^b Countries are arranged in three groups according to whether the change is a statistically significant decline ($p < 0.05$), a statistically insignificant change, or a statistically significant increase, and, within each group, according to the size of the change.

^c Average percentage change in the age ratio during each five-year period.

^d Standard error of change in age ratio.

^e Probability that the change in the age ratio will be other than 0.

TABLE 24
Average percentage five-year change in masculinity ratio^a in rates of years of potential life lost (YPLL), by country and by cause of death, 1960–1994.

Cardiovascular diseases				Ischemic heart disease				Cerebrovascular disease				Hypertension			
Country ^b	Change ^c	SE ^d	p ^e	Country	Change	SE	p	Country	Change	SE	p	Country	Change	SE	p
				United States	–2.6	0.5	0.00								
				Canada	–2.3	0.4	0.00								
Barbados	–1.3	1.6	0.45	Barbados	–4.1	4.4	0.40	Venezuela	–0.6	0.7	0.44	Barbados	–9.6	3.8	0.05
United States	0.1	0.6	0.94	Trinidad and Tobago	–1.4	0.7	0.14	Argentina	–0.1	1.0	0.94	Nicaragua	–3.5	10.2	0.75
Canada	0.2	0.7	0.79	Argentina	–1.1	0.4	0.13	Mexico	–0.1	0.5	0.80	El Salvador	–2.0	5.9	0.76
Argentina	0.8	0.9	0.43	Venezuela	0.8	0.8	0.34	Costa Rica	0.2	0.9	0.84	Costa Rica	–0.7	2.7	0.80
				Nicaragua	5.2	3.6	0.23	Canada	0.6	0.4	0.21	Trinidad and Tobago	0.0	1.4	0.99
								Barbados	1.5	3.9	0.72	Argentina	1.1	1.2	0.41
								Colombia	1.8	0.8	0.08	Venezuela	2.4	1.5	0.18
								Chile	1.9	1.0	0.12	Cuba	4.1	3.6	0.32
								El Salvador	2.2	2.0	0.35	Chile	7.4	3.1	0.06
								Trinidad and Tobago	2.3	2.4	0.39				
								Nicaragua	5.1	3.8	0.25				
Venezuela	2.4	0.5	0.01	El Salvador	4.4	0.7	0.02	United States	1.5	0.1	0.00	Colombia	3.0	1.0	0.04
Nicaragua	4.4	1.5	0.04	Cuba	5.6	1.4	0.02	Cuba	4.6	1.1	0.01	Mexico	3.9	1.3	0.03
Mexico	7.0	0.4	0.00	Costa Rica	7.3	2.3	0.02					Canada	6.8	2.7	0.04
Colombia	7.5	0.3	0.00	Colombia	8.3	0.6	0.00					United States	13.4	1.5	0.00
Trinidad and Tobago	4.7	1.0	0.01	Mexico	9.7	1.4	0.00								
Cuba	6.7	0.7	0.00	Chile	13.9	3.3	0.01								
Chile	9.0	1.5	0.00												
El Salvador	10.4	0.6	0.00												
Costa Rica	11.0	1.1	0.00												

^a Masculinity ratio = Average five-year YPLL rate for men/Average five-year YPLL rate for women.

^b Countries are arranged in three groups according to whether the change is a statistically significant decline ($p < 0.05$), a statistically insignificant change, or a statistically significant increase, and, within each group, according to the size of the change.

^c Average percentage change in masculinity ratio during each five-year period.

^d Standard error of change in the masculinity ratio.

^e Probability that the change in the masculinity ratio will be other than 0.

TABLE 25
Prevalence of risk factors for cardiovascular diseases in adults aged 25 to 64 years,
by sex, in Chile and Canada.

Risk factor	Nova Scotia, Canada (N=2,411)		Valparaíso, Chile (N=3,120)	
	Men	Women	Men	Women
HDL cholesterol ≤ 35 mg%	18%	5%	19%	12%
Total cholesterol ≥ 200 mg%	50%	40%	45%	48%
Arterial hypertension $\geq 140/90$ mm Hg	21%	13%	11%	12%
Sedentary lifestyle (in leisure time)	31%	38%	73%	94%
Overweight (body mass index ≥ 25)	67%	50%	60%	63%
Smoking (current smokers)	33%	30%	47%	35%

Source: CARMEN program, basic survey. Ministry of Health and Pan American Health Organization, Chile, 1997, and Nova Scotia health survey (CINDI Canada, 1995). Results are not age-adjusted.

tries where the YPLL rate due to cerebrovascular disease tends to be stable. The internal composition of this rate in Cuba has varied considerably, with an increase of the specific rates among men and in the group aged 45 to 64.

Hypertension

YPLL rates for this disease have increased only in Nicaragua. In Colombia, El Salvador, Mexico, and Venezuela they have remained unchanged and in the remaining countries analyzed the rates have declined significantly, especially in the English-speaking Caribbean (Table 22).

In 5 of the 13 countries—Argentina, Canada, Chile, Colombia, and Mexico—YPLL rates have declined more in the group aged 15 to 44 than in the group aged 45 to 64. In Mexico, the rates for this latter group have remained stable (Table 23). In Barbados, Colombia, Mexico, and Nicaragua YPLL rates for women were consistently higher than for men throughout the period studied. In the remaining three countries, the YPLL rates have not declined (Table 22). However, in Mexico and Colombia, the masculinity ratio has increased over time and in the last five-year period there were no significant differences between the rates for both sexes. Canada and the United States are the other two countries where the masculinity ratio has increased significantly, and in the last five-year period these two countries had the highest figures for this indicator. In Canada, for every year of potential life lost by women between 1990 and 1994, men lost two years.

Prevention and Control Prospects

The rates for premature mortality from all cardiovascular diseases have declined in many Latin American and

Caribbean countries. Although the premature mortality rates have increased in some countries, such as the Dominican Republic, El Salvador, and other countries of Central America, it can be concluded that, overall, in Latin America and the Caribbean premature mortality from cardiovascular diseases shows a declining trend. This decline seems real and does not depend on changes in diagnosis or coding, or on qualitative recording factors.

Underreporting of mortality is low in most countries, with the exception of El Salvador and Nicaragua, where it is high, and Colombia and Mexico, where it is intermediate. Quality in recording the cause of death is generally good (124), except in El Salvador, and thus the YPLL rates calculated using recorded mortality should not be very different from the actual rates. The extent and quality of the recording of deaths are usually lower in the youngest and oldest age groups and, for this reason, have less impact on the analysis of premature mortality.

The decline in premature mortality from cardiovascular diseases is fundamentally due to the decline in rates for cerebrovascular disease and hypertension. This decline is attributed to greater control of arterial hypertension through timely and effective treatment. Only four countries show a declining trend in ischemic heart disease, and most of the countries show a slight upward trend. The interpretation of the trends for ischemic heart disease should consider that a variable number of deaths from this cause are incorrectly recorded as dysrhythmia or heart failure. The extent of this problem is unknown, but it is suspected to be significant in some countries, such as Argentina. Since the recording of deaths from ischemic heart disease has become more accurate over time, this problem should not affect the declining trend in premature mortality from this cause in Argentina. However, in other countries where the trend is slightly upward, consideration of this factor could modify YPLL rates.

TABLE 26
Prevalence of risk factors for cardiovascular diseases in adults aged 25 to 64 among the general Chilean population, according to socioeconomic stratum (N=3,120).

Risk factor	Socioeconomic stratum			Value of p
	Upper	Middle	Lower	
HDL cholesterol ≤ 35 mg%	13.8%	16.1%	12.6%	0.20
Total cholesterol ≥ 200 mg%	49.0%	47.1%	45.7%	0.68
Arterial hypertension $\geq 140/90$ mm Hg	9.3%	9.8%	14.2%	0.00
Sedentary lifestyle	78.9%	83.1%	89.4%	0.00
Overweight (body mass index ≥ 25)	56.4%	61.0%	65.3%	0.00
Smoking (current smokers)	39.8%	39.5%	42.9%	0.22

Source: CARMEN program, basic survey. Ministry of Health and Pan American Health Organization, Chile, 1997.

In Latin America and the Caribbean there are two clearly differentiated epidemic curves, i.e., a downward curve for cerebrovascular diseases and hypertension and another slightly upward curve for ischemic heart disease. This situation presents two challenges: first, to maintain and increase the decline in cerebrovascular diseases and hypertension, and second, to seek the inflection point in the epidemic curve of ischemic disease.

There is consensus regarding the need to approach this task through implementation of comprehensive programs for health promotion and prevention of risk factors (125). Programs like that in North Karelia in Finland have shown that it is possible to reduce mortality from cardiovascular diseases with interventions aimed at reducing the prevalence of only three risk factors: smoking, hypertension, and high blood cholesterol (126). Recent data from the United States show that 50% of the decline in mortality from ischemic heart disease occurring during the 1980s is attributed to preventive measures (primary and secondary) affecting these same three important risk factors.

In Latin America and the Caribbean, there is no information available on the prevalence of the major risk factors for cardiovascular diseases that allows comparison of countries. The implementation of the CARMEN projects (Series of Actions for Multifactorial Reduction of Noncommunicable Diseases), involving seven countries in the Region, has begun to provide some reliable and relevant data. Table 25 presents the prevalence of six risk factors in adults of both sexes between the ages of 25 and 64 in the demonstration areas of Valparaíso, Chile, and Nova Scotia, Canada. It can be seen that the prevalence of sedentary lifestyles and smoking is much greater in Chile than in Canada. In addition, it is clear that being overweight and having high blood cholesterol are more prevalent among Chilean women than Canadian women, whereas arterial hypertension, being overweight, and total high blood cholesterol are more prevalent among Canadian

men than Chilean men. The distribution of prevalence within a country can vary considerably by socioeconomic and demographic group, and thus interventions must consider these differences if they are to be effective. Table 26 presents the differences in the prevalence of risk factors in Chile, according to the socioeconomic stratum to which the study subject belongs. We see that arterial hypertension, sedentary lifestyles, and overweight are more frequent among those belonging to the lowest stratum.

It is difficult to predict what effect reducing the prevalence of these risk factors will have on premature mortality from cardiovascular diseases. One recent study (127) estimated the impact that reducing arterial hypertension, smoking, and physical inactivity could have on total mortality in Latin America and the Caribbean. Table 27 presents the percentage of deaths attributable to these three risk factors for cardiovascular diseases. While these estimates have methodological limitations and are considered conservative, they do highlight the significant impact that preventive interventions can have on mortality from cardiovascular diseases.

TABLE 27
Percentage mortality attributable to various risk factors for cardiovascular diseases in Latin America and the Caribbean.

Risk factor	Deaths (thousands)	Total deaths (%)
Arterial hypertension	242.5	8.1
Sedentary lifestyle	117.6	3.9
Use of tobacco	99.4	3.3

Source: Murray CJL and López AD. *The global burden of disease: A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020*. Cambridge: Harvard University Press; 1996: 311–315.

MALIGNANT TUMORS

It is estimated that in 1990, malignant tumors caused 903,000 deaths in the Region of the Americas (128). This category encompasses a number of diseases that have different etiologies, but all generally follow a chronic, fatal course. Dealing with malignant tumors places demands on a number of preventive and therapeutic health care services. The countries of Latin America and the Caribbean have limited resources, and they confront an increase in the number of future cases. This makes an analysis of the situation all the more important. The aging of the population, growing exposure to risk factors such as smoking, changes in diet, and environmental and infection dangers—these growing hazards are expected to produce, in absolute terms, a 38% increase in the number of cases by the year 2000, a further 34% rise by 2010, and an additional 32% increase by 2020; total deaths in 2020 are expected to be 2.4 times their number in 1990 (129) (Table 28).

In 1990 in Canada and the United States, there were 558,000 deaths from malignant tumors, including 295,000 among males. Meanwhile, in Latin America and the Caribbean, there were an estimated 344,000 fatalities, with deaths among women outnumbering those for men (176,000 and 168,000, respectively). According to projections for a 50-year period beginning in 1990, the number of deaths from malignant tumors is expected to be the same for men and women by 2000. By 2020, men are expected to account for 429,000 deaths, or slightly more than half the total of 841,000 fatalities.

Table 29 shows the reported age-specific mortality rates from the most common malignant tumors in selected countries in the Americas. Some of the variations found could be due to this use of reported rates, rather than estimated ones that would correct for any underreporting. In calculating the estimated rates, the distribution of unreported deaths by age, sex, and tumor site is usually taken to be the same as that for reported deaths, an assumption that is not always valid. For this reason, reported rates were used, but only for those countries with an estimated underreporting ratio of less than 10%, with at least 10,000 reported deaths, and with information available for 1994.

Mortality rates for men and women differ according to age. For all malignant tumors and all countries, mortality is higher for women than for men in the 30–44 age group. In the 45–64 age group, the rates for men are similar to those for women. Then, in the 65–74 and 75-and-older age groups, mortality from cancer is always higher among men. Part of the reason is that the most frequent malignant tumors in men (stomach and lung) become more common with age. The same is true for prostate cancer, whose mortality rate increases by as much as three times after age 75. In general,

TABLE 28
Number of estimated and projected deaths from malignant tumors in the Americas, 1990–2020.

	Total	Men	Women
Regional total			
1990	902,000	463,000	439,000
Canada and the United States			
1990	558,000	295,000	263,000
Latin America and the Caribbean			
1990	345,000	168,000	176,000
2000	477,000	238,000	240,000
2010	638,000	321,000	317,000
2020	841,000	429,000	412,000

Source: Murray CJL, Lopez AD, eds. *The global burden of disease*. World Health Organization, Harvard School of Public Health, World Bank. Cambridge: Harvard University Press; 1996.

these tumors have higher mortality rates than breast or cervical tumors, which are the most common in women and are becoming increasingly curable thanks to early detection and new treatment technologies. However, breast and cervical tumors in women now occur at an earlier age than the most common malignant tumors do in men. The situation with each of the most common malignant tumors in the Region is described below.

Incidence is much more difficult to assess, because it requires population-based cancer registries. A cancer registry is regarded as reliable when the International Agency for Research on Cancer (IARC) has approved it. Canada has a national registry and the United States has a system of registries for specific areas of the country. With these registries the two countries can monitor trends in malignant tumors and determine their distribution in the population. The oldest registry in Latin America is that of Cali, Colombia. There also are nationwide registries in Costa Rica and Cuba, and a system of registries in several cities in Brazil. Ecuador, Peru, and Uruguay also have registries, and Argentina is working on organizing one. Other registries, such as those in Bolivia and Jamaica, operated for a while but could not be sustained. In some countries, population-based registries were created but adequate coverage and accuracy standards could not be achieved. Maintaining these registries is difficult, because of a lack of permanent financing and skilled personnel. Another concern is that the registries are NOT always linked with a cancer prevention and control program. If a country has not made the registry a component of its public health system or does not have the capability to conduct scientific research, the operation of the registry is limited and its upkeep is not a high priority.

Interesting variations are brought to light from comparing the age-adjusted rates of two nationwide registries in the Re-

TABLE 29
Mortality from malignant tumors by age and sex in selected countries of the Americas, 1994
(rates per 100,000 population).

Type	Age			
	30–44	45–64	65–74	75+
All malignant tumors				
Men				
Argentina	36.0	309.6	905.2	1,796.9
Canada	24.3	272.2	1,114.2	2,242.8
Chile	24.0	221.6	980.2	2,018.5
Colombia	21.1	153.6	625.5	1,358.7
Costa Rica	25.4	174.6	689.8	2,373.9
Cuba	25.7	212.2	828.4	1,796.9
Mexico	20.1	121.8	523.1	1,179.1
United States	29.2	288.9	1,107.0	2,077.5
Venezuela	23.8	152.5	641.1	1,474.1
Women				
Argentina	46.3	204.3	493.2	1,049.6
Canada	33.3	235.3	664.3	1,204.6
Chile	37.2	212.0	591.7	1,265.2
Colombia	32.4	183.6	497.6	911.9
Costa Rica	37.6	176.8	477.8	1,400.0
Cuba	41.2	188.2	517.0	935.8
Mexico	37.2	157.2	404.0	793.2
United States	34.5	233.9	692.5	1,159.2
Venezuela	43.6	181.7	454.3	944.4
Cervix				
Argentina	8.1	10.9	11.2	12.9
Canada	2.5	5.1	7.5	11.4
Chile	10.0	27.1	40.1	68.6
Colombia	7.4	27.5	38.4	56.5
Costa Rica	7.6	32.4	24.1	144.8
Cuba	6.1	12.9	19.8	26.5
Mexico	11.5	34.8	56.5	99.1
United States	3.1	6.5	8.6	10.0
Venezuela	11.5	27.8	37.0	55.6
Breast				
Argentina	11.9	54.3	101.2	181.7
Canada	12.1	56.3	110.4	188.0
Chile	7.1	31.7	54.1	90.3
Colombia	5.7	25.0	36.7	59.5
Costa Rica	7.0	33.8	64.8	113.8
Cuba	8.2	43.1	70.0	113.0
Mexico	7.2	24.3	32.2	55.0
United States	11.4	53.3	105.2	161.3
Venezuela	8.5	30.6	48.6	81.7
Trachea, bronchus, and lungs				
Men				
Argentina	9.6	97.5	232.5	302.9
Canada	4.5	98.0	412.4	590.6
Chile	1.6	40.1	159.1	213.7
Colombia	1.6	25.2	108.4	167.4
Costa Rica	2.0	19.0	102.0	226.1
Cuba	5.9	73.3	252.0	388.3

TABLE 29 (continued)

Type	Age			
	30–44	45–64	65–74	75+
Trachea, bronchus, and lungs				
Men (continued)				
Mexico	2.0	25.9	116.1	213.1
United States	5.3	109.1	420.3	561.8
Venezuela	4.6	37.3	128.0	210.7
Women				
Argentina	2.7	15.7	33.3	60.6
Canada	4.3	57.3	168.1	175.2
Chile	1.2	13.2	41.6	77.3
Colombia	1.5	14.3	43.9	66.3
Costa Rica	2.0	8.7	27.8	51.7
Cuba	3.9	25.4	78.4	129.8
Mexico	1.2	10.7	41.7	76.7
United States	3.4	60.2	198.7	215.5
Venezuela	2.9	19.7	54.3	96.1
Stomach				
Men				
Argentina	2.6	21.6	68.5	133.3
Canada	1.1	10.6	39.5	100.6
Chile	4.4	55.1	239.3	412.9
Colombia	4.1	38.0	142.6	279.1
Costa Rica	2.0	54.6	216.3	700.0
Cuba	1.8	9.9	44.6	82.1
Mexico	2.5	15.3	65.9	133.1
United States	1.1	8.4	29.8	61.1
Venezuela	3.5	27.5	108.0	240.2
Women				
Argentina	1.7	8.0	23.1	66.0
Canada	0.9	4.9	17.7	48.6
Chile	1.7	18.5	78.9	192.8
Colombia	2.9	21.3	83.0	195.6
Costa Rica	5.2	24.6	85.2	317.2
Cuba	1.0	5.3	19.1	44.7
Mexico	2.1	11.4	41.5	106.4
United States	0.7	3.6	12.6	32.9
Venezuela	2.3	15.8	53.7	158.2
Prostate				
Argentina	0.2	10.0	97.9	355.1
Canada	0.0	9.9	113.0	447.3
Chile	0.1	10.0	104.8	410.5
Colombia	0.1	7.6	76.4	345.2
Costa Rica	0.3	9.3	75.5	482.6
Cuba	0.2	12.5	135.1	570.4
Mexico	0.2	7.8	73.3	310.3
United States	0.1	11.0	114.6	445.9
Venezuela	0.2	13.8	124.4	498.2

gion—that of Canada, an industrialized country, and that of Costa Rica, a developing country. For men in Canada, malignant lung and prostate tumors represent the bulk of incidence. For men in Costa Rica, stomach cancer is the most common, although it is rare in Canada. In Costa Rica, prostate and lung tumors occupy second and third places, though their incidence is much lower than in Canada. For women in Canada, the incidence of breast cancer is three times higher than that of colorectal and lung tumors, which are next in line in terms of frequency. In Costa Rica, though the age-adjusted rates are much lower than in Canada, breast and cervical cancer are the most common, followed by stomach cancer. Malignant colorectal and lung tumors have a much lower incidence among women in Costa Rica than in Canada. This shows that the incidence of cancer, by site, varies substantially from one country to another in both men and women.

Malignant Tumors That Respond to Primary Prevention

The reduction of smoking is the primary prevention strategy with the greatest potential for impact on cancer morbidity and mortality (130). Smoking has been found to be a risk factor for several malignant tumors, but it is most directly related to cancer of the trachea, bronchus, and lungs. Currently, the highest mortality rates from these tumors in the Region are in the United States and Canada. For men in the 45–64 age group, the mortality rate is 98 per 10,000 in Canada and 109.1 per 10,000 in the United States. For men in the 65–74 age group, the rates rise to 412.4 per 10,000 in Canada and 561.8 per 10,000 in the United States. In the other countries of the Region, the mortality rates for men are all lower, but rising. Between 1965 and 1985, rates increased by 14.5% in Costa Rica, 5.9% in Uruguay, and 3.8% in Chile (131). Mortality rates are lower for women than for men in all the countries. Nevertheless, rates for women increased 27.7% in the United States and 35.2% in Canada during the 20 years from 1965 to 1985. In Latin America, the highest mortality rate for women occurred in Cuba, though Chile recorded the largest increase, approximately 6.8% over the 20-year period.

In Canada, cancer of the trachea, bronchus, and lungs is the most prevalent cancer in men and the third most common among women. In Costa Rica, in contrast, that type of cancer falls in third place for men, after cancer of the stomach and prostate, and in seventh place for women. Any tobacco control intervention will take at least 20 years to show results, according to studies estimating the number of deaths due to smoking in industrialized countries (132).

Skin cancer is a malignant tumor that goes practically undetected, and yet it is the most common cancer. The condition is usually treated on an outpatient basis and, except for malig-

nant melanoma, has a very low fatality rate if treated in a timely manner. As a result, skin cancer is not recorded in the mortality statistics or in the cancer registries, for which hospital discharges are a major data source. Exposure to ultraviolet rays is the main risk factor for both melanoma and the other tumors, particularly basal cell carcinoma. Persons who develop skin cancer almost always have had prolonged exposure to the sun (133). Apparently there is a more severe effect if exposure occurs during childhood (134). Education has been proposed as a primary prevention strategy for this cancer, particularly in persons who have already had malignant lesions (135). A possible secondary prevention strategy, skin examination by health care personnel, has been difficult to evaluate (136).

There is little information in Latin America and the Caribbean on occupational and environmental risks and their effects on the incidence of cancer. Workplace risks, however, are an increasingly serious problem in the Region, partly as a result of the transfer of industries that use carcinogenic substances from industrialized countries to developing ones. Of particular significance in Latin America are small industries, especially offshore processing facilities (*maquiladoras*). These businesses use substances that are poorly controlled, sometimes exposing workers to risks that far exceed recommended standards (137). This occupational exposure has been documented in various developing countries (137). One example is the cement industry in Brazil. In that country, exposure to benzene and its derivatives has been found in the metallurgy, petrochemical, and footwear industries. In Chile, exposure to silicone, copper, arsenic, gold, and silver in the mining industry has been studied. Other potentially dangerous but little documented risks in Latin America and the Caribbean are ionizing radiation and organic chemicals, including a number of pesticides that are widely used in the Region. Though there is a need for more comprehensive studies on workplace exposure and its impact on cancer risk, there is already sufficient documentation for such products as asbestos and silicone to support primary-level preventive measures.

Malignant Tumors That Respond to Secondary Prevention

Cervical and breast cancer screening have demonstrated their effectiveness in the timely detection of precursory or early lesions in asymptomatic persons. Research on tests for early detection of prostate, colorectal, and stomach cancer has not, however, provided hard evidence for their effectiveness in reducing deaths.

In Canada and the United States, the two industrialized countries in the Region, the mortality and incidence of cervical cancer have declined substantially since the 1960s (138).

This decrease is partly attributable to screening programs and to greater access to health services for timely diagnosis and treatment. The human papilloma virus is a necessary, but not sufficient, condition associated with malignant neoplasia of the uterine cervix. This clearly identifies the condition as a sexually transmitted disease. Therefore, people's lifestyles and the prevalence of the virus in the population have an important influence on cervical cancer trends (139). A recent study in Colombia and Spain showed that the number of sexual partners a male had was an important risk factor for cervical cancer in his female partner (140, 141). Furthermore, in Colombia, and possibly in the rest of Latin America, men frequently have many sexual partners, and the human papilloma virus is more common among women. In the United States and other industrialized countries over the last 15 years, there has been an increase in the incidence of cervical and uterine cancer among women under 40 that has been linked to the use of oral contraceptives (142). This phenomenon has not yet been seen in developing countries.

In general, mortality due to cervical cancer did not decline significantly in Latin America and the Caribbean between 1960 and 1993. Mortality rates in Canada in the early 1960s were close to those of some Latin American countries, but have declined gradually since 1965. Canada now has the lowest rate in the entire Region, 1.4 per 100,000 women. In contrast, the Latin American and the Caribbean countries that had rates similar to Canada's in the 1960s (Brazil, Colombia, Cuba, Guatemala, Trinidad and Tobago, Uruguay, and Venezuela) have shown few changes and no major reductions in mortality since then.

Three Latin American countries that had high cervical cancer mortality rates (Chile, Costa Rica, and Mexico) have shown noteworthy changes since the 1960s. In Costa Rica, mortality declined from 1965 to 1973, and since then has remained at around 10 per 100,000 women. This coincided with improved coverage and accuracy in the certification of deaths in the country, however. For example, mortality attributed to "symptoms, signs, and ill-defined conditions" fell sharply from 89.9 per 100,000 in 1980 to 16.3 per 100,000 in 1989. There was also a decrease in the mortality rates from malignant uterine tumors in which the site of origin of the tumor—cervix or uterus—was not specified. It is therefore possible that many tumors that were previously classified as uterine tumors are now correctly reported as cervical tumors, thereby hiding a possible decline in mortality. Such a decrease would follow the trend seen with all uterine tumors, which have shown average annual reductions of 3.2%. In Chile, there were no major changes in the level of ill-defined causes reported during the 1960–1993 period. There was a decline in mortality from cervical cancer among women under 35, but not among older women, who account for a majority of cases. In both countries, further analysis is needed to determine

what role early detection programs and access to health services have played in this possible initial decline. In contrast, in Mexico, the age-adjusted mortality rate of cervical cancer has risen since 1965, reaching a level of around 14.5 per 100,000 women in recent years. This is the highest reported mortality rate in Latin America. This increase, which has hit hardest women 60 and older, has been documented in several studies (143). It is still unclear, however, whether this is merely a statistical illusion resulting from improved certification or whether it is a real increase.

With respect to the incidence of cervical cancer, the Cali Cancer Registry reports a decline of 12.4% for the 1970–1990 period. Other registries have no comparable data over an extended period to determine whether similar decreases occurred in other countries. It is possible that, as living conditions for a particular population group improve, the incidence of this cancer decreases. As shown in the cancer registry in Quito, Ecuador, it is women with the lowest level of education who are found to have the most advanced tumors (144). Indeed, 51.7% of women without formal education who are diagnosed with cervical cancer are found to be at stage III or IV of the disease, at which time there is no cure. Only 13.1% of these women are diagnosed in stage I, when the chances for a cure are great. In contrast, of the women with secondary or higher education suffering from cervical cancer, 48.5% are diagnosed with the disease in stage I.

Preliminary data from periodic fertility surveys of Latin American women aged 15–49 show that, on average, 63% of them have had a Pap smear at least once in their lives. This figure ranges from 35% in Nicaragua to 70% in Costa Rica (145). Most women have had at least one Pap smear by the age of 35. The proportion of women who have had a Pap smear in the preceding two or three years, however, is lower among women 35 and over, who have a higher risk of developing cancer. Early detection programs should devise strategies to reach these older women.

Between 1970 and 1985 the incidence of breast cancer increased 4.4% per year in Canada and 14.0% per year in the United States. This general trend continued up to 1996. Though a hereditary component has been identified for breast cancer, other risk factors, such as early menarche, late menopause, and having a first child after age 30, also have been associated with higher risk. There is scientific evidence that obesity after menopause, consumption of alcohol, exposure to ionizing radiation, taking oral contraceptives, and estrogen replacement therapy in postmenopausal women are associated with a higher risk for breast cancer. There is still controversy as to whether the exposure to pesticides increases the risk of breast cancer.

Between 1965 and 1985 mortality rates from breast cancer increased 1.3% in Canada and the United States. Though mortality rates are still lower in Latin America, data show

they are rising faster than in Canada and the United States. In the 1965–1985 period, the mortality rate from breast cancer in women increased 3.7% in Uruguay, 3.9% in Chile, 14.7% in Puerto Rico, and 17.1% in Costa Rica. According to 1994 data on mortality for a group of 16 countries in the Region, mortality from breast cancer in Argentina, Chile, Cuba, Paraguay, and all the Caribbean nations is higher than mortality from cervical cancer. In absolute numbers, deaths from cervical cancer are concentrated in the under-65 age group. Fatalities from breast cancer are more common among women aged 50 and older and increase with age.

Unlike cervical cancer, whose mortality rate could theoretically be reduced by as much as 80% with good early detection efforts, there are still questions about the effectiveness of similar programs for breast cancer. It has been found that for women aged 50 and over, administering mammograms every one or two years can detect breast cancer in a timely manner and reduce deaths by up to 30%, if the women receive proper treatment (146–148). Scientists still disagree as to whether providing regular mammograms helps reduce mortality among women aged 40–49 (149). Studies evaluating the physical examination of the breast by health personnel (doctors or trained nurses) suggest that it can be as effective as mammography (150). In contrast, there is still insufficient evidence to either validate or discredit breast self-examination (151–154). Breast self-examination, however, is hardly the low-cost method it is touted to be since it would require a major educational effort that countries with scarce resources would have to assess carefully. Canada and the United States provide early detection services, including mammography, physical examinations, and instruction in self-examination. In addition, major efforts have been made to disseminate the relevant information and recommendations to medical practitioners. In Latin America and the Caribbean, some countries offer mammography mainly for diagnostic purposes, and efforts to establish early detection programs have been limited.

Mortality from prostate cancer has been on the rise in all the countries of the Region. Its incidence increases with age and is particularly common among men 75 and older. Strategies for early detection include rectal examinations, the specific prostate antigen test, and transrectal ultrasound. Nevertheless, there is no clear scientific evidence on the cost-effectiveness of any of these strategies, either individually or in combination (155–157).

Malignant stomach tumors are very common in Latin America and the Caribbean. It is projected there will be approximately 53,000 cases in the year 2000. Two countries in the Region, Chile and Costa Rica, report adjusted mortality rates that are among the highest in the world, 43.6 and 43.3 per 100,000, respectively. For both men and women, however, these rates show downward trends. While there have been efforts to develop techniques for the early detection of this

TABLE 30
Estimated cost of tertiary-level treatment of common cancers in the Region (in U.S. dollars).

Anatomical site	Cost per case treated (percentage of per capita GDP)		Cost of tertiary-level treatment per year of life gained in middle- and low-income countries (3% discount rate)
	High-income countries	Low- and middle-income countries	
Mouth and pharynx	79	243	55
Esophagus	115	709	4,056
Stomach	112	687	2,826
Colon and rectum	110	336	154
Liver	118	727	4,083
Lung	127	782	1,354
Breast	67	206	33
Cervix	57	174	90
Leukemia	114	700	...
Average	104	641	

Source: Barnum H, Greenberg A. Cancers. In: Jamison DT, Mosley WH, Measham AR, Bobadilla JL, eds. *Disease control priorities in developing countries*. Oxford: Oxford University Press; 1993.

tumor, possibilities for its prevention also have been sketched out, based on its association with the *Helicobacter pylori* infection (158).

Treatment

Little is known about cancer treatment services in the various countries of the Region or the cost to health services and the society in general of treating persons who develop malignant tumors. The cost of treatment at the tertiary level has been estimated for middle- and low-income countries (159). Table 30 shows the cost per treated case, expressed as the ratio of that cost to per capita gross domestic product (GDP) for high-income countries and for middle-income countries with a hypothetical per capita GDP of US \$1,500. For all the malignant tumors, the outlays represent a higher proportion of GDP in the lower-income countries. Treatment is particularly costly for tumors of the esophagus, stomach, liver, and lungs, and for leukemia. This can be clearly seen in the estimates of the cost of tertiary-level treatment for each year of life gained. The treatment of malignant tumors of the mouth and pharynx, breast, and cervix is cost-effective (\$55, \$33, and \$90, respectively, per year of life gained). This is due to the fact that most of these cases are operable, do not require

major investments in technology, and have a high rate of cure when the tumors are detected at an early stage. In this way, the cost of treatment is linked to the population's access to health services. In addition, these figures, which are the only ones available so far, assume all cases are diagnosed and treated at the same stages as in the high-income countries. This may or may not be true. In contrast, treatment of cancers of the esophagus and liver is not very cost-effective, particularly because of the high fatality rate with these types of tumors. Costs are high in terms of both efficiency and as a percentage of per capita GDP.

Palliative Care

Palliative care is defined as the active care of persons with an advanced disease, in which the monitoring of symptoms, particularly pain, is the foundation for treatment. The aim is to provide the best quality of life possible for patients and their families. In the past, a hospice model was used, whereby patients were admitted in the terminal stages of the disease. The strategy has now changed substantially and aims to keep patients with their families, receiving care at home, and limiting their emergency-room visits and hospitalizations as much as possible (160). This strategy gives equal weight to biomedical and psychosocial aspects, and even more importance to the ethical considerations involved in the end-of-life process. This is an area that Latin American countries have just begun to include in their cancer prevention and control programs. Of the 17 Latin American nations that responded to a PAHO survey in 1997, only 7 reported some type of initiative for the palliative care of cancer patients. An indirect means of measuring whether these services are available comes from data on the consumption of morphine for therapeutic purposes, which is reported to the International Narcotics Control Board (34). Table 31 shows the therapeutic consumption of morphine in milligrams per capita in 1993 in some of the countries where this information was available, and the total number of deaths due to malignant tumors in each of the nations. The therapeutic consumption of morphine is clearly much higher in Canada (28.4 mg per capita) and the United States (20.8 mg per capita) than in any of the other countries. In Barbados, Bolivia, Ecuador, and Mexico there is virtually no therapeutic consumption. Even though use is higher in the remaining countries, it is still far below acceptable levels, some 10 mg per capita.

The International Narcotics Control Board and the World Health Organization have identified a number of barriers to the availability of morphine in Latin America (162). They include improper interpretation of the 1961 Single Convention on Narcotic Drugs, regulations on the distribution of medi-

TABLE 31
Therapeutic consumption of morphine in selected countries in the Region, 1993.

Country	Mg/per capita	Number of reported deaths from cancer
Argentina	0.588	47,850
Barbados	0.005	422
Bolivia	0.005	...
Brazil	...	80,617
Canada	28.41	55,668
Chile	0.438	15,352
Colombia	0.516	21,261
Costa Rica	0.625	2,359
Cuba	0.275	...
Ecuador	0.005	...
El Salvador	...	1,965
Mexico	0.005	46,599
United States	20.8	521,651
Paraguay	0.4	1,280

cines, the lack of training in the use of narcotics by doctors and nurses, the lack of access by persons with advanced diseases to health services, and the high cost of opiates in some countries. The organization of primary health care services and the systems for properly moving patients between various levels of care are other basic components of a palliative care program.

National Cancer Prevention and Control Programs

Only 7 of the 17 countries responding to the PAHO cancer survey of 1997 said they had adopted the WHO guidelines for organizing national cancer control programs (163). Based on the assessments made in conjunction with WHO collaborating centers, however, none of the programs include all the recommended components. In most of the countries, treatment is part of clinical practice, and public health entities have no regulatory role with respect to standard treatment protocols. Similarly, there is no evaluation of the quality of care or quality of life of persons with advanced diseases, nor is there any measurement of the survival rate of patients in different health care centers, geographic areas, or population groups. The burden represented by the number of projected cancer cases in the Region in the coming years imposes a need for sensible use of resources, emphasis on primary and secondary prevention, and fairness in the allocation of treatment and palliative care.

DIABETES

A rise in the prevalence of overweight, obesity, and sedentary lifestyles, coupled with the aging of the population in all the countries, has helped to move diabetes to the forefront of public health concerns in the Region.

According to various studies, the mortality risk among persons with insulin dependent (Type I) diabetes mellitus is still many times higher than that in the general population, although there are wide variations depending on age, gender, and ethnicity. Persons with the other form of the disease—non-insulin dependent (Type II) diabetes—suffer similar life- and health-threatening complications such as blindness, chronic renal failure, lower limb amputations, heart disease, and stroke, but to a somewhat lesser degree. These complications are costly for those affected and for the health care system itself.

Many diabetes cases can be prevented by healthy diets and exercise. Moreover, complications can be reduced by dealing with other risk factors such as smoking, high blood pressure, and poor foot care. Better metabolic control is critical to reduce the incidence of and mortality from the major complications. Patient and public education are key to achieving these improvements.

Most persons with the disease have Type II diabetes, which is the form most intimately tied to lifestyle and, therefore, theoretically preventable through health promotion and lifestyle modification (164). Maintaining a healthy weight, eating a diet low in fat and high in fiber, preventing and stopping smoking, exercising regularly, and controlling high blood pressure are all important elements. These changes also contribute significantly to the prevention of secondary complications in Type I diabetics.

Until recently, lack of standard criteria for the diagnosis of Type I and Type II diabetes has impeded both clinical and public health understanding of the disease. In the Americas, the estimated annual incidence rates for Type I diabetes vary widely, from 0.7 cases per 100,000 in Peru to 27 per 100,000 among males living on Prince Edward Island, Canada. The prevalence of Type II diabetes is thought to range from 1.4% among the Mapuche Indians in Chile to 17.9% among adult Jamaicans (165, 166). The highest prevalence and incidence rates for Type II disease in the world have been documented among the Pima Indians of Arizona, where most adults have the disease (167). The vast differences in estimated rates of incidence and prevalence of these conditions among various populations point to a need for both epidemiological and health services research in support of the development of intervention programs.

In recent years, the World Health Organization, the International Diabetes Federation, and other interested organizations have worked to standardize diabetes diagnostic criteria. In

addition, efforts are under way to formalize the methodology for assessing the disease's prevalence. Latin America and the Caribbean, however, lag behind North America, Europe, Southeast Asia, and the Pacific in carrying out well-designed prevalence studies, which are critical for establishing baselines for interventions and evaluations of program impact (168). Given Type II diabetes' association with lifestyle factors, information also must be gathered on the population's risk factors for the disease (e.g., obesity, physical inactivity, hypertension, high cholesterol levels, and smoking) and on its complications.

Based on extrapolations from prevalence studies, the 28 million diabetics in the Americas in 1994 accounted for 25% of the world's total (169): 15 million lived in the United States and Canada and 13 million lived in Latin America and the Caribbean. Considering demographic transitions, urbanization, and lifestyle changes, these figures were projected to increase by about 45% by the year 2010, with Latin America and the Caribbean surpassing the United States and Canada by the year 2000. By 2010, the combined total for the Americas will approach 40 million. According to the projections, however, the most dramatic increase would be seen in the Central American subregion, with the figures for 2010 nearly doubling the 1994 estimated diabetes cases. Prevalence would increase by 74% in the Caribbean Islands, by 40% in South America, and by 25% in Canada and the United States of America (see Table 32).

In the 1990s, diabetes in the Americas officially accounted for 137,008 deaths (170), although the disease's underdiagnosis and an inaccurate death certification, especially of deaths from diabetes that are classified as heart disease and stroke, may make the actual number much higher. Mortality from diabetes increases with age, and after age 55, as is the case with other chronic diseases, the risk increases sharply. Throughout the Region, mortality in women is greater than in men (1.33:1 in North America, 1.2:1 in Latin America, ratios unadjusted for age) (170). This higher mortality is partly due to the fact that women have a higher statistical probability of developing Type II diabetes (between 10% and 15% greater likelihood, according to United States studies); no such gender propensity has been found for Type I disease (171). The higher mortality also may relate to the fact that women live longer and, therefore, have a greater lifetime probability of developing disease. Whether access to and quality of health care for persons with diabetes vary by sex has not yet been systematically studied.

The distribution of reported deaths in the Region is of particular concern: almost two-thirds (85,200) occur in Latin America and the Caribbean. Given the above-mentioned prevalence estimates, case-fatality ratios may be estimated as follows: 3.4 per 1,000 in North America and 6.8 per 1,000 in Latin America and the Caribbean. From such calculations, it

TABLE 32
Estimates and projections of diabetes prevalence in the Americas,
in millions, 1994 to 2010.

Subregion	1994		2000		2010	
	Type I	Type II	Type I	Type II	Type I	Type II
Mesoamerica						
(including Mexico)	0.420	3.662	0.615	5.382	0.807	7.107
Caribbean Islands	0.105	0.913	0.142	1.257	0.184	1.597
South America	0.765	6.740	0.922	8.151	1.076	9.475
Subtotal	1.290	11.315	1.679	14.790	2.067	18.179
Canada and the United States of America						
States of America	1.683	13.402	1.882	15.094	2.081	16.787
Total	2.973	24.717	3.561	29.884	4.148	34.966

Source: McCarty D, Zimmet P. Diabetes 1994 to 2010, Global Estimates and Projections. International Diabetes Federation Congress, Kobe, Japan. 1994.

would appear that persons with diabetes in Latin America and the Caribbean are approximately twice as likely to die from the disease than their counterparts in North America, an observation that has important implications for the health services. This rapidly expanding public health problem will require a collective response that must include attention to primary and secondary prevention and, just as important, to improving the availability and effectiveness of care for persons with the disease.

ACCIDENTS AND VIOLENCE

Accidents and violence (external causes of morbidity and mortality) are among the leading public health problems in the Americas and throughout the world. They are responsible for a high mortality (over 10% of all deaths worldwide in 1990), as well as for a high toll in disabilities and high cost from nonfatal injuries. It is estimated that 2% of the world population suffers some type of disability sustained through accidents or violence of some kind. Despite limitations in their coverage and quality, the data on mortality due to external causes can be used to analyze the characteristics and main consequences of accidents and violence: the loss of human lives.

External causes accounted for 9.1% of all deaths in the Americas in 1984, and 9.4% 10 years later. These data cover the 31 countries or territories with available detailed information and represent close to 97% of the Region's population. The mortality rate due to external causes has dropped from 71.0 per 100,000 to 68.6 (–3.4%). The change in the overall figures is slight, but differences among countries and subre-

gions are significant (see footnotes to Tables 33 and 34) when the data are analyzed by type of external cause (accident or violence), sex and age, and trends.

The lowest mortality rates by specific external cause in 1994 (less than 50 per 100,000 population) were recorded in Barbados (29.1), Bahamas (37.1), Trinidad and Tobago (44.8), Canada (46.0), and Costa Rica (46.3). The highest (more than 75 per 100,000 population) were in Colombia (146.7), El Salvador (123.6), Ecuador (89.8), Brazil (86.4), Nicaragua (84.3), Cuba (82.5), Guyana (75.9), and Venezuela (75.1). The other countries fall somewhere in between, with rates ranging from 50 to 74 deaths per 100,000.

The lowest proportional mortality rates due to external causes were recorded in Barbados (3.8%), Uruguay (6.3%), Canada (6.4%), the United States (6.5%), Bahamas (6.9%), Argentina (7.0%), Suriname (7.2%), and Trinidad and Tobago (7.9%). The highest figures were for Colombia (25.7%), El Salvador (20.0%), Venezuela (16.0%), Ecuador (14.7%), Panama (14.4%), Nicaragua (13.9%), Belize (13.2%), and Mexico (13.2%).

The total number of fatalities due to external causes and specific mortality rates are higher for males than females. In 1994, the male-to-female ratio of total fatalities was 3.5:1. That ratio is 5.1:1 in the 15–44-year age group. For men in this age group, deaths due to accidents and violence represent more than half of the total. The ratio of male-to-female deaths by broad group of external causes also varies widely: homicide, 7.6:1; suicide, 4.1:1; traffic accidents, 2.8:1; and accidental falls, 1.3:1. In many countries in North and Central America, the number of fatalities due to accidents related to medical or surgical complications is lower for men than for women, with a ratio of 0.9:1 for the entire Region.

Regarding the trend observed over the last 10 years, a comparison of mortality due to external causes between 1984 and 1994 shows an overall decline of 3.4% in the Region (rate per 100,000 population). The reduction, which was sizeable in many countries, was 20% or more in Suriname (–40%), El Salvador (–36%), Bahamas (–33%), Nicaragua (–30%), Mexico (–24%), Trinidad and Tobago (–24%), and Barbados (–20%). In some of these countries, for example, El Salvador and Nicaragua, the civil war of the 1980s ended in the 1990s, which could have influenced the reduction observed. Although deaths were not often classified as being due to operations of war, they were classified as being due to external causes.

In four countries—Canada, Chile, Peru, and the United States—the specific mortality rates due to external causes declined between 8% and 18%, while in Guyana (–3%) and Panama (+1%) they remained practically unchanged. In Argentina, Brazil, Ecuador, and Venezuela, on the other hand, rates rose by 4.5%–8%, while in Costa Rica, Cuba, the Dominican Republic, and Puerto Rico they rose by 10%–13%. The largest increases were observed in Uruguay (+21%), Guatemala (+24%), Paraguay (+31%), Colombia (+32%), and Belize (+35%).

Mortality by Type of External Cause

In the Region of the Americas, accidents represented 68.4% of all external causes of mortality in 1984 and 60.3% in 1994. In that year, 94.4% of accidents, or the highest proportion due to external causes, were observed in the 1–4-year age group (94.6% for males and 94.0% for females), and the lowest (49.9%) in the 15–44-year age group (47.7% for males and 61.7% for females). Table 33 shows proportional mortality rates by type of external cause and sex, and Table 34 shows specific mortality rates by subregion in 1984 and 1994.

Motor-Vehicle Traffic Accidents

Of all accidents, traffic accidents, particularly motor-vehicle traffic accidents, are the most frequent cause of death, accounting for almost half of all fatalities. Between 1984 and 1994, the proportional mortality rates of motor-vehicle traffic accidents as an external cause of mortality and the mortality rates from these accidents declined in North America, the English-speaking Caribbean, and the Andean area countries, whereas in Central America, the Latin Caribbean, and the Southern Cone, both rates increased. At the same time, proportional mortality rates increased in Mexico, despite the reduction in specific rates. This is explained by the reduction in other types of accidents along with an increase in homicides

and suicides. Finally, in Brazil, both the specific mortality rate due to motor-vehicle traffic accidents and the proportional rate among other external causes remained almost the same (Tables 33 and 34).

Brazil was the country with the highest mortality rates due to motor-vehicle traffic accidents in 1994, for both sexes, with rates of 41.5 per 100,000 for men and 11.9 per 100,000 for women. At the other extreme the English-speaking Caribbean is lowest, with rates of 16.4 for men and 4.2 for women. It also should be noted that the male-to-female ratio of fatalities was 3.9:1 in the English-speaking Caribbean, and 2.0:1 in North America. In North America, the specific rate of female mortality due to motor-vehicle traffic accidents was 10.4 per 100,000, the highest after Brazil. In terms of age, 49% of female deaths due to motor-vehicle traffic accidents were concentrated in the 15–44-year age group; this proportion was 62% for males. However, the highest relative number of deaths due to this cause was to be found in the 5–14-year age group, where it accounted for 18% of all male deaths (37.7% of external causes) and 14% of female deaths (41.9% of external causes).

Several factors influence traffic accidents, including the number of vehicles in a country, the vehicles' state of repair, a country's capability to invest in roads, legislation and control, and alcohol consumption. However, the recent reduction in mortality due to motor-vehicle traffic accidents achieved in many countries shows that prevention is possible, especially through education programs that target the entire population and that point out the responsibilities of both drivers and pedestrians, who are often run over due to their own carelessness.

Other Accidents

Accidental falls accounted for specific mortality rates ranging from 3.8 and 3.9 per 100,000 population in the Southern Cone and Brazil, respectively, to 5.7 and 5.5 per 100,000 in North America and Mexico, respectively. The deaths are largely concentrated in older groups (66% in the age group older than 65 years). Comparison of the data for 1984 and 1994 shows an upward trend in mortality due to accidental falls, especially in Brazil (+60%), and a less marked increase in the other subregions, except in the Andean area and Southern Cone, which registered a decline. Specific rates for the Region are approximately 30% higher for males, with the exception of North America, where the rates for females are slightly higher. However, among women, accidental falls represented 14.3% of all deaths due to external causes, while the proportion was 5.3% for men. These differences are explained by the fact that male mortality as a result of other external causes, such as homicide and suicide, is much higher. It is important to note that in the International Classification of Diseases,

TABLE 33
Proportional mortality from external causes, by sex and by subregion, around 1984 and 1994.

		North America ^a		English-speaking Caribbean ^b		Mexico		Central America and Latin Caribbean ^c		Andean Area ^d		Brazil		Southern Cone ^e		Total	
		1984	1994	1984	1994	1984	1995	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994
External causes	M	9.8	9.0	11.9	11.0	21.3	19.1	15.3	17.4	19.3	26.6	14.2	16.9	9.9	10.9	12.8	13.6
(% of total)	F	4.4	3.9	4.8	4.1	6.3	5.6	4.2	5.2	6.0	6.7	4.5	5.1	4.3	4.5	4.7	4.5
	T	7.3	6.5	8.7	7.9	14.8	13.2	10.4	12.4	13.4	18.3	10.2	12.0	7.4	8.0	9.1	9.4
Intention	M	2.2	2.3	13.7	11.3	2.0	5.2	18.2	21.8	5.6	6.0	15.9	12.2	14.6	19.3	7.7	8.2
undetermined ^f	F	2.3	1.9	13.3	14.6	2.0	4.1	14.6	22.7	6.1	5.0	14.1	11.1	20.9	23.3	6.0	6.4
(% of total)	T	2.2	2.2	13.6	12.1	2.0	5.0	17.5	21.9	5.7	5.8	15.6	12.0	19.3	22.3	7.3	7.8
Motor vehicle traffic	M	31.5	26.9	25.2	21.9	20.1	24.4	18.7	23.9	24.1	18.9	30.4	29.2	21.9	26.5	27.2	25.5
accidents	F	32.1	31.6	20.5	18.5	23.4	27.7	23.3	30.9	27.5	27.4	36.8	39.6	18.6	21.8	29.9	31.4
(% of external causes)	T	31.6	28.3	24.0	21.1	20.7	25.0	19.5	25.1	24.8	20.2	31.6	31.0	21.0	25.3	27.9	26.8
Drowning	M	3.5	2.9	10.4	11.7	7.6	5.7	7.9	5.1	6.8	4.1	10.0	7.6	7.5	6.1	6.4	4.9
(% of external causes)	F	2.2	1.8	7.2	5.2	6.7	5.0	7.0	7.0	7.5	5.3	8.3	6.8	4.2	3.8	4.6	3.7
	T	3.1	2.6	9.6	10.2	7.3	5.5	7.8	5.4	7.0	4.2	9.7	7.5	6.6	5.5	6.0	4.6
Accidental falls	M	6.4	7.1	5.0	7.2	6.5	6.6	4.6	5.2	4.8	3.3	2.1	3.4	6.9	4.6	5.3	5.3
(% of external causes)	F	15.1	17.5	9.2	14.1	10.8	15.3	8.4	13.3	8.9	8.3	6.8	9.3	16.2	12.2	12.5	14.3
	T	8.8	10.2	6.1	8.8	7.3	8.2	5.3	6.6	5.6	4.1	3.0	4.5	9.4	6.5	7.0	7.3
Accidents caused by	M	3.1	2.1	2.2	1.4	2.0	1.1	1.3	0.7	1.3	0.7	1.4	0.9	2.7	2.4	2.3	1.4
fire and flames	F	4.6	3.5	5.6	3.6	4.6	2.2	3.8	2.1	3.7	2.3	4.7	2.8	5.6	5.0	4.6	3.1
(% of external causes)	T	3.6	2.5	3.1	1.9	2.5	1.3	1.7	0.9	1.8	1.0	2.0	1.2	3.5	3.1	2.8	1.8
Accidental poisoning	M	3.4	6.6	4.0	1.2	1.3	1.8	2.7	3.5	1.7	0.7	0.4	0.3	1.8	1.3	2.1	3.0
(% of external causes)	F	3.7	5.1	3.6	1.4	3.7	3.1	4.1	3.9	3.3	1.8	1.0	0.6	3.1	2.6	3.3	3.5
	T	3.5	6.2	3.9	1.2	1.8	2.1	2.9	3.6	2.0	0.9	0.5	0.4	2.1	1.7	2.4	3.1
Accidents related to	M	1.2	1.2	2.4	1.8	0.1	0.2	0.3	0.7	0.3	0.2	0.6	0.4	3.4	3.8	0.9	0.8
medical care	F	3.1	3.4	2.0	3.3	0.5	0.9	1.3	6.8	1.3	0.6	2.2	1.8	8.4	9.2	2.8	3.0
(% of external causes)	T	1.8	1.8	2.3	2.2	0.2	0.3	0.5	1.8	0.5	0.2	0.9	0.7	4.8	5.2	1.3	1.3

Other accidents	M	14.2	12.3	21.6	14.4	37.0	22.6	29.6	15.3	23.8	14.2	17.5	13.6	30.1	27.3	21.5	15.2
(% of external causes)	F	11.3	11.6	24.3	12.7	36.7	26.3	26.4	8.4	30.4	23.6	17.8	14.0	26.6	27.5	19.0	16.0
	T	13.5	12.0	22.2	14.2	37.0	23.3	29.1	14.0	25.0	15.7	17.5	13.6	29.2	28.4	21.0	15.4
Subtotal	M	63.3	59.1	70.8	59.6	74.6	62.4	65.1	54.4	62.8	42.1	62.4	55.4	74.3	72.0	65.7	56.1
accidents	F	72.1	74.5	72.4	58.8	86.4	80.5	74.3	72.4	82.6	69.3	77.6	74.9	82.7	82.1	76.7	75.0
(% of external causes)	T	65.9	63.6	71.2	59.6	76.8	65.7	66.8	57.4	66.7	46.3	65.2	58.9	76.6	75.7	68.4	60.3
Suicide	M	22.8	25.0	13.8	20.9	1.6	5.6	8.1	7.6	5.0	4.0	5.8	6.0	14.3	15.6	12.3	12.8
(% of external causes)	F	16.7	14.2	13.8	22.1	1.3	4.4	10.8	10.6	6.3	6.8	9.0	7.9	11.1	11.0	11.9	10.9
	T	21.0	21.8	13.8	21.1	1.6	5.4	8.6	8.1	5.2	4.4	6.4	6.3	13.4	13.4	12.2	12.4
Homicide	M	13.6	15.6	8.2	17.5	23.0	32.0	23.4	30.4	32.2	53.4	31.8	38.6	10.5	11.8	21.5	30.5
(% of external causes)	F	11.2	11.3	9.0	18.5	9.6	15.1	13.4	15.4	11.1	23.9	13.4	17.2	6.0	6.4	11.0	14.0
	T	12.9	14.4	8.4	17.7	20.5	28.9	21.6	27.9	28.1	48.9	28.4	34.8	9.3	10.4	19.0	26.8
Legal intervention and	M	0.3	0.3	7.2	2.0	0.8	0.0	3.4	7.6	0.0	0.5	0.0	0.0	0.9	0.6	0.5	0.6
operations of war	F	0.0	0.0	4.8	0.6	2.7	0.0	1.5	1.6	0.0	0.0	0.0	0.0	0.2	0.5	0.4	0.1
(% of external causes)	T	0.2	0.2	6.6	1.6	1.1	0.0	3.0	6.6	0.0	0.4	0.0	0.0	0.7	0.5	0.4	0.5

^a North America: Canada and the United States.

^b English-speaking Caribbean: Anguilla, Bahamas, Barbados, Belize, Dominica, Guyana, Cayman Islands, Turks and Caicos Islands, Saint Kitts and Nevis, Saint Lucia, Suriname, and Trinidad and Tobago.

^c Central America and the Latin Caribbean: Costa Rica, El Salvador, Guatemala, Nicaragua, Panama, and the Dominican Republic. This subregion is usually divided into the "Central American Isthmus" and the "Latin Caribbean." As it was difficult to obtain paired data for a number of countries, it was necessary to group them into a single subregion. Also, data for Cuba (1995) are used individually and not compiled in the subregion as no detailed data are available on external causes for years prior to 1992.

^d Andean area: Colombia, Ecuador, Peru, and Venezuela.

^e Southern Cone: Argentina, Chile, Paraguay, and Uruguay.

^f Excluded from total to calculate proportional mortality by type of cause.

TABLE 34
Specific mortality rates (per 100,000 population) from external causes, by sex and by subregion, circa 1984 and 1994.

		North America ^b		English-speaking Caribbean ^c		Mexico		Central America and Latin Caribbean ^d		Andean area ^e		Brazil		Southern Cone ^f		Total	
Causes of death ^a		1984	1994	1984	1994	1984	1995	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994
External causes (total)	M	88.2	79.2	92.8	74.8	144.8	108.9	134.6	125.3	144.8	180.9	133.5	142.0	88.1	89.4	110.1	107.4
	F	35.2	32.8	30.7	23.0	32.8	25.2	28.6	26.0	36.0	32.2	29.7	30.1	29.7	29.7	32.9	30.2
	T	62.1	55.9	61.8	49.0	88.8	67.3	81.1	75.6	89.8	106.1	81.6	86.4	58.5	59.2	71.0	68.6
Motor vehicle traffic accidents	M	27.8	21.3	23.4	16.4	29.1	26.6	25.2	29.9	34.9	34.2	40.6	41.5	19.3	23.7	29.9	27.4
	F	11.3	10.4	6.3	4.2	7.7	7.0	6.7	8.0	9.9	8.8	10.9	11.9	5.5	6.5	9.8	9.5
	T	19.6	15.8	14.8	10.3	18.4	16.8	15.8	19.0	22.3	21.4	25.8	26.8	12.3	15.0	19.8	18.4
Drowning	M	3.1	2.3	9.7	8.8	11.0	6.2	10.6	6.4	9.8	7.4	13.3	10.8	6.6	5.5	7.0	5.3
	F	0.8	0.6	2.2	1.2	2.2	1.3	2.0	1.8	2.7	1.7	2.5	2.0	1.2	1.1	1.5	1.1
	T	1.9	1.5	5.9	5.0	6.5	3.7	6.3	4.1	6.3	4.5	7.9	6.5	3.9	3.3	4.3	3.2
Accidental falls	M	5.6	5.6	4.6	5.4	9.4	7.2	6.2	6.5	6.9	6.0	2.8	4.8	6.1	4.1	5.8	5.7
	F	5.3	5.7	2.8	3.2	3.5	3.9	2.4	3.5	3.2	2.7	2.0	2.8	4.8	3.6	4.1	4.3
	T	5.5	5.7	3.8	4.3	6.5	5.5	4.3	5.0	5.0	4.4	2.4	3.9	5.5	3.8	5.0	5.0
Accidents caused by fire and flames	M	2.7	1.7	2.0	1.0	2.9	1.2	1.8	0.9	1.9	1.3	1.9	1.3	2.4	2.1	2.5	1.5
	F	1.6	1.1	1.7	0.8	1.5	0.6	1.1	0.5	1.3	0.7	1.4	0.8	1.7	1.5	1.5	0.9
	T	2.2	1.4	1.9	0.9	2.2	0.9	1.4	0.7	1.6	1.1	1.6	1.0	2.0	1.8	2.0	1.2
Accidental poisoning	M	3.0	5.2	3.7	0.9	1.9	2.0	3.6	4.4	2.5	1.3	0.5	0.4	1.6	1.2	2.3	3.2
	F	1.3	1.7	1.1	0.3	1.2	0.8	1.2	1.0	1.2	0.6	0.3	0.2	0.9	0.8	1.1	1.1
	T	2.2	3.5	2.4	0.6	1.6	1.4	2.4	2.7	1.8	1.0	0.4	0.3	1.2	1.0	1.7	2.1
Accidents related to medical care	M	1.1	1.0	2.2	1.3	0.1	0.2	0.4	0.9	0.4	0.4	0.8	0.6	3.0	3.4	1.0	0.9
	F	1.1	1.1	0.6	0.8	0.2	0.2	0.4	1.8	0.5	0.2	0.7	0.5	2.5	2.7	0.9	0.9
	T	1.1	1.0	1.4	1.1	0.2	0.2	0.4	1.4	0.4	0.2	0.7	0.6	2.8	3.1	0.9	0.9
Other accidents	M	12.5	9.7	20.0	10.8	53.6	24.6	39.9	19.2	34.5	25.7	23.4	19.3	26.5	24.4	23.7	16.3
	F	4.0	3.8	7.5	2.9	12.0	6.6	7.5	2.2	10.9	7.6	5.3	4.2	7.9	8.2	6.3	4.8
	T	8.4	6.7	13.7	7.0	32.9	15.7	23.6	10.6	22.4	16.7	14.3	11.8	17.1	16.8	14.9	10.6

Subtotal	M	55.8	46.8	65.7	44.6	108.1	67.9	87.7	68.2	90.9	76.2	83.3	78.6	65.5	64.4	72.3	60.3
accidents	F	25.4	24.4	22.2	13.5	28.3	20.3	21.2	18.8	29.7	22.3	23.0	22.5	24.5	24.4	25.2	22.6
(% of external causes)	T	40.9	35.6	44.0	29.2	68.2	44.2	54.2	43.4	59.9	49.1	53.2	50.9	44.8	44.8	48.6	41.4
Suicide	M	20.1	19.8	12.8	15.6	2.3	6.1	10.9	9.5	7.2	7.2	7.7	8.5	12.6	13.9	13.5	13.8
	F	5.9	4.7	4.2	5.1	0.4	1.1	3.1	2.8	2.3	2.2	2.7	2.4	3.3	3.3	3.9	3.3
	T	13.0	12.2	8.5	10.3	1.4	3.6	7.0	6.1	4.7	4.7	5.2	5.4	7.8	7.9	8.7	8.5
Homicide	M	12.0	12.4	7.6	13.1	33.3	34.8	31.5	38.1	46.6	96.6	42.4	54.8	9.3	10.5	23.7	32.8
	F	3.9	3.7	2.8	4.2	3.1	3.8	3.8	4.0	4.0	7.7	4.0	5.2	1.8	1.9	3.6	4.2
	T	8.0	8.0	5.2	8.7	18.2	19.5	17.5	21.1	25.2	51.9	23.2	30.1	5.4	6.2	13.5	18.4
Legal intervention and	M	0.3	0.2	6.7	1.5	1.2	0.0	4.6	9.5	0.0	0.9	0.0	0.0	0.8	0.5	0.6	0.6
operations of war	F	0.0	0.0	1.5	0.1	0.9	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
	T	0.1	0.1	4.1	0.8	1.0	0.0	2.4	5.0	0.0	0.4	0.0	0.0	0.4	0.3	0.3	0.3

^a Injuries for which intention is undetermined are redistributed among other external causes.

^b North America: Canada and United States.

^c English-speaking Caribbean: Anguilla, Bahamas, Barbados, Belize, Dominica, Guyana, Cayman Islands, Turks and Caicos Islands, Saint Kitts and Nevis, Saint Lucia, Suriname, and Trinidad and Tobago.

^d Central America and the Latin Caribbean: Costa Rica, El Salvador, Guatemala, Nicaragua, Panama, and the Dominican Republic. This subregion is usually divided into the "Central American Isthmus" and the "Latin Caribbean." As it was difficult to obtain paired data for a number of countries, it was necessary to group them into a single subregion. Also, data for Cuba (1995) are used individually and not compiled in the subregion as no detailed data are available on external causes for years prior to 1992.

^e Andean area: Colombia, Ecuador, Peru, and Venezuela.

^f Southern Cone: Argentina, Chile, Paraguay, and Uruguay.

Ninth Revision (ICD-9), “accidental falls” includes a category for “fractures from unspecified causes.” So, in many cases, a fracture due to another cause is reported as an accidental fall. This partly explains the high rates in Mexico, Central America, and the Andean area, where more than half the fatalities from these causes occurred in the under-65 age group.

Accidental drowning and submersion were responsible for 4.6% of all deaths from external causes in the Americas (4.9% for males and 3.7% for females). However, in the last decade, the specific mortality rates from these accidents declined in all the subregions for both sexes, with average rates approximately 25% lower than in 1984, amounting to 5.3 per 100,000 population for men and 1.1 per 100,000 for women for the entire Region. In 1994, Brazil had the highest mortality rates from accidental drowning and submersion in the Region, with 6.5 per 100,000 for both sexes (10.8 and 2.0 for males and females, respectively). The English-speaking Caribbean was next in line with 5.0 (8.8 for males and 1.2 for females), followed by the Andean area with 4.5 (7.4 for males and 1.7 for females). The lowest rates were registered in North America, with 1.5 per 100,000 population (2.3 and 0.6 for males and females, respectively).

Another important group of external causes of death is accidental poisoning, which was responsible for 3.1% of all deaths from external causes in the Region in 1994, with a specific mortality rate of 2.1 per 100,000 population (24% higher than in 1984). As is the case with almost all external causes, men are more exposed to death by poisoning than women (a regional total rate of 3.2 per 100,000, as opposed to 1.1 per 100,000). There has been a rising trend in the rates in North America (+59%), where the highest levels in the Region have been reached (3.5 per 100,000), and in Central America and the Latin Caribbean (+12%, with a rate of 2.7 per 100,000 in 1994). The rates have been falling in the English-speaking Caribbean (–75%, with a rate of 0.6 per 100,000), the Andean area, Brazil, and the Southern Cone, and have been stable in Mexico. Deaths from accidental poisoning occur in all age groups, with no marked predominance in any particular group.

Accidents caused by fire were responsible for 2.8% of deaths from external causes in 1984; this figure fell to 1.8% in 1994. The specific mortality rates for both sexes declined from 2.0 to 1.2 per 100,000 (down from 2.5 to 1.5 for males and from 1.5 to 0.9 for females). In 1994, the subregions with the highest mortality rates from these causes were the Southern Cone and North America (1.8 and 1.4 per 100,000, respectively), and those with the lowest rates were Central America and the Latin Caribbean (0.7 per 100,000), and the English-speaking Caribbean (0.9 per 100,000).

Mortality due to accidents related to medical and surgical complications is on the decline in the Region, except for the Southern Cone and Central America and the Latin Caribbean,

where there was a sharp increase between 1984 and 1994. Those two subregions have the highest rates in the Americas: 3.1 per 100,000 in the Southern Cone and 1.4 in Central America and the Latin Caribbean. As mentioned earlier, in many countries the mortality rates for that group of causes are higher for females, especially in North America and Central America and the Latin Caribbean. In North America, the most probable explanation is that women have longer life spans. Women outlive men by several years and they require medical care more frequently, thereby being exposed to higher risk of complications. In the case of Central America and the Latin Caribbean, some fatal complications associated with pregnancy, childbirth, and the puerperium could mistakenly be classified as “complications due to medical care” (external cause). This becomes more apparent if one compares the age concentration of deaths from accidents related to medical care for females (external cause). In North America, 71% of these causes occur in the age group older than 65 years and only 9% in the 15–44-year age group (childbearing age). In Central America and the Latin Caribbean, the proportions are 46% for the over-65 age group and 21% for the childbearing age group. The differences in the age structure are not sufficient to explain the figures.

The rest of the group of other accidents includes those related to electric shock, breathing obstructions and mechanical suffocation, firearms, machines, natural disasters, and unspecified accidents. Overall, they accounted for between 12% and 16% of all accidental deaths in 1994 in almost all the subregions, except for Mexico (23%) and the Southern Cone (28%). In the case of Mexico, the difference can be partly explained by the high proportion of accidents due to firearms—almost 2% of total accidents, the highest percentage in the Region. In the Southern Cone this could be due to the redistribution of deaths in which intention is undetermined (especially in Chile); this may explain, at least partially, why the estimated mortality rates from homicide in these countries are the lowest in the entire Region.

Violence (Intentionally Caused Injuries)

In all the countries of the Region, suicides represented 12.2% of all external causes of death in 1984 (12.3% for males and 11.9% for females); there was a slight change in 1994 when proportions were 12.8% for males, 10.9% for females, and 12.4% overall. The changes in specific mortality rates due to suicide in 1984 and 1994 are also small: the rates moved from 13.5 to 13.8 per 100,000 males and 3.9 to 3.3 per 100,000 females (8.7 to 8.5 overall) between 1984 and 1994.

As do most of the cases, these overall figures mask major differences in both rates and trends. North America is the subregion with the highest rate of suicide for men, i.e., 19.8

per 100,000 in 1994; the English-speaking Caribbean is second with 15.9 per 100,000. The two subregions also have the highest rates for women, but the English-speaking Caribbean has slightly higher rates than North America, with 5.7, as opposed to 4.7 per 100,000. Another difference between the above-mentioned subregions is related to trends. While rates for men and women declined in North America (–7% overall), the reverse was true for the English-speaking Caribbean, where rates increased for both sexes (+21% overall). The Southern Cone is in third place, with a suicide rate of 13.9 per 100,000 for males (10% higher than in 1984) and 3.3 per 100,000 for women (the same as in 1984). For the total population, the mortality rate due to suicide in the Southern Cone was 7.9 per 100,000 population in 1994.

A look at the situation in each country shows that the highest mortality rates due to suicide are found in Cuba, where they were 25.4 per 100,000 for males and 15.3 per 100,000 for females (20.4 overall) in 1995. These figures are 1.8 times higher than the overall rate of the Region for males and 4.6 times higher for females. In the entire Region, 59% of suicides occur in the 15–44-year age group and about 17% in the over-65 group. This is true for countries with high rates as well as those with low rates. Cuba is, in fact, the exception, having only 46% of its suicides in the 15–44-year age group and over 25% in the over-65 group, differences which cannot be explained by the age structure.

An aspect of suicide rates that warrants analysis and in-depth psychosocial study is the fact that the countries of North America, the English-speaking Caribbean, the Southern Cone, and Cuba generally have the best health indicators in the Americas. It should also be noted that the three subregions and Cuba have the lowest homicide rates in the Americas, and that the number of suicides exceeds the number of homicides by as little as 20% in the English-speaking Caribbean and as much as 160% in Cuba.

The other subregions (Mexico, Central America and the Latin Caribbean, the Andean area, and Brazil) have the lowest suicide rates for both men and women. The lowest are in Mexico, with 6.1 suicides per 100,000 males and 1.1 per 100,000 females. Comparison of the mortality rates from suicide in 1984 with those for 1994 revealed different trends. Despite having the lowest rates, Mexico had the largest increases for both sexes (over 100%). In Central America and the Latin Caribbean (excluding Cuba) there was a decline to 9.5 per 100,000 for males (–13%) and 2.8 per 100,000 for females (–10%). In the Andean area, the rates remained steady at 4.7 per 100,000 of the total population (7.2 for men and 2.2 for women), while in Brazil the suicide rates increased for males and declined for females, with figures of 8.5 per 100,000 (+10%) and 7.7 per 100,000 (–11%), respectively.

For all the countries of the Region, homicide was the second most common external cause of death in 1984, after

motor-vehicle traffic accidents. In 1994, there were 18.4 deaths due to homicide per 100,000 inhabitants in the Americas. Among males, homicide is the leading external cause (32.8 per 100,000), whereas it ranks third for females (4.2 per 100,000), after motor-vehicle traffic accidents (9.5) and accidental falls (4.3). The differences in homicide rates between subregions and countries are considerable, though there is an overall upward trend.

The subregions with the lowest mortality rates due to suicide have the highest homicide rates, which are always much higher than the suicide rates for both sexes. The Andean area has the highest mortality rate due to homicide in the entire Region, and has experienced the greatest increases over the past decade, particularly Colombia. In 1994, that country registered 96 homicides per 100,000—123 per 100,000 for men and 14 per 100,000 for women. For both sexes, these have been the highest rates for the entire Region. In 1994, homicides in Colombia represented 16.4% of all reported deaths (3% for females and 24.9% for males). In the 15–44-year age group, 62.6% of all male deaths were homicides. Though the figures are lower in the other countries of the Andean area, the homicide rates are still high. For the entire subregion, in 1994 homicide rates were twice as high as they were in 1984, reaching 51.9 per 100,000 population (96.6 for men and 7.7 for women). In Brazil, the rates also were very high, with 30.1 per 100,000 population (54.8 for men and 5.2 for women). In Central America and the Latin Caribbean, homicide rates in 1994 were 21.1 per 100,000 (38.1 for men and 4.0 for women), while in Mexico they were 19.5 overall, with 34.8 for men, and 3.8 for women.

Unlike suicides, the lowest mortality rates due to homicide in the Region were found in North America, the English-speaking Caribbean, the Southern Cone, and Cuba, with figures for 1994 that ranged from 6.2 per 100,000 in the Southern Cone to 8.0 per 100,000 in North America. It should be noted that the broad differences between these three subregions and those mentioned in the preceding paragraph pertain almost exclusively to males. The specific mortality rates from homicide among males range from 10.5 (Southern Cone) to 13.1 (English-speaking Caribbean), i.e., 65% and 85% lower than in the other regions. Though the figures for females are generally lower, they are much closer, ranging from a minimum of 1.9 per 100,000 in the Southern Cone to 4.2 per 100,000 in the English-speaking Caribbean, the latter rate being even higher than in Mexico and Central America and the Latin Caribbean.

In all the age groups, a percentage of external causes, which never exceeds 1%, is classified as “injuries due to operations of war” and “legal intervention.” In the case of operations of war, some of the few deaths so classified represent coding errors, especially in countries where there is no war and their inhabitants are not involved in conflicts in other countries.

Differences by Age and Sex

The characteristics of the external causes of death vary significantly by age group, as shown in Table 35, and the differences are observed in all countries. With very few exceptions, deaths from external causes, in all age groups, are much higher for males than for females.

External causes accounted for 3.3% of mortality for those under 1 year old in the Region in 1994. Accidents represented 91.5% of these causes (89.1% for boys and 93.6% for girls), and the remainder were attributable almost entirely to homicide. Accidents are the only group of causes of infant mortality in which rates are higher for females than males. Similarly, the only age group with more female than male fatalities due to external causes is that of infants under 1 year old. Accidents include, notably, motor-vehicle traffic accidents (6.4%), accidental drowning and submersion (2.9%), and accidents caused by fire (2.9%). The most frequent cause of infant mortality due to external causes, however, is to be found in the "other accidents" group, namely obstruction of the respiratory tract or accidental mechanical suffocation, usually caused by inhaling objects or vomit.

In the 1–4-year age group, external causes represented 21.3% of total deaths in the Americas in 1994. The main causes are motor-vehicle traffic accidents, accounting for 21.6% of external causes, accidental drowning and submersion (19.6%), accidents caused by fire (8.1%), and homicide (6.9%). Among other accidents, accidental mechanical suffocation and accidents related to electric shock account for an important portion of externally caused deaths, as seen in the under 1-year age group.

In 1994, in the 5–15-year age group, 45.7% of all deaths were due to external causes, the principal cause being motor-vehicle traffic accidents (37.6%), which account for almost 17% of all mortality in that age group. Another major cause is accidental drowning and submersion. Over 50% of the deaths by accidental drowning and submersion are concentrated in the 5–14-year-old age group, accounting for almost 15% of external causes and 6.5% of all deaths. This category is followed by homicide (10.5% of all external causes). Suicide is in fourth place, accounting for 3.7% of deaths due to external causes.

The age group with the highest number of deaths from external causes is the 15–44-year age group. In 1994, 63.9% of male deaths and 42.5% of female deaths from external causes in the Region occurred in this age group. The sex differentials are considerable in this age group: external causes are responsible for 51.7% of male deaths and only 24.5% of female deaths. For men, the main external cause is homicide, accounting for 39.5% of the total, followed by motor-vehicle traffic accidents (25.0%) and suicide (12.5%). The proportions are lower for drowning (4.4%) and accidental poisoning

(3.3%). For women, the main external causes of death in the 15–44-year age group are motor-vehicle traffic accidents (36.8%), homicide (23.2%), suicide (15.0%), and accidental poisoning (4.7%).

In 1994, in the 45–64-year-old age group, external causes accounted for 10.9% of male mortality and 5.1% of female mortality in the Region. In that age group, the most important external causes for males were motor-vehicle traffic accidents (27.1%), homicide (22.1%), suicide (16.8%), accidental falls (6.0%), and accidental poisoning (3.6%). For females they were motor-vehicle traffic accidents (32.7%), suicide (15.4%), homicide (10.6%), accidental falls (5.5%), and accidental poisoning (4.2%).

Finally, for the population aged 65 and over, external causes represented only 2.5% of total deaths in the Region in 1994 (3.0% for men and 2.0% for women). For men, the main causes were motor-vehicle traffic accidents (23.5%), accidental falls (21.6%), suicide (17.6%), homicide (6.9%), accidents related to complications from medical treatment (3.9%), and accidents caused by fire (2.6%). For females, the main external causes of death in that age group were accidental falls, accounting for 38.5% of the total. Next in line were motor-vehicle traffic accidents (18.6%), accidents related to complications with medical treatment (6.1%), suicide (5.1%), homicide (3.2%), and accidents caused by fire (3.0%).

BEHAVIORAL DISORDERS

Consumption of Alcohol, Tobacco, and Other Psychoactive Substances

General Analysis

The abuse of many legal and illegal psychoactive substances is one of the Region's most serious health problems. Alcohol and tobacco, both legal, have the highest rates of continuous or occasional use among substances that lead to dependency.

The countries with the highest consumption of illegal substances reduced the number of people who used drugs in the last 30 days, or "users in the last 30 days." In the United States, for example, this group of users decreased from 25 million to 12.8 million between 1979 and 1996, according to estimates by the United States Department of Health and Human Services. In the United States there also are 110 million alcohol drinkers and 55 million tobacco users. In 1995, more than one-third of high school seniors used tobacco—the highest figure since 1970—representing an estimated 3,000 new cases each day. This figure is all the more alarming, considering that smokers in these age groups are eight times more likely to use illegal drugs and five times more likely to become

TABLE 35
Proportional mortality from external causes, by age and by sex, Region of the Americas, 1984 and 1994.

		Total		<1 year		1–4 years		5–14 years		15–44 years		45–64 years		65 years and over	
		1984	1994	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994
External causes (total)	M	12.8	13.6	1.6	2.6	14.0	20.3	43.2	48.2	54.6	51.7	10.1	10.9	3.0	3.0
	F	4.7	4.5	1.5	4.2	10.6	22.4	28.5	41.9	23.6	24.5	4.6	5.1	2.0	2.0
	T	9.1	9.4	1.6	3.3	12.4	21.3	37.2	45.7	44.9	44.0	8.0	8.7	2.5	2.5
Intention undetermined ^a	M	7.7	8.2	7.3	7.8	6.0	7.4	6.2	7.2	8.2	8.5	8.1	8.7	5.5	3.4
	F	6.0	6.4	5.6	4.8	6.7	4.8	6.2	5.4	7.1	7.4	6.8	6.8	3.7	6.0
	T	7.3	7.8	6.6	6.1	6.3	6.1	6.2	6.5	8.1	8.4	7.8	8.3	4.8	4.9
Motor vehicle traffic accidents (% of external causes)	M	27.2	25.5	7.5	7.5	22.5	25.1	35.9	37.7	28.7	25.0	25.5	27.1	21.6	23.5
	F	29.9	31.4	8.5	5.5	23.4	18.0	41.5	33.2	37.3	36.8	31.8	32.7	18.5	18.6
	T	27.9	26.8	7.9	6.4	22.9	21.6	37.6	36.0	30.1	26.9	26.9	28.4	20.4	21.4
Drowning (% of external causes)	M	6.4	4.9	4.0	3.6	23.8	24.6	18.5	17.3	6.1	4.4	3.9	3.4	2.5	2.1
	F	4.6	3.7	3.9	2.5	20.1	14.5	13.1	9.4	3.6	2.8	2.6	1.7	1.3	1.1
	T	6.0	4.6	3.9	2.9	22.3	19.6	16.8	14.3	5.7	4.2	3.6	3.0	2.0	1.6
Accidental falls (% of external causes)	M	5.3	5.3	2.5	2.3	4.0	3.4	3.9	3.3	2.6	2.2	5.8	6.0	19.1	21.6
	F	12.5	14.3	2.3	1.8	3.2	2.3	3.5	2.2	1.9	1.6	6.2	5.5	37.8	38.5
	T	7.0	7.3	2.5	2.0	3.7	2.9	3.8	2.9	2.5	2.1	5.9	5.9	26.6	28.8
Accidents caused by fire and flames (% of external causes)	M	2.3	1.4	6.8	3.3	12.2	9.0	4.3	2.9	1.3	0.8	2.2	1.6	3.4	2.6
	F	4.6	3.1	7.6	2.6	14.3	7.1	7.0	3.6	2.8	1.9	3.9	2.7	4.5	3.0
	T	2.8	1.8	7.2	2.9	13.0	8.1	5.1	3.2	1.6	0.9	2.6	1.9	3.8	2.8
Accidental poisoning (% of external causes)	M	2.1	3.0	4.4	2.3	3.5	2.4	1.2	1.1	2.1	3.3	2.0	3.6	1.8	1.4
	F	3.3	3.5	4.3	1.5	4.6	1.7	2.1	1.2	3.8	4.7	3.5	4.2	2.1	1.6
	T	2.4	3.1	4.4	1.9	3.9	2.0	1.5	1.1	2.4	3.5	2.3	3.8	1.9	1.5

TABLE 35 (continued)

		Total		<1 year		1–4 years		5–14 years		15–44 years		45–64 years		65 years and over	
		1984	1994	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994	1984	1994
ExAccidents related to medical care (% of external causes)	M	0.9	0.8	1.8	1.5	0.6	0.7	0.2	0.3	0.2	0.1	1.4	1.2	4.0	3.9
	F	2.8	3.0	2.0	0.9	0.3	0.4	0.5	0.4	1.1	0.9	3.8	3.4	6.0	6.1
	T	1.3	1.3	1.9	1.2	0.5	0.5	0.3	0.3	0.3	0.3	1.9	1.7	4.8	4.8
Other accidents (% of external causes)	M	21.5	15.2	62.0	68.6	28.0	26.9	27.7	21.5	19.3	11.9	23.4	18.0	23.3	20.3
	F	19.0	16.0	61.2	78.8	28.1	50.0	22.3	38.2	14.2	13.0	17.4	23.7	19.4	22.8
	T	21.0	15.4	61.6	74.2	28.1	38.3	26.0	27.9	18.4	12.0	22.1	19.1	21.8	21.5
Subtotal accidents	M	65.7	56.1	89.0	89.1	94.6	92.1	91.7	84.1	60.3	47.7	64.2	60.9	75.7	75.4
	F	76.7	75.0	89.8	93.6	94.0	94.0	90.0	88.2	64.7	61.7	69.2	73.9	89.6	91.7
	T	68.4	60.3	89.4	91.5	94.4	93.0	91.1	85.7	61.0	49.9	65.3	63.8	81.3	82.4
Suicide (% of external causes)	M	12.3	12.8	0.0	0.0	0.0	0.0	2.2	4.0	11.7	12.0	16.6	16.8	17.4	17.6
	F	11.9	10.9	0.0	0.0	0.0	0.0	2.5	3.3	16.6	15.0	20.7	15.4	6.4	5.1
	T	12.2	12.4	0.0	0.0	0.0	0.0	2.3	3.7	12.5	12.5	17.5	16.5	12.9	12.2
Homicide (% of external causes)	M	21.5	30.5	8.6	10.3	5.1	7.8	5.9	11.7	27.5	39.5	18.9	22.1	6.4	6.9
	F	11.0	14.0	7.8	6.3	5.6	6.0	7.3	8.4	18.5	23.2	9.7	10.6	3.4	3.2
	T	19.0	26.8	8.2	8.1	5.3	6.9	6.4	10.5	26.0	36.9	16.9	19.5	5.2	5.3
Legal intervention and operations of war (% of external causes)	M	0.5	0.6	2.4	0.6	0.3	0.1	0.2	0.2	0.5	0.8	0.3	0.2	0.5	0.1
	F	0.4	0.1	2.4	0.1	0.4	0.0	0.2	0.1	0.2	0.1	0.4	0.1	0.6	0.0
	T	0.4	0.5	2.4	0.4	0.3	0.1	0.2	0.1	0.5	0.7	0.3	0.2	0.6	0.1

^a Excluded from the total to calculate proportional mortality by type of cause.

excessive drinkers. In 1992, cocaine use in the United States was approximately 300 metric tons, two-thirds of which was used by people chemically or psychologically dependent on it. Since 1991, the number of new cocaine users has stabilized at approximately 500,000 per year. The number of new marijuana users rose from 1.4 million to 2.3 million between 1990 and 1994.

In Canada, the cost of smoking has been estimated at more than US\$ 7,700 million (US\$ 2,100 million in health expenditures). Other countries in the Region, with support from WHO and the World Bank, are preparing such estimates, as a way to counteract the tobacco companies' argument that tobacco sales benefit the countries' economies. WHO estimates for 1997 indicate that health problems attributable to smoking caused nearly 675,000 deaths in the Americas (500,000 in the United States, 100,000 in Latin America, 40,000 in Canada, and 35,000 in the English-speaking Caribbean).

High mortality rates from cirrhosis of the liver continue to be seen in various areas of Chile, Mexico, and Puerto Rico, although in the rest of the Region the situation appears to be stabilizing. Both Argentina and Uruguay have reduced daily alcohol consumption and deaths from cirrhosis, and it should be noted that Argentina, a country with nearly twice the population of Chile, has half the number of deaths from that disease.

There is an apparent inconsistency in the data from locally conducted surveys and reports on the demand for medical assistance and indirect indicators that relate to a critical mass of people dependent on illegal substances. This seems to indicate that, unlike consumers of tobacco, alcohol, and other legal psychoactive substances, illegal-substance users are not homogeneously distributed in the population.

Review of Indicators

The magnitude of substance abuse has not been uniformly assessed in the Region, although some countries have conducted representative surveys of the population. The number of heroin users in the United States has stabilized at 600,000, and since 1989 some 1,300 kg of this drug have been confiscated yearly. In Canada the amount of confiscated cannabis resin, used to prepare hashish, rose from 15,785 kg in 1992 to 56,639 kg in 1993. That same year, fairly low quantities of heroin were confiscated: 154 kg, compared with 99 kg in 1991 and 114 kg in 1992. The confiscation of 2,713 kg of cocaine in 1993 in Canada suggests that this country consumes one-tenth as much cocaine as the United States.

The Statistical Summary of the Organization of American States (OAS) indicates that a total of 1,112,720 kg of marijuana was confiscated in the Region in 1993, which suggests some degree of stabilization, compared with almost 1,875,415

kg recorded in the early 1990s. Mexico ranks first, with 495,000 kg confiscated, followed by the United States, with 382,000 kg, and Colombia, with 127,867 kg. The amount of cocaine confiscated has remained relatively stable in the Region (213,000 kg in 1989 and 251,142 kg in 1993). The United States and Mexico vie for first place with respect to the quantities of cocaine confiscated, with 110,693 kg and 46,159 kg, respectively. Consumption of uncut cocaine in the United States is estimated at approximately 290,000 kg, a figure that has remained stable since 1986. The Rand Corporation estimates that in the United States, two-thirds of the cocaine is consumed by habitual users and the remainder is occasionally used for recreational or experimental purposes, or as a stimulant.

Table 36 shows the per capita alcohol consumption up to 1990 in selected countries in the Americas. As may be seen, the increase has been modest.

In Latin America, the prevalence of alcohol consumption is extremely high, and several surveys report the persistence of "problem drinkers," that is, people who frequently become intoxicated. These drinkers are detected by means of specially designed instruments, such as the short alcohol consumption scale in Chile, or the questionnaire for the diagnosis of alcoholism used in Colombia and other countries, both of which are validated for the countries in which they are administered. In Colombia WHO's Complete International Diagnostic Inventory (CIDI) also was used to identify alcohol-dependent persons. The number of problem drinkers in Chile is significant; the short alcohol consumption scale yielded positive diagnoses in 24% of the cases, 35.6% of men and 11.1% of women. Similarly, the questionnaire administered in Colombia produced figures for alcoholism and high-risk drinkers (problem drinkers) of 12.0% and 9.9%, respectively. Most countries reported that some 6% to 8% of the population over 12 years of age are dependent on alcohol and almost 10% are heavy drinkers. This means that a high percentage of the population periodically gets drunk and experiences social, psychological, and work problems associated with this behavior. Although no continuous and reliable figures are available, accidents and violence of all kinds related to behavior stemming from alcohol consumption have been often described. Table 37 shows consumption levels in selected countries, according to several surveys.

Table 38 shows per capita cigarette consumption in the various regions of the world, according to distribution criteria prepared by WHO. The drop in consumption between 1980–1982 and 1990–1992 (2.8%) is noteworthy, and it could be speculated that the smoking epidemic in the Region of the Americas appears to have peaked in the first half of the 1980s. Given this, tobacco-related morbidity and mortality will continue to be observed throughout the remainder of the present century and, should this trend persist, at least

TABLE 36**Total per capita consumption of alcohol, in liters, selected countries of the Americas, 1970, 1975, 1980, 1985, and 1990.**

Country	1970	1975	1980	1985	1990
Argentina	13.28	12.8	11.6	8.9	7.5
Bolivia	1.74	2.13	2.30	...	...
Brazil	1.82	1.99	2.55	1.4	3.4
Canada	6.07	8.11	8.61	7.9	7.4
Chile	6.11	5.75	6.72	6.3	6.4
Colombia	2.19	2.18	2.68	2.6	3.0
Costa Rica	2.23	2.04	3.03	...	2.6
Cuba	1.59	2.14	2.26	3.1	3.6
Dominican Republic	1.49	2.08	2.54	...	...
Ecuador	0.94	1.70	1.92	...	...
El Salvador	0.89	1.36	1.31	...	...
Guatemala	1.89	2.61	2.52	...	...
Honduras	1.16	1.31	1.60	...	...
Mexico	2.01	2.27	2.59	2.6	3.0
Nicaragua	2.78	2.66	2.30	...	...
Panama	2.85	3.10	3.12	...	...
Paraguay	2.35	2.36	3.66	1.9	2.0
Peru	2.21	2.65	2.38	1.6	1.4
Puerto Rico	9.31	8.41	...	...	...
United States	6.87	7.76	8.26	8.0	7.4
Uruguay	5.71	6.49	4.15	5.3	5.7
Venezuela	4.02	4.17	4.37	3.1	3.3

through the first quarter of the twenty-first century, when life expectancy and chronic noncommunicable diseases will have increased.

Similarly, most countries that recently conducted surveys have shown a marked decline in tobacco consumption. In Colombia, for example, tobacco consumption in the month before the survey declined from 21.3% in 1992 to 18.5% in 1996. This indicator remained virtually unchanged in Costa Rica (18.6% in 1990 and 18.3% in 1993) and in Mexico (26.0% in 1990 and 25.1% in 1993). The disparity between lifetime use of tobacco and use during the month before the survey in the United States is significant, with an observed difference of 45%. This reflects a net reduction in smoking in the years following the Surgeon General's Report in 1964. Table 39 shows the prevalence of smoking in the population over 12 years of age.

In other countries, lifetime prevalence rates of tobacco use and rates for consumption in the last year are not very different from those referring to recent use; thus, although the prevalence is not as high, many smokers are still tobacco-dependent. Nonetheless, the per capita cigarette consumption in the Region has fallen, dropping from 2,550 in 1972 to 1,600 in

TABLE 37**Percentage of the population older than 12 years that consumes alcohol, according to several surveys, selected countries of the Americas.**

Country (year)	Some time	Last year	Last month
Bolivia (1992)	68.7	58.9	42.1
Canada (1994)	88.2	72.3	...
Chile (1996)	83.7	70.3	46.7
Colombia (1996)	...	59.8	35.2
Costa Rica (1995)	62.3	40.3	24.8
Mexico (1993)	74.6	51.6	42.9
Paraguay (1991)	36.5	31.6	25.8
Peru (1997)	84.6	74.2	40.7
United States (1994)	84.2	66.9	53.9
Venezuela (1996)	80.5	66.0	28.8

1992. This drop in daily consumption may be attributable to price and income variations.

Table 40 shows the estimated prevalence of tobacco consumption for men and women, based on data provided by the countries to PAHO. Although the data are not completely up-to-date, they represent a good indication of the situation in the Americas.

These figures represent an important factor in the morbidity and mortality from causes attributable to tobacco in terms of total annual deaths. Moreover, the changes in the epidemiological profile in developing countries will increase the prevalence of noncommunicable diseases; that, combined with increased longevity, will have a strong impact in the future, given the critical figures of average cigarette consumption in the Region.

Illicit drug consumption in countries involved in drug production or drug trafficking presents a similar picture, although figures in this case are relatively modest in comparison with those for countries identified as those with the greatest demand. Table 41 presents prevalence data on the consumption of illicit substances in selected countries.

It is noteworthy that the lifetime prevalence for consumption of mate, or coca tea, in a cocaine-producing country such as Bolivia was 59.9% and previous-month consumption was 16.7%. Similarly, 14.3% of the population engaged in the chewing of coca leaves, and the medicinal use of coca was estimated at 13%; both figures corresponded to consumption in the last 30 days. Save for the United States and Canada, every country surveyed reported that heroin use was unusual. In Mexico, a drug-producing and drug-trafficking country, lifetime prevalence was 0.1% (and nonexistent during the last month and year). Colombia reported 12,576 users (compared with 343,000 who have used coca paste and more than 1 mil-

TABLE 38
Global and Regional estimates and trends in cigarette consumption among adults
15 years of age and older, 1970–1972 to 1990–1992.

WHO regions and countries	Average annual per capita consumption			Annual percentage change		
				1970–1972	1980–1982	1970–1972
	1970–1972	1980–1982	1990–1992	to 1980–1982	to 1990–1992	to 1990–1992
Region of Africa	460	570	590	2.1	0.3	1.2
Region of the Americas	2,580	2,510	1,900	–0.3	–2.8	–1.5
Region of the Eastern Mediterranean	700	940	930	2.9	–0.1	1.4
Region of Europe	2,360	2,500	2,340	0.6	–0.7	0.0
Region of Southeast Asia	850	1,140	1,230	2.9	0.8	1.8
Region of the Western Pacific	1,100	1,610	2,010	3.8	2.2	3.0
Industrialized countries	2,860	2,980	2,590	0.4	–1.4	–0.5
Developing countries	860	1,220	1,410	3.5	1.4	2.5
World	1,410	1,650	1,660	1.6	0.1	0.8

Source: World Health Organization. *Tobacco or health. A global status report.* Geneva: WHO; 1997.

lion males who have used marijuana). In the United States, lifetime prevalence is 1% (nearly 2 million people) and the figure for consumption during the last month is 0.1% (117,000 people). According to the latest survey, the total population currently addicted to heroin is roughly 600,000, which indicates that many cases are in remission.

It can be concluded, with minor variations, that there is a trend toward less consumption of illicit substances in developing countries. The trend is even seen in the United States, the country with greatest consumption, where the total use of illicit substances is 34.4%: 31.1% (nearly 98% of the total) is connected with marijuana use. Further studies are needed on

specific populations and users in problem areas, in order to determine the sociocultural conditions underlying this phenomenon. In some areas of intense drug trafficking, such as the Caribbean, Nicaragua, and Honduras, an increase in the use of crack cocaine has been reported in recent years. An assistance program was recently launched for these regions with the collaboration of the Inter-American Drug Abuse Control Commission (CICAD) of the OAS. This program includes community-based methods for conducting situational analyses and epidemiological surveillance.

Several studies are examining the application of the Drug Use Screening Inventory as a way to determine risk factors and protective factors. The studies, which have been conducted in the Central American countries, Chile, Colombia (Medellín), the Dominican Republic, and Venezuela, point to a close association between common risk factors and drug use in the last month among student populations. Important among these factors are age (increased use with age), sex (greater propensity among males), problems at school, impulsive behavior and behavioral disorders, and association with peers involved in drug use. The common protective factor in all countries and for all drugs is good family life.

There are substances that can be gateways to the world of drugs, such as alcohol, tobacco, or both. Teenagers who had consumed alcohol, tobacco, or both were more apt to use marijuana and cocaine than those who had not. Age of initiation, therefore, represents a critical variable in prevention efforts.

TABLE 39
Percentage of the population older than 12 years old that consumes tobacco, selected countries of the Americas.

Country (year)	Some time	Last year	Last month
Bolivia (1992)	46.8	34.1	24.9
Canada (1994)	54.5	27.0	...
Chile (1996)	70.2	47.5	40.4
Colombia (1996)	38.8	25.9	22.2
Costa Rica (1995)	35.2	18.3	17.5
Mexico (1993)	45.4	...	25.1
Paraguay (1991)	...	...	24.3
Peru (1997)	62.1	42.0	31.7
United States (1994)	73.3	31.7	28.6
Venezuela (1996)	31.8	25.7	24.4

Source: Country reports.

TABLE 40
Estimated prevalence (%) of tobacco consumption in men
and women, selected countries of the Americas, in
descending order.

Position	Country (year)	Men (%)	Women (%)
1	Dominican Republic (1990)	66.3	13.6
2	Bolivia (1992)	50.0	21.4
3	Cuba (1990)	49.3	24.5
4	Peru (1989)	41.0	13.0
5	Uruguay (1990)	40.9	26.6
6	Argentina (1992)	40.0	23.0
7	Brazil (1989)	39.9	25.4
8	El Salvador (1988)	38.0	12.0
9	Chile (1990)	37.9	25.1
10	Guatemala (1989)	37.8	17.7
11	Honduras (1988)	36.0	11.0
12	Colombia (1992)	35.1	19.1
13	Costa Rica (1988)	35.0	20.0
14	Canada (1991)	31.0	29.0
15	United States (1993)	27.7	22.5
16	Paraguay (1990)	24.1	5.5
17	Bahamas (1989)	19.3	3.8

Source: Country reports.

Mental and Psychosocial Disorders

Current Care Needs

The epidemiology of psychiatric disorders and psychosocial problems (such as violence) in the Region indicates that these problems are extremely widespread and that no country is immune. In the United States, the Epidemiological Capture Area study (ECA), which employed a standardized diagnostic method known as the Diagnostic Interview Schedule (DIS), encompassing several urban and one rural population (N = 19,640), reported a lifetime prevalence rate of 32% and an active case rate of 20% in the 12 months prior to the survey (1991) (172). In a more recent study that employed the standardized CIDI, which included a random sample of the entire United States population, the following aggregate rates were found: lifetime, 48.0% and past year, 29.5%. Among men, the respective rates were 48.7% and 27.7%, and among females, 43.3% and 31.2% (173). In Canada, a 1998 study conducted in the city of Edmonton, using a similar method to ECAs, yielded a lifetime prevalence rate of 33.8% (174). A study in Ontario Province in 1994, consisting of home interviews of people 15 to 64 years of age, found a prevalence rate of 18% for the year prior to the survey for men and 19% for

women (175). In 1993, a multicenter study in Brazil reported estimated prevalence rates ranging from 19% to 34% for a series of psychiatric disorders. In Chile, the lifetime prevalence rate estimated in a 1993 study was 33.7% (176). In Mexico (177) a lifetime prevalence rate of 22% was reported. Of the 13 diagnostic categories studied, depression and alcohol dependency were most frequently associated with lifetime prevalence rates in men: 5.3% and 4.9%, respectively. In women, depression was more frequent, with a lifetime prevalence rate of 11.3%, followed by simple phobias (5.8%). A national survey published in Colombia in 1997 used the second CIDI version as a diagnostic tool. This study explored 16 diagnostic categories, with the most frequent rates of lifetime prevalence for both sexes related to tobacco dependency (28.3%), major depression (19.6%), and alcohol abuse or dependency (16.6%) (178). These aggregate rates were based on calculations of selected psychiatric disorders and, consequently, the entire series of disorders, as listed in the International Statistical Classification of Diseases and Health-related Problems, Tenth Revision (ICD-10), is not included.

Children are not exempt from psychiatric disorders. A study conducted in Puerto Rico reported a 16% prevalence rate for moderate and serious psychiatric disorders (179). In the absence of studies in other countries, this rate was projected for the Latin American and Caribbean population, yielding a figure of at least 17 million children aged 4 to 16 who are probably affected by disorders requiring intervention.

The prevalence rate for epilepsy in Latin America ranges from 1.3% to 5.7% of the total population (180). In Latin America and the Caribbean, the prevalence rates for affective disorders and schizophrenic psychoses are 4.1% and 1.1%, respectively, while in the United States they are 11.3% and 0.5%, respectively (173). It is estimated that some 3% to 5% of the total prevalence rates cited consist of serious disorders that require care from the mental health services.

Data on the frequency and distribution of some disorders in the English-speaking Caribbean have been recently compiled (181). Studies to measure the incidence of schizophrenia were conducted in Trinidad and Tobago in 1993, in Jamaica in 1994, and in Barbados in 1995. They showed rates of 0.24 per 1,000 in men and 0.19 in women; 0.11 per 1,000 for both sexes, and 0.28 per 1,000 for both sexes combined. Two studies that assessed the prevalence rate for this disorder were conducted in Trinidad and Tobago and in Dominica. In Trinidad and Tobago the rates were 0.34% among persons of African origin and 0.12% among persons of East Indian origin, with an overall rate of 0.32% for men and 0.18% for women, while in Dominica the prevalence rate for schizophrenia was estimated at 0.85% in 1990.

The World Bank estimates that 8.0% of disability adjusted years of life lost to mental disorders in Latin America and the Caribbean are attributable to these disorders, a greater pro-

TABLE 41
Prevalence (%) of consumption of illicit substances in the population older than 12 years old,
selected countries of the Americas.

Country (year)	Some time		Last year		Last month	
	Marijuana	Cocaine	Marijuana	Cocaine	Marijuana	Cocaine
Bolivia (1994)	2.5	1.2 (1.2)	0.6	0.2 (0.3)	0.2	0.1 (0.2)
Canada (1994)	23.1	3.8	7.4	0.7		
Chile (1996)	16.7	2.6 (2.0)	4	0.8 (0.6)	1.2	0.3 (0.2)
Colombia (1996)	5.4	1.6 (1.5)	1.1	0.4 (0.3)		
Costa Rica (1995)	3.9	0.9	0.5	0.2	0.3	0.1
United States (1994)	31.1	10.4 (1.9)	8.5	1.7 (0.6)	4.8	0.7 (0.2)
Mexico (1993)	3.3	0.5	0.5	0.2	0.2	0.1
Paraguay (1991)	1.4	0.1	1.4	...	...	...
Peru (1997)	6.4	1.9 (3.1)	1.0	0.2 (0.7)	0.6	0.1 (0.5)
Venezuela (1996)	3.2	1.5 (0.7)	1.7	0.7 (0.4)	1.0	0.5 (0.3)

Note: Figures in parentheses indicate consumption of crack cocaine or coca paste (free-base cocaine).

portion than for cancer (5.2%) or cardiovascular diseases (2.6%) (182). It also has been estimated that 5 of the 10 leading causes of illness in the world in 1990 were psychiatric in origin, and that depression was the most frequent (183). In Chile, a similar study found that of the 15 leading causes of disability adjusted years of life lost from illness, 4 were psychiatric in origin (alcohol dependency, with 3.02% of the total, followed by depression, 3.01%; Alzheimer's disease, 2.42%; and psychosis, 2.36%); 5 more were of a psychosocial nature (13). The economic burden of psychiatric disorders is equally high in the United States, where the cost of depression was estimated at US\$ 43 billion in 1990 (185).

Rather than being random, the distribution of mental health problems among the population appears to show an inverse relationship between socioeconomic class and psychiatric disorders as a whole—the lower the socioeconomic level, the higher the rate. Needs also are particularly high in the population groups at greatest risk, such as indigenous populations and groups that are the victims of displacement, persecution, or war. It is also true that only in a minority of cases have persons with a problem sought care from the health services. For example, a study conducted in the United States (173) showed that only 42% of those with some lifetime psychiatric disorder had gone to a health service to seek assistance.

Future Care Needs

As the number of persons at risk for psychiatric disorders increases with the growth of the population, the need for psychiatric care in the countries at the beginning of the twenty-first century is expected to increase from current levels. It is estimated that by the year 2000, 88 million persons will be suffering from some mental or emotional disorder in Latin America and the Caribbean (186); by 2010, 2 million more with schizophrenic disorders and more than 17 million with affective disorders are expected to join their ranks.

Mental Health Policies and Services

Psychiatric care treats both disturbances in the development of the psyche and the personality and functional or organic disturbances in the mind. Psychiatric care also encompasses the promotion of mental health, the prevention of psychiatric disorders, and efforts to alter psychosocial factors related to health and human development.

Both specialized and general health services, especially primary care services, provide psychiatric care. Primary care services absorb most of the demand, because they are more

accessible and because people tend to view them more favorably, as they are not associated with a mental hospital.

The incorporation of psychiatric care into the primary care strategy has progressed considerably in Latin America and the Caribbean since 1990. The development and use of simple technology to identify and manage patients with emotional disorders at the primary care level and within in-service education, supported by specialized services, have contributed greatly to extend psychiatric care coverage. Almost every country has endeavored to promote this approach by conducting research, developing manuals, and providing training.

Psychiatric care provided by specialized and general health services is insufficient to cover all of the population's needs and demand. Some of the deficit is covered by community-based arrangements, although the degree to which these means are relied upon varies from country to country. The Region's health systems, especially since 1990, have begun to link their psychiatric services to activities undertaken by the general public, such as support networks, self-help groups, and consumer organizations. This citizen involvement in psychiatric care has given rise to a vigorous and broad-based movement in the United States and Canada. The movement has spread to Latin American and Caribbean subregions, visibly taking hold in some countries such as Argentina, Brazil, Costa Rica, Mexico, Panama, and Uruguay. Even so, the demand far outstrips the services' current capacity.

Overall, psychiatric services are neither fully accessible nor of the highest quality. In response, a movement to modify the structure and function of psychiatric care—dubbed the Initiative for the Restructure of Psychiatric Care—has emerged in the Region in 1990. Most of the Latin American and Caribbean countries are participating in the initiative, which is designed to shift psychiatric care toward the community and away from mental hospitals, where most of it rests. In so doing, the initiative tries to make maximum use of the potential within the community to restore mental health, take advantage of various models of care (psychiatric care in general hospitals, convalescent homes, etc.), and overcome the problems that now beset mental institutions in most of the countries of the subregion.

Psychiatric care in Latin America and the Caribbean must contend with obstacles inside and outside the health services. Mental health care and mental illness are not generally considered priorities by health authorities in the countries of the Region, a fact that translates into meager budgets and limited activities in this field. Health authorities and professionals still harbor reservations about new approaches to primary prevention and, in particular, care for mental disorders. These attitudes are as much a result of the social stigma surrounding those who suffer from such disorders as they are of the training received by mental health service providers, which usually takes place in mental hospitals. The Initiative for the

Restructure of Psychiatric Care is an attempt to overcome this situation, and changes can already be seen. In 1997, the Directing Council of PAHO backed the initiative and urged the Member Governments to support it fully. Psychiatric services in almost all the English-speaking countries of the Caribbean are making steady headway in this direction.

ORAL HEALTH

Dental caries, oral cancer, and oral manifestations of HIV/AIDS are the gravest oral health problems in the Region. Dental caries are the most common problem, particularly among children. The lack of appropriate prevention and treatment programs in various parts of the Region continues to contribute to tooth loss among adults and the elderly. During the 1990s, the prevalence and severity of dental caries has begun to decline, however.

About 5% of all malignant tumors correspond to cancer of the oral cavity and pharynx. Despite the manifestation of pre-malignant signs and direct access to the mouth and pharynx through visual and tactile inspection, in many cases the lesions are diagnosed after they have spread and metastasized extensively. Consequently, only 50% of persons with oral cancer survive the fifth year after diagnosis.

HIV infection has particular importance, because it causes lesions in the oral cavity and the virus can be transmitted in dental clinics and laboratories.

Dental Caries and the DMFT Index⁴

Epidemiological surveillance of dental caries in the Region of the Americas is carried out through clinical cross-sectional surveys in specific population groups (cohorts), following protocols established by WHO (187). WHO has set a prevalence of no more than three decayed, missing, or filled teeth (DMFT ≤ 3) in 12-year-old children as a worldwide goal for the year 2000.

Table 42 shows the prevalence and severity of dental caries in 12-year-old schoolchildren from various countries in the Region. It uses the DMFT index from epidemiological studies carried out in the 1970s, 1980s, and 1990s and compiled from various sources. Figures from most studies carried out during the 1970s and 1980s come from WHO's Global Oral Health Databank⁵ (188), the medical literature (189–201), official

⁴ The DMFT index measures the total number of decayed (D), missing (M), and filled (F) teeth as a result of dental caries. The index is disaggregated by age or specific age groups.

⁵ These data are published in "Dental caries levels at 12 years" and distributed periodically by WHO's Oral Health Program.

TABLE 42
Percentage of decline in the DMFT index for 12-year-olds, Region of the Americas, 1970–1990.

Country	DMFT	1970s	DMFT	1980s	DMFT	1990s	Percentage reduction
North America							
Canada (189) ^a	4.4	1974	3.2	1982	1.8	1990	27%
							44%
							59%
United States	2.6 (203)	1979–1980	1.8 (204)	1986–1987	1.4 (192)	1988–1991	32%
							22%
							47%
Mexico	5.3 (198) ^b	1975	3.2 (206)	1984		Being executed	
			4.4 (199) ^c	1988			
Central America and							
Panama							
Guatemala			8.1 (206)	1987			
			2.4 (190) ^d	1988			
Belize	4.0 (208)	1979–1983	6.0 (206)	1989			
El Salvador			5.1 (188)	1989			
Honduras			5.7 (206)	1987	3.7 (234)	1997	36%
Nicaragua			5.9 (206)	1988	2.81 (193) ^e	1997	52%
Costa Rica			8.4 (191)	1988	4.9 (212)	1992	43%
Panama			4.2 (206)	1989	3.6	1997	14%
Caribbean							
Anguilla	5.6 (188)	1978	7.5 (188)	1986	2.4 (207)	1991	68%
Antigua			0.7 (200)	1988			
Aruba					2.9 (207) ^f	1990	
Bahamas			1.6 (188)	1981		Planned	
Barbados	4.4 (208)	1979–1983					
Cuba	5.1 (201)	1973	2.9 (206)	1989	2.9 (188) ^g	1992	0%
Dominica	4.8 (188)	1979	2.6 (207) ^h	1989			
Grenada			2.6 (207) ⁱ	1984	5.5 ^j	1991	–112%
Cayman Islands			4.6 (188) ^k	1989–1990	1.7 (209)	1995	63%
Jamaica			6.7 (188)	1984	1.1 (215)	1995	84%
Dominican Republic			6.0 (206)	1986	4.4 (224)	1997	27%
Saint Kitts and Nevis	5.5 (208)	1979–1983					
Trinidad and Tobago			4.9 (207) ^l	1989			
Suriname	4.9 (188)	1979			2.7	1992	
Guyana			2.7 (208)	1983	1.3 (210)	1995	52%

(continued)

publications of government agencies (202–205) and international organizations (206–208), and from studies undertaken by PAHO's Regional Oral Health Program (209–210). The most recent data for Bolivia (211), Costa Rica (212), Chile (213), Ecuador (214), Jamaica (215), Peru (216), and Uruguay (217)

were obtained from baseline studies or evaluations from the epidemiological surveillance systems of the respective national fluoridation programs. For Argentina, Chile, Guatemala, and Honduras, results come from two epidemiological studies carried out in the same decade. For Brazil, a national study

TABLE 42 (continued)

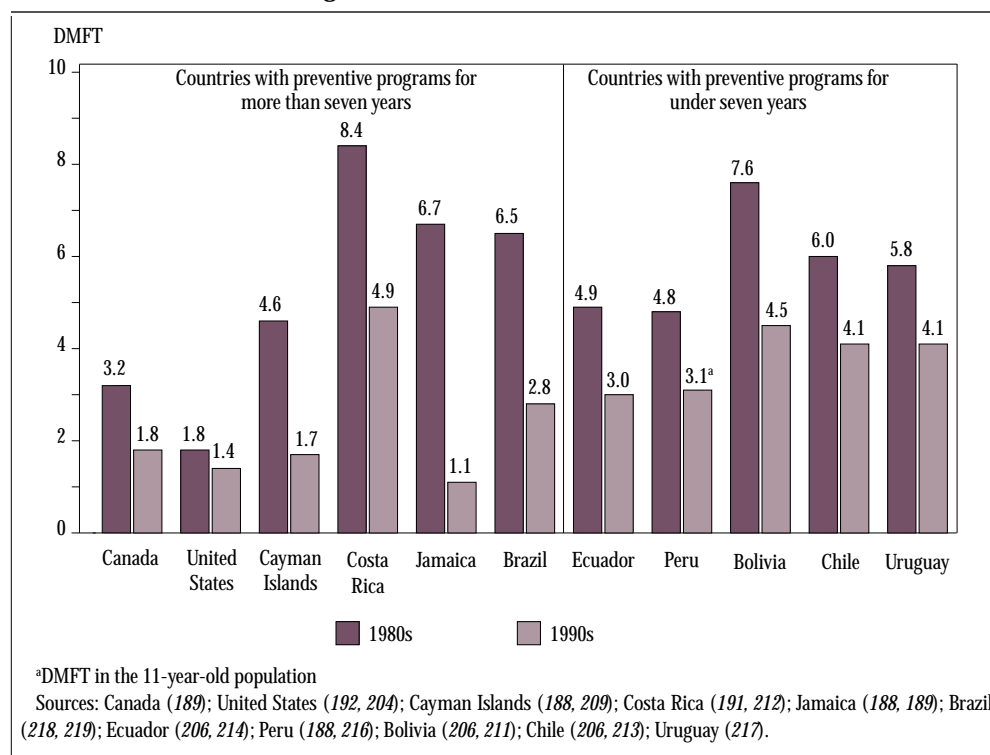
Country	DMFT	1970s	DMFT	1980s	DMFT	1990s	Percentage reduction
Andean Area							
Venezuela ^m	3.9	1969–1972	3.9	1981–1987		Being executed	
Colombia	7.5 (188) ⁿ	1973	4.8 (192)	1980		Planned	36%
Ecuador			4.9 (206)	1988	3.0 (214)	1996	40%
Peru			4.8 (188)	1983	3.1 (216) ^o	1990	36%
Bolivia	0.6–1.7 (194) ^p	1976	7.6 (206)	1981	4.7 (211)	1995	39%
Chile	6.6 (195) ^q	1978	6.0 (206)	1989	4.1 (213) ^r	1996	22%
							32%
Southern Cone							
Argentina			3.2 (188)	1980			
			3.4 (206)	1987			
Uruguay			8.5 (196) ^s	1983	4.1 (217)	1992	52%
			5.6–6.0 (217) ^t	1983–1987			
Paraguay			5.9 (206)	1983		1997, being executed	
Brazil	8.6 (197) ^u	1976	6.7 (218) ^v	1986	2.8 (219)	1984	58%
			5.9–6.5		3.9 ^w	1988	35%

^a Province of Ontario.^b Urban population only.^c Students in Mexico City.^d Rural population only.^e Study of 60 persons from 12 to 17 years old who received dental treatment, selected at random.^f Unpublished data reported in (207).^g Figures from the Global Oral Health Databank from the Web site: www.whocollab.odont.lu.se/amro.html.^h Unpublished data reported in (207).ⁱ Results from HOPE Project as reported in (207).^j Aponte-Merced LA, et al. Oral health of 6-, 12-, and 15-year-old children in Grenada. *Health Volunteers Overseas/Dentists Overseas*. 1991. (Unpublished).^k Reported to the Global Oral Health Databank by the National Director of Odontology, January 1990.^l Unpublished data reported in (207).^m Population 7–14 years old.ⁿ Population of Medellín only.^o Population of 11-year-olds.^p Only the Aymara population of western Bolivia.^q Urban population is not represented.^r Includes only six regions of Chile.^s Population 13–19 years old.^t Range of figures in three studies presented in (217).^u Population of Piracicaba, São Paulo.^v Urban population. The lower figures correspond to the average for São Paulo and the Southeast, respectively, taken from the same study (218).^w Cities of Padrópolis, São Paulo, and Rio de Janeiro, respectively.

of urban areas carried out in 1986 is included (218). This study provided the statistical means at the country level (DMFT = 6.7), for the State of São Paulo (DMFT = 6.5), and the Southeast region (DMFT = 6.5); percentages of decline also were calculated for the city of Padrópolis, State of São Paulo, in 1994 (DMFT = 2.76) (219) and for Rio de Janeiro in 1988 (DMFT = 3.9). Data for Canada were taken from studies

carried out in the Province of Ontario (189), the country's most populated province. Data for the United States were obtained from three national studies (1979–1980, 1986–1987, and 1988–1991) (192, 203, 204). Several countries, including Mexico, Paraguay, and Venezuela, are in the final phase of collecting and analyzing data that are included in epidemiological surveillance systems for national salt fluoridation cam-

FIGURE 11
DMFT among 12-year-olds in countries with wide-coverage preventive programs,
Region of the Americas, 1980s and 1990s.



paigns. Two countries, the Bahamas and Colombia, have programmed epidemiological studies for 1998–1999 (listed as “planned” in the table). In countries where there are two epidemiological studies, the percentage of decline/increase of DMFT was calculated using the mean of the earlier study as a reference value. For Canada and the United States, each of which has three studies, three percentages were calculated.

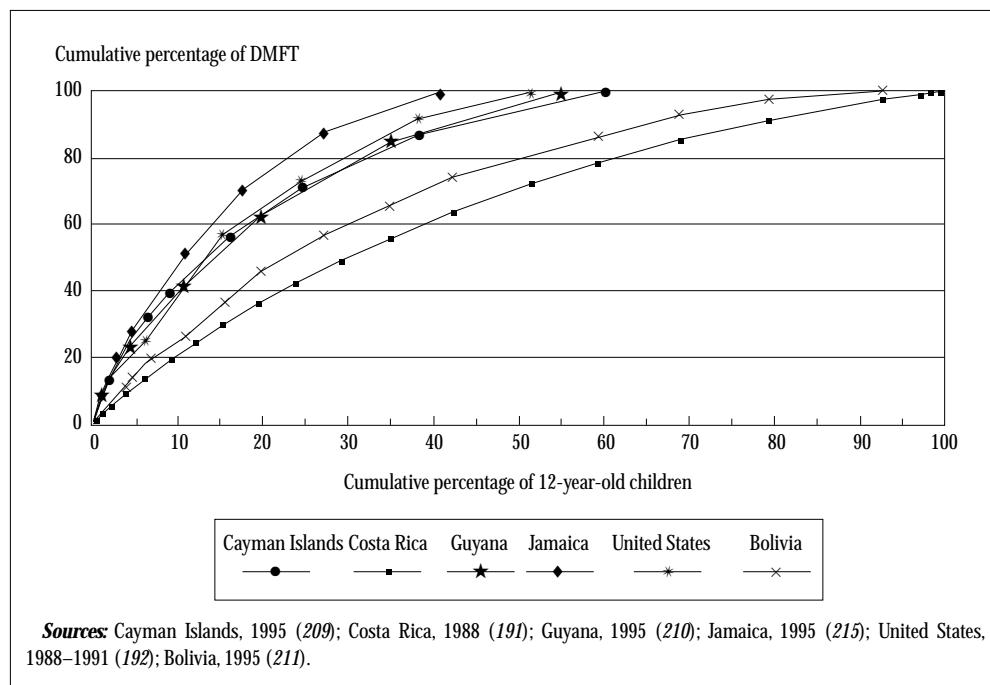
Table 42 shows the large disparity in average levels for decayed, missing, or filled teeth among 12-year-olds. In the 1980s, DMFT ≥ 6 was found in Anguilla, Belize, Bolivia, Brazil, Chile, the Dominican Republic, Jamaica, and Uruguay. In Costa Rica and Guatemala, the average DMFT was 8 or more. In the 1990s, the average DMFT declined more than 20%, with the exception of Grenada—where there was an increase of 112% between 1984 and 1991—and Cuba, where following a reduction of 43% between 1973 and 1989, the DMFT stayed constant between 1989 and 1992 (DMFT = 2.9). Anguilla, Antigua, Aruba, the Bahamas, Canada, the Cayman Islands, Dominica, Ecuador, Guyana, Jamaica, Suriname, and the United States have reached the goal of a DMFT average of 3.

Figure 11 shows changes in the DMFT for 12-year-olds between the 1980s and the 1990s in two groups of countries: (a) countries that have had dental caries prevention programs in place for more than seven years (Brazil, Canada, the Cayman

Islands, Costa Rica, Jamaica, and the United States);⁶ and (b) countries that have only started such programs recently (Bolivia, Chile, Ecuador, Peru, and Uruguay). In countries where prevention programs have been in place for a long time, the percentage decline in dental caries between the 1980s and the 1990s ranges from 43% in the case of Costa Rica to 84% in Jamaica. Four of these six countries—Canada, the Cayman Islands, Jamaica, and the United States—reported DMFTs < 2.0 in their last epidemiological evaluation. The second group of countries showed reductions ranging from 30% to 50%; only Ecuador has reached DMFT ≤ 3 , however, and no country has obtained averages of less than 2. It is hoped that the DMFT will continue to decline in the group of countries with recently implemented fluoridation campaigns, as the new cohorts benefit from the preventive effect of fluoride. In countries with preventive programs in place over a long period, and that have reached a DMFT < 2 , this figure will continue to

⁶ The United States and Canada have water fluoridation programs with wide coverage (65% and 40% of the population with drinking water service, respectively). Brazil has similar service in some states, such as São Paulo, and cities such as Rio de Janeiro. Costa Rica and Jamaica have had national salt fluoridation programs since 1987. The Cayman Islands has a prevention program with wide coverage that uses topical fluoride.

FIGURE 12
Cumulative percentage of DMFT in 12-year-old children in six countries of the Region of the Americas, 1988–1995.



decline, but in smaller proportions, because dental caries are found in high-risk population groups.

To illustrate this point, Figure 12 shows the cumulative percentage of DMFT in the population of six countries, five of which also are represented in Figure 1.⁷ In Costa Rica in 1988, for example, approximately 20% of the total DMFT in the population of 12-year-olds was found in 10% of the population. This same percentage was found in only 3% of the population of the United States (1991), Jamaica (1995), the Cayman Islands (1996), and Guyana (1996). Similarly, 80% of the total DMFT of 12-year-olds was found in 22% of the population of Jamaica; between 30% and 33% of the populations of the Cayman Islands, Guyana, and the United States; 50% of that of Bolivia; and 62% of Costa Rica's population. From this comparative point of view, the countries where dental caries affect a large percentage of the population have slow growth curves and lineal trends; countries where dental caries are found principally in a reduced percentage of the population show rapid growth curves.

⁷ Cumulative percentages are calculated using the statistical distribution of DMFT and its frequency; the results are gathered through distributional extremes that correspond to the highest values of DMFT, until reaching the total DMFT of the population. The figures are expressed in terms of the cumulative percentage of the sample population.

Table 43 presents information from countries that have carried out recent epidemiological studies, and includes the four categories representing degree of severity of dental caries: percentage of persons free of dental caries (DMFT = 0), percentage with DMFT of 1 to 3, percentage with DMFT of 4 to 6, and the percentage of those with DMFT greater than 6. In this way, the table shows the percent contribution of the three elements of DMFT in those persons affected by dental caries (DMFT > 0). Table 43 distinguishes two groups of countries. In the group comprising the Cayman Islands, Guyana, Jamaica, and the United States, 40% or more of the 12-year-old schoolchildren had no dental caries (DMFT = 0). In Bolivia, Ecuador, and Uruguay, this percentage fluctuated between 10% and 25% of the population. This characteristic is reciprocal: in Bolivia, over 50% of the 12-year-old population had three or more teeth with dental caries or sequelae (DMFT ≥ 3); in the Cayman Islands and Guyana this degree of severity was found in less than 20% of the population.

The type of dental services available to the population can be inferred from the analysis of the percent contribution of each component of the DMFT in persons with dental caries (Table 43). Populations with access to dental services that offer restorative treatment have high percentages of teeth that are filled and low percentages of caries and extractions. Conversely, populations with limited access to restorative treatment have high percentages of cavities and extractions. Table

TABLE 43
Severity of dental caries and relative percentage of DMFT components in 12-year-old children in selected countries.

Country	Age	No.	Severity of DMFT (Percentage of children by DMFT)				Percentages of DMFT		
			DMF 0	DMF 1 ≤ 3	DMF 3 ≤ 6	DMF > 6	D/DMFT %	M/DMFT %	F/DMFT %
Bolivia (215)	12	383	12.34	30.08	29.05	28.53	89.19	4.74	6.00
Cayman Islands (209)	12	154	39.60	44.20	11.70	4.50	50.88	0.54	48.57
Chile (213) ^a	12	565	34.20		65.80			...	
Costa Rica (191) ^b	12	1,349		...			67.26	3.81	28.57
Ecuador (214)	12	500	22.40		77.60		83.05	7.45	9.49
Guyana (210)	12	547	45.00	44.20	9.70	1.10	76.87	22.49	0.64
Honduras (234)	12	307	16.61	38.11	28.66	16.61	90.15	2.92	6.93
Jamaica (219)	12	362	66.00		34.00		72.60	9.90	17.50
United States	12	3,186	41.70		59.30		19.70	0.90	79.40
(204, 192) ^c	12	176	50.00		67.30		27.00	1.30	71.40
Uruguay (221)	12	573	14.66		85.34		60.98	17.07	21.95

^a Includes only one group of administrative regions.

^b Results included are from a 1988 epidemiological study. Costa Rica has undertaken a more recent epidemiological study (1992), the results of which were published in (212), but data were not available for calculation of percentage contribution of each component of DMFT.

^c The findings are from a national study in 1986–1987 of 3,186 children (204), and a 1988–1991 study of 176 children presented in (192). The contributions of different components of DMFT were obtained through personal communication with Larry J. Furman of the National Institute of Dental Research (NIDR), the institution in charge of data analysis.

43 distinguishes between countries such as the United States, with high percentages of teeth filled (56% to 80%), from countries such as Bolivia and Ecuador, where the percentage of teeth with caries is 80% to 90% of the DMFT. The Cayman Islands and Costa Rica have intermediate levels. The situations in Jamaica and Guyana warrant further explanation. Both countries have similar percentages of teeth with untreated lesions of caries (D = decayed) (73% and 77% of the DMFT, respectively); Jamaica, however, has a higher percentage of people without caries (66%), and 17.5% of its DMFT have restored teeth. These data imply that the population of Jamaica has, on average, better access to clinical restoration than the population of Guyana, where oral health needs are addressed primarily by extracting teeth. It is possible that the difference is due to the absence of preventive measures and restoration applied early in the process of the illness; for example, Jamaica has three times more dentists per inhabitant than Guyana. Similarly, it is possible that the low DMFT of Guyana (1.3 in 1995) can be attributed to the fact that the aforementioned study included isolated rural populations that had still not adopted cariogenic diets (210).

Differences among Population, Racial, and Ethnic Groups

The distribution of dental caries within the population is heterogeneous and responds to geographic, demographic, ethnological, and socioeconomic factors. It is necessary to include these variables in the population sample and describe the prevalence and severity of dental caries in the different groups in the study.

The stratification of dental caries indexes by geographic location allows areas that require specific interventions to be identified. For example, in the 1990 study carried out in Peru (216), the average DMFT of 11-year-old children varied by geographic area from 1.2 to 6.9, with an average value of 3.1.

Table 44 shows the prevalence and severity of dental caries in three racial groups in Guyana in 1995 (210). Prevalence and severity among blacks was higher than for the other two racial groups: 51% of 12-year-old children had one or more teeth with untreated caries. The DMFT of 1.53 for blacks was the highest of the three groups. The indigenous group had the lowest prevalence and severity: 43% had one or more untreated caries, and the DMFT was 1.17. Table 45 shows dental

TABLE 44
Prevalence and severity of dental caries in schoolchildren in Guyana, 1995, by racial/ethnic group (210).

Racial/ ethnic group	12-year-old population		5–17-year-old population				5–17-year-old population with DMF > 0		
	% caries-free (DMFT=0)	% with one or more teeth with untreated dental caries (D ≥ 1)	DMFT	DMFT 1 ≤ 3 (%)	DMFT 3 ≤ 6 (%)	DMFT > 6 (%)	D/DMFT (%)	M/DMFT (%)	F/DMFT (%)
East Indian	45.7	50.3	1.23	20.7%	5.5%	2.5%	82.7%	14.9%	2.4%
Black	41.3	51.3	1.53	23.4%	10.5%	4.7%	77.2%	21.0%	1.8%
Indigenous	47.6	42.9	1.17	19.5%	6.2%	3.5%	80.4%	18.1%	1.5%

TABLE 45
Prevalence and severity of dental caries in United States schoolchildren, 1988–1991, by racial/ethnic group (192).

Racial/ethnic group	Population of 5–11-year-olds		Population of 5–11-year-olds with DMFT > 0		
	% caries-free	DMFT	D/DMFT (%)	M/DMFT (%)	F/DMFT (%)
Caucasian	74.8	0.6	15.8%	1.0%	83.2%
African-American	77.0	0.5	39.2%	3.7%	57.1%
Hispanic (Mexican)	69.4	0.7	38.4%	1.8%	59.8%

caries by racial group taken from the most recent epidemiological survey in the United States (1988–1991) (192). In this study, African-Americans and Hispanics (of Mexican origin only) had DMFTs that, despite being similar to that of Caucasians, had a high level of teeth with caries (39%, in comparison to 16% for the Caucasian group). African-Americans also had the highest percentage of lost teeth (3.7%), despite being the group with the highest percentage of caries-free persons (77%).

Quality of Information

Table 42 shows that several countries carried out epidemiological evaluations during the 1980s. This is due in part to WHO's preparation and distribution of procedures and protocols to carry out studies and to the Organization's offer to disseminate the data obtained as part of a Global Oral Health Databank. Despite pre-established protocols, Table 42 shows discrepancies in the reference populations and the assigned ages. Some of the reviewed studies include reduced sample groups and convenience samples, and present results in arbitrary age groups.

Many studies, particularly those that are not published in scientific periodicals that require editorial and peer review,

fail to include important elements regarding the qualifications of their examiners and the level of inter- and intra-examiner consistency. A group of studies published in the medical literature or prepared by PAHO's Regional Oral Health Program show different interpretations in appraising "experience of dental caries in 12-year-olds, DMFT." These studies sometimes include deciduous teeth when reporting DMFT, which results in an overestimation of the actual figure, particularly in young age groups.

Most studies carried out in the 1990s have used probability samples, and their findings are accessible in the medical literature or in detailed publications supported by national oral health programs or by PAHO's Regional Oral Health Program. Several countries of the Region are planning or carrying out epidemiological evaluations with assistance from the Regional Oral Health Program. These studies have standardized the sampling, calibration, analysis, and notification processes, facilitating improved epidemiological surveillance of oral health in the Region.

Multi-Year Plan for Fluoridation in the Americas

The preventive benefits of fluoridation in water systems and salt have been demonstrated in several countries of the Amer-

icas and Europe. Fluoridation of drinking water has been an important factor in reducing the prevalence of dental caries in Canada and the United States (220). Similar benefits have resulted from consumption of fluoridated salt (221). In Costa Rica and Jamaica, where salt fluoridation programs have been in place since 1987, there have been DMFT reductions of 43% in 1992 (222) and 84% in 1995 (223), respectively.

In 1994, PAHO put in place a multi-year plan to establish water and salt fluoridation programs. The key objectives of the plan include prevention of dental caries, training to develop technical capacity, and the continuity of the program. The plan's first step classified countries of the Region according to a typology representing different levels of DMFT severity for 12-year-olds. Belize, the Dominican Republic, Guatemala, Honduras, Nicaragua, and Paraguay were found to be in a state of emergency (DMFT >5). Countries in a position of growth (DMFT between 3 and 5) included Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Peru, Trinidad and Tobago, Uruguay, and Venezuela. Finally, countries in a strong position (DMFT ≤3) included the Bahamas, Bermuda, Canada, the Cayman Islands, Cuba, Dominica, Jamaica, and the United States.

In the 1990s PAHO's Regional Oral Health Program aims to guide the countries through a long-term process of epidemiological change—from a state of emergency, with high prevalence and severity of dental caries, to one of strength. With a view toward meeting this objective, water fluoridation projects have been initiated in Argentina's and Chile's urban areas, and salt fluoridation programs have been put in place in the Dominican Republic, Honduras, Nicaragua, Panama, and Venezuela. Water fluoridation programs are being reviewed in Puerto Rico, and salt fluoridation programs are under study for Belize, El Salvador, Guatemala, Guyana, Paraguay, and Suriname. There are also water fluoridation programs under way in urban areas of Brazil and salt fluoridation programs in Colombia, Costa Rica, Ecuador, Jamaica, Mexico, Peru, and Uruguay. It is expected that by the year 2000, more than 300 million people in Latin America and the Caribbean will have access to fluoridated water or salt.

Oral Cancer

Ninety-six percent of malignant tumors of the oral cavities and the pharynx are carcinogenic; of those, some 90% are of an epidermoid type (224). Consumption of alcohol and tobacco increases the risk of oral and pharyngeal cancer, and their consumption together has a synergistic effect (225, 226). The herpes simplex virus (HSV) has been associated with neoplastic transformation *in vitro*, but the carcinogenic effect has only been demonstrated in animals (227). To date, the direct effect of HSV on oral cancer in humans has not

been established. Similar effects have been suggested for the human papillomavirus (HPV); however a recent review of this issue concluded that the association of HPV with oral cancer is circumstantial (228).

A 1992 document published by the International Association for Research on Cancer (IARC) (229) identified seven cancer registries in Latin America and three in the Caribbean. These include the cities of Goiânia and Porto Alegre (Brazil), Cali (Colombia), Trujillo (Peru), Asunción (Paraguay), and Quito (Ecuador), as well as national registries in Costa Rica, Cuba, Martinique, and Puerto Rico. According to the document, during the 1980s men in Martinique and Puerto Rico had the highest incidence of cancer of the mouth (gums, palate, and floor and walls of the mouth), with annual rates of more than 5 cases per 100,000 population. Puerto Rico and Martinique also showed rates of more than 4 cases per 100,000 population for cancer of the tongue and oropharynx, respectively. In Goiânia, Porto Alegre, Cali, Trujillo, and Asunción, the tongue and mouth were the sites with the highest incidence of cancer, but these rates were lower than those reported in Martinique and Puerto Rico. Lip cancer was the most frequent oral cancer in Costa Rica and Cuba. Women had lower rates, with one case per 100,000 population.

Repercussions of HIV/AIDS on Oral Health

There are two important aspects in the relationship between HIV/AIDS and oral health. First is the presence of lesions detectable at the clinical level, which are important in diagnosing and treating persons infected with HIV. These lesions include oral candidiasis, hairy leukoplakia, periodontitis associated with HIV, Kaposi's sarcoma, and lymphoma. In persons who are HIV-positive, oral candidiasis can have prognostic value in the subsequent appearance of AIDS (230). Recent advances suggest that early diagnosis and treatment with combined therapies reduce the blood levels of HIV, with possibilities of increasing the clinical prognosis. The second aspect is the possibility that through dental consultations infectious agents such as HIV/AIDS and hepatitis B and C, as well as tuberculosis and other microbial, viral, and mycotic infections, could be transmitted.

Periodontal Disease

Periodontal disease is a generic term used to describe a group of diseases of the dental support structures (periodontium): dental roots, periodontal ligaments, and dental alveolus (231). These include, in order of prevalence, gingivitis, chronic adult periodontitis, localized children's periodontitis, and necrotizing ulcerative gingivitis. Clinically, gingivitis is a

reversible inflammatory process. The different types of periodontitis manifest themselves in periodontal sacs, loss of dental support, and tooth mobility; some teeth have to be extracted as a result of periodontitis (232). All of these diseases have a bacterial etiology. Some illnesses, such as non-insulin-dependent diabetes, exacerbate the clinical appearance of periodontal diseases. For example, among the Pima Indians of North America, the incidence and prevalence of non-insulin-dependent diabetes is the highest in the world; they also show prevalence and severity of destructive periodontal disease three times higher than any other group of people in the world (233).

There is no single index to evaluate the periodontal status of the population. From the classic Russell periodontal index to the recent community periodontal index, the various indexes in use identify the presence of clinical elements of past disease in certain teeth or groups of teeth. Moreover, indexes that use instruments to measure the depth of periodontal sacs require a long examination and are difficult to standardize for population studies, especially when assessing the early stages of the disease. WHO recommends the use of the community periodontal index, which measures the presence of periodontal sacs and bleeding in six groups of teeth called "quadrant indicators" (187). Although this index has been used extensively in various countries of Asia and Europe, it has seen very limited use in the Region of the Americas. A study carried out in Nicaragua (193) found periodontal sacs over 4 mm deep in between 74% and 84% of persons between ages 18 and 64. In a review of the literature, Adewakun (207) reports on studies that found periodontal sacs in over 50% of the population between 12 and 15 years old in various Caribbean countries. Because periodontal disease is not common in children (with the exception of juvenile periodontitis), it is possible that these studies overestimated the presence of periodontal sacs, particularly if the tooth being examined was in the process of eruption.

PROBLEMS RELATED TO PREGNANCY, CHILDBIRTH, AND THE PUERPERIUM

Since the late 1980s, governments, international organizations, and broad segments of society have given special attention to high maternal mortality and morbidity levels and the need for care during pregnancy, childbirth, and the puerperium. In 1990, the PAHO Member Governments accepted the commitment outlined in the Regional Maternal Mortality Reduction Plan (235).

The maternal mortality rate is a very sensitive indicator of women's health conditions, social development, quality of life, and access to quality medical services. For a group of 29 countries of the Region, the contribution of maternal mortal-

ity to years of potential life lost (YPLL) between birth and age 75 dropped 31% during the 1980–1994 period (see Chapter 1). This decrease varied between 4% and 42% by subregions and countries.

Table 46 presents the number of maternal deaths registered each year between 1990 and 1995 by country, and Table 47 shows registered maternal mortality rates per 100,000 live births, by country, for the same period. The data come from the countries' civil registries. Table 47 includes only those countries with at least 10 maternal deaths registered in each of the years considered for which PAHO had detailed mortality data; it excludes countries for which rates were not available for any of the years in the period.

Table 48 highlights the importance of complications of pregnancy, childbirth, and the puerperium as a cause of death in women between the ages of 15 and 44 years. In 1994, of total deaths attributed to natural causes, maternal deaths accounted for less than 2.0% in Canada, Puerto Rico, and the United States; between 2.0% and 6.9% in Argentina, Brazil, Chile, Costa Rica, Cuba, and Trinidad and Tobago; between 7.0% and 11.9% in Colombia, Ecuador, El Salvador, Guyana, Mexico, Nicaragua, Panama, and Venezuela; and 18.6% in Paraguay.

Tables 46 and 47, when analyzed together, highlight the difficulties involved in interpreting registered maternal mortality rates. This is partly due to the underregistration of deaths and the low quality of medical certification of cause of death. An additional difficulty for interpretation involves the fact that maternal mortality rates often are calculated even for countries with small populations, where few deaths are to be expected, with only a few of them being related to maternal causes. For these countries, calculation of the maternal mortality rate should cover a period of at least three years.

A third factor that complicates the analysis is that countries where the coverage of death registration has improved show a greater number of maternal deaths; rather than an actual increase in mortality, this reflects better coverage. Such is the case in Brazil, where maternal mortality has been the subject of close scrutiny by researchers and health services. Consequently, in Table 46, rather than a decrease, the increase in fatalities probably is due to greater detection.

A fourth factor that makes it difficult to interpret and utilize maternal mortality rates is that in many Latin American countries underregistration of births is relatively high, which detracts from the rate's reliability inasmuch as the denominator is of unknown quality. Occasionally, considerable increases can be seen from year to year in the number of live births registered, due to campaigns oriented toward improved recording, even if it is late registration.

In addition to underregistration of deaths, which is high in many countries of the Region (236), the underrecording of maternal mortality tends to be much greater because the

TABLE 46
Deaths due to complications of pregnancy, childbirth, and the puerperium, by country, 1990–1995.

Country or territory	1990	1991	1992	1993	1994	1995
Argentina	353	334	328	309	265	290
Bahamas	1	1 ^a	...	1	1	4
Barbados	4	2	3	1	2	—
Belize	3	4	...	—	4	1
Brazil	1,632	1,521	1,528	1,641	1,654	1,639 ^a
Canada	10	12	19	15	14	17
Chile	123	106	91	100	73	...
Colombia	541	506	464	476	456	...
Costa Rica	12	28	18	15	31	16
Cuba	78	80	71	56	84	70
Dominican Republic	91 ^a	...	...	...	...	...
Ecuador	309	320	338	348	241	170
El Salvador	55	77	...	...	...	...
Guatemala	357 ^a	...	...	...	...	...
Guyana	25 ^a	...	...	18	31	...
Jamaica	42 ^a	25 ^a	...	...	...	...
Mexico	1,477	1,414	1,399	1,268	1,409	1,454
Nicaragua	57	85	115	105	83	...
Paraguay	98	117	75	96	111	104
Puerto Rico	13	13	14	...	5 ^a	...
Saint Kitts and Nevis	3	3	1	1	—	1
Saint Lucia	2	2	—	1	—	—
Suriname	1	...	11	...	...	...
Trinidad and Tobago	13	11	14	14	15	...
United States	343	323	318	302	328	277
Uruguay	9	21	...	...	...	...
Venezuela	347	...	299	331	383	...

^aProvisional figure.

Source: PAHO, Mortality database, Technical Information System.

medical certificate contains insufficient information to permit the coder to assign the death to a cause related to pregnancy, childbirth, or the puerperium. Accordingly, the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) recommends that death certificates include a question about whether the deceased was pregnant, or had been, during the one-year period prior to death (237).

In the countries with high maternal mortality rates at the beginning of the 1990s, the change was uneven; the trend in number of deaths was not necessarily consistent with that of the rate (Tables 46 and 47). Argentina and Chile experienced decreases both in the number of maternal deaths and in the maternal mortality rates. In Colombia and Cuba, however, the decrease in maternal deaths was not always accompanied by a reduction in rate. In the United States, maternal deaths

TABLE 47
Maternal deaths per 100,000 live births, by country, 1990–1995.

Country	1990	1991	1992	1993	1994	1995
Argentina	52	48	48	45 ^a	39	44
Brazil	67	65	63	...	...	...
Canada	2	3	5	4	4	...
Chile	40	35	31	34	25	...
Colombia	...	...	37	33	35	...
Costa Rica	15	35	22	19 ^a	39 ^a	20
Cuba	42	46	45	37	57	48
Ecuador	153	121	170	175	...	94 ^a
El Salvador	37	51	...	...	...	...
Guatemala	101 ^a	...	...	...	...	...
Guyana	172 ^a	...	...	...	...	...
Jamaica	70	42 ^a	...	...	...	...
Mexico	54	51	50	45	49	...
Nicaragua	61 ^a	...	97 ^a	85 ^a	71 ^a	...
Paraguay	150	166	100	123	139	131
Puerto Rico	20	20	22	...	8 ^a	...
Trinidad and Tobago	54	49	61	66 ^a	76	...
Uruguay	16	38	...	...	...	...
United States	8	8	8	8	8	7
Venezuela	60	...	53	63	70	...

^aProvisional figure. The numerator, denominator, or both, may be modified.

Source: PAHO, Mortality database, Technical Information System.

dropped from 328 to 277 between 1994 and 1995, resulting in a decrease in the rate from 0.8 per 100,000 live births, where it had remained for several years, to 0.7. Although the PAHO database has no recent detailed information on mortality by cause of death in the Dominican Republic, there are limited data showing that in 1990 there were 87 deaths due to maternal causes among women between 15 and 44 years old, representing 6.9% of all deaths in that age group (238). In many countries, no downward trend in maternal deaths can be detected, as is the case in Costa Rica, Nicaragua, and Venezuela.

In the 1997 reports to PAHO and WHO on progress made toward attaining the goal of health for all by the year 2000, some countries included information on maternal mortality. Brazil indicated that the maternal mortality rate in 1991 as estimated by the Ministry of Health, with adjustments for underreporting (underregistration of deaths and problems of cause-of-death certification), was 114 per 100,000 live births. Maternal death committees are being established in that country's states to investigate all deaths in women of child-bearing age and identify those that actually were maternal deaths in order to take preventive action.

Based on data obtained in its 1995 maternal and child health survey, Guatemala reported an estimated rate of 190

TABLE 48
Deaths due to natural and maternal causes among women ages 15–24, 25–34, and 35–44, by country, around 1994.

Country (year)	Total deaths due to natural causes (15–44-year age group) ^a	Maternal causes ^b					Hemorrhage of pregnancy and childbirth				Toxemia of pregnancy				Abortion				Complications of the puerperium			
		15–44 years No.	15–24 years % ^c	25–34 years	35–44 years	15–44 years	15–24 years	25–34 years	35–44 years	15–44 years	15–24 years	25–34 years	35–44 years	15–44 years	15–24 years	25–34 years	35–44 years	15–44 years	15–24 years	25–34 years	35–44 years	
Argentina (1993)	5,608	287	5.1	92	110	85	42	11	15	16	...	...	...	...	87	33	34	20	55	15	21	19
Brazil (1992)	28,015	1,476	5.3	530	605	341	228	58	97	73	419	178	151	90	177	70	75	32	234	93	94	47
Canada (1994)	2,614	14	0.5	2	7	5	—	—	—	—	2	—	1	1	2	—	2	—	4	1	2	1
Chile (1994)	1,710	73	4.3	23	31	19	6	1	1	4	14	4	8	2	19	5	9	5	11	3	5	3
Colombia (1994)	5,458	435	8.0	150	193	92	66	15	37	14	153	54	61	38	68	23	32	13	45	19	20	6
Costa Rica (1994)	441	30	6.8	8	12	10	2	1	1	—	5	1	2	2	3	1	1	1	7	2	3	2
Cuba (1995)	1,906	69	3.6	20	38	11	—	—	—	—	15	7	4	4	8	—	6	2	8	3	4	1
Ecuador (1995)	2,098	168	8.0	57	56	55	45	13	18	14	48	14	19	15	12	2	7	3	8	6	1	1
El Salvador (1991)	898	72	8.0	24	36	12	11	5	1	5	6	2	2	2	7	1	6	—	8	3	5	0
Guyana (1994)	248	28	11.3	9	14	5	12	1	8	3	6	4	2	—	6	2	3	1	—	—	—	—
Mexico (1994)	16,743	1,379	8.2	436	592	351	332	99	139	94	381	119	166	96	94	33	41	20	145	51	68	26
Nicaragua (1994)	671	80	11.9	32	22	26	26	8	8	10	13	8	1	4	7	3	2	2	14	7	3	4
Panama (1989)	365	36	9.9	10	13	13	9	1	3	5	1	—	—	1	6	1	3	2	3	1	—	2
Paraguay (1994)	580	108	18.6	38	39	31	26	4	7	15	20	10	10	—	24	10	10	4	20	9	7	4
Peru (1989)	3,319	360	10.8	106	146	108	130	34	54	42	38	15	16	7	44	14	22	8	49	17	18	14
Puerto Rico (1992)	749	14	1.9	5	6	3	1	1	—	—	3	—	1	2	2	—	2	—	6	3	3	—
Trinidad and Tobago (1994)	405	15	3.7	2	7	6	3	1	1	1	3	—	1	2	5	1	3	1	2	—	1	1
United States (1994)	37,144	327	0.9	112	136	79	46	13	18	15	66	27	30	9	41	13	20	8	102	32	42	28
Venezuela (1994)	4,024	378	9.4	122	160	96	59	19	24	16	84	31	34	19	64	19	29	16	60	19	27	14

^aTotal of deaths due to defined causes, except for deaths due to external causes.

^bThe ICD-9 categories included in the different columns are:

Maternal causes, codes 630–676;

Hemorrhage of pregnancy and childbirth, codes 640–641, 666;

Toxemia of pregnancy, codes 642.4–642.9, 643;

Abortion, codes 630–639;

Complications of the puerperium, codes 670–676.

^cTotal deaths from maternal causes as a percentage of deaths from “natural” causes.

Source: PAHO. Mortality database, Technical Information System.

maternal deaths per 100,000 live births for that year. By contrast, data obtained from the birth and death registry indicate a rate of 111 for 1992. According to an analysis by Guatemala's National Institute of Statistics, there have been no changes in maternal mortality behavior over the past 10 years, and the variations shown are due to registration problems.

Honduras reported that a 1990 study of mortality in women of childbearing age is the only reliable and recent source of information available in the country for health problems of women in the 15–44-year age group. The results of this survey showed a maternal mortality rate of 221 per 100,000 live births, with significant differences between departments. The highest rates were found in departments with more precarious socioeconomic conditions and where there is greater difficulty accessing basic health services.

Panama indicated a registered maternal mortality rate of 40 per 100,000 live births for 1994. The Dominican Republic reported that around 1990 the estimated rate fluctuated between 93 and 180 per 100,000 live births and that the most commonly used figure was 110. The registered rate varied from around 48 in 1986, to 59 in 1988, and 45 in 1990.

Table 48 provides details on some of the causes of registered maternal mortality and shows that the relative importance of these causes varies from one country to another. For example, in Brazil, toxemia of pregnancy accounts for 28% of all maternal deaths, nearly twice that due to hemorrhage of pregnancy and delivery; in Colombia, toxemia caused 35% of maternal deaths; in Mexico, 28%; and in Venezuela, 22%. Hemorrhage in pregnancy or delivery caused 27% of the maternal deaths in Ecuador, 43% in Guyana, 33% in Nicaragua, and 36% in Peru. Of particular interest is the fact that 31% of maternal deaths in the United States are due to complications of the puerperium. This group of causes of maternal death is also significant in Canada, Costa Rica, and Puerto Rico, but the total number of maternal deaths in these countries is rather small, and no stable results are produced when they are disaggregated by cause. In the other countries, fewer than 20% of maternal deaths are due to complications of the puerperium. In 1990 in the Dominican Republic, according to data from a national publication (238), toxemia accounted for 29% of the registered maternal deaths, hemorrhages 20%, and abortions 10%.

In almost all Latin American countries the magnitude of the mortality figures registered for abortion is even less reliable than for maternal deaths overall. Due both to the illegality of abortion in most of the countries and to problems with medical certification, this mortality tends to be assigned to other causes, such as hemorrhage or sepsis not associated with pregnancy, childbirth, or the puerperium. It is noteworthy, therefore, that Table 48 data show abortion as the leading cause of maternal death in Argentina (30% of maternal

deaths) and in Chile (26%). There is no reason to believe that abortion constitutes a more serious problem in these two countries than in the rest of Latin America, and it would seem that perhaps they have better medical certification of maternal deaths.

In the United States, with reliable available data, 4,215,172 legal abortions were reported in the 1989–1991 period, with 28 deaths reported to the abortion surveillance system (239), a figure which represents 1 death for every 156,000 legal abortions. According to vital statistics sources, in those three years there was a grand total of 161 deaths due to abortion in the United States, or approximately 54 per year. This means that some 45 deaths annually were due to spontaneous or clandestine abortion, or were not entered in the surveillance system, and 9 deaths annually were due to legal abortion. During the same period, 4.1 million live births per year were registered in the United States (almost 3 live births per legal abortion and almost 76,000 live births for each of the 54 deaths due to abortion). In 1990 there were about 59 million women between the ages of 15 and 44 in that country. In Venezuela, by contrast, 64 deaths due to abortion and 548,000 live births were registered in 1994, or fewer than 8,600 births for each death due to abortion. The population of women between the ages of 15 and 44 was almost 4.9 million. Induced abortion is illegal in that country.

When abortion is clandestine, and particularly in the low socioeconomic strata, it is difficult to obtain under conditions that do not put the woman's life at risk. If the woman goes to the emergency room when complications arise, she faces not only the possibility of being reported to the police for the illegal act, but in some countries, she risks verbal abuse by health personnel (240).

It has already been mentioned that mortality due to abortion is underestimated as a result of attributing the cause of death to hemorrhage, septicemia, or other causes that might mask it. It is interesting to note that in Argentina, 194 deaths due to septicemia were registered in 1993 among women between 15 and 44 years old, out of a total of 5,608 deaths from natural causes of women in that age group. In the United States, there were 393 deaths from out of 37,144 deaths due to natural causes. In other words, in Argentina 1 out of every 29 deaths of women in the childbearing years was due to septicemia, while in the United States 1 out of every 95 died from this cause.

Maternal Morbidity

The perception of morbidity during childbirth was analyzed in Brazil, Colombia, Guatemala, and Peru in national demographic and health surveys in which the women surveyed

TABLE 49
Percentage of live births in the five years prior to the survey, whose mothers had complications during delivery, in Brazil, Colombia, Guatemala, and Peru, 1995–1996.

Country	Complications during delivery				None
	Prolonged labor	Excessive bleeding	Vaginal infection	Convulsions	
Brazil	10.3	5.4	3.7	2.7	83.3
Colombia	26.6	25.7	4.9	5.2	55.8
Guatemala	27.9	32.0	17.2	11.7	46.1
Peru	34.6	34.6	12.2	7.4	48.2

Source: Demographic and Health Surveys. The data for Colombia and Guatemala are from the 1995 survey, and those of Brazil and Peru from the 1996 survey.

indicated the principal causes of morbidity in relation to deliveries resulting in live births during the five-year period prior to the survey. The results indicated that in 16.7% of the births in Brazil, 44.2% in Colombia, 51.8% in Peru, and 53.9% in Guatemala, the women reported having undergone at least one of the following complications: protracted labor, excessive bleeding, vaginal infection, and convulsions (Table 49).

The annual number of induced abortions is unknown, but in some countries there is information on the number of women who require inpatient care for this reason. Several authors have made estimates in an attempt to measure the magnitude of induced abortion in the countries of Latin America and the Caribbean, using direct and indirect methods. In a recent study on hospitalizations due to complications of abortion, after making adjustments for incomplete or incorrect reporting, it was found that approximately 741,000 women in Brazil, Chile, Colombia, the Dominican Republic, Mexico, and Peru, combined, were hospitalized for induced or spontaneous abortion during one year (241).

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IV. THE RESPONSE OF THE HEALTH SYSTEMS

INTERSECTORAL RESPONSE

A collaborative effort across many sectors is required to meet the challenges presented by the demographic, mortality, and morbidity situation described previously. Improvements in health care technology and health service delivery are not sufficient to improve health status, because most of the factors that influence health fall outside its purview. It also is recognized that health is influenced by decisions made at all levels of government and in daily life.

To abolish or improve prevalent social, environmental, occupational, and behavioral risk factors is an essential function of health promotion. The population, health services, health authorities, and other productive and social services must go beyond a passive response to the demand for health care services once health outcomes occur; they must make a joint effort to improve the status of individual and collective health.

Health Communication

Studies in the United States, Canada, and Europe indicate that for every person who obtains information on health from health care personnel, 2 get it from the radio and 25 from television. Surveys in both industrialized and developing countries indicate that health is one of the top three topics on which the general public would like to obtain additional information.

Studies show a relationship between tobacco and alcohol advertising and the consumption of these products by children and adolescents, as well as a relationship between viewing violence and the subsequent aggressive behavior of children and adolescents. In about one-third of countries, there are national communication agencies that regulate the advertising of tobacco and alcohol on radio, television, and in the press.

The Peruvian experience is a good example of health communications experiences in the Region of the Americas. In 1991, PAHO and Peru's Ministry of Health began to publish *VIDA*, a health supplement distributed weekly by the newspaper "La Republica." The supplement was published for five years, representing an investment by the newspaper of approximately US\$ 3.5 million. As of 1997, eight Peruvian newspapers were publishing information on health issues without the direct involvement of PAHO or the Ministry of Health.

Based on the Peruvian experience, PAHO collaborated with the Ministry of Health of Panama in June 1997 to incorporate health in the media. Several Panamanian newspapers are now publishing information on health on a regular basis. In the United States and Canada, the majority of newspapers publish health supplements.

About one-third to one-half of the Ministries of Health have either a health communication policy or guidelines that orient the planning and implementation of programs promoting healthy lifestyles. The health communication programs generally work closely with technical programs in the Ministries to coordinate programs promoting health. Countries including Jamaica, Trinidad and Tobago, and Uruguay are implementing health communication activities in several program areas, while Brazil, Chile, Colombia, Mexico, Panama, Peru, and Venezuela have ongoing programs covering larger number of topics. Many countries (including Colombia, Nicaragua, Panama, Peru, Trinidad and Tobago, and Venezuela) have reported an increase in health coverage in the mass media in 1997 as compared with four years ago. Ministries of Health frequently pay for media access, but in certain countries (Eastern Caribbean countries and Venezuela, for example) the Ministries can publicize health information through their Government Information Services.

Universities in several countries (including Argentina, Brazil, Colombia, the Dominican Republic, Ecuador, Mexico, Peru, Uruguay, and Venezuela) include courses in health communication or health journalism in their curricula. The World

Bank, Mothercare, BASICS, the Academy for Educational Development, and other bilateral and multilateral agencies are investing large sums to implement health communication programs in Latin America and the Caribbean.

Healthy Municipalities and Health-Promoting Schools

The “settings approach” to promote health has been developed and strengthened in most countries in the Region. The two major settings are the movement to develop and maintain healthy municipalities (healthy municipalities movement) and the initiative to promote health in schools (health-promoting schools initiative). The primary goal of the approach is to create and maintain supportive environments for health. This approach focuses community action and participation, as well as health education and communication, on building personal skills and community capacity to improve the physical and psychosocial conditions in the places where people live, study, work, and play.

The Healthy Municipalities Movement

The process of promoting health in a municipality begins when local organizations, citizens, and elected authorities formalize an agreement and implement a plan of action to continuously improve the environmental and social conditions that produce health and well-being for all the people who live there.

The healthy municipalities movement in the Region of the Americas has advanced rapidly in a context of increasing decentralization and democratic participation. From 1990 to 1995 the projects were implemented, following the European and Canadian experiences with healthy cities, in Valdivia, Chile; Cienfuegos, Cuba; Zacatecas, Mexico; Manizales, Colombia; Zamora, Venezuela; and San Carlos, Costa Rica. These projects remain active today and the experience gained from implementing them contributed to the conceptual and operative framework of the healthy municipalities movement in the region. The World Health Organization has a global project with Dutch support for five healthy city projects throughout the world; one of the cities is Managua, Nicaragua, which specifically emphasizes environmental and urban health concerns. During 1996 the movement dramatically increased and by 1997 all the countries in the Region were involved in developing healthy municipalities, cities, or communities.

The healthy municipalities movement can be illustrated by describing some of the activities and achievements of countries during the period 1995–1997.

In Argentina, five municipalities were actively participating. Community and local authorities in Rosario determined

that accident prevention was a priority and they implemented a multifaceted plan to address it, including changes in traffic patterns and health education for motorists and pedestrians. In Berisso, La Plata, Encinada, and Posadas communities participated in preparing plans of action to improve healthy lifestyles, including health education in schools and youth involvement to prevent people from smoking.

In Brazil 12 districts are active participants. The National Council of Municipal Health Secretaries endorses the movement, provides training to municipal personnel in developing and implementing plans of action, and has set up a special committee to develop and test indicators for monitoring and evaluation. Campinas won the World Health Day Award in 1996 for their plan of action to improve food security, to provide minimum wages to poor households, and to improve child care programs. The School of Public Health at the University of São Paulo created a working group to provide technical assistance to the districts to help implement and monitor the activities necessary to become healthy municipalities.

Four provinces in Canada have healthy city networks with 300 active members. The international commitment to promote health took hold in 1986 when the Ottawa Charter was adopted. This strengthened the healthy cities movement in Canada and the United States and prompted its adoption all over the Region and the world. Provincial networks of cities and towns that participate in the movement provide a vehicle for sharing knowledge and experiences and for reviewing lessons learned. British Columbia has 79 communities in the network, Manitoba has 35, Ontario has 76, and Quebec has 110. Quebec is an active partner in the development of this movement throughout the Region. It hosted the first meeting of network coordinators and prepared a directory of healthy cities and municipalities in the Region.

In Chile, 59 *comunas* (communes) were actively involved in the process of building healthy communities. Valdivia continues to implement a health education strategy to abolish risk factors for chronic disease and to promote healthy behaviors. The school health education project reported moderate success in changing student awareness and behavior. A survey was conducted by the Ministry of Health to identify obstacles to and facilitating conditions for the healthy municipalities movement. From 52 respondents of 334 municipalities, 90% indicated a need for greater commitment of local authorities. An intersectoral planning committee, headed by the Ministry of Health and the Chilean Association of Municipalities, was established and included representatives from the public and private sectors. Health teams have developed and implemented “healthy *comunas*” plans of action, including adopting a strategy for primary environmental care. Viña and Quilota established a healthy *comunas* network with support from the Andaluza School of Public Health. The network continues to support the San Martín “healthy hospital initiative,”

an experience that provided insight into the relationship between changes in management practices and healthy and supportive environments for patients, families, and staff.

In Colombia, 11 municipalities were involved in the movement. Municipal spaces were established that needed environmental improvement and strengthening of human local resources to improve basic sanitation in Manizales, Versalles, Cali, Santafé de Bogotá, Sincelejo, Los Chircales, Circasia, Montenegro, Quimbaya, Cauca, and others. Community organizations in collaboration with local agencies are assuming the direct administration of primary health and environmental care services and projects, with the support of CIMDER and other academic and research centers. Recycling projects for plastics, cardboard, paper, and glass were made possible through a consensus-building process involving industry, merchants, the public sector, and private citizens.

Thirty cantons in Costa Rica participate in the Network of Healthy and Ecologically Sound Cantons. The focus is on smoking prevention campaigns and training primary health care teams to improve people's eating habits, to promote exercise, and to protect the environment via health education. The network also supported establishment of health-promoting schools and assessment of environmental conditions at schools.

There are 53 municipalities in Cuba affiliated with the National Network of Municipalities for Health. The main subjects addressed are healthy lifestyles and practices, including physical exercise, nutrition, stress management, and reduction of cigarette and alcohol consumption. Grandparent groups, with the potential to contribute the knowledge and experience of many retired persons, are a distinguishing feature.

Three municipalities in the Dominican Republic—Salcedo, Tenares, and Villa Tapia—focus on reducing infant mortality, improving food security and eating habits, and improving water and sanitation. A Department of Healthy Municipalities was created in the Ministry of Health to develop a national healthy municipalities program.

Five municipalities participate in the movement in El Salvador. Santa Ana, Metapán, and Ahuachapán focus on community participation, particularly youth, in health education, with an emphasis on healthy relationships, prevention of violence, and reduction of smoking and substance abuse. With training provided by the National Association of Municipalities the newly elected mayors are introduced to the concept of healthy municipalities. At participating healthy-market sites, vendors clean fruit stands, wash floors and walls, fumigate to eliminate pests, increase lighting to improve security, and install public bathrooms.

In Honduras, Santa Barbara, Trinidad, and six municipalities along the border with El Salvador strengthened community participation on health intersectoral committees, which included participation of mayors.

The national network in Mexico consists of approximately 600 municipalities. The movement has a high degree of sustainability; participatory planning processes were instituted at the local level and a variety of projects are being implemented, including basic sanitation, community development, healthy schools, nutrition, exercise, environmental protection, cultural pursuits, and others. Seventeen municipalities in the State of Veracruz created a network to facilitate the dissemination and sharing of knowledge and experiences and to collaborate on health promotion activities. The Ministry of Health supports the network and sponsored the Second Latin American Congress of Healthy Municipalities held in Boca del Rio, Veracruz, with 930 mayors and 300 health sector representatives from 27 countries.

Ten municipalities in Nicaragua are implementing activities by using the healthy settings approach. El Sauce, La Paz Centro, León, Nagarote, Nandaime, Nandasmo, Nindirí, Quezalgoaque, and San Juan de Oriente address priorities in their communities to improve sanitation, nutrition, youth involvement in family planning and reproductive health education programs, school health programs, and involvement of the elderly in community health activities. To encourage sub-regional involvement, Nicaragua has sponsored preparation of a Central American Healthy Municipalities Project. In Managua, the healthy city project has the support of UNDP, WHO, and the Dutch Government and it focuses on environmental protection and improved urban planning.

In Panama, intersectoral development committees in Arraiján, Cémaco, Chepo, Chiriquí Grande, Juan Díaz, Kuna Yala, La Pintada, Las Minas, Pocrí, and Portobelo carried out needs assessment as part of the Municipalities of the Twenty-First Century Program. The Ministry of Health has launched a plan to promote healthy lifestyles in the context of the healthy municipalities program.

In Peru, health personnel, local authorities, community organizations, and various nongovernmental organizations (NGOs) formulate plans of action to address issues of poverty and elaborate projects to protect the environment. They focus on environmental education; water; sanitation; food safety; food availability and nutrition education; recycling of waste in educational centers and in the organized communities, including conversion of organic waste into compost; and the conservation and rational use of water. To improve safety, promote peaceful relations, and prevent violence, Miraflores District in Lima and Callao, Cerro San Cosme, Puno, San Cristobal, Tacna, Tumbes, and Villa El Salvador implemented community health education programs involving youth clubs and community organizations.

The California Healthy Cities Network, The Coalition for Healthier Cities and Communities, the National Civic League, and the New Mexico Network for Healthier Communities are organizations that support and enhance community involve-

ment and empowerment. In the United States a variety of community health education and development activities are being implemented that address issues of lifestyles, aging, child and family development, education, environment, health and human services, recreation, housing, transportation, and public safety. The Indiana Institute of Action Research for Community Health is a PAHO/WHO collaborating center and an active partner.

Twenty-eight municipalities are active members of the national network in Venezuela. The Ministry of Health has encouraged and supported the development in each state of at least one healthy municipality, based on the highest index of unmet needs. This approach was intended to deal with the issues of poverty and inequity particularly in areas of social development, health, and education. With the support of the IDB and PAHO, the municipalities submitted 150 community-based projects; 35% of them were implemented and funding was provided by the social investment fund. The Venezuelan Network of Municipalities for Health is one of the strongest and most active healthy municipalities movements in the region. The State of Falcon formed its own network with 10 municipalities.

The diversity of experiences in Latin America demonstrates the Region's widespread involvement in the healthy municipalities movement. There is much variation in the projects that are under way, but they address many areas of common concern. An interesting recent development in the Latin American experience is the popularity of awards that acknowledge innovation. This highlights the seriousness and pride of municipalities in their commitment to the movement.

Many countries in Latin America are in the process of developing a national network; a few, such as Mexico and Venezuela, have developed state networks. The interest in forming networks as a forum for sharing experiences continues to grow as do the number of events to disseminate the information, knowledge, and current practices generated by the movement in this Region.

Latin America now has approximately six years of involvement in the movement and a review of project descriptions shows that adoption of the movement generally follows four phases: formal initiation and identification of priorities, preparation of a plan of action, consolidation of organizing committees and implementation of activities, and creation of information systems to monitor and evaluate the process. The process typically starts with strong support from local authorities. This support and commitment often result in a public declaration to prioritize health issues on the political agenda. Coordinating committees are commonly formed and usually include representatives from various sectors such as health, education, local government, community, and sanitation. Less common is involvement of representatives from community groups such as youth and adolescents, senior cit-

izens, media, church, recreation and culture, and the private sector.

Many municipalities have made needs assessment a priority but the form of the assessment varies and may consist of one or more of the following: personal interviews, studies, surveys, focus groups, and existing records. Other than the knowledge that this data gathering has taken place, few if any details about the process are known. Moreover, it is difficult to determine both how representative and inclusive the health and priority assessments are as well as how this diagnosis adequately reflects the opinions and priorities of the community.

The consolidation phase typically involves development of a municipal action plan or strategy based on the needs assessment. This is an important step in the process, but, as with the needs assessment, little is known as to what extent the community and other sectors participated. It is too early to determine how many of the intended activities in the municipal plans and strategies are carried out, as well as the effects of these activities on the quality of life in the municipalities and communities. An analysis of the completion rate could be useful for future development of strategies and allocation of resources.

Although a variety of projects and themes have resulted from Latin America's experience with healthy municipalities, it is important to emphasize that this movement is much more than a collection of distinct projects. Rather, the healthy municipality paradigm, with its focus on the process, strengthens intersectoral and community participation, as well as the capacity to design and implement programs based on local priorities that contribute more fully to improving health conditions and quality of life in the community.

The Health-Promoting Schools Initiative

Latin America and the Caribbean have more than 220 million school-aged children (between 5 and 18 years of age)—27 million in the Andean Region; 53 million in Brazil and the Southern Cone; 41 million in Mexico, Central America, and the Latin Caribbean countries; 2 million in the English-speaking Caribbean; and 103 million in the United States and Canada.

The total number of teachers is slightly more than 5 million and the average student-to-teacher ratio at the primary school level has diminished from 34 in 1970 to 26 in 1991. The ratio varies from 12 students per teacher in Cuba to 38 in Honduras. The efficiency of the education system has been identified as one of the aspects that needs to be improved; 20% of children start school late, 42% repeat first grade, and 30% repeat second grade. Annually, US\$ 3,500 million are spent on 22 million repeaters.

The health-promoting schools initiative provides a comprehensive vision and a multidisciplinary approach that considers people in the context of their daily life in the family, community, and society. The initiative focuses on development of knowledge, abilities, and skills so that people can take care of their health and that of others and minimize risk behaviors. A critical-reflexive analysis of values, behaviors, social conditions, and lifestyles is encouraged, with the goal of strengthening those factors that favor health and human development and helping members of the educational community make decisions to promote their health and that of others. The initiative contributes to socially egalitarian relations between the genders—encouraging good citizenship and democracy, strengthening traditions of solidarity and community spirit, and protecting human rights. The activities are carried out in a variety of educational opportunities and not solely in the classroom. The initiative in the Americas has three key components: comprehensive health education, healthy and supportive environments and surroundings, and health services and food and nutrition programs.

Comprehensive health education focuses on participatory learning, based on the needs of the students at each stage of development, to strengthen self-esteem and the capacity of young people to acquire knowledge and skills and to form healthy lifestyles and practices.

Healthy and supportive environments and surroundings include basic sanitation, clean and structurally adequate physical spaces, and support networks for healthy and safe psychosocial surroundings that are free from physical, verbal, and emotional abuse as well as assaults and violence. This strengthens the capacity of each school to create and maintain environments supportive to health and learning for students and teachers and includes outreach activities with parents and community organizations and work-study programs for youth at risk or who have dropped out of school.

Appropriate health services and food and nutrition programs for children, youth, and teachers help to prevent health problems and decrease risk factors, behaviors, and conditions; this includes early detection and counseling services and includes physical education activities, sports, and recreation as means of creating healthy and supportive environments.

The strategic plan of action includes revising joint health and education policy; strengthening national commissions as intersectoral coordinating mechanisms; developing, implementing, and evaluating school health plans and programs to improve health promotion in the schools; involving parent-teacher associations, community organizations, and representatives of the health sector and other sectors in promoting health in the school environment; and designing and implementing studies with the school-aged population as well as monitoring and evaluating school health programs.

Implementation of this strategy involves teachers at every phase of the process, with a simplified methodology to carry out school-based needs assessments and design and test teaching material as well as materials for in-service teacher training; qualitative and quantitative indicators are used to monitor and evaluate the process and products of this initiative. A variety of school health promotion and education activities have been implemented in various countries during the last five years.

A joint school health initiative involving 1,200 schools was launched in 1997 by the Ministries of Health and Education of Argentina. In Buenos Aires, a health-promoting school project was implemented, with activities that ranged from cleaning up to a health fair and healthy camps, and covering themes such as conflict resolution, reduction of smoking, sexual awareness, and prevention of teen pregnancy.

In the Bahamas, schools are the main setting for preventive actions with regard to mental health, food safety and nutrition education, dental health, basic sanitation and vector control, physical education, and family life.

The Joint Commission for Health and Education of Bolivia carried out a survey of health risk behaviors among schoolchildren. Multiculturalism and participation of the community are fundamental components of health education and promotion activities. In addition, environmental education and improvement of school environments, including water and sanitation, are key aspects.

The Program of Innovations in Basic Education (1992–1999) in Brazil includes reform of the school health program emphasizing school lunch distribution, health screening (vision and hearing), immunizations, preventive oral health care, iron and vitamin A supplements, evaluation of nutrition, and health interventions. Municipal governments in Rio de Janeiro, Santos, Campinas, and Sobral implemented innovative activities within the context of health-promoting schools, including exercises to help children and teachers deal with issues of violence. The municipality of Santos, with the support of the Catholic University, implemented a project in Bernabé to train teachers in life-skills instruction.

In Chile, a National School Health Program implemented in 1992 reportedly improved the health knowledge and practices of students and contributed to their healthy development. Research to identify priority health problems and determine disease prevention activities included a survey of health risk behaviors among students. A series of “Health and Education Notebooks” were published for teachers, students, and parents and covered topics such as environmental health, smoking and substance abuse, accident prevention, nutrition, and oral health. The World Bank supported a Program for Primary Education Improvement (1993–2001) that provides health screening and referrals for 250,000 first graders every year and 18,000 daily food rations.

In Colombia, the Ministry of Health, in partnership with 40 NGOs, implemented an ambitious sexual health education program. The project components were training, research, evaluation, and communications to promote sexual health.

Health education in Cuba is imparted to children from preschool through secondary school. Services for school-children include oral health, school meals, and active involvement of teachers and nurses in school-based activities.

The government of El Salvador has identified the declining physical structure as one of the factors that hinders the capacity of schools to promote the health of their members. A program for school renovation is being carried out.

The Ministry of Health of Honduras along with the National Institute for Agriculture, the Ministry of Education, PAHO, and the Food and Agriculture Organization prepared and distributed a series of modules on self-training for educators in health and nutrition. Between 1991 and 1996 the World Bank contributed through its social investment fund to provide school breakfasts and to expand food coupon programs to primary schoolchildren in the 13 departments with the highest malnutrition rates.

NGOs in Jamaica were involved in school-based programs such as PALS (violence prevention and conflict resolution strategies) and the Addiction Alert Adolescent Program (which promotes drug-free lifestyles among adolescents).

Actions undertaken in Mexico include cross-curricular health education, preventive campaigns, school-based first aid, health screening, creation of school brigades for environmental health campaigns, and others. The Secretary of Health together with the Secretary of Public Education has produced several manuals for teachers on hearing and vision, oral health, nutritional surveillance, accident prevention, and disaster awareness.

Nicaragua evaluated the implementation of school health programs in 13 SILAIS. On the basis of the results, a work plan has been elaborated to strengthen coordination between MINSA and MED and to improve joint monitoring of the school health programs.

The Ministries of Health and Education of Peru activated the Joint Commission to implement a free health insurance program for students between 3 and 18 years of age. The program benefited 5 million public-school children in 1997. Teacher training programs include family and sexual education, life skills, prevention of STDs and AIDS, and prevention of violence. About 12,300 teachers from secondary schools and 2,400 from primary schools have been trained.

The health-promoting schools initiative prepares future generations with the knowledge, abilities, and skills necessary to care for their health and that of their family and community and creates healthy environments where people study, work, and live. The initiative helps primary health and environmental health services and schools work together to im-

prove their ability to detect and offer assistance to teachers, students, and families in a timely fashion, minimizing the increase in the number of young people and adolescents who adopt risk behaviors that put their health in danger, such as smoking, consumption of alcoholic beverages, substance abuse, STDs, and early pregnancy. The prevalence of phenomena such as exploitation of child labor (to which hundreds of boys and girls are exposed when they drop out of school) or the violence epidemic in many cities of the Region could be diminished with school-based actions to prepare young people for the world of work and activities to improve living conditions, as well as by involving young people in a learning process that would avoid discrimination, promote harmonious relations between the genders, and model ways for people to resolve conflicts by dialogue and negotiation. Participation of the family and community in extracurricular health-promotion activities is an important component of the initiative and many activities focus on promoting healthy and supportive environments. The Latin American network of health-promoting schools provides an opportunity to continue the health promotion and health education dialogue at all levels; it provides for the exchange of ideas, resources, and experiences to nurture the commitment and enthusiasm of teachers, students, and parents.

ENVIRONMENT AND HEALTH

Environmental Policies and the Regulatory Role of the State

The 1990s have been characterized by a growing concern for the problems affecting the world community and the urgent need to solve them. The Earth Summit, the name given to the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, presented new development concepts and policies and proposed approaches to make them less destructive and more humane. In adopting the Declaration of Rio de Janeiro and the Agenda 21 plan for environmental protection, world leaders acknowledged the importance of investing in the protection and improvement of health and the environment, as a way to guarantee the sustainable development of every country in the world. Thus, Agenda 21 represents a political commitment at the highest world levels, whose fulfillment is primarily the responsibility of governments, and also of international cooperation. The Agenda 21 plan of action has important implications for national and international health agencies, and the World Health Organization has focused on six programs in which the health sector has primary responsibility: meeting the need for primary health care, above all in rural areas; leading the fight against contagious diseases; protecting the

most vulnerable groups; solving urban health problems; reducing health risks caused by pollution and environmental dangers; and expanding and accelerating international evaluation of the risks from chemical products (1).

Follow-Up to the Earth Summit

Regional Initiatives. The issue of health and the environment in development has been dealt with at the highest regional and subregional levels in the Americas. In 1994, the heads of state and of government began to hold a series of meetings related to sustainable development. The first, the Summit of the Americas, held in Miami in 1994, produced the Declaration of Principles and the Plan of Action, which deals with such issues as equitable access to basic health services and the prevention of pollution. The two documents also detail commitments to assure sustainable development and preserve environmental resources for future generations.

The Inter-American Development Bank (IDB) has committed itself to playing an important role in the implementation of UNCED's Agenda 21. In 1994 IDB was given the mandate of concentrating development-related efforts on three priority areas: reduction of poverty, modernization and economic integration, and the environment. IDB is now channeling its resources in that direction, and it has been proposed that 40% of its loans be directed to the social sectors.

The Pan American Health Organization held the Pan American Conference on Health and the Environment in Sustainable Human Development in Washington, D.C., in 1995. From it came the Pan American Charter on Health and the Environment in Sustainable Human Development, as well as the Regional Plan of Action. The most important result of the Conference was its policy contribution that consolidated the countries' efforts to incorporate health and the environment into their national development policies and plans and to ensure that national development processes remain strong. The Regional Plan of Action is a strategic blueprint for implementing policy principles and strategies, common priorities, and the shared responsibilities agreed upon in the Pan American Charter, in accordance with each country's characteristics.

The Summit of the Americas Conference on Sustainable Development, held in Santa Cruz de la Sierra, Bolivia, in 1996, emphasized the importance of promoting equitable access to basic health services. Participants also agreed that the principles and priorities established in the Pan American Charter on Health and the Environment in Sustainable Human Development should be implemented where appropriate. In other agreements at the Conference, representatives committed their countries to establish policies, laws, and programs to protect public health and safeguard the water supply.

The Summit of the Americas, held in Santiago, Chile, in April 1998, provided follow-up to the summits of Miami and Santa Cruz de la Sierra. The Santiago meeting included in its agenda a discussion of the issue of health technologies for the Americas, including improving the coverage and quality of the drinking water supply, basic sanitation, and solid waste management, with special emphasis on poor urban and rural areas.

Subregional Initiatives. At the subregional level and within the framework of the Central American Alliance for Sustainable Development, the XIII Special Meeting of the Central American Health Sector, held in Belize in September 1997, brought together representatives from the environmental and social security sectors, as well as directors of drinking water enterprises. Meeting participants approved the Central American Plan for Health and the Environment in Sustainable Development. The plan complements national health and environmental plans through four lines of action: establishing regional policies, capacity-building, cooperation between countries, and organizing international cooperation.

In 1989, the presidents of Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua established the Central American Environment and Development Commission; Panama and Belize joined the commission in 1990. The Commission carries out communication and coordination activities in the area of development and the environment. It also is responsible for promoting the consideration of environmental issues at the highest levels of policy-making in the Region, fostering a shift toward development approaches that allow economic growth with equity, an integrated management of resources, and the control of environmental quality, while incorporating principles of social equity and environmental sustainability.

National Initiatives. Under the leadership of their health ministers, every country of the Region is carrying out high-level national, multisectoral processes to prepare national plans of action on health and the environment in sustainable human development. These plans, in turn, will be incorporated into national plans for sustainable development. In general, the working groups include representatives of governmental and nongovernmental institutions, universities, and other societal groups, and deal with aspects of health and the environment contained in Agenda 21, the Pan American Charter on Health and Environment in Sustainable Human Development, and the corresponding Plan of Action.

United Nations agencies and other cooperation institutions have adapted their policies and programs, in order to coordinate their efforts with those of the governments. Seventeen countries already are preparing national plans of action on health and the environment in sustainable human develop-

ment. Seven have produced reports and other documents, and eight countries have formulated national plans of action on health and the environment. Bolivia has a General Economic and Social Development Plan and is conducting a project to incorporate environmental health in sustainable development plans. The project began with the preparation of Agenda 21 municipal programs, in which the public has participated extensively. In Brazil, a working group was coordinated by the Minister of Health, and the ministries of the Environment, of Natural Resources, of Amazonia Legal, of Planning and Budget, of Labor, of Education, of Mining and Energy, and of Foreign Relations participated. The working group prepared the National Plan for Health and Environment in Sustainable Development, which was approved for implementation by the Government.

The Canadian Provincial Ministers of Environment approved the document *Principles of Cooperation in Health and the Environment*, inspired by the Pan American Charter, and are negotiating agreements based on these principles at the federal, provincial, and local levels. In 1995, the Canadian Government developed a new foreign policy called "Canada in the World." Its purpose is to support sustainable development in developing countries, as a way to reduce poverty and contribute to an equitable and safe world. That policy devotes special attention to basic needs, including water and sanitation. In Mexico, a working group was formed, coordinated by the Subsecretariat of Regulation and Health Development through its Office of Environmental Health. This group produced the document *Health, the Environment, and Sustainable Human Development: The Case of Mexico* (November 1996), and is preparing the Program for Strengthening National Management Capability in Health and the Environment in Sustainable Human Development, the first stage of which deals with drinking water and sanitation.

In Central America, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama have developed their national health and environment plans for sustainable human development, through multisectoral and interinstitutional processes and with public participation.

Health Risks Caused by Environmental Pollution

UNCED's Agenda 21 suggests that pollution in the water, air, and soil, and in the work and home environments is on the rise, and that it is essential to reduce risks to a minimum. Development must be promoted, but without endangering human health and safety. In their efforts to reduce pollution, some countries have proposed alternatives to the traditional pollution control approach that relied solely on regulation. Some of these alternatives offer polluters flexible incentives to encourage them to comply with standards and

laws, and some also use persuasion or social and market pressures (2).

Water. In some Latin American and Caribbean countries, the availability of sufficient and good quality water for human consumption and related uses is being taxed by an increase in demand, population movements, demands for water for other uses, and growing contamination from the discharge of untreated domestic and industrial sewage and from agricultural residues. It is estimated that 90% of the wastewater is discharged without treatment.

Agenda 21 emphasizes the need to review water resource management in order to establish policies with greater economic incentives for improving efficiency, providing services to the poor, and encouraging more effective institutional initiatives. These policies should take into account the interdependence of the sectors involved, as well as the protection of ecosystems. The declarations of the Group of Eight and of the Santa Cruz de la Sierra Summit also highlight the need for policies that protect and conserve fresh water, as well as the water supply for human consumption.

The World Bank collaborated with United Nations agencies and consulted extensively with borrowers, international governmental and nongovernmental organizations, and developing countries in order to adopt a new policy for water resource management. The policy takes a comprehensive approach that emphasizes economic performance, overcoming political and market imperfections, more efficient use of water, and greater environmental protection (3).

Most of the Region's countries have adopted decentralization policies that view the municipality as the primary administrative unit responsible for the well-being of its inhabitants, including offering basic services to homes. As a result, most of the countries have amended their policies and laws in order to allow more local decision-making regarding water supply and sanitation. Several countries also have put in place policies that give the private sector a greater role in providing drinking water and sanitation services, viewing this as a viable alternative for improving efficiency through the use of private capital.

Private management and supply of water is not, in itself, a guarantee of reduced unfairness and increased social well-being. Therefore, supplementary measures must be adopted in the provision of these services. To this end, several countries have established regulatory mechanisms to ensure that privatization responds to the needs of the entire community, especially lower-income persons.

Air. Air pollution in the countries of Latin America and the Caribbean is a growing concern. This is especially true in large cities, where some pollutants exceed the limits recommended by the World Health Organization. The Plan of Action signed at

the Summit of the Americas by the heads of state of 34 countries includes the Alliance to Prevent Pollution. This agreement has brought about cooperation to develop environmental policies and establish laws and institutions. One of the commitments the respective governments have made is to establish national plans of action to gradually eliminate lead from gasoline. At the Santa Cruz de la Sierra Summit, 11 countries in the Region reported having taken this step: Argentina, Bermuda, Brazil, Canada, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and the United States (4).

In order to cooperate with the governments in their plans to eliminate lead from gasoline, a group of international, regional, and national institutions have initiated a technical assistance project to develop national plans and exchange information and experiences. These institutions include the World Bank, the Pan American Health Organization, the Organization of American States, the United States Environmental Protection Agency, the United States Department of Energy, the Inter-American Development Bank, and the Natural Resources Defense Council. As part of the process, government representatives who participated in a workshop organized by the International Bank for Reconstruction and Development in Santiago, Chile, in 1996, expressed their commitment to lead the initiative to eliminate lead from gasoline (2).

Municipal Solid Waste. The municipal solid waste sector has undergone major changes during the last five years. Policies aimed at increasing private sector involvement in most of the countries resulted in contracts and concessions to operate urban sanitation services. In a study carried out by the Pan American Health Organization and the Inter-American Development Bank in 33 large cities in Latin America and the Caribbean, it was found that 63% of the cities had contracted part or all of their services for solid waste collection and disposal to private companies in the 1987–1996 period. The changes have had both positive and negative effects. On the positive side, there is a trend toward more efficient use of human and financial resources. Also, municipalities are more interested in recovering costs through new fees and reduced subsidies. The negative aspects include the loss of jobs and benefits for municipal personnel, and a general decline in the salaries of sector workers.

Studies of the solid waste sector were carried out by Chile, Colombia, Guatemala, Mexico, Nicaragua, and Uruguay (circa 1996), using methodology developed by PAHO. The studies point to the absence of any central or national agency to direct the sector, and to the spreading of responsibilities among the ministries of environment, health, planning, or others whose activities in the area of solid waste, when they exist at all, have low priority and are poorly coordinated. At the same time, the policies of nearly all the countries include developing environmental legislation. Chile and Colombia, for exam-

ple, already have laws for private companies to provide services. Table 1 lists the laws and other legal instruments that exist in Latin America and the Caribbean.

Housing. It is believed that approximately three million residential units would need to be constructed annually to meet the current need for housing in Latin America and the Caribbean. Set against the historically modest performance of the sector, these figures suggest the need to revise housing policies to improve management in that area. Furthermore, there is a need to set clear policies and standards on the quality of housing and minimum sanitation requirements. In this regard, several countries have established centers or groups on housing-related health within universities, designed to advise government agencies, nongovernmental organizations, other institutions, and communities on the necessary criteria to make housing safe and sanitary. Currently, there is an inter-American network which operates through centers in Bolivia, Chile, Cuba, Mexico, Nicaragua, Venezuela, and the United States.

In terms of urban policies, the institutions responsible for housing have become more sensitive to the siting of housing complexes, taking into consideration not only the cost of the real estate, but also the urban and social consequences of the location. In this way, lower-income families can have access to educational and health services that are central for improving their quality of life and poor urban populations can have the opportunity to achieve progress, thus adding a benefit to obtaining housing. In Colombia, the regulatory and legal structures governing property and the urban real estate market are being revised, and reforms are being studied that would improve land management in central and outlying urban areas in terms of decisions on where to construct housing.

While in most cases housing policies operate in a highly centralized way, through a specialized national institutional or ministerial entity, countries have shown an increasing interest in decentralizing policy development and management and transferring greater responsibilities to the municipalities. During the Fifth Regional Meeting of Ministers and High Officials of the Latin American and Caribbean Housing and Urban Planning Sector, held in Kingston, Jamaica, in November, 1996, the countries agreed to maintain or reactivate these multisectoral groups in order to develop urban and housing policies as a way of bringing about collaboration between national and local government institutions.

Chemical Safety. In order to strengthen international cooperation on the ecologically sound management of chemical products and provide follow-up to Agenda 21's Chapter 19 on chemical safety, the 114 governments that participated in the International Conference on Chemical Safety (Stockholm, 1994) established the Intergovernmental Forum on Chemical

TABLE 1
Existing legal instruments on waste management in Latin American and Caribbean countries.

Legal instrument	Countries with legal instruments	Countries where instruments are currently being prepared
National laws on municipal solid waste (general or specific)	Chile, Colombia, Honduras, Peru, and Venezuela	Costa Rica, Haiti, Paraguay, and Uruguay
National regulations and technical standards on municipal solid waste	Bolivia, Brazil, Chile, Colombia, Costa Rica, Honduras, Mexico, Paraguay, and Venezuela	Ecuador, Haiti, and Uruguay
Technical standards on solid waste management at specialized and health care facilities	Argentina, Brazil, Colombia, Costa Rica, Cuba, Honduras, Mexico, Paraguay, Peru, Uruguay, and Venezuela	Bolivia, Ecuador, and Guatemala
Basel Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and Uruguay ^a	

^a Latin American and Caribbean countries that had ratified the Basel Convention as of July 1997.

Sources: Pan American Health Organization. *Análisis sectorial de residuos sólidos en Uruguay*. Washington, DC: PAHO; 1996. (PIAS, Serie Análisis Sectorial 7); Pan American Health Organization. *Análisis sectorial de residuos sólidos en Colombia*. Washington, DC: OPS; 1996. (PIAS, Serie Análisis Sectorial 8); Pan American Health Organization. *Análisis sectorial de residuos sólidos en Guatemala*. Washington, DC: PAHO; 1995. (PIAS, Serie Análisis Sectorial 6); Pan American Health Organization. *Análisis sectorial de residuos sólidos en México*. Washington, DC: PAHO; 1996. (PIAS, Serie Análisis Sectorial 10); Pan American Health Organization. *Procesamiento de información del Sistema de Monitoreo de Residuos Urbanos (SIMRU)*. Washington, DC: PAHO; 1996; Pan American Health Organization, Inter-American Development Bank. *Informes de algunos países para el presente diagnóstico*. 1996.

Safety. Within the framework of the first meeting of the Forum's liaison group, representatives from Latin America and the Caribbean (Brazil, Colombia, Mexico, Nicaragua, and Trinidad and Tobago), as well as from Canada and the United States, held a Regional Meeting of the Americas. They decided to establish an Expanded Liaison Group, in order to invite the other countries of the Region to join the Group and request that they prepare an outline of the toxic substance situation.

The three members of the North American Free Trade Agreement (Canada, Mexico, and the United States) formed the Commission for Environmental Cooperation (CEC), as stipulated in the North American Agreement on Environmental Cooperation (NAAEC), to deal with regional environmental problems, help in preventing possible trade and environmental conflicts, and promote the effective implementation of environmental legislation. CEC's Council of Ministers approved a resolution requesting the preparation of regional plans of action to deal with polychlorinated biphenyls (PCBs), DDT, chlordane, and mercury. It also decided to create the North American Inventory of Polluting Emissions to gather information on the emission of pollutants in North America and make it available to industry and to those making decisions on these questions.

During 1995, studies began on the control, modeling, and evaluation of air quality in the three countries. These studies will be used in developing long-term programs to provide the information required for policy-planning, decision-making, and the management of shared air basins and crossborder air pollutants.

Hazardous Waste. The Basel Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal is in line with Agenda 21's chapter on sound ecological management of toxic chemicals, including illicit international traffic in toxic and hazardous products. By July 1997, the Agreement had been ratified by 26 countries in the Region.

The Pan American Network of Environmental Waste Management was established in 1994 through an agreement among the German Agency for Cooperation (GTZ), PAHO's Division of Health and Environment, and the Pan American Center for Sanitary Engineering and Environmental Sciences. The network's goal is to foster appropriate environmental waste management that contributes to preserving and promoting health and sustainable human development. The strategy is to integrate the efforts of the three sectors involved in environmental safety: the manufacturing and service sector that gen-

erates wastes; the government, which regulates and controls environmental quality; and the affected community. The Network is made up of six countries—Argentina, Brazil, Colombia, Costa Rica, Ecuador, and Peru—and Mexico is in the process of joining. Participating countries have a National Information and Communications Coordination Center.

Workers' Health

Because of rapid population growth and urbanization, traditional, formal types of employment have begun to give way to informal and family-based work. Combined with the current economic development model, these trends have changed the nature of illnesses and accidents among workers in the Region. To deal with this new situation, in 1996 WHO adopted the Global Strategy for Worker's Health. The strategy emphasizes policy development, consideration of the issue in health sector reforms, improvement of the work environment, and adoption of measures to promote health in the workplace (5). The International Labor Organization (ILO) carried out important cooperative efforts in developing policies on workers' health, and has incorporated the approach of sustainable development in its programs, working jointly with the State, workers' organizations, and with workers themselves. Since 1948, through the Joint ILO/WHO Committee on Occupational Health, these efforts have been supplemented by activities to promote policies on workers' health and safety. In addition, ILO and UNICEF jointly promote the development of policies in the area of child labor in the Region.

In its Declaration of Principles, the Summit of the Americas states that free trade and greater economic integration are key factors for improving the working conditions of the peoples of the Americas and protecting the environment. The North American Free Trade Agreement and other, similar agreements, as well as MERCOSUR, the Andean Pact, and other economic integration processes, facilitate the relocation of companies abroad and the movement of products and services, and also offer possibilities for progress in workers' health (5, 6).

According to reports from the countries in the Region, many changes relating to workers' health have occurred over the last four years. Argentina, Colombia, and Mexico promoted policies that gave rise to new legislation for worker health and welfare. In a few cases, the ministries of health have strengthened their oversight and surveillance roles, while in other countries, those responsibilities have been cut back. Chile and Colombia have occupational health plans and programs within the health sector. Responding to a PAHO initiative, more than 20 countries in the Region have developed national worker health plans. There also were important

changes in social security. On the one hand, private businesses now provide occupational risk insurance, mainly offered by private insurers, as is the case in Argentina, Chile, Colombia, and Peru. In other cases, social security institutes assume this responsibility. For their part, workers' organizations have made advances in the field of health promotion. In order to bring together isolated efforts, forums to provide training and conduct participatory research (5) have been organized by workers' groups in partnership with universities and governmental organizations, and, in some cases, social security institutes and ministries of health.

Housing Conditions and Their Effect on Health

Human health is tightly linked to housing conditions and basic sanitation. Inadequate housing and sanitation often are determinants of excesses in mortality and are systematically associated with poverty, socioeconomic underdevelopment, and other inequities in Latin America and the Caribbean (7). According to the Economic Commission for Latin America and the Caribbean (ECLAC), in 1994, 39% of Latin American households—or more than 200 million people—lived below the poverty line (8).

Substandard housing is found both in rural and peripheral urban areas; the populations living there run the highest risk of contracting diseases related to housing and environmental conditions. This vulnerability is magnified in areas endemic for vector-borne diseases such as Chagas' disease, malaria, dengue, and yellow fever. This same population also is exposed to gastrointestinal, respiratory, and other infectious diseases. All these diseases can be linked to housing deficiencies, including inferior materials used in floors, walls, and roofs; poor ventilation; and a lack of sanitation services and protective barriers against insects and rodents.

As the urban population swells, concentrating poor families on city outskirts in areas prone to landslides and flooding, and as the service infrastructure deteriorates, housing conditions have become a major source of concern (9). Squatter settlements also are exposed to drugs and violence, as well as to psychosocial diseases to which overcrowding and a lack of recreational areas are contributing factors.

According to the Latin American Demography Center (CELADE), a study of risk factors associated with child survival in Costa Rica (relating to the condition of building materials, water supply, sanitation services, and overcrowding) found infant mortality rates of 27 per 1,000 population in families living in substandard dwellings, compared with 16 per 1,000 for those with adequate housing; dilapidated housing represented the most definitive risk (7).

Table 2 presents data on households and housing stock in Latin America for the 1981–1993 period. The housing data

TABLE 2
Existing households and housing stock in Latin America and the Caribbean, 1981–1993.

Country	Year	Estimated households	Adequate dwellings		Unsalvageable dwellings		Salvageable dwellings	
			No.	%	No.	%	No.	%
Argentina	1991	9,380,204	6,434,209	75.2	624,274	7.3	1,496,212	17.5
Bolivia	1992	1,614,995	880,172	54.5	406,979	25.2	327,844	20.3
Brazil	1991	35,517,542	9,490,609	56.1	5,098,394	14.7	10,145,712	29.2
Chile	1992	3,365,462	2,394,995	76.7	364,760	11.6	361,212	11.5
Colombia	1985	5,824,857	3,303,051	62.9	525,127	10.0	1,423,095	27.1
Costa Rica	1984	527,299	339,840	67.9	43,804	8.8	116,386	23.2
Cuba	1981	2,350,221	1,698,649	74.1	335,427	14.6	256,100	11.1
Dominican Republic	1981	1,140,798	676,791	59.3	126,238	11.0	337,769	29.6
Ecuador	1990	2,136,889	1,375,212	68.4	296,609	14.7	336,834	16.7
El Salvador	1992	1,091,728	508,858	48.5	359,873	34.3	180,461	17.2
Guatemala	1989	1,610,994	874,111	54.9	283,225	17.8	433,952	27.2
Honduras	1988	808,222	481,658	63.2	90,921	11.9	189,767	24.9
Mexico	1990	17,394,368	11,382,906	71.0	1,964,712	12.3	2,687,615	16.7
Nicaragua	1991	...	128,545	20.1	289,994	45.3	220,992	34.5
Panama	1990	541,704	365,650	69.7	86,268	16.5	72,366	13.8
Paraguay	1992	873,694	517,578	60.5	143,080	16.7	194,889	22.7
Peru	1993	4,762,779	2,231,469	50.4	872,221	19.7	1,323,828	29.8
Uruguay	1985	902,300	685,934	83.3	40,998	4.9	104,553	12.7
Venezuela	1990	3,750,940	2,672,168	76.0	529,702	15.1	315,359	9.0
Average				63.1		14.0		23.0

Source: Adapted from ECLAC. *Alojar el desarrollo: una tarea para los asentamientos humanos*. Santiago: Chile: ECLAC; 1996; Table 8 (LC/L. 906 (conf. 85/3) Rev. I).

shows 63% of the housing stock as adequate, 14% as irreparable, and 23% as failing to meet all requirements for healthful living but capable of being upgraded. The table shows major differences among countries, with the largest proportion of adequate housing found in Argentina, Chile, Cuba, Uruguay, and Venezuela and the smallest in Bolivia, El Salvador, Guatemala, Nicaragua, and Peru (10).

There were approximately 93 million private homes in Latin America and the Caribbean in the early 1990s. With an estimated demand for 113 million dwellings, the housing deficit was roughly 20 million dwellings (7). This deficit was exacerbated by the number of dwellings requiring upgrades or replacement. Table 3 presents country data on the housing deficit and annual increase in the number of new households in Latin America and the Caribbean for the 1981–1993 period. The quantitative housing deficit is defined as the difference between the estimated number of households and the number of adequate and salvageable dwellings. The qualitative housing deficit refers to the number of dwellings in poor

but salvageable condition. The housing shortage in the Region's countries far exceeds the scope of housing policies that aim to produce sufficient numbers of new dwellings to prevent an increase in the cumulative deficit (10). It would be necessary to build more than one-half million new dwelling units annually merely to sustain current coverage rates for Latin America and the Caribbean. If an increase in the cumulative deficit is to be averted, given new demand, construction targets would need to be somewhere between 2.3 and 3.2 million units per year. Efforts to upgrade existing housing are virtually nonexistent, which explains the consistently high ratio of dilapidated and obsolescent dwellings, which, in turn, adds to the housing deficit.

An estimated 73% of the population had house connections to water supply systems or a readily available source of water (a public standpipe at a distance of less than 200 m from the dwelling) in 1995. Service coverage rates in rural areas were extremely low (41%), compared with urban areas (84%). Only 59% of the water supply was disinfected and, in

TABLE 3
Housing deficit and annual increase in the number of new households in Latin America and the Caribbean, 1981–1993.^a

Country	Year	Quantitative housing deficit		Qualitative housing deficit (salvageable dwellings)		Total housing deficit	Annual increase in households
		No.	%	No.	%		
Argentina	1991	1,449,783	49.2	1,496,212	50.8	2,945,995	152,378
Bolivia	1992	406,979	55.4	327,844	44.6	734,823	44,400
Brazil	1991	5,881,221	36.7	10,145,712	63.3	16,026,933	909,000
Chile	1992	609,255	62.8	361,212	37.2	970,467	72,000
Colombia	1985	1,098,711	43.6	1,423,095	56.4	2,521,806	200,000
Costa Rica	1984	71,073	37.9	116,386	62.1	187,459	25,000
Cuba	1981	395,472	60.7	256,100	39.3	651,572	42,000
Dominican Republic	1981	126,238	27.2	337,769	72.8	464,007	49,000
Ecuador	1990	424,843	55.8	336,834	44.2	761,677	69,000
El Salvador	1992	402,410	69.0	180,461	31.0	582,870	31,000
Guatemala	1989	302,931	41.2	433,952	58.8	736,883	69,000
Honduras	1988	136,797	41.9	189,767	58.1	326,564	42,000
Mexico	1990	3,323,847	55.3	2,687,615	44.7	6,011,462	535,000
Nicaragua	1991	289,994	56.8	220,992	43.2	510,986	29,000
Panama	1990	103,688	58.9	72,366	41.1	176,054	16,000
Paraguay	1992	161,227	45.3	194,889	54.7	356,116	30,000
Peru	1993	1,207,483	47.7	1,323,828	52.3	2,531,310	105,000
Uruguay	1985	111,812	51.7	104,553	48.3	216,366	8,400
Venezuela	1990	763,413	70.8	315,359	29.2	1,078,772	148,000
Total		17,267,177		20,524,946		37,792,122	2,576,178
Average			45.7		54.3		

^aPercentage of the population of Latin America and the Caribbean studied in 1990: 96.15%.

Source: Adapted from ECLAC. Alojamiento y desarrollo: una tarea para los asentamientos humanos. Santiago, Chile: (LC/L.906 (Conf.85/3)/Rev.1). ECLAC; 1996: Table 9.

some cases, service was irregular, provided only intermittently throughout the day or not available every day (11).

In 1995, 69% of the population had wastewater and excreta disposal services (80% of the urban and 40% of the rural population) (11), and 81% of all households had electricity (10). Average service coverage for solid waste collection was 90%, and 57% for final disposal services in Latin American capitals and large cities (12), compared with rates of 70% and 20%, respectively, in smaller cities.

Other factors affecting human health which are still largely overlooked in Latin America and the Caribbean include a lack of handicap access to buildings and dwellings, storage methods for hazardous chemicals such as solvents and farm chemicals, and the use of residences as small-scale factories.

Indoor air pollution caused by burning fossil fuels in the home is a problem in rural and certain urban areas. Tens of millions of households around the world continue to cook or

heat with coal or other flammable fuels in open fireplaces or poorly ventilated stoves to which infants and children are often exposed. Exposure to these pollutants can stunt growth and trigger acute respiratory infections, including pneumonia and chronic obstructive pneumonopathy in adults. Reducing air pollution in the home would lower the incidence of and corresponding deaths from pneumonia in children (13).

Cigarette smoke inhalation by infants and young children also should be considered when conducting household air pollution studies. A study carried out in a residential suburb of London showed that children of parents who smoked in the home run a greater risk of contracting bronchitis and pneumonia than children of nonsmokers (14). The risk is even greater in overcrowded or poorly ventilated homes.

Injuries from falls are frequent in substandard housing and in dwellings built on steep slopes, where children are particularly vulnerable. A survey of 599 children under 5 years of

age in Rio de Janeiro shantytowns found that accidents accounted for 19% of all health problems, with falls (66%), wounds (17%), and burns (10%) representing the most frequent types of injuries sustained (15).

Whether or not electromagnetic fields can harm health is a highly controversial issue in the scientific community and continues to be the focus of a worldwide debate. With the exception of studies by the Cuban Health, Epidemiology, and Microbiology Institute, which established safety zones around leading sources of electromagnetic emissions such as radio and television antennas and high-voltage lines, there are very few publicized studies or research projects on this topic in Latin America and the Caribbean. There is not evidence that studies on air pollution in modern air-conditioned buildings in the Region have been conducted.

Very little is known about the radon situation in the Region. Radon is a colorless, odorless, radioactive gas that penetrates homes from underground water, rocks, or soil. There is a great deal of concern in the United States over health risks associated with exposure to natural radon gas in nonindustrial environments in general, and in homes in residential areas in particular. Findings from several research studies show many homes in the United States with extremely high radon concentrations and thousands of unsuspecting people exposed to high levels of radiation. As much as 15% of all cases of lung cancer may be caused by radon (16). According to the U.S. Environmental Protection Agency, at least 20,000 deaths from lung cancer have been linked to prolonged exposure to radon (17).

A WHO survey conducted in 1988 gathered information on housing conditions for the general population and for shantytown dwellers, squatters, refugees, and nomadic population groups, as well as on the role of health agencies in socioeconomic development processes (18). Seventy countries around the world responded to the survey, including 14 Latin American and Caribbean nations (Argentina, Bahamas, Barbados, Bolivia, Brazil, Chile, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Paraguay, and Peru). The survey identified such problems as shortages of adequate housing (in terms of structure, location, basic services, and space), which were more severe in rural than in urban areas. The survey also revealed that very little was being done to protect the population from air pollution in the home and from excessive noise, even in wealthy countries. While housing conditions generally mirrored economic conditions nationwide, and poverty was certainly a major factor, there were issues other than purely economic factors involved. The study concluded that not only are worldwide housing conditions not improving, but in certain densely populated developing countries they are actually deteriorating. In most countries, national development policies do not give high priority to upgrading housing.

In 1994, a joint initiative by PAHO and the WHO Collaborating Center at the State University of New York at Buffalo (U.S.A.) began the so-called "Health in Housing" centers at universities and other educational institutions in Bolivia, Chile, Cuba, Mexico, Nicaragua, and Venezuela, which, in turn, established the Inter-American Health in Housing Network in 1995. These centers have been set up to conduct research on health in housing and organize interdisciplinary groups made up of public health experts, architects, and other professionals to share information on health aspects of housing with government agencies and nongovernmental organizations working in this sector. Several network affiliates have begun to study this issue. The Cuban center, for example, conducted studies of heat and noise problems in multifamily dwellings, which led to the adoption of building standards in 1996. The center in Chile has conducted studies on psychosocial health, overcrowding, and the lack of healthful living environments in Santiago.

At the second meeting of network affiliates in October 1997, the Chilean center presented the findings from its "Health and Habitat" research project, which started in 1992 in the community of Villa Los Navios (19). The goal of the project was to assess health and environmental conditions, act on this information, and identify linkages between health and environment and necessary measures for improving living conditions. The major problems identified in this process had to do with the extremely small size of dwelling units, pockets of "hidden" poverty (female heads of household, child malnutrition), common diseases (acute respiratory infections, intestinal infections, accidents in the home), women's mental health (anxiety, depression, sexual dysfunction), pollution and danger sources, nonexistent or inadequate meeting and recreational facilities, children with learning problems in school, and insufficient school lunch programs.

After two years of operation, evaluation of the "Health and Habitat" project revealed a number of improvements in health conditions and environmental quality. The most important gain was the change in the feelings and attitudes of community members towards their neighborhoods, which spurred community-led improvements that, in turn, developed the community's capacity to negotiate with authorities.

It is a well-known fact that there is a close correlation between health and housing. The structure, as well as the location, setting, servicing, and uses of dwelling units all have an enormous impact on physical, mental, and social well-being. Substandard and poorly used dwellings offer inadequate protection against death, illness, and accidents and can even increase vulnerability to these factors. A large segment of the population lacks adequate housing or the necessary know-how for deriving the greatest possible health benefits from their dwelling. However, there are ongoing efforts throughout the Region to improve this state of affairs.

Water Supply and Sanitation Services

Water Resources

Population growth and agricultural and industrial development can deplete water sources and undermine their quality. The World Health Organization and other international, bilateral, and national organizations, as well as several United Nations Conferences have repeatedly expressed concern over the availability and the quality of water resources. Agenda 21 of the United Nations Conference on Environment and Development, for one, urged countries to adopt the rational management and allocation of water resources as a means of preventing conflicts and enhancing national development. It also pointed out that diseases related to water continue to pose major health problems, especially in developing countries, and that diseases caused by microbiological pollution, inadequate sanitation, and the lack of clean water are widespread.

In 1996, the Region's heads of state and government came together at the Summit of the Americas on Sustainable Development, held in Bolivia, to consider the social and economic value of water resources. They agreed to establish and implement specific programs, laws, and policies to protect the public's health by ensuring that drinking water is free from microorganisms, heavy metals, and chemical contaminants.

A concept of annual per capita renewable water resources has been established to assess the overall availability of water and to predict how population increases may create water scarcity. In these terms, Latin America and the Caribbean, with approximately 13% of the continent's water, clearly are well endowed with water resources. Some estimates suggest, however, that by the turn of the century the water available to each person, on average, will be one-third of what it was in 1950. Currently, some of the Region's countries, particularly several Caribbean islands, are near the limit of the sustainable yield of their groundwater resources and are on the verge of experiencing water scarcity. For other countries, problems may arise because their populations are concentrated in certain areas or because of economic activities that affect water distribution. In fact, because about 60% of the population of Latin America and the Caribbean is concentrated on the 20% of land that has only 5% of the Region's water resources, water problems in the Americas tend to be localized.

Water quality also is a critical issue. When human activities affect rivers, lakes, aquifers, and their associated systems, the environment, as well as human health and well-being, begins to degrade. For example, domestic, industrial, and agricultural activities can contaminate the water supply with household and chemical waste. And, as contaminated water often is used for drinking, preparing food and beverages,

and irrigating food crops, it becomes an important transmission pathway for some of the most serious and prevalent communicable diseases affecting Latin American and Caribbean countries. The use of water contaminated through the unsafe disposal of sewage and excreta is responsible for the transmission of amebiasis, hepatitis A and E, shigellosis, paratyphoid, typhoid fever, rotavirus infections—and cholera (20).

In Santiago, Chile, for example, 80% of the city's household and industrial sewage flows into irrigation canals and is subsequently used to irrigate agricultural land near the city. In 1992, some 350,000 ha in Mexico were irrigated with mostly untreated sewage, most of it untreated. And in Peru, about 33 sewage reuse projects, covering 4,000 ha, have been established along the coastal desert. Many of them use stabilization ponds before irrigation, and the effluent of these ponds is considered to be acceptable for several uses, including horticulture. Along the coast where 50% of the agricultural potential is untapped for lack of water, the applications of treated wastewater are very important to the economy.

In many of the Region's areas, explosive population growth in large cities, limited water availability, and a rising demand for food production perpetuate the use of water from urban sewer systems to irrigate crops. It should be noted that although the use of untreated wastewater for irrigation and other purposes poses serious health risks, municipal wastewater is a valuable resource with an important role to play in water resource management. Few countries have made any headway in recycling municipal wastewater for irrigation, hydroponics, and aquaculture, and before doing so, they must adopt control measures to ensure that water recycling practices follow sanitary standards.

Along the coast, few municipalities treat their sewage before discharging it into the ocean, and few outfalls transport sewage to sufficient depths or dilute it enough through proper design to minimize health risks. As a result, the contamination of brackish and saltwater bodies from which shellfish is harvested has been identified as a major contributing factor in the transmission of cholera, typhoid, paratyphoid, hepatitis, gastroenteritis, and paragonimiasis. Moreover, because nutrients in sewage can support increased biomass production, it is not uncommon for fishermen to harvest edible marine life in the most contaminated waters. Fishing in the immediate vicinity of the discharge should be banned, especially for products that are eaten raw. Oil spills from tanker accidents also contaminate ocean waters and shorelines, potentially harming the area's flora and fauna; the cost to clean up these spills and lost income from tourism can be high.

Groundwater pollution deserves special consideration, since it directly threatens the health of large segments of the population of Latin America and the Caribbean, as an esti-

mated 50% of the communities rely solely on groundwater as their source for water. Larger municipal areas, although somewhat less dependent on groundwater, commonly have many wells connected directly to the distribution systems to augment their surface water supply. And yet, despite the importance that groundwater has as a source of drinking water, aquifer protection has not received adequate consideration in the Region.

Increasingly widespread disposal of untreated household and industrial effluents directly into the ground, agricultural practices that introduce large quantities of inorganic fertilizers and pesticides into the soil that ultimately find their way into the groundwater, irrigation practices that can increase the salinity of groundwater, and poorly constructed wells are all responsible for groundwater contamination.

Most often, the health threat is the result of chemical contamination of groundwater. Nitrate levels that exceed the World Health Organization's Drinking Water Quality Guidelines (50 mg/l) are commonly due to improperly designed and constructed septic tanks in urban areas and to the excessive use of agricultural fertilizers in rural areas. Groundwater contamination by the leachates from landfills also is of growing concern in Latin America and the Caribbean. Excessive levels of such contaminants as arsenic and fluoride have been linked to some forms of cancer and to dental fluorosis in the Region, particularly in Argentina, Chile, and Mexico. In addition, industrial and commercial solvents such as chlorinated ethenes and chlorinated alkanes, as well as benzene, chlorobenzenes, and alkylbenzenes, are increasingly being identified as groundwater contaminants in many countries. Finally, leakage from buried gasoline tanks or pipelines also has been identified as a major cause of groundwater contamination, especially in metropolitan areas.

Although there have been no comprehensive groundwater contamination studies carried out in Latin America and the Caribbean, limited studies and spot checks indicate that groundwater contamination is on the rise. The protection of water sources and the integrated management of water resources lack support in the countries of the Region.

Drinking Water Supplies

The International Drinking Water Supply and Sanitation Decade (IDWSSD), 1981–1990, recommended that governments adopt programs with realistic goals for providing sufficient and good quality water to urban and rural areas.

In the Region, the evaluation of IDWSSD, based on 1988 information, established that by the end of 1988, 79% of Latin America and the Caribbean's population had water supplied through house connections or had reasonable access to public

sources.¹ Deficiencies also came to light, such as intermittent supplies, lack of monitoring and surveillance, and discharge of untreated or inadequately treated sewage in freshwater sources, all of which undermined the safety of the water supplied to the covered population. Other limitations included the sector's lack of organization in such aspects as investment recovery, wasted water, and human resources development, as well as a lack of political commitment.

In response to these results from the evaluation, international organizations, bilateral agencies, and NGOs underscored the need to renew efforts to improve these basic services for all the population. In the Americas, for example, the Directing Council of PAHO, the Inter American Association of Sanitary Engineering and Environmental Sciences (AIDIS), and others emphasized the importance of meeting the goals of IDWSSD.

Other international organizations and initiatives also have taken up the issue of drinking water supplies. The 1990 New Delhi Statement, which emerged from the global evaluation of the International Drinking Water and Sanitation Decade, proclaimed the need to provide access to safe water in sufficient quantity for all on a sustainable basis. Specifically, it proposed that by the year 2000, all urban residents should have access to safe water. Agenda 21 of the 1992 Earth Summit includes the most comprehensive set of recommendations for the sustainable development of urban and rural water supply, including protecting and safeguarding environmental health through the integrated management of water resources, pursuing institutional reform, and fostering community management and sound financing practices as the guiding principles for the development of water and sanitation services. The Caribbean Cooperation in Health initiative has set 1995 as the year to achieve total coverage in the CARICOM countries, and the 1995 World Summit for Children established global goals for water supply and sanitation for the year 2000.

The Declaration of Santa Cruz de la Sierra and the Plan of Action for the Sustainable Development of the Americas, which emerged from the Summit of the Americas on Sustainable Development, held in Bolivia in 1996, promote the equitable and effective access to basic health services and secure water supply, requesting that the governments strengthen their programs to assure that water supplies are safe and adequate.

The Environmental Leaders' Summit of the G7 countries and Russia that was held in Miami, Florida, in May 1997, issued a declaration that recommended that foreign assistance

¹Reasonable access to water supply in an urban setting is defined as the availability of water at a distance no greater than 200 m from a home. In rural areas, the definition is more flexible, and depends on the area's topography.

programs of the eight countries, international organizations, and international financial institutions, focus increased attention on drinking water disinfection and water source protection worldwide. They also called for an exchange of monitoring data on microbiological drinking water contaminants and waterborne disease outbreaks and for research cooperation to support the development of technologies and methods, focused on small drinking water systems, to control disease outbreaks.

The United Nations General Assembly in its Special Meeting on the Implementation of Agenda 21, held in June 1997, adopted a program for the further implementation of agenda recommendations. Meeting participants highlighted the fact that a diminishing supply of clean water was an issue for many countries, impeding their sustainable development. Moreover, they expressed concern over the depletion of groundwater supplies because of intense irrigation and fear that conflict over water rights could lead to regional political disputes and even armed conflict in the next century. Rapid urbanization and inadequate infrastructure has meant that up to one-third of the world's population had no access to potable water or modern sanitation facilities. The Assembly warned of a water crisis by the year 2025 if water use and management patterns were not altered.

Furthermore, the Secretary General of the United Nations in his 1991 report on the achievements of the International Drinking Water Supply and Sanitation Decade recommended that information systems on water and sanitation be strengthened, as did the New Delhi Statement, the declaration on water and sanitation issued at the World Summit on Children, and the 1990 Declaration of Puerto Rico.

Based on population growth projections, 80 million persons would need to be provided with water supply and sanitation between the years 1990 and 2000, and this figure is in addition to the 89 million persons already lacking these services, as reported in the 1990 evaluation of IDWSSD.

Echoing the pronouncements and recommendations of the United Nations and various international organizations and fora, the World Health Organization and UNICEF signed an agreement to assist Member Countries to develop an information system that would enable them to more accurately estimate the coverage and quality of water services. Referred to as WASAMS, this system would identify populations at risk and help plan for services, especially those targeted to the unserved population. The decentralization of services and the absence of a central agency that can undertake responsibility for this process, among other factors, have delayed the development of this system in some countries (21). Without the existence of such a reliable information system at the national level, the water and sanitation situation in the countries cannot be accurately assessed.

Mid-Decade Water Supply Coverage

In 1995, 23 of the Region's countries—representing 98% of the population in Latin America and the Caribbean—reported on their water supply and sanitation coverage. Based on this information, in 1995 73% of these countries' total population had water supplied through house connections or other means such as public standposts at a reasonable distance of the home.

The mid-decade survey also indicates that the development of water supply services in this Region has been much slower than expected (22). In comparison, information supplied to PAHO by the Water Resources Division of the United States Environmental Protection Agency in 1996 indicates that in the United States, 250 million people (93% of the population) are served by public water systems and 20 million (7%) by private systems. Canada also indicates that 99% of its population is supplied with safe drinking water: 86% through central systems and 14% through individual means (Health Canada, communication to PAHO, 1997). Table 4 shows each of the 23 countries' urban and rural water supply coverage and the total coverage reported for 1995.

In 1988, the 23 countries reported that coverage of their urban water supply services through house connections and public sources was 88%. In the rural sector, 55% of the population had water supplied primarily through public sources. By 1995, urban coverage was reported at 84% and rural coverage at approximately 41%.

Brazil, Colombia, Haiti, and Venezuela reported a drop in water supply coverage figures in 1995, as compared to the 1988 figures. For example, Brazil experienced a drop in urban water supply coverage, from 100% in 1988 to 80% in 1995, and its rural coverage dropped from 86% in 1988 to 28% in 1995. (It should be noted that some countries such as Brazil that encompass a large proportion of the Region's population, can significantly affect regional statistics.) Colombia also reduced its rural coverage from 87% in 1988 to 32% in 1995, and Ecuador, from 47% in 1988 to 10% in 1995. Haiti reported a drop from 55% in urban population served by the end of the 1980s to 38% in 1995, and Venezuela reduced both its urban and rural coverage figures from 89% in 1990 to 79% in 1995.

In contrast to the above countries, Bolivia, the Dominican Republic, and Mexico notified significant increases in water supply coverage from 1988 to 1995. Bolivia's coverage rose from 46% in 1988 to 70% in 1995; the Dominican Republic's, from 68% urban coverage and 28% rural coverage to 88% and 55%, respectively; and Mexico's, from 80% urban coverage and 41% rural coverage to 83% and 57%, respectively.

Clearly, an in-depth evaluation of coverage is needed, particularly for those countries that reported decreases. It also is

TABLE 4
Population served with water supply, Latin America and the Caribbean, 1995 (population in thousands).

	Drinking water supply											
	Population			Total population served		Urban population						Rural population
	Total	Urban	Rural	Population	%	House connections	%	Easy access	Total	%	Total	%
Argentina	34,587	30,153	4,434	22,590	65	20,580	68	944	21,524	71	1,066	24
Bahamas	278	235	43	261	94	207	88	17	224	95	37	86
Bolivia	7,061	4,320	2,741	4,979	71	3,232	75	579	3,811	88	1,168	43
Brazil	161,784	126,190	35,594	111,035	69	93,158	74	7,867	101,025	80	10,010	28
Chile	13,951	11,823	2,128	12,644	91	11,649	99	N/A	11,649	99	995	47
Colombia	35,886	26,491	9,395	26,848	75	22,782	86	1,060	23,842	90	3,006	32
Costa Rica	3,300	1,441	1,859	3,286	100	1,438	100	N/A	1,438	100	1,848	99
Cuba	10,998	8,200	2,798	10,020	91	6,749	82	1,251	8,000	98	2,020	72
Dominican Republic	7,374	3,996	3,378	5,388	73	2,255	56	1,259	3,514	88	1,874	55
Ecuador	11,460	6,944	4,516	6,256	55	5,484	79	321	5,806	84	450	10
El Salvador	5,310	2,685	2,625	2,831	53	2,103	78	105	2,208	82	623	24
Guatemala	10,621	4,108	6,513	7,087	67	3,461	84	517	3,978	97	3,109	48
Haiti	7,180	2,588	4,592	2,795	39	743	29	246	989	38	1,806	39
Honduras	5,462	2,425	3,037	4,211	77	1,870	77	337	2,207	91	2,004	66
Mexico	91,606	66,396	25,210	76,097	83	61,761	93	N/A	61,761	93	14,336	57
Nicaragua	4,139	2,138	2,001	2,553	62	1,847	86	146	1,993	93	560	28
Panama	2,630	1,412	1,218	2,216	84	1,380	98	18	1,398	99	888	73
Paraguay	4,564	2,297	2,267	1,768	39	1,358	70	N/A	1,358	59	150	6
Peru	23,468	16,446	7,022	15,486	66	10,410	63	2,878	13,288	81	2,198	31
Suriname	410	263	147	366	89	250	95	13	263	100	103	70
Trinidad	1,257	887	370	1,212	96	800	90	87	887	100	325	88
Uruguay	3,129	2,820	309	2,795	89	2,626	93	169	2,795	99	N/A	N/A
Venezuela	21,844	18,656	3,188	17,276	79	13,696	73	1,073	14,769	79	2,507	79
Total	468,299	342,914	125,385	340,000	73	269,840	79	19,147	288,987	84	51,083	41

Source: Information provided by the countries.

important to establish a database in the countries for monitoring the sector for the remainder of the decade.

There are no sustained initiatives to promote the development of water and sanitation and attain the targets and goals of providing access to water to all the population in the Region by the year 2000. Moreover, major disparities remain between the countries as far as coverage is concerned. Table 4 indicates that Haiti and Paraguay still cover less than 40% of their population with access to safe drinking water, and Guatemala, Ecuador, Nicaragua, Peru, and Brazil report less than 70% total coverage. Given these figures, the total unserved population is estimated at 128.3 million. In addition, ten countries reported covering less than 40% of their rural

population with water supply. Coverage figures for countries not included in this analysis are shown in Table 5.

Drinking Water Quality

The cholera epidemic that has buffeted the Region since 1991 and the publication of the English and Spanish versions of the revised WHO Guidelines for Drinking Water Quality provided strong incentives for evaluating the safety of drinking water and for improving its quality.

Prior to the cholera epidemic, most Latin American and Caribbean countries had focused on the quantity, rather than

TABLE 5
Coverage of water supply in selected English-speaking Caribbean countries, 1996.

Country	Total population	Urban and rural coverage (%)	Coverage by house connection (%)
Anguilla	9,000	all use rain water	
Antigua and Barbuda	66,000	100	86
Barbados	260,000	100	95
Cayman Islands	32,000	90	90
Dominica	72,000	85	65
Grenada	95,000	94	64
Saint Kitts & Nevis	42,200	98	70
Saint Lucia	140,000	98	70
Saint Vincent and the Grenadines	107,600	75	47
Turks and Caicos Islands	14,000	no system of distribution	

Source: Caribbean Environmental Health Institute, April 1996.

the quality, of water available for human use. In fact, studies revealed that fewer than 25% of the community water systems in Latin America and the Caribbean were reliably and continuously disinfected. The cholera epidemic brought about an examination of water quality, motivating several countries to put in place programs designed to improve water quality and sanitary waste disposal. As a result, the incidence of other waterborne diseases also dropped.

The most dramatic effects were seen in Chile. With more than 98% of the population already served by water supplies that were reliably and continuously disinfected, the environmental health and education measures taken to prevent cholera also considerably reduced the incidence of typhoid fever and the number of cases of hepatitis A. Other countries also reported decreases in the incidence of and mortality from diarrheal diseases as a byproduct of cholera control measures. Since 1991, most of the countries of the Region have increased surveillance and monitoring of drinking water quality and have improved water quality control, particularly the disinfection of water distribution systems.

A study carried out in 1994 (23) on the status of water disinfection in Latin America and the Caribbean put the percentage of the population who regularly received disinfected water at 59%. There are great variations between countries and between urban and rural areas, however. Five countries, including Brazil, reported that less than 10% of their rural population supplied with water received disinfected water, and four countries indicated that less than 50% of their populations were supplied with disinfected water. Available information indicates that Mexico has been able to increase coverage of chlorinated water from 35 million people in 1991 to approximately 68 million people in 1994. The information also shows that 13% of the countries reported covering less than 40% of their urban population and less than 45% of

their rural population with disinfected water. Most countries pay less attention to the disinfection of water supply in the rural areas.

The Government of Germany-sponsored Project on Training and Social Mobilization for the Prevention and Control of Cholera in Latin America that has been under way since 1993, has provided Bolivia, Colombia, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Panama, and Peru with an opportunity to plan for the introduction and testing of technologies for on-site production of disinfectants and the use of disinfectant solutions such as sodium hypochlorite. The Government of Italy provided funds for similar projects in Bolivia, Colombia, the Dominican Republic, and Nicaragua; the first two countries have been particularly successful in experimenting with disinfection at the household level as an effective measure to control cholera and diarrheal diseases.

In 1995, 23 countries in the Region reported that most people living in urban communities received water according to the WHO Drinking Water Guidelines, while rural inhabitants did not. Moreover, there was a strong correlation between receiving disinfected water and receiving water according to the guidelines. It should be noted that the population covered with systems that have adequate monitoring and surveillance is small, even in urban areas; however, it is known that in many urban areas the integrity of the water supply systems is questionable, because supplies are intermittent and the systems have many leaks. In rural areas monitoring and surveillance is virtually nonexistent.

Although the disinfection of the water supply in Latin America and the Caribbean has advanced measurably since 1991, the systematic disinfection of water continues to lag. Scarce chlorine, insufficient funds, and improper operation and maintenance have caused disinfection to stop for several

periods, particularly in small towns. These problems were partially responsible for the spark in interest in the development and use of technologies for on-site generation of chlorine and other disinfectants during 1990–1995.

The lack of quality control of drinking water also is a matter for concern. A recent survey revealed that most of the Latin American countries did not have adequate regulations or appropriate surveillance systems.

Efforts are under way to help the countries attain the goal of providing safe drinking water for all people in the Region. Part of this effort involves the development of a strategic plan for water quality improvement for the countries as discussed in the Regional Drinking Water Quality Conference held in Lima, Peru, in May 1996.

Water Usage. Water consumption in urban areas ranges from 100 l per capita per day in Uruguay to more than 600 l per capita per day in Panama; on average, water consumption hovers around 200 l per capita per day in urban areas. In rural areas, water consumption ranged from 40 l per capita per day in Nicaragua to 200 l per capita per day in Argentina; average use in rural areas is estimated between 80 and 90 l per capita per day. It should be noted that unaccounted water levels are high in many urban and rural areas. Table 6 shows the daily water consumption reported by the countries.

Sewage and Excreta Disposal

In 1988, wastewater and excreta disposal facilities reportedly covered 66% of the Region's population, a figure that represents an increase of 7% over the 1980 coverage. The extension of urban services (from 78% to 80%) in that period essentially only kept up with population growth. Rural coverage during the same period increased from 22% to 32%. In comparison, by 1995 total coverage had increased to 69%; although urban services remained constant at 80%, rural services were extended to approximately 40% of the population.

Data for 1995 further indicate that only 52% of the urban population was connected to municipal sewage collection systems; the remainder is served by individual facilities such as septic tanks, cesspools, and latrines. For the most part, sewage disposal in rural areas is disposed of through individual facilities, mainly latrines and some septic tanks and seepage fields. Because sewage collectors are very costly, several countries, including Brazil, have resorted to appropriate technologies that combine septic tank systems and small diameter sewers. On-site waste disposal technologies are also being applied in most suburban areas of Latin America. Table 7 shows the level of coverage for sewage collection and excreta disposal by country and for urban and rural areas.

TABLE 6
Per capita consumption of water and
source of water supply, 1995.

Country	Estimated water consumption (liters per capita per day)	
	Urban	Rural
Argentina	300	200
Bahamas	159	136
Bolivia	120	60
Brazil	175	...
Colombia	150	150
Costa Rica	250	180
Dominican Republic	600	100
Ecuador	145	50
El Salvador	200	80
Guatemala	124	88
Haiti	100	20
Mexico	278	100
Nicaragua	156	40
Panama	666	...
Peru	300	50
Suriname	120	86
Trinidad	275	190
Uruguay	100	...
Venezuela	356	...

Source: Pan American Health Organization. Mid-decade evaluation of water supply and sanitation in Latin America and the Caribbean. Washington, DC: PAHO; 1997. (PAHO/HEP/97/14).

In 1988, an estimated 162 million people in Latin America and the Caribbean lacked adequate means of wastewater and excreta disposal, 73 million in urban areas and 89 million in rural. By the end of 1995, and based on the figures provided by the countries, 145 million persons had unmet needs—67 million in urban areas and 78 million in rural. To date, the lack of sewage treatment continues to be one of the most critical sanitary problems in Latin America.

Estimates prior to 1995 put the level of sewage collected that received treatment at 10% or less. The 1995 survey indicates that the median for the percent of sewage collected that received treatment is just 13%. Argentina reports treating 10% of its sewage, while Colombia reports treating only 5%. Brazil estimates that it treats 20% of its sewage and Mexico, 13%. The water pollution problems in Latin America have been well documented, and data show no evidence of any substantive effort to change this situation. Nonetheless, some activities deserve mention. For instance the Buenos Aires metropolitan area has constructed 20 waste treatment plants and is building 15 more, and Mexico has built 16 treatment plants to control the discharge of wastewater into the Lerma-Santiago River basin.

TABLE 7
Population served with sewerage and sanitation services, Latin America and the Caribbean, 1995 (population in thousands).

Country	Sewage and excreta disposal											
	Population			Total population served		Urban population					Rural population	
						House connections						
	Total	Urban	Rural	Population	%	%	Others	Total	%	Total	%	
Argentina	34,587	30,153	4,434	26,104	75	11,686	39	12,565	24,252	80	1,852	42
Bahamas	278	235	43	278	100	38	16	197	235	100	43	100
Bolivia	7,061	4,320	2,741	4,376	62	1,784	41	1,324	3,108	72	1,068	39
Brazil	161,784	126,190	35,594	109,075	67	44,036	35	49,563	93,599	74	15,476	43
Chile	13,951	11,823	2,128	11,231	81	9,340	79	1,891	11,231	95	...	...
Colombia	35,886	26,491	9,395	21,081	59	17,219	65	1,325	18,544	70	2,537	27
Costa Rica	3,300	1,441	1,859	3,198	97	788	55	653	1,441	100	1,757	95
Cuba	10,998	8,200	2,798	9,643	86	3,608	44	3,953	7,561	92	2,082	74
Dominican Rep.	7,374	3,996	3,378	5,680	77	1,127	28	2,445	3,572	89	2,308	68
Ecuador	11,460	6,944	4,516	6,073	53	4,262	61	627	4,889	70	1,184	26
El Salvador	5,310	2,685	2,625	4,091	77	1,615	60	773	2,388	89	1,703	65
Guatemala	10,621	4,108	6,513	7,141	67	2,868	70	998	3,866	94	3,274	50
Haiti	7,180	2,588	4,592	1,846	26	...	...	1,112	1,112	43	734	16
Honduras	5,462	2,425	3,037	4,453	82	1,216	50	1,078	2,294	95	2,159	71
Mexico	91,606	66,396	25,210	69,292	76	54,063	81	8,000	62,063	93	7,229	29
Nicaragua	4,139	2,138	2,001	2,437	59	730	34	1,147	1,877	88	560	28
Panama	2,630	1,412	1,218	2,381	91	899	64	500	1,399	99	982	81
Paraguay	4,564	2,297	2,267	1,465	32	466	20	...	466	20	999	44
Peru	23,468	16,446	7,022	14,431	61	9,654	59	3,141	12,795	78	1,636	23
Suriname	410	263	147	303	74	7	3	244	251	95	53	36
Trinidad	1,257	887	370	1,204	96	284	32	580	864	97	340	92
Uruguay	3,129	2,820	309	1,593	51	1,593	56	...	1,593	56	...	...
Venezuela	21,844	18,656	3,188	15,767	72	11,562	62	2,295	13,857	74	1,910	60
Total	468,299	342,914	125,385	323,343	69	178,845	52	94,611	273,457	80	49,886	40

Source: Information provided by the countries.

In contrast to the situation in Latin America, 75% of homes in the United States are served by centralized collection and treatment systems, and most of the remaining 25% are served by septic tank and soil absorption fields (information supplied to PAHO by the United States Environmental Protection Agency's Waste Disposal Section). Canada reports that 100% of its population is provided with adequate wastewater and excreta disposal facilities: 75% of these systems are central and 25% individual; only 5% of the central systems discharge wastewater without adequate treatment. The New Delhi statement specifically proposed that by the year 2000, 75% of urban residents should have on-site or community facilities for sanitation; that quantitative and qualitative discharge standards would have been established and applied to municipal and industrial effluents; and that 75% of solid waste should be collected, recycled, or safely disposed of.

The 1991 Consultative Meeting on Excreta and Wastewater Disposal in Latin America and the Caribbean identified several critical issues that must still be addressed (24). Insufficient political support from governments to relevant sector institutions, as well as an overall lack of awareness on the part of the public have left pollution virtually unchecked in the countries. Latin America and the Caribbean must pursue an integrated management of water resources and waste treatment and disposal. Other issues, such as the need to change methodologies and criteria used for financing wastewater facilities by the international financing agencies, also were identified, as were the inadequacy of environmental policies, institutional deficiencies, and the need to develop appropriate technological and engineering standards for waste disposal.

Meeting participants recommended that cooperation of international financing agencies concentrate on the Region's

wastewater treatment needs, emphasizing the development of projects for the collection and treatment of wastewater and the control of water pollution.

Moreover, greater participation of professional organizations and pressure groups was seen as essential for supporting the development of appropriate environmental policies and addressing environmental issues related to waste treatment and water pollution. The strengthening of environmental education programs to promote community awareness and participation also was recommended to improve sector policies.

When wastewater and excreta disposal projects are analyzed financially, the benefits of preventing diseases such as cholera should be considered. It has been suggested that sectors such as tourism, agriculture, and industry should be taxed to help defray the expenses of providing adequate collection and treatment of waste and to support environmental control in the Region.

Participants also strongly recommended that the international financing institutions consider a more integrated approach for projects, in particular, that water supply projects not be financed unless there is a concomitant commitment to fund wastewater disposal projects. And in developing integrated and well coordinated water resources management programs, they recommended that health, environmental, and economic aspects be considered. Finally, meeting participants recommended that more research be conducted on the use of appropriate technologies as a way to provide low cost solutions to the collection, treatment, and disposal of wastewater.

Overview of the Sector

The sector's development has been curtailed by various restrictions that directly affect operational efficiency. Sector analyses in Belize, Colombia, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico (Oaxaca), Venezuela, and several states in Brazil indicate that most countries face similar problems. These include institutional inefficiency, inadequate sectoral planning, limited capacity to carry out projects, insufficiently developed fee systems to guarantee adequate availability of resources within time periods that are in line with the maturation period of investments, weak management, and a vast need for training. Even though Argentina, Bolivia, Colombia, Mexico, Nicaragua, Panama, Peru, and Venezuela try to take optimal advantage of citizen participation, especially of the private sector, in managing services in urban and rural areas (25), available information confirms the continuing erosion in the quality of services seen at the end of the last decade.

Institutional Factors. The decentralization of the operation and provision of services, and the devolution of invest-

ment management to the regional and municipal levels, began in the Region during the 1970s. These changes, however, were not always accompanied by effective delegation of authority and formulation of consistent and appropriate legal instruments. Local entities were created without clearly defining their roles, without measures to plan investment and independently manage the systems, and without powers to set and meet financial goals. Moreover, many activities of the centralized agencies are planned and put into practice in an isolated way, without coordination with the other agencies involved, other sectors, or the population to be served. In many cases, the economic authorities are not provided with justifications for fee or loan requests submitted in times of crisis, and they make decisions without considering the sector's overall development framework.

Managers of municipal government or autonomous water and sewerage agencies, particularly in cities of less than 100,000 inhabitants, still are not using appropriate business management mechanisms. In addition, they are unable to benefit from economies of scale and cannot afford to pay adequate salaries to administrative and trained technical staff, due to existing fee systems and the public's limited ability to pay for services. Brazil, Chile, and Colombia have satisfactorily solved the problem through regional public companies and companies that serve several municipalities and towns. In various countries of the Region, there are entities that provide efficient planning and oversight services for construction and are also effective in operating and maintaining the physical infrastructure of the services and in commercial and financial management. Examples include the Metropolitan Sanitation Works Company in Chile, the municipalities of Medellín and Cali in Colombia, and, in Brazil, the State Sanitation Company of Paraná, the State of São Paulo Basic Sanitation Company, and the Sanitation Company of Minas Gerais.

Sectoral Planning. The sector's agencies that are responsible for overseeing services usually give adequate attention to engineering factors in developing investment projects to expand hydraulic sanitation infrastructure, but not to economic, financial, and institutional analysis. Investments turn out to be inefficient, because minimum cost analyses are not yet universally applied in choosing among alternative methods to carry out projects. Furthermore, there is often no complementary analysis of project demand, optimum capacity of existing infrastructure, size of and opportunity for new investment, and the effect of an adequate maintenance system on efficiency.

Ability to Execute Projects. The average time it takes to carry out projects to expand and improve the infrastructure of services continues to be very long, regardless of the nature and source of the funding. In addition to a lack of op-

portunity to use local matching funds, there are flaws in such elements as the procurement process and construction management methods, which also affect the execution of projects.

Financial Factors. The sector continues to rely on State budgets for funding capital investment and, to a lesser extent, operational costs. The results of this ongoing subsidy are more harmful than beneficial, because this type of government assistance discourages the establishment of fees that reflect actual service costs.

Unofficial cost-recovery policies also hinder efforts to improve operational efficiency, since commercial and measurement practices, high levels of water not accounted for, and the low billing and collection levels create the need for more works and for even greater subsidies to cover the operational and investment costs.

Because most of the agencies within the sector do not have the authority to set customer fees, they must charge expenses against operating costs, but lack the power to set financial goals. The authority to set the charges rests with government officials, and they are often reluctant to establish explicit fee policies and authorize price increases, even if only to keep them on a par with inflation; this reduces the incentive for financial planning. In addition, most of the operating agencies are not in a position to formulate effective strategies to increase earnings, control costs, or identify sources of financing for future investment needs. This flaw in financial planning is worsened by inadequate accounting systems that do not provide proper and timely information on costs and on the financial status of the companies. As a result, investment programs are paralyzed, the execution of work is long delayed, and maintenance receives inadequate attention.

The proliferation of specifically allocated concessional funds and financing windows for water supply and other municipal services has made the decision-making process on investments in these services more confusing and has distorted resource allocations. Those water companies that have been able to systematically generate an operating surplus to finance a significant part of their own investment programs show levels of service above 95% and above-average performance indicators.

Management and Training. Management flaws affect the sector at all levels, but especially the local provision and management of services (26). Administrative instability is responsible for an absence of goals and long-term planning, poorly defined lines of communication, inadequate delegation of responsibility and authority, and a complicated decision-making process. In many countries, the fact that there is no system for career advancement in the field of public adminis-

tration, along with low salaries (even in comparison with other public agencies), mean that the best-trained people are not drawn to management positions in the sector.

In general, there has been no overall evaluation of the need for training, and training programs rarely go beyond the limited concept of courses, seminars, and occasional grants. Most of the agencies are reluctant to fund training programs, viewing them as a waste, due to the high staff turnover.

Government Responsibility and Community Participation

Because of the close relationship that drinking water and sanitation services have to health and well-being, they have come to be seen as vital public services, with the government having the exclusive role and responsibility of providing the physical, institutional, and regulatory means to establish the services and make them available to the community. The principle of equity—of making the services available to the entire population—is an essential component of supplying public water and sanitation services (27).

Currently, most of the aqueducts and sewerage systems in Latin America are overseen by specialized public entities, State industrial and commercial companies, some private concessionary companies, cooperatives, and associations of users at the national, regional, municipal, or rural level. These entities are primarily involved with investing funds to construct the physical structures to produce and distribute water and to collect and dispose of sewage. They are not concerned in any significant way with appropriate business organization or management practices that provide efficient and effective services.

Community Participation. In urban areas the community has participated little in the various stages of carrying out projects. Nevertheless, the current trend of participatory democracy has led, in several countries in the Region, to active community representation on boards of directors or on the boards of community groups that manage the operating agencies. This has given community members an added awareness of their rights and duties as service users. Community participation has ranged from passive observation to active involvement, but in only a small number of cases has the full potential for participation been utilized. In rural areas, communities contribute through manual labor, materials, and local funds to cover construction costs. At times, rural communities also form local committees and assume responsibility for managing the systems, collecting revenues, and paying basic operating costs. In order to encourage wider participation, it is essential to organize such committees and provide them with technical assistance on the operation and maintenance of their systems.

Reform and Modernization in the Sector

While it is important not to overlook the progress achieved by certain drinking water and sanitation service operating agencies, it must be noted that there has been a marked slow-down in the growth of coverage and a clear degradation in the quality of services. The wave of reform and modernization in the sector, which coincides with and is part of the broader trend toward reforming and modernizing the State, must start with an analysis of the situation. The strengths and weaknesses of each situation must be identified, and a simplified process developed to formulate the best institutional/organizational approach. The particular characteristics of how the services are managed must be taken into account, at the same time that maximum efficiency is ensured and that necessary requirements for equity and social benefit are met.

These processes have been put into practice in Argentina, Bolivia, the Dominican Republic, Nicaragua, Panama, Peru, and Trinidad and Tobago. The Dominican Republic and Nicaragua began their activities by carrying out sectoral analyses of drinking water and sanitation, with technical assistance from PAHO as part of the Environment and Health Investment Plan initiative (PIAS).

The trend throughout the Region has been to focus on the municipality as the primary administrative unit responsible for the well-being of its inhabitants, including providing homes with basic services. There is also a trend toward encouraging more private sector provision of these services, with the aim of improving their efficiency. As a result, it has been necessary to regulate this participation so as to guarantee equity in its various social aspects.

Decentralization. The general trends toward reducing the size of the government and increasing the participation of society at large, along with decentralizing the decision-making process on planning and investment issues, have defined the development policy of countries and, therefore, of municipalities. For various reasons, this policy has not yet been put into practice everywhere, and the rate of progress in this process is different in each country. In some cases, operation and management have been fragmented, eliminating advantages of economies of scale; in other instances, the operating agencies have gained management autonomy.

Private-Sector Participation. Various factors have encouraged countries to promote greater private sector participation in providing drinking water and sanitation services. These include the increase in efficiency and effectiveness of the operating agencies, the reduction in costs, the flaws caused by the monopolistic nature of the services, and the trend toward attracting private capital to the sector in order

to try to reduce deficiencies in coverage and quality of services. Private sector participation also is seen as a viable alternative for improving the quality of both the services and the economic management of the responsible institutions.

The form and the rate of privatization depend on the particular situation of each country and on other local factors. Likewise, the extent of participation by the private sector in operating and financing water and sanitation services varies widely (27, 28). Participation in project design, oversight, and construction has become an increasingly common practice, encouraged in nearly all of the countries. Participation in the operation, administration, and management of the services also has increased in recent years, making it possible to reduce public agency staff who prepare and oversee the contracts. The experience of the Metropolitan Sanitation Works Company, in Santiago, Chile, is an example of the type of contract that is used in most of the countries in the Region.

Contracts for construction, operation, and property transfer, whereby the private sector finances new construction and then operates and maintains the facilities for indefinite or specified periods (generally 30 years), have been used in a number of countries. They include Argentina (Buenos Aires, Corrientes, Mendoza, Santa Fe, and Tucumán), Bolivia (La Paz), Mexico (Cancún), and Panama (Panamá City). The Municipality of Cartagena, Colombia, put together a joint venture with a private operating firm through a 26-year contract (29, 30).

Regarding private sector involvement in the management and operation of drinking water and sanitation services, the most significant examples are the Management Contract for Aqueduct and Sewerage System Services of Puerto Rico, and the contracts established by the Basic Sanitation Company of the State of São Paulo, Brazil, to operate the drinking water and sanitation systems (including large treatment plants) of the metropolitan and coastal areas. Also worthy of mention are the cases of Puerto Vallarta (wastewater treatment plant) and the drinking water and sanitation services of Aguascalientes (both in Mexico), those of Monagas and Lara, in Venezuela, and the Regional Aqueduct of Esmeraldas, in Ecuador.

All of these types of private sector involvement have introduced some form of competition, which translates into greater efficiency in management, measured in terms of greater earnings, improved revenue collection, and reduced water loss; these, in turn, make it possible to expand services to more users.

Regulation. The regulation of services related to water, especially those of drinking water supply and sewerage systems, helps protect the welfare of users and provides the operating agencies with clear performance rules. There are two predominant patterns in regulation. One is the national and

centralized regulation of private sector participation through an institution that wields the maximum level of authority and relative autonomy, such as is done in Chile, Colombia, Ecuador, Panama, Peru, and Puerto Rico. The other pattern involves decentralized regulation at the local or provincial level, such as is done in Argentina (30, 31).

Food Protection

Foodborne diseases (FBDs) constitute a public health problem and lead to decreased economic productivity as a result of diarrhea in children and adults, cholera, salmonellosis, listeriosis, infections from enterohemorrhagic *Escherichia coli*, and chronic poisoning caused by chemical contaminants. In addition to the suffering they cause, FBDs impose a substantial economic toll on those affected and their families, as well as on industry and health care systems.

Outbreaks of foodborne diseases affect tourism and trade. In 1991, the cholera epidemic in Peru led to a loss of US\$ 700 million due to the temporary halt in fish and shellfish exports. A further US\$ 70 million was lost in the first three months of the epidemic from the shutdown of food production facilities and the decrease in tourism. The World Health Organization estimates that, in 1993, FBDs produced worldwide losses of approximately US\$ 380 million in the international food trade. This serious impact, however, is not reflected in the limited funds allocated to programs specifically aimed at controlling food safety and quality.

Food Protection and Hygiene Services

The 1985 Inter-American Conference on Food Protection pointed out that the lack of coordination between various national and international institutions was an obstacle to solving food safety problems. The problems caused by socioeconomic changes experienced by countries in the Region add to this. Bias in allocating professional and sectoral responsibilities and in the competition for raising additional funds frequently interfere with an effective coordination among various institutions. There are also marked disparities among countries in the activities to control chemical and biological substances used in food. The greatest weaknesses can be seen in the areas of human resources and infrastructure. Laboratories do not have quality assurance programs, and nearly all the countries lack programs to control toxic residues in food for domestic consumption.

North America. The most advanced and comprehensive food protection programs in the Americas are being implemented in North America. While the United States is a leader

in food protection in the Region, it was only in 1996 that its present, unified food protection program was established. Until then, the Department of Agriculture's Food Safety Inspection Service (FSIS), responsible for monitoring all meat products, and the Department of Health and Human Service's Food and Drug Administration (FDA), which monitors all other food products, had operated independently. Currently, the two institutions coordinate their activities, and they have established a joint research center. The Food Safety Initiative, announced in 1997, is indicative of the trend toward interinstitutional cooperation, with activities that include the active participation of the Centers for Disease Control and Prevention (CDC), which is responsible for epidemiological monitoring of FBDs.

In Canada, food monitoring programs were restructured in 1997. All of the inspection activities are now consolidated within Agrifood Canada, a new agency that is part of the Ministry of Agriculture and operates in coordination with the Ministry of Health. Monitoring activities related to sale and distribution remain the responsibility of the Ministry of Health, which is also in charge of epidemiological monitoring of FBDs. The structure is similar at the provincial level.

In Mexico, monitoring of food products is carried out by several institutions, and until 1997, there was no coordination between them. The Ministry of Agriculture is responsible for monitoring facilities where animals are slaughtered for domestic consumption or export. Other food products for domestic consumption are monitored by the Ministry of Health, which also oversees food marketing and consumption, except for fish and shellfish, which are the responsibility of the Office of Environmental Sanitation. The remaining food products are under the control of the Subsecretariat of Regulation and Oversight. Epidemiological monitoring of FBDs is carried out by the Ministry of Health's Office of Epidemiology.

Central America. The Central American subregion is especially well positioned to market meat and other foods derived from animal products. Since the subregion is free of foot-and-mouth disease, it is able to export fresh meat to the United States. Because of this, the ministries of agriculture in all the countries have meat inspection services that monitor meat plant producing for export. Meat and other foods produced for domestic consumption are overseen by the ministries of health. In general, there is no coordination between the ministries of health and the ministries of agriculture, and epidemiological monitoring of FBDs is still being established.

Guatemala has an intersectoral committee that coordinates food monitoring activities. As part of this effort, the Ministry of Agriculture inspects meat for export, but not for the domestic market. In addition, the Ministry of Public Health and Social Assistance oversees marketing of food sold by street vendors, but only through the granting of permits for prod-

ucts produced for the national market and without truly effective control. The national system for monitoring FBDs has submitted its initial results. In 1997, Panama established the National Comprehensive Food Protection Program. Administered by the Ministry of Health, it aims to coordinate the activities of the different institutions involved, including those doing epidemiological monitoring of FBDs.

Caribbean Subregion. Cuba stands out as the country with the best food monitoring system in the Caribbean subregion. The program is unique in terms of legislation and coordination, and its activities are decentralized at the provincial level. All food products are monitored, and the monitoring system for FBDs is linked with the country's hospitals, hotels, and health care facilities. In Jamaica, the National Food Protection Committee is responsible for coordinating the actions of the various institutions. While coordination falls under the authority of the Ministry of Health, most of the monitoring activities are carried out through the Office of Weights and Measures, with officials located throughout the country. The Dominican Republic has a food monitoring program administered by the Ministry of Public Health and Social Assistance. At present, however, only the inspection of meat for export operates adequately.

Andean Subregion. Progress in food safety has taken various forms in the Andean subregion. Bolivia established the National Health Inspection Program, with guidelines to be followed by departments and municipalities. In addition, a national food monitoring network of laboratories with multi-sectoral participation is being organized. The system for epidemiological monitoring of FBDs is under development in five of the country's main cities. In Ecuador, a document entitled "National Integrated Food Protection Program" was produced. The municipalities of Quito and Guayaquil monitor food sold on the street but not meat intended for consumption by the local population. In Peru, significant progress has only been achieved in monitoring food sold on the street, because of its particular importance in the spread of cholera during the recent epidemic that ravaged the country. With financial support from Sweden, meaningful progress has been achieved in educating street vendors on the handling of food and on the facilities they use.

The Southern Cone. After North America, the Southern Cone has the most organized food protection programs in the Americas. Argentina is progressing in formulating a comprehensive program. During 1996, the Agricultural Food Quality Program, supported by the Secretariat of Agriculture, Livestock, Fishing and Food, encouraged the consolidation of food protection services. The National Department of Food and Agricultural Health and Quality now inspects food of an-

imal origin (meat, milk, and fish), and plant-derived products (fruits, vegetables, and grains). The Ministry of Health and Social Action supervises marketing at the national level and carries out epidemiological monitoring of FBDs through activities coordinated by the National Office of Drugs, Food, and Medical Supplies, the National Institute of Food Products, and the National Department of Epidemiology.

In Brazil, there is no comprehensive national program, but there is an inspection department in the Ministry of Agriculture that is well-equipped to supervise food of animal origin (primarily that intended for export), and beverages. The Ministry of Health's National Secretariat for Health Monitoring lacks a formal food monitoring program. Some states and municipalities carry out effective monitoring of food safety and quality; others lack the necessary mechanisms. While there is no national system for epidemiological monitoring of FBDs, some states, such as Paraná and Rio Grande do Sul, already have a system in place for that function.

The situation in Paraguay is similar to that of the other meat-exporting countries. That is, the Ministry of Agriculture has a good system for the inspection of export plants, and the Ministry of Public Health oversees the other food products. The Municipality of Asunción established an infrastructure to supervise its food sold on the street, and the initial results have been excellent. Until recently, Uruguay only had a meat inspection service, but at the end of 1996, all of the federal and departmental institutions in the field of food protection were mobilized to organize the National Comprehensive Food Monitoring Program. Early results showed the benefits of this strategy, which preserves the autonomy of the various institutions involved in the process. Epidemiological monitoring of FBDs has progressed significantly in the short time since it began, and has enjoyed broad participation.

It is evident that the countries' policies of integrating and coordinating the activities of the various institutions in a planned way and of using existing resources to the best advantage are appropriate and improve the health and well-being of the entire population.

Economic Integration Processes

The process of economic globalization has forced countries to seek economic integration in order to make better use of their own resources and fill the needs of neighboring trading partners. Subregional initiatives to standardize health requirements in international trade are exemplified by the North American Free Trade Agreement (NAFTA), the Southern Cone Common Market (MERCOSUR), and the Caribbean Community (CARICOM). The Central American countries and the Andean countries also are discussing forming other subregional trade blocs. At the same time,

under the leadership of the United States, formation of the Free Trade Area of the Americas (FTAA) is being encouraged, with the goal of eliminating all trade barriers between countries in the Region.

Through the Sanitary and Phytosanitary Agreement, the World Trade Organization has promoted the use of the *Codex Alimentarius* standards in resolving international disputes related to food safety.

The Hazard Analysis and Critical Control Points (HACCP) system, developed by the United States food industry and officials of the country's aerospace program, is a valuable tool for monitoring food products and preventing FBDs. It combines principles of food microbiology quality control, and risk analysis. At the same time, the United States Food and Drug Administration and the food industry use this approach to ensure the safety of low-acidity processed foods. This approach, which is used by the world's major food processing industries, is widely accepted in educational campaigns for food-handlers and homemakers in several countries in the Region.

Authorities responsible for food monitoring in Canada, the United States, and the European Union have already incorporated the HACCP system into their laws. The *Codex Alimentarius* has recognized the validity of this system and has adopted it in order to foster its use in ensuring food safety. In addition, 650 government officials from institutions responsible for monitoring food products in the Region have been validated to training others about the system, thus greatly promoting awareness of the HACCP.

Together, the countries in the Region have defined strategies to provide an ongoing exchange of epidemiological information on FBDs, measure the effectiveness of national food protection programs, promote activities aimed at prevention and control, and establish means of estimating the economic losses caused by these foodborne diseases. Since 1993, the *Guide for Establishing Epidemiological Monitoring Systems for Foodborne Diseases and for the Investigation of Outbreaks of Food Poisoning and Infections* has been avail-

able. Also, between 1993 and 1996, the countries trained individuals in strategies of institutional organization and the operation of local epidemiological monitoring systems for FBDs.

Foodborne Diseases

During 1995 and 1996, 1,669 outbreaks of FBDs were reported in the Region, causing 57,455 people to become ill. Since the number of reported outbreaks and of cases is a function of the quality and sensitivity of the countries' systems for monitoring FBDs, the information presented here represents a small proportion of the actual total. Furthermore, it is believed that countries reporting a large number of cases have highly sensitive systems, but because of the lack of specificity in the reports, there is no detailed information as to etiology and other factors related to the diseases.

The data in Table 8 show that, during 1995 and 1996, there were 144 deaths. Of that number, 102, or 70.8%, resulted from poisoning. The information in Table 9 points to the fact that chemical substances caused 73 of those 102 deaths from poisoning, and that methanol was the most important etiological agent (62 cases). Information on the type of illness in the outbreaks of FBDs points up the large proportion of cases where the etiological agent was unspecified. In outbreaks where the cause is known, infections are most frequent, but the highest mortality comes from poisonings (Table 8). Further, it can be seen that *Salmonella* is responsible for the greatest number of cases, 9,730 during 1995 and 1996.

Municipal Solid Waste

The Agenda 21 plan for environmental protection was approved during the Earth Summit (United Nations Conference on Environment and Development) held in Rio de Janeiro in 1992. Chapter 21 of the Agenda deals with the sustainable

TABLE 8
Type of illness in outbreaks of foodborne diseases, Latin America and the Caribbean, 1995–1996.

Illness	Total outbreaks		Cases		Deaths	
	1995	1996	1995	1996	1995	1996
Poisonings	270	379	3,963	2,125	36	66
Infections	101	97	9,759	6,989	8	1
Toxin infections	66	32	2,933	1,799	3	11
Not specified	183	541	5,100	24,787	2	17
Total	620	1,049	21,755	35,700	49	95

Source: Regional System for Epidemiological Surveillance of Foodborne Diseases, Pan American Institute for Food Protection and Zoonoses.

TABLE 9
Etiological agents in outbreaks of foodborne diseases, Latin America and the Caribbean, 1995–1996.

Etiological Agent	Total outbreaks		Cases		Deaths	
	1995	1996	1995	1996	1995	1996
Bacteria	239	161	14,376	7,750	6	1
<i>C. botulinum</i>	1	0	10	0	2	0
<i>C. perfringens</i>	15	4	815	116	0	0
<i>E. coli</i>	39	6	1,662	109	2	0
Intestinal bacteria	2	1	35	3	0	0
<i>P. shigelloides</i>	1	0	18	0	0	0
<i>Salmonella</i> sp.	58	80	3,237	6,493	1	1
<i>Shigella</i> sp.	12	4	5,498	79	0	0
<i>Staphylococcus</i> sp.	83	39	2,658	543	1	0
<i>Streptococcus</i> sp.	2	0	162	0	0	0
Others	26	0	281	0	0	0
<i>B. cereus</i>	0	5	0	206	0	0
Pseudomonas	0	1	0	2	0	0
Saurina	0	16	0	167	0	0
<i>V. cholerae</i>	0	5	0	32	0	0
Viruses	8	1	463	17	7	0
Hepatitis A	3	1	45	17	0	0
Rotavirus	5	0	418	0	7	0
Parasites	11	3	396	340	0	0
<i>E. histolytica</i>	9	3	284	340	0	0
<i>F. hepatica</i>	2	0	112	0	0	0
Chemicals	26	20	211	105	14	59
Potassium bromide	6	0	44	0	0	0
Heavy metals	1	0	5	0	1	0
Methanol	4	16	52	84	10	52
Sodium nitrite	7	0	51	0	1	0
Pesticides	3	2	35	6	2	0
Others	5	0	24	0	0	0
Alkaloids	0	1	0	13	0	7
Furadan	0	1	0	2	0	0
Marine toxins	130	288	782	914	10	2
Siguatoxin	128	287	668	912	2	2
Saxitoxin	1	1	112	2	6	0
Tetradoxin	1	0	2	0	2	0
Phytotoxins	1	0	11	0	7	0
Amantin	1	0	11	0	7	0
Not specified	205	576	5,516	26,574	5	33
Total	620	1,049	21,755	35,700	49	95

Source: Regional System for Epidemiological Surveillance of Foodborne Diseases, Pan American Institute for Food Protection and Zoonoses.

TABLE 10
Material contained in trash in the
United States and Colombia.

Material	Percentage by weight (wet weight)	
	U.S.A. 1994	Colombia 1996
Paper and cardboard	39	18
Food waste	7	52
Glass	6	5
Metal	8	2
Plastic	10	14
Yard waste	15	... ^a
Other	15	9
Total	100	100
Estimated % of humidity in the trash	25	50

^a Included in food waste.

Source: United States Environmental Protection Agency. *Municipal solid waste factbook*. Washington, DC: EPA; 1996, and Inter-American Development Bank, Pan American Health Organization. *Diagnóstico de la situación del manejo de residuos sólidos municipales en América Latina y el Caribe*. Washington, DC: IDB/PAHO; 1997.

management of municipal solid waste and establishes and defines goals for four programmatic areas: minimizing waste, maximizing reuse and recycling, improving treatment and disposal, and increasing coverage for collection services. Below is an analysis of the waste management situation in the countries of the Americas, using these goals as a frame of reference.

Sanitation Services

In 1995, the 360 million urban residents of Latin America and the Caribbean produced 330,000 tons of waste per day, of which an average of 70% was collected, with less than 30% being disposed of properly. Waste-management services have approximately 350,000 formal workers and another 300,000 persons working in informal scavenging. The cost of the services, including street sweeping, collection, transfer, and final disposal, ranges between US\$ 15 and US\$ 50 per ton, representing a median cost of US\$ 2 to US\$ 6 per household per month.

Unlike developed countries, in Latin America and the Caribbean there are few policies and programs aimed at minimizing waste generation, and only a few that encourage recycling. Also lacking in relation to the Agenda 21 goals are monitoring systems to evaluate the efficacy of the plans and programs. Following is an analysis of the different components of the services (32).

Generation of Solid Waste. The amount of solid waste produced is correlated with per capita income and with city size. The national median for generation of waste is 1.8 kg/person/day in Canada and 2.0 kg/person/day in the United States (33), and from 0.5 kg/person/day to 1.2 kg/person/day in the countries of Latin America and the Caribbean, with a regional average of 0.92 kg/person/day. Cities with populations of more than two million generate 0.97 kg/person/day, while medium-sized cities generate 0.74 kg/person/day, and the figure for cities with less than 500,000 population is 0.55 kg/person/day (32).

Recycling. The most important factors affecting recycling are humidity and the percentage of recyclable products contained in the waste. Table 10 shows the difference between solid waste in the United States and that in Colombia, a country considered typical of Latin America.

The data explain the low rate of recycling in Latin America and the Caribbean, compared to that in developed countries. Only Canada and the United States can monitor the quantity of recycled material. Canada recycles 10% of its waste; the United States, 24%. The percentage of waste recycled exceeds 40% in several cities of the United States. In Brazil, however, São Paulo recycles 0.4%; Rio de Janeiro, 4.0%; and Brasília, 3.0%. In Mexico City, the figure is 7.0%.

Street Sweeping. Around 1996, more than 50% of personnel employed by municipal sanitation services were engaged in street sweeping, and in some cities this service accounted for as much as 40% of the budget for sanitation services. Street sweeping occurs mainly on paved streets that have a large volume of pedestrian traffic. A street sweeper covers an average of 1 to 2 km of street (2 to 4 km of curbside) per day, and collects from 30 to 90 kg of waste per kilometer swept. In Chile, 93% of 370 towns and cities have some type of street sweeping and cleaning service for public streets. In the country as a whole, it is estimated that 80% of the paved streets are swept. Approximately 50% of the cities with more than 50,000 residents contract the services out to private companies. Mechanical street sweeping in Latin America and the Caribbean is done, for the most part, with imported equipment, which displaces manual workers. This method has had only limited use in the Region, except in Mexico.

Collection and Disposal. It is difficult to estimate the coverage of collection and disposal, since the countries lack reliable monitoring systems. In some cases, there have been sporadic evaluations or samplings; in others, all that is available are subjective estimates of national specialists. Table 11 presents the scanty nationwide information that is available. It shows that only in Chile, Cuba, and Trinidad and Tobago is waste collection provided for 95% or more of the

TABLE 11
National coverage of urban sanitation in some countries
of Latin America and the Caribbean.

Country	Year	Garbage collection ^a (%)	Sanitary, secure, or other landfill ^b (%)
Chile	1994	99	83
Cuba	1991	95	90 ^c
Trinidad and Tobago	1993	95	70
Antigua	1995	85	...
Peru	1996	84	5
Venezuela	1995	75	85
Brazil	1996	71	28
Uruguay	1996	71	—
Mexico	1996	70	17
Bolivia	1996	68	50
Costa Rica	1996	66	68
Dominica	1995	50	...
Grenada	1995	50	...
Paraguay	1996	35	5
Haiti	1996	30	20
Honduras	1996	20	—

^a Coverage of garbage collection as a percentage of the urban population.

^b Coverage of landfills as a percentage of the quantity collected.

^c The percentage of sanitary landfills has dropped to almost zero in Cuba.

Source: Inter-American Development Bank, Pan American Health Organization. *Diagnóstico de la situación del manejo de residuos sólidos municipales en América Latina y el Caribe*. Washington, DC: IDB/PAHO; 1997.

urban population, followed by Antigua (85%) and Peru (84%).

Information regarding cities is more reliable, as it comes from agencies that provide the services. Table 12 summarizes the data from 33 of the largest cities of Latin America and the Caribbean. Waste collection coverage nears 90%; poor, marginalized areas are the ones without the service.

In Latin America and the Caribbean, each worker collects an average of 4 tons of waste per day; in the United States, the average is 8 tons. The cost of garbage collection per ton ranges from US\$ 12 in Mexico and Central America to between US\$ 30 and US\$ 40 in the Southern Cone. In Canada and the United States, costs range between US\$ 50 and US\$ 125.

Transfer Stations. The use of transfer stations increases where sanitary landfills are further away from the areas where the waste is generated. The costs of transportation are reduced by using tractor-trailer trucks of 50 m³ to 70 m³ that carry up to 25 tons and hold the loads of 4 or 5 garbage trucks, providing savings in fuel and personnel. Most of the cities with more than a million residents have transfer stations. Mexico City had 14 transfer stations in 1995. In Brazil in 1989, 19 out of

4,425 municipalities surveyed had transfer stations, which handled 7,716 tons of waste per day, according to a study by the Brazilian Geography and Statistics Foundation.

Treatment and Final Disposal. More than 99% of the treatment and final disposal of solid waste is done in sanitary landfills (compacting the trash in 2- to 5-meter layers that are covered daily with dirt) or controlled landfills (similar to sanitary landfills, but these do not meet standards on environmental contamination regarding the control of biogas and leachates). Less than 1% of the trash is composted, and this is done mainly in Brazil. Due to the high cost (US\$ 40 to US\$ 100 per ton), incineration in Latin America and the Caribbean is confined to hazardous hospital waste. In Canada and the United States, as is true in the developed countries of Europe and in Japan, waste incineration continues to be used because the high cost of sanitary landfills makes the process economically competitive. Table 13 compares the final destination and type of treatment of solid waste among Canada, the United States, and some Latin American cities. Both Canada and the United States submit nationwide data, while the countries of Latin America only provide data on cities.

Given the socioeconomic situation of Latin America and the Caribbean, sanitary landfills continue to be the most economical and adequate method, except for some islands and tourist regions with fragile ecosystems. Table 12 shows the level of proper disposal in 33 large cities. Sanitary landfills and other methods of adequate disposal accounted for 57% of the waste collected, with another 29% being disposed of in controlled landfills. The costs of operating a sanitary landfill range from US\$ 3 to US\$ 10 per ton in Latin America and the Caribbean, and up to US\$ 30 a ton in Canada and the United States.

In Santiago and Valparaíso, in Chile, the biogas from sanitary landfills is used for the cities' gas distribution systems. In Chile, Colombia, Honduras, and Peru, there are manual sanitary landfills in communities with fewer than 20,000 residents. This type of landfill, used in small localities that produce up to 20 tons of solid waste per day, is created by digging ditches, dumping in the trash, and then manually covering it with the original dirt from the ditches.

In the United States, the leachates, or highly contaminated liquids that flow from the sanitary landfills as a result of water passing through the solid waste, are treated in situ or in sewage treatment plants. In Latin America and the Caribbean, for many years only recirculation of the leachates was done. Treatment is now being done with a physical and chemical processing in Buenos Aires. In São Paulo, many years ago a biological treatment process using oxidation lagoons was tried.

Hospital Waste. It is extremely expensive to buy and operate new hospital waste incinerators that comply with regula-

TABLE 12
Coverage of solid waste collection and disposal in Latin American capitals and other major cities.

City and year ^a	Population (millions)	Trash (tons/day)	Coverage (% collected)	Coverage by sanitary landfill ^b			Service (own service or contracted)	Income/cost ^c (% not subsidized)	Number of employees
				Good	Medium	Poor			
São Paulo									
metropolitan area (1996)	16.4	22,100	95	100	—	—	Private	Good	10,000
Mexico City									
metropolitan area (1996)	15.6	18,700	80	50	25	25	Municipal	Poor (0%)	17,000
Buenos Aires									
metropolitan area (1996)	12.0	10,500	91	100	—	—	Private (97%)	Good	...
Rio de Janeiro (1996)	9.9	9,900	95	—	100	—	Mixed	Moderate	12,000
Santiago (1995)	5.3	4,600	100	100	—	—	Private	Good	...
Bogota (1996)	5.6	4,200	99	100	—	—	Private	...	2,600
Lima									
metropolitan area (1996)	7.5	4,200	60	—	40	60	Mixed	Poor	5,500
Caracas (1995)	3.0	3,500	95	—	100	—	Private	Poor (15%)	5,110
Belo Horizonte (1996)	3.9	3,200	90	100	—	—	Mixed	...	...
Monterrey									
metropolitan area (1996)	2.8	3,000	81	—	100	—	Mixed	...	...
Salvador (1996)	2.8	2,800	93	—	100	—	Mixed	...	2,345
Santo Domingo (1994)	2.8	1,700	65	—	—	100	Private	Poor	...
Brasilia (1996)	1.8	1,600	95	—	75	25	Mixed	...	745
Guayaquil (1996)	2.3	1,400	100	100	—	—	Private	Good	843
Havana (1991)	2.0	1,400	100	—	100	—	Municipal	...	1,800

Cali (1996)	1.8	1,350	95	—	—	100	Municipal	Good (100%)	1,313
Curitiba (1995)	2.1	1,300	100	100	—	—	Private	...	...
Montevideo (1995)	1.4	1,260	97	—	—	100	Municipal	Poor (20%)	2,443
Guatemala City (1992)	1.3	1,200	80	—	—	100	Mixed	Good	594
Asuncion (1996)	1.2	1,100	80	—	—	—	Municipal	Moderate	1,100
San Jose (1995)	1.0	960	90	100	—	—	Municipal	Good	900
Barranquilla (1996)	1.0	900	98	—	—	100	Mixed	...	659
Quito (1994)	1.3	900	85	—	—	100	Municipal	Good (100%)	1,100
Panamá City (1995)	0.8	770	90	—	100	—	Municipal	Good (100%)	2,100
Medellin (1987)	1.5	750	99	100	—	—	Mixed	Good (100%)	750
Rosario (1996)	1.1	700	100	—	100	—	Private	...	...
San Salvador (1992)	1.3	700	60	—	—	—	Municipal	Moderate (60%)	1,150
Tegucigalpa (1995)	1.0	650	75	—	—	100	Municipal	Moderate	480
Managua (1988)	1.0	600	70	—	—	100	Municipal	...	...
Port-of-Spain (1993)	0.5	600	98	—	100	—	Mixed	Poor	...
Cartagena (1996)	0.6	560	96	—	100	—	Mixed	...	...
La Paz (1996)	0.7	380	92	100	—	—	Private	Poor	450
João Pessoa (1996)	0.7	250	95	—	100	—	Mixed	...	730
Total	114	107,730	89	57	29	14			71,712

^a Year of the latest update.

^b Good = Sanitary landfill; Medium = Controlled landfill; Poor = Open-air dump.

^c Poor = I/C<33%; Moderate = I/C<66%; Good = I/C>66%.

Source: Adapted from Inter-American Development Bank. Pan American Health Organization. *Diagnóstico de la situación del manejo de residuos sólidos municipales en América Latina y el Caribe*. Washington, DC: IDB/PAHO; 1997.

TABLE 13
Percentages of treatment used and final destination of solid waste in selected countries and cities.

Countries and cities	Treatment			
	Recycling (%)	Incineration (%)	Composted (%)	Landfill ^a (%)
United States (1994)	21	15	3	61
Canada (1994)	10	8	0	82
Latin America and the Caribbean	<5	<1	<1	94
Mexico City	7	0	1	92
Rio de Janeiro	4	0	15	81
Brasilia	3	1	13	83
São Paulo	<1	1	<5	94
Santiago (Chile)	0	0	0	100

^aSome are only controlled landfills.

Sources: United States Environmental Protection Agency. *Municipal solid waste factbook*. Washington, DC: EPA; 1996, and Inter-American Development Bank, Pan American Health Organization. *Diagnóstico de la situación del manejo de residuos sólidos municipales en América Latina y el Caribe*. Washington, DC: IDB/PAHO; 1997.

tions on the emission of pollutants into the atmosphere. Because of this, there has been an attempt to reduce costs by sorting the waste at the point of origin and incinerating only what is truly toxic. The special waste generated at health care facilities poses a danger to the health of the people who handle them and to the health of the public in general, if not disposed of safely. However, not all such waste is toxic. It is estimated that the waste generated by hospitals is 3 kg/bed/day; of this, the toxic portion is 0.5 kg/bed/day. Though countries classify toxic hospital waste in different ways, all include waste from surgery and isolation rooms, laboratory cultures, hypodermic needles and other sharp instruments, as well as animal parts and materials that have been exposed to pathogens in research areas.

The most common methods for treating and disposing of hospital waste are incineration, sanitary landfills, and autoclave sterilization, as well as microwave and irradiation processes. Among 4,425 Brazilian municipalities surveyed, 61 municipalities (1.4%) use hospital incinerators, 266 (6.0%) use sanitary landfills, 19 (0.4%) use landfills for special waste material, and 4,074 (92.2%) burn the waste in the open or dispose of it in open-air dumps. In Chile, hospital waste is properly managed, and there is appropriate regulation. In Cali, Colombia, an autoclave was set up; it operates as a central treatment facility for hospitals that send their waste there.

In Argentina, Brazil, Mexico, Peru, and Venezuela, private companies have been encouraged to sell their services to hos-

pitals, and the firms have been authorized to install incinerators, chemical sterilizers, and autoclaves. Treatment costs in Mexico vary from US\$ 0.50 to US\$ 1.00 per kilogram of waste, and in Argentina from US\$ 0.60 to US\$ 2.00.

Privatization and Other Institutional Factors

One of the main obstacles to strengthening waste services is the lack of national coordinating entities to manage municipal solid waste, which also hinders achieving most of the goals of Agenda 21. Sectoral analyses were conducted in Chile, Colombia, Cuba, Guatemala, Mexico, and Uruguay between 1995 and 1997 with the support of PAHO, IDB, the World Bank, and the United States Agency for International Development. The analysis showed that the responsibility for managing solid waste is divided among the ministries of health, of environment, and of planning, which act independently and with no coordination. As a result of the sectoral studies, coordinating agencies have begun to be formed, such as the National Solid Waste Management Council in Guatemala, and various intersectoral commissions in Chile and Uruguay. In some countries, these coordinating roles are fulfilled by public organizations, such as associations of sanitation companies in Bolivia and Colombia, the Mexican Association for the Control of Solid and Toxic Waste, and national chapters of the Inter-American Association of Sanitary and Environmental Engineering, in Central America and other countries.

The problem of the financial sustainability of local services also has been emphasized. As can be seen in Table 12, nearly all of the services in the 33 cities listed are being subsidized. While 48% of the municipalities are approaching self-sufficiency, the rest provide subsidies that cover 35% to 100% of the costs. This situation is due to the lack of political commitment on the part of mayors to establish or raise sanitation fees or rates. Another problem is the manner of charging for the service. Most of the municipalities make the fee for the service part of the general real estate taxes, but others charge a specific tax. Though the practice is declining, some municipalities charge for the service as a fee tied to drinking water or electrical service, as is done in Quito and Guayaquil in Ecuador, and Lima in Peru.

The most important change in recent years is the growing participation of the private sector in the operation of solid waste services. Table 12 shows that only 11 of the 33 cities listed collect waste directly. The results of this change have been better management at the local level, more effective control over the cost of services, and greater efficiency. These results have not been achieved when the contracting process was not open or when those in charge did not develop acceptable information and criteria for the bidding process. In Chile and Brazil, it is estimated that more than 60% of the

urban population is served by private companies. In Mexico, as a result of the standards that were set in 1996 regarding hospital waste, nearly all of the modern public treatment services are provided by the private sector under a system of free competition.

Environmental Pollution and Infrastructure of Services for Its Control

Environmental Pollution

Economic production processes, including the mining of raw materials, their transformation into products and their consumption, and the disposal of domestic and industrial waste, may directly or indirectly endanger people's lives. Persons who live in poor areas of large cities are the most susceptible and most exposed to environmental pollution caused by domestic and industrial waste (34). In addition, the destruction of the ozone layer, changes in terrestrial and aquatic ecosystems, and planetary temperature changes (35), along with the effects of household pollution from tobacco smoke, carbon monoxide produced by combustion, volatile organic compounds, pesticides, and heavy metals, pose health risks for the population (36).

Available data for 1993–1996 show that society's concern about chemical environmental pollutants is growing in Latin America and the Caribbean. This added concern is caused by the increase in and the types of production processes, greater collective awareness of the different players on the social scene involved in the problem, and the greater availability of means to diagnose environmental risks and effects.

Air Pollution. Air pollution has increased significantly in recent years in nearly every Latin America and Caribbean industrial city. Studies conducted in Brazil, Chile, and Mexico demonstrate a rise in daily mortality related to increased air pollution. In São Paulo, Brazil, it was noted that an increase of 10 $\mu\text{g}/\text{m}^3$ in particulate matter in the air coincided with a 1.3% increase in mortality among adults over 65 years of age (37). In Chile and Mexico, similar results were noted, with an increase of 0.6% in mortality among this age group.

The increase in vehicular traffic is the factor most responsible for the Region's atmospheric pollution. In Argentina, there are reports indicating that 70% of air contaminants come from automobiles. In cities like Buenos Aires, pollutants tend to disperse due to local topography and meteorology, even if the median pollution levels do not exceed the limits established by international guidelines.

Ozone is a contaminant that can be used as an indicator of air pollution effects on human health. In many cities, the ozone standard is exceeded, especially in summer. In 1996, in

TABLE 14
Reported cases of acute poisoning from pesticides
in some countries.

Country	1993	1994	1995	1996
Argentina	3,361	7,763	10,354	...
Uruguay	1,132	1,478	1,293	1,221
Nicaragua	...	799	1,207	1,128
Costa Rica	382	583	989	792
Guatemala	282	237	...	...
El Salvador	...	...	1,961	1,469

Source: Reports from the countries.

Mexico City, it was reported that ozone concentrations exceeded allowable limits by nearly threefold. For nitrogen dioxide, in 1996, the metropolitan area of São Paulo, Brazil, showed a concentration that reached annual averages of 99 $\mu\text{g}/\text{m}^3$, nearly twice the standard. In Cubatão, the concentration of suspended particulate matter (PM) reached a 24-hour average of 443 $\mu\text{g}/\text{m}^3$, and in Rio de Janeiro the concentration reached an annual average of 245 $\mu\text{g}/\text{m}^3$, almost three times the standard. In La Paz, Bolivia, concentrations of total suspended particulate matter had a maximum value of 390 $\mu\text{g}/\text{m}^3$, more than double the base value of 150 $\mu\text{g}/\text{m}^3$ per 24 hours. In Quito, the concentration of total suspended particulate matter was 570 $\mu\text{g}/\text{m}^3$, nearly four times the standard. In Lima, the same concentration reached 343 $\mu\text{g}/\text{m}^3$, more than double the suggested level. In the metropolitan area of San José, a median concentration of 339 $\mu\text{g}/\text{m}^3$ total particulate matter was measured in 24 hours, more than double the standard, and in Guatemala City, air samples revealed that suspended particulate matter also exceeded acceptable levels.

Pesticides. Pesticides are being used more and more in agriculture in the Region. This poses a public health problem, as it directly affects agricultural workers and persons living near crop fields. The entire population is indirectly affected through contamination of food products. Table 14 shows reported cases of acute poisoning from pesticides in some Latin American countries. In Guatemala and Honduras, 65% of the population lives in rural areas, and agricultural workers make up approximately 40% of the economically active population. Many of the children under 16 years of age also work in agriculture. The presence of pesticide residues in mothers' milk was confirmed in Guatemala, where concentrations were found that were 250 times higher than the amount allowed in cow's milk. In Panama, 16 persons were poisoned by pesticides in a single incident in 1997 in the central region of Herrera, in the district of Ocu (38).

Reports in Costa Rica in 1996 illustrate the use of pesticides in the Region. The country imported 346 million kg of

herbicides, 690,000 kg of fumigants, 4 million kg of fungicides, 3.8 million kg of insecticides/nematicides, 550,000 kg of miticides, 26,000 kg of rodenticides, and 20,000 kg of growth regulators. In Nicaragua, according to Central Bank sources, the import of pesticides grew from US\$ 12.5 million to nearly \$30.4 million in the 1991–1995 period, an annual growth rate of 24.8%. In 1996, Uruguay's National Toxicology Information System stated that 315,052 kg of raw materials were imported to produce 2,934,605 kg of pesticides; 57.1% of the herbicides, 26.3% of the fungicides, and 11.3% of the insecticides were used in Uruguay.

Waste from pesticides has been a cause of concern to national authorities throughout the Region. The Ciudad de los Niños area of Rio de Janeiro, Brazil, has a population of 1,000 persons, including transient persons and children who live in a local shelter. A local hexachlorocyclohexane (HCH) plant there was closed in 1995, but nearly 350 tons of waste were left on site (39). Blood samples were taken from 31 people living within 100 m of the waste, and from the 184 children in the shelter. These samples show concentrations of β -HCH up to 60 times higher than samples from people who had not been exposed. Furthermore, it was shown that all the water, grass, and soil sampled in the area contained residues of HCH; the limit of detection for HCH is 0.5 ppb.

In 1994, in a garbage dump in Samaritá, in the Baixada Santista area of São Paulo, Brazil, where 42,000 people were living, a chemical company had disposed of waste containing mostly hexachlorobenzene (HCB). A sample of 234 people showed significant differences in the levels of HCB according to where the individuals lived. Levels were higher among people who lived close to the dump. The median levels of HCB in this area were 4.095 $\mu\text{g/l}$, while the levels in the rest of the region ranged between 0.341 and 0.414 $\mu\text{g/l}$ (40).

In order to control pesticide exposure, Brazil's Secretary of Health Monitoring in 1997 instituted the Health Monitoring Program for Environments and Populations Exposed to Toxic Agricultural Substances, within the Unified Health System. In addition, in May 1995 the Governing Council of the United Nations Environment Program put together a special study group on eliminating the use of DDT throughout the world, as well as polychlorinated biphenyls, dioxins, furans, aldrin, dieldrin, endrin, chlordane, hexachlorobenzene, mirex, toxaphene, and heptachlor. These substances are part of an initial list of persistent organic pollutants that are resistant to photolytic, chemical, and biological degradation and, therefore, are persistent pollutants worldwide.

Heavy Metals. Mining, an important economic activity in several of the Region's countries, pollutes the environment with metals that can harm human health. In Bolivia, during inspection of a site located 7 km from the city of Oruro, where hazardous waste from the metallurgic area of Vinto

was dumped, a median of 1,940.3 mg/kg of lead was detected in the soil, as well as 356.9 mg/kg of arsenic in the surface soil, 296.8 mg/kg of arsenic in dust inside the houses, and 11.0 $\mu\text{g/l}$ of arsenic in the water (41). The concentration of lead in the soil alone, without any other exposure, could lead to children having up to 13 $\mu\text{g/dl}$ of lead in the blood, compared to a standard of 10 $\mu\text{g/dl}$, as set by the Agency for Toxic Substances and Disease Registry (ATSDR) of the United States Department of Health and Human Services. Lead concentrations in the soil far exceeded the 250 mg/kg limit recommended by the ATSDR for children's recreation areas. Concentrations of arsenic in urine had a geometric mean of 71.4 $\mu\text{g/g}$ of creatine, above the 50 $\mu\text{g/g}$ limit established by the United States Environmental Protection Agency for effects of arsenic on the nervous system.

In a 1993 study of atmospheric exposure in workers exposed to heavy metals in a facility in Bolivia, concentrations of up to 390 $\mu\text{g/m}^3$ of arsenic, 230 $\mu\text{g/m}^3$ of cadmium, and 280 $\mu\text{g/m}^3$ of lead were found (42). In August 1995, an industrial mining accident in Guyana polluted the Osmai and Esequibo rivers. Before the spill was brought under control, 4.2 million m^3 of cyanide reached the Osmai. As a result, the mining companies were ordered closed until safety measures were implemented.

In addition to the pollution caused by mining, natural pollution of water by arsenic also is of concern for several countries of the Region. In Argentina, 87 cases of regional endemic chronic hydroarsenic poisoning were reported in the 1972–1993 period. Male specimens predominated in the study (73.56% of cases), with a median age of 46 years and typical cutaneous lesions such as palmar and plantar keratoderma, melanoderma, and epitheliomas (43). In the State of Mexico, a higher prevalence of skin and eye irritation symptoms was found in persons living near an oxidation lake that has elevated concentrations of arsenic, mercury, lead, and chromium in the deep water and sediment (44).

Another important source of pollution in many cities of the Region is lead emitted by automobiles using gasoline containing lead additives. Lead can remain in the environment for between 70 and 200 years (45). In Mexico, 2,564,880 vehicles are still using this leaded gasoline, with 470,000 in Peru, 450,000 in Chile, 350,000 in the Dominican Republic, 312,931 in El Salvador, and 254,000 in Panama. Lead can also lower children's IQ (intelligence quotient), if there are sufficiently high concentrations of the metal in their blood. In populations exposed to lead, an increase in the number of persons with lower IQs is found, with the majority of that population having a lower-than-average intelligence levels.

Eliminating lead requires the use of alternative additives to increase octane levels in gasoline. Among the possible substitutes are hydrocarbons, methylcyclopentadienyl manganese tricarbonyl (MMT), ethanol, and methanol. It is necessary to

evaluate which of these alternatives causes the least effect on human health and the environment, according to the specific conditions of the countries. The fuels with the most toxic effects are, in ascending order, compressed natural gas, liquid petroleum gas, gasoline, and diesel. Other important sources of environmental pollution from lead are exposure to paint and glazed ceramic dishes.

Several countries have undertaken programs to reduce lead pollution. In Mexico, as a result of the gradual substitution of unleaded gasoline for regular gasoline and the implementation of standards to control the lead content in paint, lead exposure levels are decreasing. There also have been changes in the methods for manufacturing glazed ceramic containers to reduce lead exposure to a minimum. Thus, median levels of lead in the atmosphere of the metropolitan area of Mexico City decreased from 1.95 $\mu\text{g}/\text{m}^3$ in 1988 to 0.28 $\mu\text{g}/\text{m}^3$ in 1994.

In Ecuador, the National Program for the Elimination of Lead in Gasoline has been in effect since 1996, and more agencies monitor and denounce activities harmful to the environment through studies, proposals, and recommendations. A study carried out in 1996 looked at concentrations of lead in 250 blood samples from Quito residents. While the maximum acceptable level is 10 $\mu\text{g}/\text{dl}$, the medians found were 14.4 $\mu\text{g}/\text{dl}$ in 27 infants, 28.8 $\mu\text{g}/\text{dl}$ in 64 schoolchildren, 18.4 $\mu\text{g}/\text{dl}$ in 83 pregnant women, and 28.2 $\mu\text{g}/\text{dl}$ in 76 street vendors (46).

In Venezuela, lead content in gasoline was reduced 68% during the 1988–1996 period. In the Silencio area of Caracas, lead concentration in the air went from 2.8 $\mu\text{g}/\text{m}^3$ to 1.38 $\mu\text{g}/\text{m}^3$, and lead concentrations in the blood from a sample of individuals decreased from 19 $\mu\text{g}/\text{dl}$ to some 16 $\mu\text{g}/\text{dl}$ (47).

The growing number of lead smelters and small battery recycling industries in Latin America and the Caribbean have caused concern, as there is no oversight process. A cross-sectional epidemiologic study conducted in 1992 evaluated lead poisoning in 101 children 1 to 5 years old who lived within a 500-m radius of a primary lead smelter in the city of Santo Amaro, Bahia, Brazil. The geometric mean of the concentration of zinc protoporphyrin (ZPP) was 65.5 $\mu\text{g}/100$ ml, more than double the level of 30 $\mu\text{g}/100$ ml established by the United States Centers for Disease Control and Prevention. The highest median values of ZPP were found in girls of African descent who lived in the houses closest to the smelters, and among daughters of smelter workers (48).

Mercury, which is used indiscriminately in gold mining, is the most widespread chemical pollutant for the Amazon region of Brazil, Colombia, Peru, Suriname, and Venezuela. Among countries in the Americas, Brazil is the country with the greatest number of people directly and indirectly exposed to mercury. According to data from the National Department of Mining Production, in 1993 approximately 30,000 miners in the states of Pará and Mato Grosso and an unknown num-

ber of persons in the general population were exposed to metallic mercury emissions and also potentially exposed to methyl mercury by eating fish.

Between 1994 and 1996, the Evandro Chagas Institute's Human Ecology and Environment Coordination Working Group carried out studies in regions at risk for mercury contamination from informal gold mining in the hydrographic basin of the Tapajós River in the state of Pará, Brazil. In comparison to a reference level of 6 $\mu\text{g}/\text{g}$, the research showed that average concentrations of mercury in the hair of people who lived in communities exposed to methyl mercury were 11.75 $\mu\text{g}/\text{g}$ in 220 persons from Brasília Legal in the state of Pará; 16.01 $\mu\text{g}/\text{g}$ in 324 persons from Saicinza, among them indigenous people from the village of Munduruku; 19.96 $\mu\text{g}/\text{g}$ in 327 persons from São Luis de Tapajós; and 4.41 $\mu\text{g}/\text{g}$ in 326 persons from Santana do Itaquí. Workers in establishments that market gold also are exposed to metallic mercury. Compared to a base value of 10 $\mu\text{g}/\text{g}$, the average concentrations of mercury in the urine of those workers were found to be 57.52 $\mu\text{g}/\text{l}$ in gold-buying establishments in Santarém, 27.84 $\mu\text{g}/\text{l}$ among workers at similar establishments in Itaituba, and 4.83 $\mu\text{g}/\text{l}$ in persons from a test group (49).

In terms of the general population, a study funded by the German Technical Cooperation Agency (GTZ) and PAHO indicated that residents of the city of Poconé, in the east-central area of Brazil, who were not exposed to mercury through their work showed concentrations of 102 $\mu\text{g}/\text{l}$ (4.35 $\mu\text{g}/\text{l}$ average) of this metal in their urine simply by virtue of residing within 400 m downwind from businesses that market gold (50). In an area on the outskirts of the city there were people who produced gold alloys inside their houses who had mercury concentrations in their urine of up to 86.6 $\mu\text{g}/\text{l}$ (51). At the same homes, elevated levels of mercury in the soil were also found (9.8 ppm) and in dust in the houses (100.86 ppm). It should be pointed out that where there is informal gold mining in the Amazon regions, the numerous risk factors make it difficult to diagnose specific agents, such as mercury.

In the Andean countries, the main area in Peru where there is exposure to mercury is in the area of Madre de Dios, where approximately 85% of the country's gold is produced. In Colombia, one of the main pollutants is mercury, and data from the Ministry of Mines indicate that the greatest contamination is generated in the main gold production center, in the regions of Bajo Cauca and Nordeste, in Antioquia.

In Venezuela, gold production takes place primarily in the Amazon region, in the states of Bolívar and Delta Amacuro. A document produced by a project called the Evaluation of Impacts on Environmental Health estimated that in 1995 a total of 3,328 workers produced 22,600 g of gold in the Guayana region (52). In another study of the Caroní River region, mercury concentrations above 0.5 $\mu\text{g}/\text{g}$ were found in fish dorsal muscles, as well as microorganisms that could indicate the possibility of a

transformation of inorganic mercury to its organic form (53).

In Nicaragua, a sectional study of 163 miners, adult settlers, and children living in the gold mining region of Bonanza-Rosita showed that 12 persons (8%) had mercury concentrations higher than 10 ppm in their hair. The study's authors estimated that 8% of this area's population could be exposed to mercury levels that would affect their health (54), and measures were developed to prevent and control the problem.

In order to minimize the risks of exposure to mercury in the atmosphere, the Institute of Biophysics at the Federal University of Rio de Janeiro and the United States Agency for International Development (USAID) tested closed-circuit equipment that makes gold alloys. The factors limiting use of this equipment are socioeconomic and cultural: miners say that they like to watch the transformation process of the gold mixture and believe that the equipment is able to retain some gold; they also consider the mercury to be inexpensive.

Hazardous Waste. Hazardous waste from production processes and from garbage dumps have increased with industrial development, becoming a potential public health problem for the countries of the Americas. An agency of the Government of Argentina estimated that 70% of the country's industries are located in the province of Buenos Aires and that they produce approximately 500,000 tons of hazardous waste each year (55). Another potential source of hazardous waste are urban garbage dumps. The products resulting from garbage decomposition can have high concentrations of heavy metals. An evaluation of environmental contamination caused by a secure sanitary landfill in the locality of Morro do Céu, 12 km from the center of the city of Niterói, in Rio de Janeiro, Brazil, showed the presence of most heavy metals in the soil, sediment, and surface water. The surface water had concentrations above recommended levels for iron, magnesium, nickel, and zinc (56).

In Mexico, in order to test a methodology for studying hazardous waste, contaminated locations were selected in San Luis Potosí and Ciudad Juárez. A San Luis Potosí location was estimated to have 9,390 tons of lead, 6,840 tons of chromium, 1,348 tons of mercury, 53 tons of nickel, 52 tons of arsenic, and 32 tons of asbestos (57).

Infrastructure of Control Services

The main infrastructure elements in environmental control services include surveillance systems with environmental and biological monitoring networks, toxicology services, laboratories, and personnel training. Given the complexity of environmental control, the ministries of health, of environment, of social security, and of labor, among others, should work together in an integrated and intersectoral manner.

It is important for laboratories to assure the quality of analytic procedures and give priority to external laboratory monitoring practices. A project developed by PAHO and GTZ supported initiatives to develop methods to monitor hazardous substances in Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, and Venezuela. These initiatives included activities that would be incorporated in the surveillance systems in areas where there was mercury exposure and areas where there was informal gold mining. They also provided for toxicology laboratory networks and environmental testing procedures, monitoring of pesticides, and risk evaluation. In Brazil, support for laboratories involved in the monitoring of diseases and injuries is coordinated at the national level by the Ministry of Health's Worker Health and Human Ecology Research Center.

In terms of the use and management of hazardous substances, the Intergovernmental Forum on Chemical Safety developed a model of minimum criteria. The model includes legislation, responsible administrative structures, intergovernmental coordination mechanisms, the gathering and dissemination of information, risk evaluation capabilities, risk management policies, the ability to respond to contaminated localities and individuals exposed to hazardous products, educational programs on the use and management of hazardous substances, the ability to respond to emergencies, and needed improvements. Countries that have developed criteria based on this model include Barbados, Bolivia, Brazil, Canada, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Trinidad and Tobago, and the United States.

DISASTER PREPAREDNESS

The population of the Region of the Americas lives at risk from a variety of natural and man-made hazards. Seismic and volcanic activity, particularly in the Andean countries, Central America, Mexico, and the Pacific coast of the United States, has caused the loss of many lives, dwellings, and the means of livelihood and services. Hurricanes threaten the Caribbean region every year, and the El Niño phenomenon cyclically produces floods and droughts throughout the Region, with serious consequences. Technological advances have fostered an increase in the production, storage, transportation, and use of chemical products, heightening the risk of accidents caused by hazardous materials. Health facilities, because of the complexity of their services, equipment, and supplies, are extremely vulnerable to natural disasters. When damaged, their ability to provide normal and emergency services is limited, and rehabilitation is costly and lengthy.

In developing countries, the high cost of relief operations can, in a matter of days, consume the resources allocated to

long-term development and primary health care programs. The groups most affected are children, expectant and nursing mothers, the elderly, and low-income groups, especially those living in peripheral urban areas, because their survival, development, and welfare are related directly to the slow recovery of health services.

Natural Disasters

Number and Type of Disasters

Existing statistics and databases on natural disasters vary widely. They use different criteria for defining a disaster or determining whether an event should be included in a database. Table 15 summarizes the major natural disasters during the 1992–1997 period, selected on the basis of the severity of their impact on life and the economy, as well as the need for international assistance immediately following the disaster or during the rehabilitation and reconstruction phases.

Small-scale events, while not systematically recorded in the traditional databases, are recurrent and scattered among various countries. They represent a more serious problem than that revealed in the records of the major and mid-level events, due to the overall impact they have on the population (58).

Magnitude and Direct Human Impact of the Events

During 1992–1997, the natural disasters having direct human impact (i.e., dead and injured) were not comparable to those occurring in Latin America and the Caribbean between 1970 and 1986. The event with the greatest loss of life occurred in 1994—floods and landslides associated with Tropical Storm Gordon in Haiti caused the death of 1,122 persons, left 87,000 persons homeless, and otherwise affected 1.5 million people.

The reduced number of major impact events in terms of lives and homes lost during this period can be explained by two main factors. First, there were no large earthquakes in densely populated or highly vulnerable areas. The earthquakes of Páez, Colombia (1994); Nazca, Peru (1996); Cotopaxi, Ecuador (1996); Mexico (1995); and the State of Sucre, Venezuela (1997); affected sparsely populated areas or small to mid-sized cities. The Northridge, California (U.S.A.), earthquake in 1994 occurred in an area of relatively low levels of structural vulnerability. Second, the highest intensity hydrometeorological events (hurricanes and floods) affected countries that were well prepared to cope with or withstand their consequences in terms of protecting human lives. Both the impact of Hurricane Andrew (1992) and the flooding of the Mississippi (1993) and Red River (1997) in the United

States, occurred in a country with highly sophisticated early warning and evacuation systems.

The absence of deaths inflicted by Hurricane Lili in Cuba (1996) also is an example of the efficacy of preparations in that country, where hundreds of thousands of people and heads of livestock threatened by the hurricane were evacuated. In contrast with these cases, the mortality associated with the impact (indirectly, by rainfall) of Tropical Storm Gordon in Haiti (1994) and Hurricane César in Costa Rica (1996) is related to deficiencies or flaws in the local warning and evacuation systems (59). In Mexico, of the 400 persons who died during Hurricane Pauline in 1997, almost half lived in the densely populated coastal region of Acapulco where relief efforts into rural areas were hampered by landslides and blocked roads.

Landslides, avalanches, or cave-ins, which are considered, perhaps more than any other phenomena, as a major cause of death, gathered significant importance during this period. Many of the phenomena associated with extreme hydrometeorological conditions (in particular, intense rains that oversaturate the soil) are worsened by poor environmental management and deforestation of urban and rural areas with high population density. In many of the disasters listed officially as floods, the main causes of death actually are landslides or avalanches. The events of the Llapi zone in Larecaja, Bolivia, in December 1992; the case of Nambija, Ecuador, in May 1993; and that of Apurímac, Peru, in February 1997, all involved landslides without associated flooding. Fatalities listed in official statistics as being caused by flooding include the impact of Tropical Storm Gordon in Haiti (1994); the Santiago, Chile, floods in May 1993; Tropical Storm Bret, which devastated Caracas in August 1993; several events recorded in Rio de Janeiro, Bahia, Minas Gerais, and Recife in Brazil (1992–1996); the effects of Hurricane César in southern Costa Rica (1996); and Hurricane Pauline in Mexico (1997). In all of these cases, however, many of the fatalities were due to massive earth movements caused by instability of the slopes.

Impact on Health and the Health Services and Sanitation Infrastructure

The structural and functional weakness of health facilities, and, on occasion, their location, have caused repeated damage and losses during extreme events such as earthquakes, hurricanes, and flash floods. For example, during the tropical storm that struck Cuba in 1993, the Havana Maternity Hospital had to be evacuated, and vast quantities of antibiotics and vaccines were lost. The impact of Hurricane Andrew on the island of Eleuthera in the Bahamas (1992) damaged the health clinics, although equipment and drugs could be salvaged. The tsunami that hit Nicaragua in 1992 destroyed two clinics and damaged 17 others. The pediatrics wing of Saint Lucia's Victo-

TABLE 15
Major natural disasters in the Americas, 1992–1997.

Country	Date	Event	Deaths	No. affected ^a
Antigua and Barbuda	September 1995	Hurricane	...	66,000
Argentina	April 1994	Flood	...	100,000
	April 1995	Flood	5	6,000
Bahamas	August 1992	Hurricane	4	1,700
Bolivia	February 1992	Flood	...	40,000
	December 1992	Landslide	49	...
	December 1994	Drought	...	50,000
Brazil	January 1992	Flood	25	...
	February 1992	Flood	41	...
	March 1992	Landslide	30	...
	May 1992	Flood	29	125,200
	December 1995	Flood	61	...
Chile	May 1993	Flood	21	3,200
	October 1997	Earthquake	8	15,000
Colombia	October 1992	Earthquake	10	23,000
	April 1993	Flood	100	...
	January 1994	Flood	11	8,500
	June 1994	Earthquake	271	24,800
	February 1995	Earthquake	40	11,900
	March 1995	Earthquake	8	...
	July 1995	Flood	69	86,000
Costa Rica	December 1993	Flood	5	35,000
	November 1994	Flood	2	2,000
	February 1996	Flood/Landslide	9	99,000
	July 1996	Flood/Landslide	40	571,300
Cuba	February 1992	Flood	...	9,100
	May 1992	Earthquake	...	7,000
	March 1993	Storm	5	149,700
	May 1993	Flood	7	40,000
	April 1994	Flood	12	38,600
	November 1994	Hurricane	2	67,800
	April 1995	Flood	7	40,000
Dominican Republic	May 1993	Flood	...	20,000
	August 1995	Flood	9	...
Ecuador	March 1992	Flood	22	125,000
	March 1993	Flood	50	20,000
	May 1993	Landslide	300	...
	March 1996	Earthquake	25	...
El Salvador	September 1992	Flood	2	8,000
Haiti	May 1993	Flood	13	5,000
	November 1994	Flood	1,122	1,500,000
Honduras	September 1993	Storm	20	64,200
	October 1993	Flood	150	15,000
	November 1996	Flood	6	75,000
Jamaica	May 1993	Flood	9	...

TABLE 15 (continued)
Major natural disasters in the Americas, 1992–1997.

Country	Date	Event	Deaths	No. affected ^a
Mexico	January 1993	Flood	24	25,000
	July 1993	Hurricane	28	14,000
	September 1993	Hurricane	45	50,000
	December 1994	Volcanic eruption	...	50,000
	September 1995	Hurricane	107	40,000
	October 1995	Hurricane	8	...
	October 1995	Earthquake	66	...
	October 1996	Hurricane	400	200,000
Montserrat	March 1996	Volcanic eruption	10	6,000
Nicaragua	April 1992	Volcanic eruption	1	300,000
	September 1992	Tsunami	116	40,500
	August 1993	Flood	31	61,200
	November 1995	Volcanic eruption	...	12,000
	July 1996	Hurricane	9	100,000
Panama	July 1992	Storm	12	...
Paraguay	May 1992	Flood	...	65,600
Peru	July 1992	Drought	...	1,100,000
	March 1992	Flood	...	30,000
	March 1993	Flood	...	249,000
	February 1994	Flood	52	89,000
	November 1996	Earthquake	17	92,000
	February 1997	Avalanche	39	2,500
	September 1995	Hurricane	...	42,000
Saint Kitts and Nevis	September 1994	Storm	4	600
United States	August 1992	Hurricane	55	160,000 ^b
	November 1992	Fires	1	25,000
	April–August 1993	Floods	50	74,000
	January 1994	Earthquake	52	...
	April 1997	Floods	11	...
	May 1992	Flood	...	4,700
Uruguay	September 1993	Storm	...	2,000
	August 1993	Flood	150	5,000
	July 1994	Landslides	...	400,000
Venezuela	July 1997	Earthquake	80	2,200
	September 1995	Hurricane	16	2,000

^a Includes persons temporarily or permanently evacuated from their homes, requiring food assistance, or in financial difficulty as a consequence of a natural disaster.

^b Homeless persons.

Sources: U.S. Agency for International Development, Office of U.S. Foreign Disaster Assistance. *Disaster history: significant data on major disasters worldwide, 1900–1995*. Washington, D.C.: U.S. Federal Emergency Management Agency; 1996 (unpublished documents).

ria Hospital was destroyed during Tropical Storm Debby in 1994, and the hospital's radiology section also suffered severe damage. Hurricane Luis caused losses at hospitals and health centers in Antigua and Saint Kitts (1995), damaging and destroying equipment and medications. In Costa Rica, Hurricane

César (1996) incapacitated two hospitals that were located in the very flood zones of the country's southern rivers. An earthquake in Cotopaxi, Ecuador (1996), damaged several health clinics, and the Nazca, Peru, earthquake (1996), resulted in losses or damage in 37 health centers. The earthquake which

struck Coquimbo in Chile (1997) caused major structural damage in the Illapel hospital, where only emergency cases could be treated, and in the Salamanca hospital, where the operating rooms were flooded by burst water lines. In contrast, the Northridge, California (U.S.A.), earthquake in 1994 had little structural impact but caused serious damage in equipment and systems, thus confirming the importance of nonstructural mitigation measures in hospital safety.

Regarding potable water supply services and sewerage systems, during the immediate aftermath of Hurricane Andrew in Florida (U.S.A.), a survey conducted in the communities of Homestead and Florida City showed that 33% of the occupied homes had no working toilet and 29% had no running potable water three days after the hurricane. These percentages dropped to 11% and 10%, respectively, 10 days after the event (60).

In contrast to these data, Tropical Storm Debby damaged 75% of the potable water supplies and sanitary systems in Saint Lucia, due chiefly to sedimentation in the distribution pipes. The same thing occurred in a large area of Cuba with the March 1993 tropical storm, in Haiti (1994) with Tropical Storm Gordon, and in Paraguay with the massive flooding of April 1995. Also, in the state of Táchira, Venezuela, 400,000 persons were left without potable water after several landslides were triggered by the torrential rains of 1994. The earthquakes in Cotopaxi in Ecuador, Nazca in Peru, and in northeastern Venezuela had severe impacts on the potable water and sewerage systems in those areas.

During 1992–1997, there were several eruptions or increased volcanic activity in Cerro Negro in Nicaragua, Poás in Costa Rica, Pacaya in Guatemala, Popocatépetl in Mexico, and Soufrière in Montserrat. The eruption of Cerro Negro on 9 April 1992 affected about 300,000 persons, causing damage to homes, crops, livestock, and the population's health. More than 10,000 persons were evacuated and required some type of emergency assistance; the diarrhea incidence rate was six times greater than normal; pulmonary problems increased between three- and six-fold, having the greatest effect on children between 1 and 14 years old. An estimated 85% of the injuries treated occurred while cleaning away ash or repairing house roofs (61). Since July 1995, the continuous volcanic activity in Montserrat has forced the evacuation of more than half of the 12,000 residents to locations off the island or to the area designated as a "safe zone" in the territory's northern portion, where infrastructure and dwellings are sparse. The hospital, most governmental offices, schools, and business establishments in Plymouth have been abandoned. The June 1997 eruption caused 10 deaths, and the prolonged exposure to toxic and irritant gases, smoke, and ash placed the inhabitants at risk for respiratory tract infections and irritations. Inasmuch as many of the island's health professionals were evacuated, temporary personnel from neighboring countries

are administering health care to Montserrat's residents. Neighboring countries have provided hospital beds in their facilities to increase the complement of beds available to the island population. The threatened eruption of Popocatépetl (Mexico) which began in December 1994, required the evacuation of 50,000 persons and assignment of necessary resources for health care in the temporary settlements.

Most of the hydrometeorological events have caused increases in the incidence of diarrhea and pulmonary disorders. The 1992 floods along Ecuador's coastline produced serious health problems; the flat terrain encouraged standing water, which was contaminated with sewage or wastewater, triggering an increase in the incidence of cholera, malaria, and dengue fever. The subregion's health ministers, fearing that Central America's 1995 dengue fever epidemic—when 24,000 cases were recorded—might become more acute, applied rigid controls during flood-related outbreaks. Health problems occurring in the aftermath of hurricanes were seen in the case of Hurricane Pauline, which caused a serious interruption of the water supply in the Mexican states of Oaxaca and Guerrero in 1997, causing cholera and other diseases related to sanitation and water supply problems in the temporary settlements. A survey conducted in 19 districts of south-central Louisiana in the United States, heavily hit by Hurricane Andrew in 1992, confirmed the significant rise in injuries and disease during the period after the impact. Of 406 injuries and illnesses recorded, 4% occurred before the impact, 17% during the impact, and 79% after the hurricane. Men had an incidence rate 2.5 times that of women and the 30–39-year age group suffered the most (62).

Rural and urban droughts tend to have a slower impact on health conditions because of their effect on the food supply and availability of potable water. The 1992 drought in Peru caused agricultural losses estimated at US\$ 300 million and affected more than 1 million persons; the 1994 drought in Bolivia seriously affected 50,000 residents of the city of Potosí. The urban drought phenomenon is a major problem, because aquifer strata and surface water sources that supply major population concentrations are depleted and contaminated.

El Niño

El Niño is a natural phenomenon which provokes excessive and prolonged precipitation and temperature anomalies. No proof yet exists that directly links an increase or decrease in the incidence of infectious diseases with the events produced by El Niño. Indirect evidence obtained by retrospective studies and preliminary data from studies under way suggest, however, that there is an effect on the incidence of certain diseases. In general, diseases whose origins are tied to water, such as leptospirosis and diarrheal infections, increase during

periods of heavy rainfall. Moreover, the incidence of malaria in Iquitos (Peru) and in Boa Vista, Roraima (Brazil), diminished in 1997 during a dry spell attributed to El Niño. Likewise, extreme climatic events that occur in years when El Niño is not present can produce infectious disease outbreaks, as is the case of the leptospirosis outbreak that occurred in Nicaragua in 1995.

Several of the Region's countries have gone to great lengths to prevent and mitigate the damaging health effects produced by El Niño events. Bolivia, Colombia, Ecuador, and Peru have prepared emergency plans specifically dealing with the phenomenon and they have put programs in place that aim at ensuring an adequate water supply in drought zones, improving the water quality in flood zones, establishing basic sanitation in temporary settlements and shelters, reinforcing epidemiological surveillance systems, and developing a system for management of donations in disaster situations.

Man-Made and Technological Disasters

Disasters resulting from human activity encompass crisis situations that range from complex disasters (stemming from wars and conflicts or acute social problems) to problems involving contamination, explosions, and transportation accidents.

During the 1992–1997 period, Nicaragua sought to consolidate its transition to democracy, Haiti emerged from a military dictatorship, and the Governments of El Salvador and Guatemala signed peace treaties with insurgent forces, putting an end to decades of internal conflict. On the other hand, Colombia remained immersed in internal violence and drug trafficking problems and Peru continued to face violence from the Sendero Luminoso and Tupac Amaru guerilla movements. All of these processes imply humanitarian problems and challenges relating to the health and welfare of demobilized groups or indirectly affected populations.

In regard to technological disasters, the absence of controls and oversight in the use of technology and hazardous materials that characterize modern urban and industrial development resulted in numerous incidents in the Region. One of the more serious was an explosion in 1992 in Guadalajara's sewer system, when gasoline and liquid hexane gas leaked from a PEMEX production facility. The accident caused more than 250 fatalities and 15,000 people were left homeless (63). Other major events included an explosion caused by a gas leak that destroyed a shopping center in São Paulo (Brazil) in 1996, resulting in dozens of deaths and injuries; a munitions factory explosion in 1995 in Córdoba, Argentina, that killed 13 and injured 300; in 1992, an electrical fault in a shopping center in Santa Cruz in Guanacaste Province, Costa Rica, brought about the destruction of that city's historic central

district; and a cyanide spill contaminated several kilometers of Guyana's Essiquibo River, causing serious damage to the area's ecology in 1995.

The population is increasingly exposed to chemical accidents and to hazardous materials as a consequence of transportation accidents. Efforts have been made to systematize information and to design and apply prevention and response methods for such events. Colombia's Chemical Products Information Center (CISPROQUIM), Mexico's Chemical Industry Transportation Emergency System (SETIQ), Brazil's Environmental Pollution Control and Sanitation Technology Company (CETESB), and Argentina's Emergency Chemical Information Center (CIQUIME), among others, have undertaken these efforts with international support.

Radiological Accidents and Incidents

In the Region of the Americas, there have been no reported fatal accidents involving either workers or members of the public due to exposure to radiation sources in the 1992–1997 period, in spite of the fact that the use of such sources in agriculture, industry, medicine, and research continues to grow. There is increased awareness by radiation protection authorities of the risks posed by ionizing radiation and the need to establish strong radiation control programs. Practically all the countries in the Region are revising their regulations, modeling them after the "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources" that were endorsed by the XXIV Pan American Sanitary Conference in 1994.

Another factor in the prevention of radiation accidents has been the aggressive policy of international organizations such as the International Atomic Energy Agency (IAEA) and PAHO in the conditioning or removal of radioactive sources no longer in use. At Georgetown General Hospital in Guyana, PAHO sponsored the removal of 170 mg of radium-226 brachytherapy sources that were jammed in a storage vault, and they were transported to the United States for safe disposal. In another instance, the Ministry of Health and Welfare of Venezuela closed a Caracas radiation therapy facility in 1997 to prevent patient overexposure due to a malfunctioning cobalt-60 unit.

Radiation overexposures that have occurred in this period involved cancer patients under radiotherapy treatment. In 1996, the Ministry of Health of Costa Rica asked PAHO to assess the doses received by 109 radiotherapy patients who were allegedly overexposed after the replacement of the radioactive source in a cobalt-60 unit. It was determined that miscalibration resulted in a factor of 1.72 times the prescribed dose. Within one year of exposure more than 50% of the patients had died, and the issue of liability was under judicial investigation.

In 1997, a seminar was held in Havana, Cuba, to analyze the status of radiological emergency preparedness and response in the Region, and to agree on a strategy to develop adequate emergency plans. Representatives from 16 countries in the Region and three WHO Collaborating Centers on Radiological Emergencies attended, and some countries have started implementing the agreements reached.

Institutional Action for Risk and Disaster Management

During the 1992–1997 period, risk and disaster management policies, actions, and mechanisms significantly advanced in Latin America and the Caribbean, especially in hazard prevention and mitigation. Activities were developed within the framework of the United Nations International Decade for Natural Disaster Reduction (IDNDR). The conclusions and recommendations of the Interamerican Conference on Natural Disaster Reduction (Cartagena de Indias, March 1994) and of the World Conference on Natural Disaster Reduction convened by the United Nations (Yokohama, May 1994) provided global support to the guidelines.

The Region's countries, particularly in Central America and the Caribbean, received financial and technical support from international institutions. This support was provided in the context of the IDNDR and the complex emergencies associated with the end of armed conflicts and the humanitarian needs of insurgent forces and displaced populations returning to their countries (e.g., El Salvador, Guatemala, and Nicaragua). Haiti, whose ongoing emergency status was heightened by the economic blockade prior to its return to democracy in 1994, was the object of a major intervention by international agencies concerned with the population's survival, nutrition, and health.

Institutional and Legal Framework

During the 1992–1997 period, the institutional framework in the area of disasters underwent major national, regional, and international changes. At the national level, many countries instituted changes in official agencies to increase their presence, efficiency, and decentralization, as well as giving greater consideration and coherence to hazard reduction, prevention, and mitigation through the systematic promotion of intersectoral approaches. Notable among the changes instituted or consolidated in these countries are the creation of the National Disaster Reduction System in Guatemala, civil defense reforms in Brazil, strengthening of the National Civil Protection System in Panama and the National Emergency Office in Chile, preparation of the first national emergency

plan and promotion of changes in disaster legislation in Costa Rica, and efforts by the Federal Emergency Management Agency of the United States to expand its activities in the area of disaster prevention. In general, these changes have not been accompanied by budget increases for the official agencies, which leads to some degree of dependence upon international financing.

The Center for Coordination of the Prevention of Natural Disasters in Central America (CEPRENAC), established in 1988, has become a regional intergovernmental agency. Since a 1995 accord of national presidents and legislatures, it has participated in the Central American Integration System. In the Caribbean Community (CARICOM) countries, the Caribbean Disaster Emergency Response Agency (CDERA), established in 1991, consolidated and expanded its programs and activities with the support of several international agencies. During sessions of the Latin American Parliament, the Andean Parliament, the Central American Parliament, and CARICOM, as well as during the IV Ibero-American Summit (1994), the subject of disasters and disaster legislation was discussed and supported by several resolutions. Under the auspices of the Organization of American States (OAS), Colombia, Nicaragua, and Panama became the first countries to ratify the Inter-American Convention to Facilitate Assistance in Disasters in November 1992. Likewise, cooperation in disaster situations between countries with shared borders was strengthened between Chile and Peru, Colombia and Venezuela, Costa Rica and Panama, Mexico and Guatemala, Mexico and the United States, Bolivia and Peru, Colombia and Ecuador, and Argentina, Brazil, and Paraguay.

On the international scene, the United Nations Department of Humanitarian Affairs established a permanent office of the IDNDR for Latin America and the Caribbean, and Doctors without Borders opened its first regional office for Central America.

In the professional field, the Network of Social Studies on Prevention of Natural Disasters in Latin America (La RED) (1992) and the Ibero-American Emergency and Disaster Society (1996), were among several groups established with a commitment to the subject of hazards and disasters. These institutions complement the growing number of national emergency medicine societies created in the Region between 1992 and 1997.

Preparedness and Management of Humanitarian Response

After the catastrophic disasters of the 1970s, the impact of the Popayán, Armero, and Mexico City disasters and of Hurricanes Gilbert and Hugo in the 1980s, a major portion of disaster-oriented activity has been devoted to disaster preparedness and humanitarian response. Despite the efforts, the

serious deficiencies and gaps that remained in these areas reappeared with each new emergency situation. Consequently, the Region's ministries of health appointed health program coordinators for disasters and mandated them to coordinate response activities, to conduct rapid damage assessment, and to determine the health needs immediately after a disaster. These coordinators are also responsible for reviewing and updating hospital plans for disasters and ensuring that sector personnel are trained in preparation for, and response to these events.

During the 1992–1997 period, international agencies devoted to disaster preparedness and response continued collaborating with national authorities and with new international institutions. In August 1992, PAHO and the Government of France's Ministry of Cooperation and Development initiated a hospital preparedness project in the six countries that are members of the Organization of Eastern Caribbean States, which included a periodic evaluation of medical treatment, emergency simulations, and functional and structural mitigation measures. Disaster response exercises, known as "Tradewinds," were held in various Caribbean islands between 1992 and 1996. Increased national and subregional response capacity was complemented by the work of PAHO's Caribbean Response Team, established earlier to evaluate disaster effects on health and needs emerging from disaster situations.

In other activities, the Supply Management project (SUMA) was expanded to facilitate the receipt and distribution of humanitarian relief supplies in the aftermath of disasters, including the inventory, classification, prioritization, and updating of information on supplies with a user-friendly computer software program. SUMA was introduced into many of the Region's countries; more than 1,500 professionals have been trained in the use of this tool, and it has been deployed in more than 10 disaster situations in the Region.

With regard to disaster response, the Office of Foreign Disaster Assistance of the U.S. Agency for International Development (OFDA/USAID) continued to conduct training courses for disaster management instructors and offered assistance to various government agencies in the integration of activities taken in preparation for and in response to disasters. Between 1995 and 1997 the United Nations Humanitarian Affairs Department's Disaster Evaluation and Coordination Team trained 24 professionals from six Latin American countries (Colombia, Costa Rica, Ecuador, Guatemala, Peru, and Venezuela) on evaluating needs and coordinating international relief assistance in cooperation with the U.N. representatives in countries affected by a disaster.

Another initiative in the area of preparedness addresses community training programs supported by the International Federation of Red Cross and Red Crescent Societies and the adaptation of the American Red Cross series 3000 to Latin

American and Caribbean needs through workshops held in different countries (Colombia, Costa Rica, Ecuador, El Salvador, Jamaica, Mexico, and Venezuela).

Disaster Prevention and Mitigation

Risk reduction through specific prevention and mitigation measures constitutes the essential objective of the International Decade for Natural Disaster Reduction (IDNDR). The years between 1992 and 1997 witnessed innovations in the approach to this problem in the Region, which are critical for its future management.

The structural and functional safety of hospitals and health facilities has taken on great importance. The destruction of hospitals during earthquakes in Mexico (1985) and El Salvador (1986), the successful experience of the Costa Rican Social Security Fund in retrofitting three of its hospitals between 1988 and 1991, and the acknowledgement that more than half of the 15,000 hospitals in Latin America and the Caribbean are located in areas at risk to natural hazards, prompted PAHO to analyze this vulnerability and encourage corrective action in collaboration with health authorities in several countries of the Region (64). The work begun in Chile, Colombia, and Mexico was broadened to analyze the vulnerability of 47 hospitals in Chile, Ecuador, and Venezuela. Through a PAHO-managed project and with the assistance of the European Union's Humanitarian Office (ECHO), activities were coupled with wide dissemination of publications on the subject and the convening of the International Conference on Disaster Mitigation in Health Facilities in Mexico in 1995. According to Conference recommendations, hospital risk and vulnerability studies were carried out in several countries, but little progress has been made in implementing the recommendations of these studies.

During the 1992–1997 period, water supply and sewerage systems received new attention, which focused on the design and dissemination of methods to evaluate their vulnerability. Accomplishments include the development of methods in universities in Colombia, Mexico, and Venezuela, and workshops organized by the Mexican Sanitary Engineering Society and PAHO in Monterrey, Tijuana, Guadalajara, and Mexico City. Institutions providing assistance in developing plans for preparing and repairing water distribution systems include CETESB in Brazil (which was designated a WHO Collaborating Center) and the ongoing work of the Pan American Sanitary Engineering Center (CEPIS) headquartered in Peru.

In the face of excessive centralization and sectoralization of many efforts, community and local participation has assumed an increasingly important role in the debate and in the quest for disaster prevention and mitigation plans. The work of national nongovernmental organizations with the commu-

nities at the local level has expanded to projects of major territorial coverage and scope.

Dissemination of Disaster Information and Documentation

The Regional Disaster Information Center (CRID), established in 1990 in San José, Costa Rica, has continued to evolve, adding to its wealth of documents and disseminating them through the publication of bibliographic summaries and storage of the information on the LILACS CD-ROM published by BIREME. In 1995, a pilot electronic communications network was inaugurated in Central America, which links health sector professionals, civil defense workers, legislators, and other persons involved in disaster management. The system gives access to the CRID and other global information networks.

Notable among the events that have transpired are the International Conference on Natural Disasters held in Huaráz, Peru, in 1995, 25 years after an earthquake struck that country; the First Latin American Congress on Prehospital Medical Emergencies and the first Latin American Congress on Chemical Accidents, both held in Buenos Aires in 1995; the Hemispheric Conference on Disasters and Sustainable Development held in Miami; and the Interamerican Sanitary and Environmental Engineering Congress held in Mexico City in 1996, which included the Regional Symposium on Preparations for Chemical Accidents organized by PAHO.

Formal Education and Training

Between 1992 and 1997 Latin America and the Caribbean shifted from an education pattern carried out through short courses and training activities specialized in the area of health and humanitarian response, to a complementary pattern that includes curriculum reforms in the framework of formal education, and candidacy for or enrollment in undergraduate or graduate university programs.

In emergency medicine, curriculum reforms have permitted courses or specializations to be introduced in the medical schools and colleges of the University of Costa Rica; the University of the West Indies in Barbados; the Central University of Venezuela; the University of Marília in São Paulo, Brazil; and the University of the Oriente in Venezuela. The universities of San Marcos de Lima and of Trujillo, in Peru, offer master's degrees in this discipline and the Public Health School of Colombia's University of Antioquia (a WHO Collaborating Center) has played a major role in promoting curricular reforms in Latin America.

The University of Cuenca, Ecuador, and the University of Puerto Rico initiated undergraduate courses on disaster man-

agement; the University of Antofagasta, Chile, started a distance learning program in the subject; the Ibero-American University and the Social Anthropological Studies and Research Center in Mexico offer diplomas in the area of civil defense and disaster management, and the National Disaster Prevention Center in that same country offers courses in collaboration with the National Autonomous University of Mexico. The National University of Colombia began a specialized course in disaster management, and created the Center for Disaster Prevention Studies in 1993. The notion of multidisciplinary study centers was made a reality at the Greater University of San Andrés, Bolivia, and at the University of Paraíba in Campina Grande, Brazil.

In the area of graduate studies, Colombia's University of Antioquia, during the 1993–1994 academic year, initiated the first master's degree program on Contemporary Social Problems, with an emphasis on emergencies and disasters. In 1997, La RED began to design Latin American bachelor's and master's degree programs in risk management and disaster prevention using the Internet as the main remote education teaching tool. In the pre-university area, Partners of the Americas, a nongovernmental organization, carried out valuable work in promoting curriculum reforms at the Region's primary and secondary education levels and supported the Panamanian National Civil Protection System in executing the civil protection education program in 1996.

HEALTH AND ENVIRONMENTAL LEGISLATION

Health legislation enacted over the past four years has centered on two core issues, namely sectoral reform and the economic integration and globalization process. Other developments include the passage of legislation addressing specific issues involving the disabled, children, adolescents, and the elderly; consideration of social problems associated with domestic violence, AIDS, and the deterioration in the living conditions of high-risk population groups; and progress in the legal treatment of bioethical issues.

Legislation on Health Sector Reform

Health sector reforms continued to be embodied in instruments that regulate health financing and private participation in the delivery of health care services and that consolidate decentralization and social participation processes. In Argentina, Law 24.754 (1997) regulates private participation and extends the mandatory medical care program established in 1995 to voluntary insurance schemes. In Colombia, the law creating the comprehensive social security system (1993) has increased regulatory efforts in the incorporation

of health promotion enterprises and service delivery institutions as an integral part of the system, establishment of basic packages under the Basic Health Care Plan, organization of an alternative system of subsidies, and adoption of regulations for the accreditation of health care facilities. Mexico's Social Security Act (1997) guarantees the right to health, medical care, protection of the means of subsistence, social services, and pensions. The system is based on a mandatory insurance program covering all employers and employees and a voluntary scheme extending coverage to other recipients.

Peru adopted legislation in 1996 that modernizes the social security system, enforces the constitutional right to protection of public welfare and free access to the services of public, private, and semi-public institutions, and makes the Ministry of Health responsible for providing comprehensive health care for the poor. Moreover, the Peruvian Social Security Institute ceases to be the only insurance provider, and its contributors may supplement social security benefits with health plans and programs offered by other health care providers.

Paraguay's National Health System Act (1996) is based on principles of equity, quality, efficiency, and social participation. Coordinated by a National Health Council, the system offers services operated by public, private, and semi-public care providers, as well as by universities. Brazil's National Emergency Fund (1994) uses its resources to meet health care and education system costs. The addition of Article 74 to the provisions of Brazil's Constitution in 1996 levied a temporary tax on transfers of commercial bills, loans, and financial contributions with corresponding tax revenues earmarked for a national health fund. In addition, a mandatory 15% contribution was established in 1996 to finance the social security system.

The United States enacted two pieces of health financing legislation in 1996. The Health Care Portability and Accountability Act allows anyone who leaves a job providing health insurance coverage to obtain other insurance even if there is a pre-existing condition which might otherwise be excluded from the coverage provided by a new insurance carrier. However, this legislation makes no provision for health insurance coverage for the poor. The new law also promotes the use of medical savings accounts to pay for specific medical services and granting tax exemptions on sums deposited to these accounts by qualified taxpayers. The Personal Responsibility and Work Opportunity Reconciliation Act reduces the number of Medicaid recipients by allowing the states to deny benefits to adults who fail to qualify for the short-term assistance program for needy families. It also gives states the authority to grant or deny coverage to legal immigrants, except in the case of emergency medical care, and excludes them from receiving Medicaid benefits for a period of five years from the date of their arrival in the country (65).

Several countries have established regulatory agencies to monitor new entities incorporated into existing health care

systems. In Argentina, for example, the Office of the National Superintendent of Health Services, which is attached to the Ministry of Health and Social Welfare, has supervised all national health insurance system agents and institutions since 1995. In Colombia, the National Council on Social Security has coordinated social security system operations since 1994. Peru's regulatory agency, the Office of the Superintendent of Health Care Providers, was established in 1997.

Ecuador enacted Regulations for the Modernization of the State (1994), which promote private participation in the operation of public services; a 1996 constitutional amendment required the Government to establish a national health care policy and apply it to public and private health care services. Accordingly, the national health system is a mix of public and private service providers, with plans to set up a supervisory and regulatory agency for private health care services.

Increased private participation in the delivery of health care requires mechanisms to ensure that health care services are of good quality and to delineate professional responsibilities. Efforts to improve service coverage include the enactment by the Chilean Government of Law 19.381 in 1995 (amending Law No. 18.933) for the establishment of social insurance institutions (ISAPRE). This legislation strengthened ISAPRE accreditation procedures and made the system more equitable by eliminating exclusions. It ensures coverage for women during pregnancy and for six months after giving birth, and for children up to 6 years of age.

To establish professional responsibilities, many countries have developed statutes for previously unregulated occupations or have updated existing standards. Argentina, for example, passed regulations governing the occupations of physical therapist, kinesiologist, and nutritionist in 1994 and the practice of psychology in 1995. Regulations were put into effect governing the occupation of nursing assistants in Brazil in 1994, the nursing profession in Colombia in 1995, the practice of dentistry, surgery, homeopathy, and nursing in Costa Rica in 1994, and for the activities of pharmacists in Honduras in 1994. Mexico established a National Medical Arbitration Board in 1996 to settle disputes between consumers and service providers, while the Uruguayan Medical Association established a code of medical ethics for its members in 1996. In Canada, the province of Alberta began revising regulations governing the practice of medicine in an effort to streamline the health care system, and incorporating lower-cost services to improve equity and efficiency in the allocation of health resources (66).

Peru followed up on its reform efforts with the passage of a General Health Act (1997) designed to modernize the entire health care system, and Guatemala enacted a new Health Code (1997). There are also general health bills or health codes currently under discussion in the legislatures of the Dominican Republic, Nicaragua, Panama, and Puerto Rico.

Other efforts to modernize the health sector include the adoption of provisions establishing intersectoral working groups and amendments to existing health legislation by the Dominican Republic (1995 and 1997), Venezuela (1995), and Mexico's Health Sector Reform Program for 1995–2000.

Several countries have enacted legislation to facilitate decentralization and social participation. Regulations implementing Bolivia's Social Participation Act and its Government Decentralization Act (1994) strengthen participation by involving indigenous, farming, and urban communities in the country's legal, political, and economic processes. This legislation also lays the groundwork for passing tax revenues on to local governments and public universities for the administration of health care services. The country's decentralized and participatory health system, established in 1996, reconciles the provisions of both pieces of legislation to ensure equity, quality, and efficiency in the delivery of health care services, universal access to health care, and better service coverage.

In 1994, Brazil established a national decentralization program and Chile adopted regulations governing the delivery of primary health care services at the municipal level. Trinidad and Tobago passed laws in 1994 mandating Regional Health Authorities to establish efficient health care mechanisms and to assist municipal governments with respect to public health issues. Finally, the Local Government Act (1996) passed by the Bahamas divides the country into districts, whose functions include maintaining hospitals and clinics and protecting the surrounding environment (67).

The economic crisis forced several Canadian provinces to enact legislation regionalizing the operation of health care services, in the belief that a decentralized system would be more efficient and more responsive to the needs of each community. The need to keep costs down led several provinces, Alberta in particular, to challenge the provisions of the 1984 Canada Health Act, which require them to maintain a universal, transferable, comprehensive, accessible, public health care system as a condition for qualifying for federal funding. The provinces propose the addition of a privately funded second tier to the system and redefinition of the concept of "medically necessary" services to more clearly establish provincial government obligations (68).

Efforts to promote public participation have been bolstered by a variety of instruments. In Argentina, for example, the constitutional amendment of 1994 provides for the possibility of filing legal action for the protection of rights safeguarding the environment, competition, service users and consumers, as well as rights impacting on society as a whole. Provisions designed to protect consumer rights and get consumers more involved in production and monitoring processes have been instituted in Argentina (1994), Brazil (1995 and 1997), Chile (1995), El Salvador (1996), Guatemala (1994), Mexico (1994/1997), and Panama (1997). Ecuador en-

acted a patient rights act (1995) and both Ecuador and Bolivia established procurator offices in 1997.

The Integration Process and Economic Globalization

The integration process and the process of economic globalization have also had consequences on health legislation. Nations around the world are required to fulfill commitments undertaken as members of the World Trade Organization (WTO) and as signatories of the Agreement on Trade Related Aspects of Intellectual Property, which sets minimum standards for the protection of such rights. It was within this context that both Argentina and Brazil updated their patent and copyright laws.

The Hemisphere-wide trade liberalization process spurred by efforts to establish an Americas Free Trade Area by the year 2005 has engendered a need to standardize trade regulations for goods and services, including those related to health. Efforts at the subregional level to realign the operating structure and functions of the Andean Community, CARICOM, and the Central American Integration System to provide for economic trade included the adoption of standardized regulations for the health sector. The enactment of "Official Mexican Standards" under the North American Free Trade Agreement was an important breakthrough in this respect. MERCOSUR regulations are beginning to be incorporated into the legislation of member countries, particularly with respect to standards of quality for trade in food products, customs regulations, and compliance with human and plant health agreements. The subgroup on technical standards and the establishment of a subgroup on health in 1996 helped bolster the framing of these instruments.

Legislation Targeting Special Issues

The disabled have benefited from new legislation designed to make them more independent and more involved in economic and social activities in Argentina (1994), Bolivia (1997), Brazil (1994 and 1995), Chile (1994/1995), Colombia (1995), Cuba (1996), the Dominican Republic (1994), Ecuador (1994), El Salvador (1994), Guatemala (1994), and Mexico (1994 and 1995). Cuba's creation of a national council on health care for the disabled in 1996 helped facilitate the implementation of preventive health care policies.

Efforts targeted specifically at children and adolescents included the passage of regulations creating special funds for the implementation of policies benefiting both these groups in Brazil (1994) and Colombia (1994), the enactment of legislation in Argentina (1995) providing for mandatory examinations of newborns for the detection of medical conditions,

and the establishment of comprehensive child health care systems in Peru (1995). The Dominican Republic (1994), Guatemala (1996), and Honduras (1996) enacted welfare codes for children and adolescents. Ecuador issued regulations under its existing child welfare code (1996), while Peru passed regulations governing the operations of its protective services for children and adolescents (1997). Costa Rica enacted legislation on day-care centers and nursery schools (1994), while Panama started up a program for the distribution of milk and nutrition bars in preschools and primary schools throughout the country in 1995. New Chilean legislation (1995) provided for mandatory vaccinations of children between 1 and 14 years of age against measles and of children up to 2 years of age against other vaccine-preventable diseases. The children's vaccination program legislated in the United States in 1997 protects children covered by Medicaid, uninsured children, and children vaccinated at duly qualified federal centers or rural clinics (65). Brazil (1996), Chile (1994), Colombia (1994), Guatemala (1996), and Honduras (1994) all passed regulations designed to protect the rights of the elderly and promote their social involvement.

Several countries in the Region, including Argentina (1995), Bolivia (1997), Chile (1994), Costa Rica, the Dominican Republic (1997), El Salvador (1996), Guatemala (1996), Jamaica (1995), Peru (1997), Saint Lucia (1995), and Saint Vincent and the Grenadines (1995), have established regulations to impose penalties for and prevent domestic violence. The United States banned the mutilation of female genitalia (1996) and Brazil amended its penal code (1995) to increase penalties for rape and other crimes perpetrated against children, the elderly, the disabled, and pregnant women. Peru made similar changes in its penal code (1997), while Mexico set up a council to assist victims of and prevent domestic violence in the Federal District (1996).

Human development concerns are echoed in provisions designed to fight hunger in Argentina (1994), Brazil (1995), and Venezuela (1994 and 1995) and to improve living conditions in impoverished areas of Antigua and Barbuda (1995), Chile (1994), and Ecuador (1996). Ecuador and El Salvador both set up solidarity funds to promote human development in 1996. Brazil passed an action program on sanitation in 1995 that is designed to improve sanitation conditions in poor urban areas. Peru mounted an assistance program for the resettlement and development of emergency areas (1997). Ecuador set up a national council for the planning and development of indigenous and black communities (1997), while Guatemala organized a commission for the official recognition of indigenous languages (1997).

New AIDS legislation in Argentina (1995) has begun to extend the coverage of certain social services programs to include drugs and treatments for AIDS sufferers. Brazil (1996) has guaranteed AIDS patients free access to drugs under its

unified health system, while the United States (1996) extended benefits under the Ryan White Comprehensive Resource Emergency Act of 1990 on comprehensive emergency assistance for AIDS sufferers to high-risk groups (i.e., families, women in general and pregnant women in particular, children, adolescents, Native American and rural communities, hemophiliacs, the homeless, and the prison population) (65).

Bioethics has had an effect on legislation in different areas. In the area of reproductive health, Guyana issued regulations under a therapeutic abortions act designed to promote safe motherhood and reduce maternal mortality from septic abortions. Brazil issued regulations under the article of its Federal Constitution addressing the issue of family planning, recognizing it as a civil right and guaranteeing public access to information and education in this area (1996). The Peruvian law establishing a national population policy (1995) provides for freedom of choice with respect to the use of contraceptives. Moreover, Brazil passed regulations governing the use of genetic engineering and manipulation techniques on organisms to be subsequently released into the environment, while Argentina (1997) and the United States (1997) issued regulations governing experimentation with cloning. The U.S. passed legislation in 1997 banning the use of federal funds to assist in the suicide or mercy killing of the terminally ill and for fetal abortions (65). A Supreme Court ruling in Colombia lifted criminal sanctions against persons who help a terminally ill patient to die with the patient's authorization.

Legislation on Environmental Issues

The range of legislation addressing environmental issues has also grown in the Region. Environmental impact assessments have been stepped up, there is new legislation establishing legal liability for damage to the environment, and a number of environmental commissions or tribunals have been established. Environmental provisions were written into the Constitution of Argentina (1994) and incorporated in constitutional amendments by Costa Rica (1994) and Uruguay (1996). As part of its decentralization process, Bolivia passed regulations establishing regional development corporations (1994) in each department attached to the Ministry of Sustainable Development and Environment. Under the provisions of its Social Participation Act, these corporations each have legal status; an administrative, technical, and financial self-management capacity; and independent assets. Chile's Environmental Policy Act (1994) strengthens community participation in environmental assessments, obliges the Government to bolster public participation and promote environmental education campaigns, and establishes the concept of legal liability for repairing damage unlawfully caused to the environment. Argentina (1996), Belize (1995), Canada

(1995), Cuba (1994), Guyana (1996), and Uruguay (1994) also passed regulations governing practices and procedures for environmental impact assessments.

Several countries in the Region have restructured their environmental protection agencies in line with ongoing modernization processes. Nicaragua enacted legislation creating a Ministry of Environment and Natural Resources (1994), Brazil adopted regulations for its Ministry of Environment (1994), Paraguay established a National Environmental Sanitation Service (1994), and Peru issued regulations for the Office of the Superintendent of Sanitation Services (1994). Peru also created a National Environmental Council in charge of coordinating environmental programs which operates under the aegis of the Chairman of the National Council of Ministers (1994). The United Nations Conference on Environment and Development (Rio de Janeiro, 1992) prompted the organization of a national council on sustainable development in Honduras (1994) and a policy-making commission addressing sustainable development and Agenda 21 in Brazil (1997).

The English-speaking Caribbean nations have also introduced sweeping institutional reforms. Jamaica established an office in 1995 to authorize licensing for public services that pose no health or environmental risks, Saint Kitts and Nevis formed a Department of the Environment and the Saint Kitts Solid Waste Management Corporation (1996), Saint Lucia formed the Saint Lucia Solid Waste Management Authority (1996), and Guyana established an environmental protection agency, environment fund, and environmental appeals board (1996). Likewise, Trinidad and Tobago formed an environmental authority to update environmental legislation and established an environment fund and multisector environmental commission. Finally, Saint Lucia restructured the governing board of its Water and Sewerage Authority (1996) to make it an intersectoral body (67).

New legislation in Chile (1994), Guatemala (1996), and Uruguay (1995) addressed the issue of air pollution by setting emission standards for motor vehicles. Chile also set standards for concentrations of arsenic (1994), and Panama set environmental standards for lead and petroleum products (1995). Mexico issued environmental protection regulations for its Federal District (1996) and Venezuela declared an environmental state of emergency in several districts (1994). Saint Lucia's new traffic and motor vehicle regulations (1995) require drivers to ensure that their vehicles do not produce hazardous emissions. Belize passed environmental protection regulations in 1996 requiring industries to install detoxification equipment for toxic emissions and discharges.

The increase in processing of hazardous materials has prompted several countries to regulate commerce in and the control of pesticides and other toxic products, including Belize (1995), Costa Rica (1994), Guatemala (1994), Peru (1995), and the United States (1996). Guatemala has regulated

the use of lead (1994), while Chile has regulated the transportation of hazardous materials and liquefied gas on roads and multi-lane highways, as well as the storage, refining, transportation, and public sale of petroleum by-products. Peru instituted provisions governing the transportation of hydrocarbons (1995), while both Brazil and Venezuela enacted legislation governing the removal, manufacturing, and marketing of asbestos (1995). Panama has set minimum requirements for hospital waste management in public and private institutions (1995) and Argentina has established procedures for the classification of high-risk hazardous wastes (1994). Several countries in the Region have set water quality standards for drinking water, including Antigua and Barbuda (1996), Honduras (1994), Panama (1995), Peru (1994), the United States (1996), and Venezuela (1995). In 1994, Mexico adopted national water regulations and instituted a water resources program for 1995–2000.

Legislation on occupational safety and health in Argentina (1995) and Mexico's Social Security Act (1997) incorporate private participation in the provision of workmen's compensation insurance. Colombia established regulations for its occupational safety and health system (1994), which are complemented by regulations for the classification of occupational diseases (1994), a handbook of technical and administrative licensing procedures for occupational safety and health services (1994), and provisions for benefits for occupational illnesses (1996).

Other developments in the area of occupational health include Cuba's revision of its schedule of occupational diseases (1995) and the passage of regulations by Guatemala (1994) and Honduras (1996) governing the operations of their national occupational safety commissions. Chile (1996) and Peru (1996) both established mechanisms for monitoring compliance with occupational safety and health standards and conducting workplace inspections. Peru also produced an official labor inspection guide (1995), while Ecuador added a new title to its workmen's compensation insurance regulations dealing with the composition and functions of its national commission on occupational hazards and the regional commissions that evaluate disabilities (1996).

Several countries have extended the scope of their labor regulations to address working conditions in different occupations, with Argentina regulating working conditions in aircraft and fishing industries (1994), Brazil regulating working conditions for rural workers (1996), Belize adopting safety, health, and environment regulations relating to mines and minerals in 1994, and both Ecuador (1996) and Peru (1994) regulating working conditions in mines. Peru also amended its labor regulations governing the length of the workday, overtime, and night work (1996), and granted working women the right to accumulate maternity leave, which was to commence 45 days prior to and extend up to 45 days after

giving birth (1996). Chile formed an advisory committee for the elimination of child labor and the protection of minors (1996), while Paraguay amended its labor code to protect minors against sexual harassment in the workplace (1996).

A number of world events taking place during this period are destined to affect legislation on health and the environment. Agenda 21, which came out of the United Nations Conference on Environment and Development, calls on the international community to consider the relation of health, the environment, and sustainable development. At the regional level, the Summit of the Americas (Miami, 1994) included health care reform and environmental concerns in its Plan of Action, urging governments to work with their citizens to ensure sustainable development, mainly through the rational use of energy and the prevention of environmental pollution. In keeping with this mandate, the Pan American Conference on Health and Environment in Sustainable Human Development (Washington, D.C., 1995) drew up a Pan American Charter on Health and Environment in Sustainable Development, while the Santa Cruz Summit (Bolivia, 1996) approved a Plan of Action for the Sustainable Development of the Americas. Both documents call for strategies to implement their underlying principles. The action plan, for example, promotes the establishment and strengthening of national funding for the environment, community participation, health and environmental education, the concept of healthy cities, and the channeling of domestic and international assistance into sustainable development efforts.

Several English-speaking Caribbean nations, Guatemala (1997), and Peru (1997) have already established funds for environmental protection, and Honduras has issued regulations regarding healthy cities (1995). At the international level, the Central American countries approved a regional agreement on cross-border transport of hazardous wastes (1994).

While most countries in the Region have formulated instruments for modernizing the health sector, not all have developed a consistent legal framework for implementation purposes. There are still gaps in the definition of basic health care packages, appropriate alternative financing systems, private insurance schemes, and accreditation mechanisms for health facilities and professionals. Changes produced by the globalization process have raised a number of questions. On one hand, agreements such as MERCOSUR have devised mechanisms for setting trade standards for various goods and products, including health-related products while, on the other hand, health-related regulations have not been developed in the context of the North American Free Trade Agreement. Nor have solutions been found to potential problems caused by the changing labor environment, particularly in regard to workers in the informal sector, migrant workers, the growing numbers of women in the work force, and child labor.

HEALTH RESEARCH

In a Hemisphere-wide comparison of scientific research in health, the situation of Canada and the United States contrasts markedly with that of the Latin American and Caribbean countries. The United States accounts for approximately 60% of worldwide funding and scientific output in the health field, compared with 2% for Latin America and the Caribbean. This section examines different trends in health research in Latin America and the Caribbean that have emerged over the past few years, as well as challenges facing this Region, specifically as regards organization, financing, patterns of scientific output, new conceptual and methodological approaches, and ties between research and the policy-making process in the health field.

Trends and Challenges

During the 1960s and 1970s, the establishment of specialized government agencies responsible for setting centralized science and technology policies in nearly all Latin American and Caribbean nations reflected the prevailing concept that the State was the main catalyst for development. In the 1990s, global and regional changes, both at the macroeconomic level and in the dynamics of scientific and technical development, have given rise to new trends in the organization and conduct of scientific activity in Latin America and the Caribbean. Health research and technology is increasingly being affected by factors such as new patterns of population growth, mortality, and disease, and changes in health care organization.

Under this new scenario, scientific and technological activities can no longer be organized on the basis of centralized planning, in which the State plays the leading role. Instead, the State must focus on strengthening its role as facilitator, and provide incentives to involve a variety of participants in setting corresponding development policies. New issues raised by health conditions and reforms in health care systems include demographic and epidemiological transition, changes in lifestyles and living conditions, and environmental degradation. These factors dictate a need not only for strengthened scientific and technical capabilities, but also for profound change in the features of the scientific community working in the health field and in institutional mechanisms promoting the dissemination and use of scientific knowledge.

Financing Science and Technology in Latin America and the Caribbean

The analysis of financing science and technology focuses on five Latin American countries, namely Argentina, Brazil,

Chile, Mexico, and Venezuela, which account for nearly 90% of all scientific and technological spending and output in the Region (68).

None of the countries in this Region have attained the goal set in the 1970s to earmark 1% of their GDP for activities in the field of science and technology. In general, spending on science and technology in the countries included in the study ranges from 0.24% to 0.75% of GDP, compared with 2.7% in industrialized countries. Aggregate annual spending in all five countries in the early 1990s amounted to approximately US\$ 5.7 billion, with the State furnishing nearly 80% of these funds. In contrast, the United States spent US\$ 160.8 billion on research and development in 1993, of which 42% was supplied by federal funding, 52% by industry, and 6% by other sources. A breakdown of the uses of these research funds shows 60% going to development research, 25% to applied research, and 15% to basic research. The breakdown for federal funding was 53% for development research, 23% for applied research, and 24% for basic research, and 69%, 25%, and 6%, respectively, for funding supplied by industry. Of the US\$ 71,339,000 in United States Government spending on research and development in 1996, US\$ 12,040,000 went to health and, of this figure, US\$ 11,871,000 were administered by the National Institutes of Health (69).

The 1990s have been marked by two major trends in research and development financing in Latin America and the Caribbean, namely, greater participation by private enterprise and a boost in external financing by the World Bank and the Inter-American Development Bank (IDB), primarily for activities geared to technological innovation. Trends in the modernization of the science and technology sector are most visible in Chile and Mexico. These countries have witnessed tangible growth in aggregate spending in this sector, stepped-up private participation, priority given to new areas of scientific and technological development, emphasis on technological innovation, and stronger ties between research and the goods-producing sector through the establishment of agencies and funds specifically designed to promote these types of activities. Of the five countries studied, Argentina and Venezuela are lagging farthest behind in these areas.

From 1990 to 1993, spending on health sciences accounted for close to 25% of government research and development funding in Argentina, 4% of federal spending on science and technology in Brazil and Mexico (with increases in Brazil and decreases in Mexico), 34% of funding from Venezuela's National Council on Scientific and Technological Research, and 17% of National Scientific and Technological Development Fund resources in Chile. The World Bank and IDB were the Region's two major international sources of research funding.

Inter-American Development Bank

The IDB first began financing the advancement of higher education, science, and technology in the 1960s. Since that time, of a total of approximately US\$ 5.9 billion in IDB financing, close to US\$ 2 billion in loan proceeds and technical co-operation funding has gone to Latin American and Caribbean nations for projects in these areas. The volume of IDB financing for science and technology programs for the 1990–1995 period was calculated at US\$ 791 million. From 1961 to August 1995, 80% of the IDB's Science and Technology Program financing and 45.7% of its Higher Education Program financing went to Argentina, Brazil, Chile, Mexico, and Venezuela.

Between 1961 and 1987, IDB financing targeted research and development capacity-building at public universities and research centers, primarily through grants for overseas graduate work and capital expenditure for the construction and equipping of laboratories, libraries, and computer centers. Since 1988, with changes in development models and countries' endeavors to increase the competitiveness of their output, the IDB shifted the focus of its own policies and began to concentrate on forging ties between the developers and users of scientific advances and technology.

Loans approved between April 1993 and April 1995 for 10 projects in Latin America and the Caribbean totaling US\$ 311,450,000 represent another source of IDB financing for health research, particularly for research on health care systems and services. Another 17 projects valued at US\$ 857.8 million are pending approval (70). Nearly all of these projects will provide financing for the restructuring of health care systems and include a research component as the basis for the restructuring process.

World Bank

The World Bank has financed operations in the field of science and technology since 1970, supplying US\$ 3.18 billion in project lending, of which 23.6% was granted between 1990 and 1991. As of 1990, of the countries selected for study purposes—Argentina, Brazil, Chile, Mexico, and Venezuela—the Bank had granted a single US\$ 72 million loan to Brazil. Since that time, it has furnished US\$ 504 million for three projects in Argentina, Brazil, and Mexico.

As is the case with IDB, the World Bank finances many projects that address the issue of health care reform in Latin America and the Caribbean. These projects represent an additional source of financing for health research, since many include an operational research component. The Bank approved US\$ 1,492,600,000 in financing for 25 health projects in the Region between March 1988 and April 1995.

The trend toward the expansion and diversification of financing sources for the advancement of science and technology in the health field should help strengthen infrastructure in this area and strengthen ties with various domestic and international sectors. Making this potential into a reality, however, will not come automatically. There is always the risk that new funding will go to research groups that do not have real ties to the recipient country or do not adhere to specific priorities.

Scientific Output in Health

The following analyses are based on a study of articles published by resident authors in six Latin American countries (Argentina, Brazil, Chile, Cuba, Mexico, and Venezuela) over the 1973–1992 period (71). The study used scientometrics, a discipline that has been criticized for both its conceptual approach and methodology (72). More specifically, it has been criticized for its narrow conception of science, which is based on the input/output model and whose only recognized output is a scientific article published in a prominent scientific journal. The scientometric approach is also criticized for its lack of study parameters and criteria for assessing optimum production and productivity. Cross-country comparisons using this method fail to take into account cultural differences that influence publication, as well as differences in publication standards for different areas and types of research (basic and applied research). The most frequently used source of data for these analyses, namely the Institute for Scientific Information (ISI) citation index, is considered ill-suited for examining scientific output by developing countries because the index is limited to articles published by authors in the 3,500 or so leading journals in industrialized countries, and as such, it ignores a portion of the output by developing countries. It is essential to overcome these shortcomings through studies providing better insight into the nature and patterns of scientific activity in developing countries, the development of new indicators that take these specific elements into account, and the establishment of local databases. Scientometric analysis, while providing only a partial picture of ongoing scientific activity in developing countries and being a rather weak basis for decisions on scientific policy, does, nevertheless, illustrate certain trends in scientific activity in health in the six countries selected for study.

Between 1973 and 1992, 41,238 articles were published by resident authors in Argentina, Brazil, Chile, Cuba, Mexico, and Venezuela and recorded in the ISI database; 38.3% were produced during the first half of the study period and 61.7% during the second half. The largest increase in output was between the first and second five-year periods, coinciding with

Region-wide growth in economic indicators and spending on science and technology. The six-country sample accounts for nearly 90% of all articles published by authors from this Region recorded in ISI. There is a similarly high concentration of production within the sample: 61% of the articles originated in Argentina (28.1%) and Brazil (32.9%).

Published articles in the three areas of biomedical, clinical, and public health research were not evenly distributed among the six countries. Clinical research, which has the longest tradition in this Region, was distributed more or less evenly. Argentina and Brazil accounted for nearly 70% of all articles published on public health in each of these fields. Brazilian authors account for 60.7% of the 1,107 articles on public health, a share that tended to rise over the course of the study period. This is a cause for concern because research on public health, which includes epidemiology and health care services, should be broadly represented given its importance for policy-making and the variety of existing public health problems. However, there is little evidence of this in the output recorded in the ISI database.

A breakdown of articles by research area reveals the emphasis placed on the individual rather than the population approach to the study of health problems. Despite the increase from 1.8% to 3.2% between the first and second halves of the study period, only 2.7% of the articles published over the entire 20-year period are classified as research on public health, as compared with 53.4% in clinical research and 43.9% in biomedical research. A look at the average number of citations received for each article presents a discouraging picture of the status of public health research. There were an average of three citations of works by authors in the six countries (less than half of the overall average of 7.78 citations per article indexed in the ISI database). Articles on biomedical research received an average of 4.03 citations, compared with 1.61 for research articles on public health.

The “modernization” of scientific activity in the countries included in the study is evident in a downward trend in the number of articles published by individual researchers compared with works by research groups. In the first 10 years of the study period 17% of the articles published had a single author, compared with 10% in the second half of the period. The percentage of articles with more than six authors rose from 8% to 15% in the same period.

Regional output in the field of epidemiology in journals with international circulation continues to reflect pre-transitional patterns of mortality and disease. Of the 95 articles on epidemiological research published between 1973 and 1992 in the 11 leading international public health journals by resident authors in the six selected countries, 66% were produced by Brazilian authors. Nearly all (96%) dealt with infectious diseases and maternal and child health, compared with 4% deal-

ing with chronic diseases. The international literature shows a different pattern, with approximately 78% of articles dealing with chronic diseases. Moreover, articles on epidemiology by authors in the six countries in the study group had an average of 4.36 citations per article, which is well above the citation index for articles on public health (1.61), as well as for the broader study for all health-related scientific articles (3.1).

In conclusion, despite the diversification in subject areas, disciplines, and methods of health research, there is no significant change in scientific output with international circulation. While there are certain encouraging trends (more scientific collaboration and better interagency cooperation on a national and international scale), scientific output continues to be extremely limited in quantitative terms (accounting for roughly 1.5% of that produced worldwide), highly concentrated in a small number of countries, and focused on an individualized approach to health research (biomedical and clinical research).

This imbalanced approach to addressing health problems is not only a scientific/technical problem. In fact, it would appear to reflect a perception of the relationship between the individual and society, in which the individual is viewed as the basic unit of society which, in turn, is simply the sum of the beliefs, decisions, and actions of the individuals forming that society. This also explains the fact that, in most epidemiological studies, social and cultural determinants are measured by a limited number of discrete variables treated as if they were individual rather than group attributes (73). Public health research must not only overcome limitations in quantitative terms, but must surmount a profound epistemological, conceptual, and methodological crisis. One sign of this crisis is that the current conceptual framework for public health research does not specifically address health: its target continues to be the disease itself, which is treated in a fragmented, residual fashion, in terms of "risks" and "risk factors" (74). There are four key words defining current scientific activity that suggest progress in the development of a new public health paradigm, namely, its multidisciplinary nature (75), complexity (76), plurality, and praxis. The development of new conceptual models in which health is considered a reflection of living conditions would give new momentum to social participation and lay the groundwork for more appropriate and effective intervention strategies.

Health Research and the Demand for Knowledge

The important changes occurring in health conditions and health care systems are creating a new demand for knowledge and involving new stakeholders in the framing and implementation of health policies. This, in turn, dictates a need for

corresponding changes in the production and dissemination of knowledge (77). To be effective, government agencies responsible for health assessment, performance evaluation of health interventions, policy-making, regulations, and quality assurance require an ongoing production, collection, and analysis of information. Furthermore, different stakeholders must have access to new types of knowledge through nontraditional channels in order to strengthen the local decision-making process.

Over the past few years various initiatives have been designed to overcome Region-wide weaknesses in this area. Unfortunately, some of these efforts were not very successful because they were grounded in unrealistic expectations and misconceptions, and lacked necessary insight into the policy-making process. However, it is possible to find ways in which applied research can be used in the framing of health policies for Latin America and the Caribbean. One way is to conduct in-depth studies of different social stakeholders in the health sector to identify the sources of information on which they rely, the type of information that interests them, how they evaluate this information, their motivations in making specific decisions, and the other stakeholders with whom they interact, compete, or form partnerships.

Other strategies for breaking down barriers between research and policy-making include use of consensus-building methods among the different participants in the health policy-making process, the inclusion of decision-makers on advisory research committees and researchers in policy-making bodies. Confusion created by inconsistent findings can be lessened by using meta-analysis and consensus-building forums, as well as by reporting intermediate research results. The ability to respond quickly and to take advantage of opportunities can help to overcome time constraints. Finally, researchers should be trained to present their results in a way that helps to overcome communication problems, and incentives should be developed to enable researchers to more effectively promote the use of research findings.

HEALTH CARE SYSTEMS

Public Health Services

The living and health conditions of the Region's population reflect the unequal distribution of health determinants and the disparity in the means used to compensate for this inequality. A broad spectrum of health problems, needs, and aspirations continue to increase, but the health sector's resources are limited or scarce.

Worldwide, the view of public health as society's commitment to its health ideals has won greater acceptance in

the last two decades, gradually replacing the concept of public health as the State's duty or as a professional endeavor or field. Health's sphere of action also has expanded to embrace international and local dimensions of health, and it has shifted away from exclusively dealing with the realm of diseases, moving into the area of sustainable human development.

In a general context characterized by political inclusion and social exclusion, the main risks consist in the health system's growing fragmentation, increasing inequities in levels of health and access to services, serious difficulties in managing the system, and a loss of efficiency.

Restrictions in public sector expenditures that came about as a consequence of the economic adjustment models that were put in place, resulted in a decline in the supply capacity of government institutions, often leading to cutbacks or interruptions in certain basic public health services. Given these circumstances, it has become critical to identify those public health functions that are essential for ensuring that services are provided in essential areas for the population's health and well-being.

Monitoring the Community's Health Status

The need to evaluate and monitor health conditions, which is a public function that validates policy-making, has given rise to activities designed to diagnose the community's health. They include monitoring, conducting needs assessments, collecting and interpreting data, analyzing the causes of problems, searching for cases, forecasting trends, and conducting outcome research and evaluations. These activities provide broad-based information that governments can use to define policies, establish priorities, and allocate resources efficiently, thereby facilitating the attainment of higher levels of effectiveness, efficiency, and equity in decision-making and interventions in the public and private sectors.

Epidemiological Surveillance Systems and Disease Prevention and Control Programs

The reassessment and restructuring of epidemiological surveillance systems in the Region, which began in 1991, was evident in a 1995 survey conducted in 25 Latin American and Caribbean countries. All these countries have systems for surveillance of infectious diseases, 96% of the reports deal with the determination of cases of specific diseases, 88% of the countries have periodic publications, and 96% of them have lists of notifiable diseases. Almost all reports emanate from the public sector, with little or no intervention by the private system, and 75% come from hospitals, health centers, or sen-

tinel units. In the private sector, 40% of the reports are issued by doctors and 35% by health organizations.

The number of outbreaks of infectious diseases reported by each country in 1995 ranged from 0 to 354, with an average of 6.8 (excluding Mexico). Investigation of the outbreaks involved 23 national surveillance units (92%) and 15 regional surveillance units (60%). In 25% of the outbreaks reported, the media equaled or surpassed the health system organizations in detecting them. Most surveillance systems in the countries that were part of the study (88%) rely on the telephone or fax to communicate between the central and the regional levels, and 52% of the countries still use regular mail for formal notification.

Pathogenic agents are monitored in 22 of the countries (88%) through microbiological and serological studies, and 17 countries monitor antimicrobial resistance (68%). Half of the countries reported the results of monitoring risk factors in the transmission of infectious diseases (migrations, resistance of vectors to insecticides, agricultural production, water quality, and climatic changes). Thirteen countries (52%) use geographic information systems with varying degrees of complexity to carry out epidemiological surveillance (Argentina, Barbados, Belize, Bolivia, Chile, Colombia, Costa Rica, Cuba, Haiti, Jamaica, Mexico, Paraguay, and Suriname). Only nine countries include emerging diseases on their reporting agendas and intensified surveillance systems.

Public Health Laboratories

Public health laboratories in the Region vary according to the size of the country, the availability of resources, and the magnitude of the health problems. Countries with small populations, such as those in the Caribbean, usually have their national or reference laboratories within hospitals; countries with larger populations have central or reference laboratories or institutes at the head of a surveillance and diagnostic network that coordinates with the epidemiology departments. Reference, supervision, training, and research services and the analyses conducted in central or reference laboratories and institutes vary according to the complexity of each country's surveillance and diagnostic system.

A survey conducted by PAHO's Regional Laboratory and Blood Bank Services Program showed that 95% of central laboratories have close ties with national epidemiological departments; 90% monitor infectious diseases; only 75% monitor emerging diseases; and 50% deal with chronic diseases. Surveillance activities focus on HIV/AIDS, enteric diseases (detection of bacterial infections, helminths, and some protozoa), and tuberculosis. Sexually transmitted diseases are considered important, but serological studies are limited to HIV and syphilis and, to a lesser extent, to the microscopic diag-

nosis of gonorrhea. In addition, 35% of the national centers carry out *Neisseria* isolation and the study of chlamydia. Regarding environmental monitoring, 74% of the centers perform bacteriological analyses and 45% perform chemical analyses of water; 25%–30% of reference laboratories are capable of determining levels of pesticides, herbicides, organic waste, and heavy metals.

Only half of the systems have national operational guidelines for laboratory services, 70% have methodological and quality assurance guides, and 80% have biosecurity manuals. However, access to equipment needed to apply the biosecurity guides is limited, and there are insufficient programs and establishments for the disposal of contaminated material.

Information, Education, and Community Participation in Health

The evolution of participatory democracy poses new challenges for the management of public and social affairs. Community efforts toward self-management and self-determination are linked to new civic-building movements, social control efforts, and health advocacy. Government decentralization processes also help to create new social participation opportunities. In contrast, the negative impact of economic policies makes it necessary to formulate social policies and establish government institutions such as social compensation funds.

Skills of Health Workers

Public service careers, particularly in the area of health, are beset by high personnel turnover and a labor force with limited technical training and little financial, intellectual, or personal motivation. These characteristics make it difficult for workers to become public health professionals, and limit the practice of health services, especially at the local level.

Under the ongoing health service decentralization, training in public health is fostered by investment projects that include a major component for strengthening the work force. Various processes and activities in the Region reflect an incipient trend in public health toward trouble-shooting and problem solving that incorporates managerial and administrative elements to solve the problems identified in the health services. Interventions and available resources and their management, as well as policy-making processes, gathered more importance (78). Lastly, an interest has been expressed in defining skills and profiles of professionals as a way to facilitate the new orientation in the development and regular training of specialists.

Formulation of Health Management Policies and Plans

Policy formulation is the result of many interactions among public, private, and individual agencies. This process involves society's identification of problems, as well as its making decisions about them, choosing targets and interventions, and allocating resources for accomplishing agreed-upon purposes. Though governments—with the public sector's participation—provide general guidelines for policy-making, they also must ensure that the decisions made are in the public's interest.

The countries in the Region of the Americas are trying to define health policies with targets formulated in terms of health indicators (including quality-of-life indicators), rather than simply in terms of the supply of services and the mobilization of resources. Given that these policies seek to have a measurable effect on the health of a target population, reliable and relevant data on the health situation are required, as are acceptable criteria for setting priorities; the availability of intervention strategies is fundamental among the latter (79).

In many countries there are alarming cutbacks in public health practices designed to detect the health problems of different population groups and to come up with population-based solutions. The absence of a precise definition of the functions and responsibilities of the various levels of health service delivery, as a result of the ongoing political and administrative decentralization, also limits the proper practice of public health. Such a definition would make it possible to use the existing information to accomplish essential functions at each level (national, provincial, and municipal). Decentralization, in turn, would make the social sectors more adaptable, flexible, and responsive to emerging social problems, thereby improving their management.

Essential public health functions should be considered within the context of society as a whole and, in particular, within the framework of the health ministries' role on behalf of the State. One of the main functions of the public sector is to ensure that high quality and sufficient essential services are provided, either directly, through government institutions, or indirectly, through support to the private sector. This leadership, exercised through the nontransferable authority of the public sector, includes the implementation of legislative mandates, compliance with statutory responsibilities, and regulation of services and products provided by the public and private sectors. It also includes accountability to society at large for those actions and for meeting the targets set.

Some countries in North America and Europe and the World Health Organization have coined the concepts of "essential public health functions" (EPHF) and "essential public health services" (EPHS) to indicate the precise requirements for the optimal performance of societies and national systems. The idea, which is equivalent to the "basic health care"

concept of the late 1970s, is technical in nature, but its definition is political and specific for each country.

Essential public health functions are defined as a set of basic and indispensable activities carried out to protect the population's health and treat diseases using environmental and community-oriented means. Though this work may include personal care services for the protection or treatment of vulnerable or high-risk groups or for the treatment of infectious diseases, not all patient care will be an essential public health task (78).

The Public Health Functions project of the United States Department of Health and Human Services is designed to elucidate problems and develop strategies and mechanisms for strengthening the country's public health infrastructure (80). WHO, for its part, is trying to identify essential public health functions as a way to support the renewal of the goal of health for all. Given the reorganization of the countries' health systems, changes in epidemiology, demographics, and sanitation; the reduction in government responsibilities; and cuts in financing for health, WHO's task is justified by national difficulties in maintaining public health's output at a level sufficient to protect the population's health. Once the list of essential functions is prepared, an international group of public health experts will be asked to study and modify the list, using the Delphi system, to make it universally applicable (81).

Personal Health Care Services

Health services systems in Latin America and the Caribbean, although large, are a relatively scarce resource for the vast and diverse health needs of the populations they serve. Most resources are assigned to health care services, particularly clinic staff. These health services are so large and varied because of particular qualities those services have adopted, their problems, the differing types of provision, and the strategies used in the sectoral reform process.

The mix of public and private care has changed as a result of privatization, contracting of services between sectors, and decentralization to local administrations. These changes have made the systems more dynamic and complex and have allowed outpatient clinics and hospitals of various sizes, offering different types of coverage, and operating at different complexity levels of care to coexist. This variation is an obstacle for obtaining systematic information on the infrastructure and functioning of the different health care levels and institutions among countries and even within the same country. Available statistics cover the public sector in general or the social security system, and deal particularly with hospital facilities and the delivery of primary health care services, such as immunization coverage and prenatal care.

Hospitals

Table 16 summarizes the evolution and availability of hospitals by country, expressed as beds per 1,000 population, for selected years between 1964 and 1991 (82) and according to provisional information from a 1996 Latin American and Caribbean hospital inventory (83). Between 1964 and 1991 the number of beds per 1,000 population tended to decline, and data from the hospital inventory reflect that trend. The number of beds and hospitals in some countries and sectors was probably underreported, however.

Figure 1 shows the trend in 11 selected countries of the Region that have 90% of the hospital beds, reflecting an overall systematic decline. Cuba, which had shown a different trend between 1978 and 1984, also showed a decline. In countries with fewer hospital beds available, such as Bolivia and Mexico, there was a slight increase between 1991 and 1996.

According to the inventory of hospitals, the Region has 16,566 hospitals with a total of 1.1 million beds. The countries with the largest number of hospital beds per capita have populations of fewer than 500,000 (Netherlands Antilles, Barbados, Turks and Caicos Islands, and the Virgin Islands). In countries with populations of more than 500,000, the availability of beds per 1,000 population ranged from 5.1 in Cuba to 0.7 in Haiti. Of all the hospitals, 60.5% have 50 beds or fewer and 15.8% have between 51 and 100 beds (Table 17), which means that 76.3% of all hospitals have 100 or fewer beds. These hospitals have only 37.3% of the total number of beds; in contrast, hospitals with more than 500 beds house 15.4% of the total number of beds, but account for only 1.3% of the total number of hospitals.

There is a slightly higher proportion of hospitals in the private (47%) than in the public (44.4%) sector. The latter figure includes establishments in the public sector in general (39.2%) and in the social security system (5.2%). In addition, 7.8% of hospitals are operated by philanthropic organizations and 0.8% are military hospitals. The proportion of beds, however, is slightly higher in public hospitals (52.7%)—45.1% in the public sector and 7.6% in the social security system; only about one-third (34.9%) are in the private sector (Table 18). This greater percentage results from the fact that public hospitals tend to have more beds because they include teaching hospitals, psychiatric hospitals, and hospitals for chronically ill patients. Hospitals run by philanthropic organizations account for 11.4% of the remaining beds, and military hospitals account for 1%.

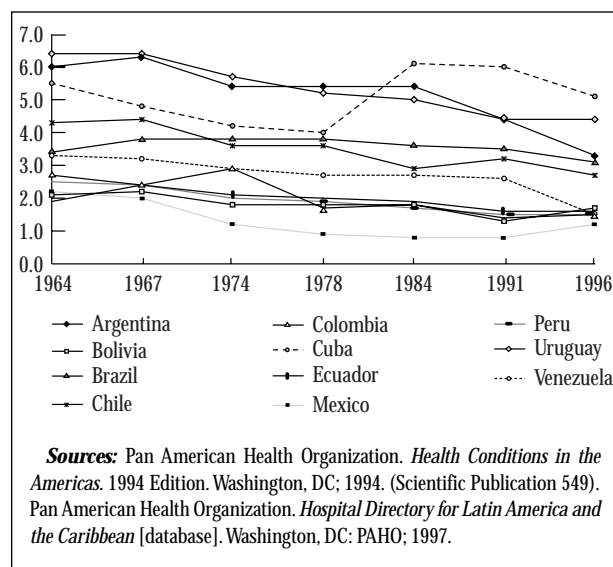
In 10 countries of the Region all hospitals are public (not social security), and in the remaining countries there is a mix, with different levels of coverage in the private sector. For example, 69% of hospitals in Mexico are private, and in Honduras, where the figure is 62%, nearly a quarter of hospitals are run by philanthropic organizations (23.4%). A fifth of the

TABLE 16
Beds per 1,000 population in Latin American and Caribbean countries, 1964–1996.

Country	1964	1967	1974	1978	1984	1991	1996
Anguilla	...	...	...	...	...	2.7	1.3
Antigua and Barbuda	7.2	7.0	5.8	6.3	5.8	...	3.9
Argentina	6.0	6.3	5.4	5.4	5.4	4.4	3.3
Bahamas	5.5	4.9	3.9	4.3	4.1	4.0	4.0
Barbados	5.8	10.4	8.7	8.7	8.0	8.1	7.6
Bermuda	...	...	...	...	...	...	6.3
Belize	4.9	4.9	4.6	3.2	2.5	2.2	2.1
Bolivia	2.1	2.2	1.8	1.8	1.8	1.3	1.7
Brazil	3.4	3.8	3.8	3.8	3.6	3.5	3.1
Cayman Islands	...	...	...	...	...	2.6	...
Chile	4.3	4.4	3.6	3.6	2.9	3.2	2.7
Colombia	2.7	2.4	2.9	1.7	1.8	1.4	1.5
Costa Rica	4.5	3.8	3.8	3.1	2.9	2.2	1.9
Cuba	5.5	4.8	4.2	4.0	6.1	6.0	5.1
Dominica	4.9	4.5	4.3	3.0	3.0	3.3	2.7
Dominican Republic	2.7	2.8	2.8	2.0	1.2	1.9	1.5
Ecuador	1.9	2.4	2.1	2.0	1.9	1.6	1.6
El Salvador	2.3	2.2	1.8	1.8	1.3	1.6	1.7
Grenada	6.9	6.9	7.5	8.6	9.0	6.6	5.7
Guadeloupe	...	...	...	...	...	...	3.1
Guatemala	2.6	2.5	2.0	1.6	1.6	1.6	1.0
Guyana	5.4	4.6	4.3	4.5	4.5	1.5	3.8
Haiti	0.7	0.7	0.7	0.8	1.0	0.8	0.7
Honduras	2.0	1.7	1.7	1.3	0.9	1.1	1.1
Jamaica	4.0	3.7	3.8	2.4	2.6	2.2	2.2
Martinique	...	...	...	...	...	...	1.0
Mexico	2.2	2.0	1.2	0.9	0.8	0.8	1.2
Montserrat	5.3	4.9	4.7	5.1	5.7	4.8	4.0
Netherlands Antilles	...	...	...	...	...	7.6	6.2
Nicaragua	2.3	2.3	2.2	1.6	1.6	1.2	1.6
Panama	3.2	3.3	3.2	3.9	3.6	2.7	2.2
Paraguay	2.2	2.0	1.5	1.5	1.4	1.2	1.3
Peru	2.5	2.4	2.0	1.9	1.7	1.5	1.5
Puerto Rico	...	...	...	...	...	...	3.4
Saint Kitts and Nevis	...	...	...	...	...	...	6.3
Saint Vincent and the Grenadines	4.4	4.4	5.4	5.1	4.9	4.4	1.8
Saint Lucia	4.7	4.8	5.2	4.4	3.8	3.7	3.8
Suriname	5.2	5.3	5.4	5.8	5.4	3.2	3.8
Trinidad and Tobago	5.3	5.1	4.5	4.1	4.8	3.3	5.0
Turks and Caicos Islands	...	...	...	...	...	2.9	9.6
Uruguay	6.4	6.4	5.7	5.2	5.0	4.4	4.4
Venezuela	3.3	3.2	2.9	2.7	2.7	2.6	1.5
Virgin Islands (UK)	4.3	4.3	3.6	3.5	4.7	3.5	3.1

Sources: Pan American Health Organization. *Health Conditions in the Americas. 1994 Edition.* Washington, DC: PAHO; 1994. (Scientific Publication 549). Pan American Health Organization. *Hospital Directory for Latin America and the Caribbean* [database]. Washington, DC: PAHO; 1997.

FIGURE 1
Beds per 1,000 population in selected countries of Latin America and the Caribbean, 1964–1996.



hospitals in Brazil (19.5%) are private. In the remaining countries, only a small proportion of hospitals are run by philanthropic organizations.

The availability of beds according to affiliation, by country, shows a distribution similar to that for hospitals (Table 19), but there are more beds in the public sector hospitals, because facilities tend to be larger. Mexico is a notable exception, where nearly 70% of hospitals are private but account for only 30% of the beds.

Diagnostic Laboratories

There are an estimated 30,000 diagnostic laboratories in the Region. The English-speaking Caribbean countries, given their size and population, have an average of two to five laboratories apiece, with the exception of Jamaica, which has approximately 100. The reason for the small number of laboratories in the public sector and social security systems is that they are generally associated with hospital centers. Most clinical laboratories in Latin America are private and, in general, need only register with health authorities in order to operate.

Although only Argentina, Brazil, and Mexico have laboratory accreditation systems, not all laboratories in these countries are accredited; there are ongoing efforts to improve the quality of laboratory work, with an emphasis on external performance evaluations in different areas. The regional serology program for the human immunodeficiency virus (HIV), which is part of the U.S. Centers for Disease Control and Prevention

TABLE 17
Percentage of beds and hospitals, according to size of hospital, Latin America and the Caribbean.

Number of beds	Hospitals ^a		Beds	
	No.	%	No.	%
1–50	10,027	60.5	219,383	20.0
51–100	2,615	15.8	189,559	17.3
101–200	1,703	10.3	242,770	22.1
201–300	544	3.3	133,225	12.1
301–400	242	1.5	84,811	7.7
401–500	133	0.8	58,951	5.4
501–1,000	186	1.1	126,169	11.5
>1,000	29	0.2	43,097	3.9
No data	1,087	6.6		
Total	16,566	100.0	1,097,965	100.0

^aThe number of beds is unknown in 1,087 hospitals.

Source: Pan American Health Organization. *Hospital Directory for Latin America and the Caribbean* [database]. Washington, DC: PAHO; 1997.

(CDC), began with 10 laboratories in 1988, expanded to 35 in 1992, and to 41 in 1996; only 80% of those laboratories are active participants on a permanent basis. Affiliation with the serology program for syphilis, also directed by the CDC, rose from 15 laboratories in 1992 to 26 in 1996, with active participation that increased from 28% to 82% during that time.

Blood Banks

Blood banks in the Americas follow procedures dictated by agencies within the ministries of health, but they belong to or are administered by different sectors: the Ministries of Health, the social security systems, nongovernmental organizations, the armed forces, and the private sector. Table 20 shows the distribution of blood banks according to sectoral affiliation in seven countries.

In every Latin American country, with the exception of El Salvador and Nicaragua (where efforts are under way to enact pertinent legislation), blood banks are regulated by national laws. Standard-setting and supervision falls under the direction of national commissions or blood bank programs in Argentina, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Paraguay, and Peru. Although most systems prohibit paying blood donors and promote voluntary donation, almost all blood donors are directed or replacements. For example, in Bolivia in 1994, 69.7% of donors were directed and 23.5% were replacements; the figures for 1995 were virtually the same, at 69% and 23.9%, respectively.

Testing of donors also is regulated: national systems require that units of blood be screened for possible infections

that could be transmitted by the blood or its products. All blood banks also must test for markers of HIV, hepatitis B virus (HBV), hepatitis C virus (HCV), and, in endemic areas, *Trypanosoma cruzi*, human T-cell lymphotropic virus (HTLV), *Plasmodium*, and, as an indicator of other risk factors, *Treponema pallidum*. In Argentina blood is screened for *Brucella* and in Canada and the United States it is screened for cytomegalovirus. Table 21 presents information provided to PAHO by national authorities on the number of blood donations per year and the percentage of them that are screened for each of the infectious agents with the greatest probability of being transmitted by transfusion.

The countries with the greatest number of donations (over 50,000 in 1995) are more likely to screen donated blood than countries with fewer donations. Given that in countries for which information is available (excluding Uruguay), some of the blood units are not screened for all the infectious agents, it is possible for some of the units to be infectious. The results of national and international external performance evaluations in this area indicate that there are problems with false-positive (specificity) and false-negative (sensitivity) results in the serologic tests of the markers analyzed by participating blood banks.

Rehabilitation Services

Effective care for the disabled and their full incorporation into daily life continues to be a challenge for countries of the Region. The health sector in Latin America and the Caribbean is one of the sectors most involved in care of the disabled, even more than the education sector.

A 1995 study by PAHO (84) reported that in 92.5% of the 27 participating countries of Latin America and the Caribbean, the health sector plans and carries out rehabilitation services, followed by the education and labor sectors. The private sector and nongovernmental organizations also play important roles.

Although the countries have acknowledged that intersectoral cooperation is vital to the successful rehabilitation of the disabled, this cooperation has yet to be consolidated. The PAHO study found that 50% of the countries report little, partial, or no coordination among the different sectors. Each sector has developed its own isolated activities, with little effect on the disabled population. Most countries lack comprehensive rehabilitation programs, offer incomplete services, and have no national plans; they often succeed in functionally rehabilitating the disabled but not in fully integrating them into society. In fact, 74% of the responding countries reported only partial integration. Yet many countries have policies, programs, and laws that promote comprehensive treatment for the disabled, with national rehabilitation commissions to es-

TABLE 18
Proportion of beds and hospitals, according to sector of affiliation, Latin America and the Caribbean.

Sector of affiliation	Hospitals ^a		Beds	
	No.	%	No.	%
Public (not social security)	6,498	39.2	494,710	45.1
Public (social security)	876	5.3	83,356	7.6
Private	7,783	47.0	383,353	34.9
Philanthropic	1,284	7.8	124,923	11.4
Military	125	0.8	11,623	1.1
Total	16,566	100.0	1,097,965	100.0

^aThe number of beds is unknown in 1,087 hospitals.

Source: Pan American Health Organization. *Hospital Directory for Latin America and the Caribbean* [database]. Washington, DC: PAHO; 1997.

establish the necessary interinstitutional and intersectoral coordination to meet rehabilitation goals. Of the countries participating in the study, 51.8% have rehabilitation programs and 62.9% have national laws dealing with this issue.

The mentally and physically disabled have become more self-aware and better educated about their disabilities and their rights. Moreover, the social sectors involved in the defense of human rights have increasingly stressed the need to understand and apply the legal framework and the Uniform Standards on Equal Opportunity for the Disabled, approved by Resolution 48/96 of the General Assembly of the United Nations.

The organization of services for the disabled by level of complexity is the most widely used criterion for medical rehabilitation and the one that has been the most successful in countries with active national programs. Although the services do not have uniform standards, almost 80% of the countries have institutions responsible for providing specific care to the disabled in hospitals, special facilities, and community projects. In general, the countries have more services at higher levels of complexity (levels II and III) and fewer services at the lower level (level I).

Community-based rehabilitation approaches incorporated at the primary level of health care provide an alternative in terms of decentralized and integrated services, because it encourages community participation and provides disabled people with access to care. A PAHO evaluation of La Rioja (Argentina), Barbados, Bolivia, Chile, Dominica, Ecuador, El Salvador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela showed that this strategy has been established in 10% to 40% of the provinces in most of the countries and that the strategy works in connection with the health system. Fifty percent of caregivers are salaried staff and the remainder are volunteers. Only 68% of the projects

TABLE 19
Hospital beds in Latin American and Caribbean countries, by sector of affiliation, 1996.

Country	Number of beds	Beds per 1,000 inhabitants	Percentage of hospital beds by sector of affiliation				
			Public		Private	Philanthropic	Military
			Not social security	Social security			
Anguilla	10	1.3	100.0	—	—	—	—
Antigua and Barbuda	255	3.9	94.1	—	5.9	—	—
Argentina	115,803	3.3	57.2	3.6	37.7	0.5	1.0
Bahamas	1,119	4.0	92.3	—	7.7	—	—
Barbados	1,998	7.6	98.8	—	1.2	—	—
Belize	473	2.1	96.8	—	3.2	—	—
Bermuda	396	6.3	100.0	—	—	—	—
Bolivia	12,650	1.7	52.5	26.8	19.0	1.7	—
Brazil	501,876	3.1	27.1	1.1	48.0	23.3	0.5
Chile	38,446	2.7	71.0	0.1	20.5	8.4	—
Colombia	54,502	1.5	53.4	8.5	35.4	0.9	1.9
Costa Rica	6,645	1.9	96.5	3.5	—	—	—
Cuba	56,505	5.1	100.0	—	—	—	—
Dominica	195	2.7	100.0	—	—	—	—
Dominican Republic	11,921	1.5	61.1	9.8	29.0	—	—
Ecuador	18,141	1.6	60.1	9.6	18.5	7.4	4.4
El Salvador	9,571	1.7	69.6	20.3	9.5	0.6	—
Grenada	522	5.7	100.0	—	—	—	—
Guadeloupe	1,355	3.1	69.2	—	30.8	—	—
Guatemala	10,703	1.0	64.7	12.9	15.3	6.4	0.7
Guyana	3,242	3.8	86.1	—	13.1	0.8	—
Haiti	5,241	0.7	59.0	0.9	23.6	16.5	—
Honduras	6,497	1.1	72.0	6.0	21.5	—	0.5
Jamaica	5,400	2.2	94.4	—	5.6	—	—
Martinique	390	1.0	86.7	—	13.3	—	—
Mexico	107,288	1.2	32.5	34.5	30.4	0.5	2.2
Montserrat	44	4.0	100.0	—	—	—	—
Netherlands Antilles	1,242	6.2	21.9	—	78.1	—	—
Nicaragua	6,666	1.6	93.0	—	3.0	—	4.1
Panama	5,901	2.2	70.6	17.7	11.6	—	—
Paraguay	6,658	1.3	58.8	14.0	26.6	0.6	—
Peru	35,690	1.5	51.7	20.0	19.4	0.4	8.4
Puerto Rico	12,546	3.4	69.7	2.0	28.3	—	—
Saint Kitts and Nevis	260	6.3	100.0	—	—	—	—
Saint Vincent and the Grenadines	207	1.8	100.0	—	—	—	—
Saint Lucia	534	3.8	100.0	—	—	—	—
Suriname	1,618	3.8	55.9	—	40.4	3.7	—
Trinidad and Tobago	6,622	5.0	89.3	—	10.7	—	—
Turks and Caicos Islands	134	9.6	100.0	—	—	—	—
Uruguay	14,064	4.4	68.3	0.7	31.0	—	—
Venezuela	32,738	1.5	72.6	18.0	8.3	0.7	0.4
Virgin Islands (UK)	58	3.1	86.2	—	13.8	—	—
Virgin Islands (USA)	1,839	17.5	65.1	7.9	27.0	—	—
Total	1,097,965	2.3	45.1	7.6	34.9	11.4	1.1

Source: Pan American Health Organization. *Hospital Directory for Latin America and the Caribbean* [database]. Washington, DC: PAHO; 1997.

TABLE 20
Number and percentage of blood banks, by sector of affiliation, in selected countries of the Americas, 1996.

Country	Public sector		Social security		Red Cross		Independents	
	No.	%	No.	%	No.	%	No.	%
Chile	122	68	...	...	2	1.0	56	31
Colombia	117	71	11	7	11	7.0	25	15
Ecuador	4	11	3	9	26	74.0	2	6
Mexico	264	44	115	19	20	3.0	205	34
Paraguay	15	44	1	3	1	3.0	17	50
Uruguay	38	48	1	1	...	...	41	51
Venezuela	98	53	28	15	1	0.5	59	32

in progress are supervised by personnel who specialize in rehabilitative care. The activities of the community-based programs are not self-sustaining, unless they form part of a government sector program or measure that guarantees their continuity and permanence.

An important trend in countries of the Region involves the establishment of national councils for integration of the dis-

abled, many of which have their origins in legislation that protects and defends the rights of the disabled. These councils are responsible for managing and coordinating policies for rehabilitation and integration of the disabled and for the intersectoral management of these policies. Argentina, Chile, Costa Rica, Ecuador, El Salvador, Nicaragua, Peru, Uruguay, and Venezuela have already formed such councils.

TABLE 21
Number of blood donations and percentage of units screened in Latin American countries, 1994–1995.

Country	Year	Number	HIV %	HBV %	HVC %	<i>T. pallidum</i> %	<i>T. cruzi</i> %
Argentina	1995	811,850	85.0	84.0	70.0	88.0	96.0
Bolivia	1994	19,987	80.0	67.0	0.0	67.0	71.0
	1995	22,146	64.0	60.0	0.0	64.0	66.0
Colombia	1994	332,540	72.0	75.0	67.0	70.0	7.7
	1995	370,815	100.0	100.0	99.8	64.0	66.0
Costa Rica	1995	45,311	100.0	100.0	100.0	100.0	13.0
Ecuador	1994	98,473	89.5	88.0	33.0	86.7	51.0
	1995	100,774	100.0	99.0	42.6	100.0	75.4
El Salvador	1994	49,559	100.0	100.0	46.0	100.0	65.0
	1995	52,365	100.0	100.0	74.0	100.0	99.0
Honduras	1994	31,275	100.0	84.0	30.0	100.0	85.0
	1995	31,937	100.0	92.0	42.6	100.0	90.0
Nicaragua	1994	44,840	100.0	95.0	55.0	97.0	68.0
	1995	48,030	99.0	96.0	51.0	96.0	51.0
Panama	1994	26,333	100.0	85.0	21.0	0.0	24.0
	1995	37,107	93.0	100.0	65.0	0.0	2.0
Paraguay	1994	29,325	98.0	90.0	6.0	70.0	82.0
	1995	34,216	98.0	93.0	14.5	79.0	81.0
Peru	1994	81,103	60.0	90.0	43.0	60.0	0.0
	1995	82,656	60.0	60.0	50.0	60.0	4.0
Uruguay	1994	110,309	100.0	100.0	100.0	100.0	100.0
	1995	111,518	100.0	100.0	100.0	100.0	100.0
Venezuela	1994	202,247	100.0	100.0	32.0	100.0	100.0
	1995	202,515	100.0	100.0	57.0	100.0	100.0

Ocular Care Services

There are an estimated 2.3 million blind people and another 1 million who suffer from poor vision in Latin America and the Caribbean. Approximately half the cases of blindness are the result of cataracts not surgically treated, and the rest are due to diabetic retinopathy and glaucoma. Uncorrected refractive problems are an important reason for poor vision in 13% of the population, and nearly 80% of the cases of blindness due to cataracts could have been prevented or cured were services available for everyone. This occurs because a large percentage of blind people have limited resources and thus limited access to visual health services.

The decline in resources for health brought on by the economic crisis of the 1980s also affected visual health services. At the same time, significant progress in technological development, which facilitated important advances in cataract surgery with lens implants, vitreous surgery, laser treatments, and refractive surgery, was responsible for the higher cost of equipment. In addition, not enough qualified personnel are available to carry out these procedures. With few exceptions, government hospitals and services in Latin America were unable to make this technological change, rendering obsolete many public ophthalmological services, and leaving most of the ophthalmology practice in private hands.

One of the factors that favored progress in ocular health services during the 1990s was the increase in services offered by nongovernmental organizations, which met part of the unmet demand and installed an infrastructure to provide community visual health services that the Region had never had. Innovative strategies to reduce the high cost of supplies for ophthalmological services also helped: for example, lens implants produced by nongovernmental organizations reduced the cost of cataract surgery by US\$ 50. From 1994 until December 1997, 42,000 lenses had been used in 20 countries, for a savings of \$2.1 million.

The provision each year of 7,000 pairs of low-cost eyeglasses produced by self-sustaining programs in Belize, Bolivia, and Colombia has accounted for savings of \$600,000 annually to communities and service providers. In addition, beginning in 1996 eyedrops were produced in Dominica, which reduced the cost of that medicine. Currently there are plans to establish visual health services in Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and Uruguay.

Reproductive Health Services

Integrated reproductive health services are still not a reality throughout the Region. These functions have been carried

out through maternal and perinatal health services, family planning, testing for cervical cancer, and prevention and treatment of STDs and HIV/AIDS.

In general, the services reflect the social and sanitary conditions of the countries and of the different regions within each country, which reveal the inequity in access to services and in quality of service in Latin America and the Caribbean. This inequity is worse in rural areas, in depressed and marginal zones, and among indigenous peoples and those displaced by natural disasters or war.

It has been repeatedly noted that a woman's educational level directly influences her knowledge, attitudes, and practice about reproductive health, particularly maternal health, as well as reproductive behavior, attitudes toward family size, and family-planning practices. The level of education also reflects socioeconomic circumstances, which ultimately determine access to health services and the quality of those services.

Within the Region, there are some model reproductive health programs and services of limited coverage, whose orientation focuses on women's health. At the national level, experiences in Brazil, Colombia, Chile, Mexico, and Peru represent an integrated approach to women's health. At the service level, some models promoted by women's nongovernmental organizations work to meet women's health needs using a gender approach. However, even the more advanced models have not managed to incorporate the participation of men.

In general, reproductive health services in the countries use variations of a three-tiered model: the first tier functions with a health promoter and a midwife, who recognize the needs and complications of reproductive health and who organize, together with the family and the community, access to maternal care services, management of obstetric emergencies, and family planning; the second tier has professionals who provide basic obstetric care and family planning, identify and refer cases for emergency obstetric care, and provide services for prevention and control of STDs and HIV/AIDS; the third tier has professionals for essential obstetric care, family-planning services including surgical procedures, diagnosis and treatment of gynecological cancer, and prevention and management of STDs and HIV/AIDS.

Access to and use of prenatal care services provided by trained staff improved considerably in some countries during the 1990–1995 period (Table 22). In 1995, the figures ranged from 53% of pregnancies in Bolivia to 100% in the Caribbean countries and in Chile and Cuba (85). The average number of prenatal checkups per pregnancy varies: nearly 2 in Ecuador and Nicaragua; 5 in Chile, Honduras, Mexico, and Uruguay; and 10 or more in Cuba and the United States (86). In 1992, the percentage of women receiving care during the first trimester of pregnancy varied between 8.3% in Paraguay and 75% in Costa Rica; in Nicaragua, Panama, Paraguay, and Uruguay, where prenatal coverage is above 75%, checkups are

often late, as they are in countries where coverage is less than 75%.

Prenatal care, an effective number of checkups, and early start-up of prenatal care are directly related to social class, especially level of education. For example, the Demographic Health Survey in Paraguay showed prenatal coverage of 68.5% for pregnant women with less than two years of schooling and 99.6% for those with a secondary education or above; in terms of initiating care in the first trimester, coverage for the respective groups was 36.8% and 89.4%. Among women who had five checkups or more, the figures were 57.4% and 92.5%, respectively.

In 1995, of the 31 countries and territories for which information is available on deliveries attended by trained personnel, 22 showed coverage higher than 80%; in 19, coverage was 90% or more; and in 4, it was lower than 50% (Table 22). In addition, there was a close relationship between deliveries attended by trained personnel and level of maternal mortality: in countries with high maternal mortality, institutional coverage for deliveries was 60% or less. Training of professionals who work in maternal health is handled by specialized personnel. Although Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Jamaica, and Mexico have education programs in place, the training has been insufficient to satisfy what is needed.

Six recent demographic and health surveys showed that most deliveries in medical facilities occur in urban areas. For example, in Colombia, 88.5% of deliveries in urban areas and 56% in rural areas are institutional; 96.8% of first-child births in Brazil and 89.3% in Colombia take place in a medical facility, but the figures are 69.8% and 39.2%, respectively, for the sixth or subsequent children. In Brazil and Colombia, mothers with higher education give birth in a medical facility, but only 71.3% of Brazilian mothers with no education and 40.5% of those in Colombia do so (87, 88). Postpartum coverage is also very low, ranging from 4% in Colombia to 73% in Jamaica. However, it should be noted that most countries do not keep systematic records of this information. The different figures reported are evidence that the indicator alone identifies neither accessibility nor quality of partum or postpartum care.

Establishing maternity homes for women with high-risk pregnancies and limited geographic access to services as well as birth centers for women with low-risk pregnancies in rural areas are complementary measures that can assure access to and quality of care. However, only a handful of countries have made a significant effort in this area: Cuba, Guatemala, Honduras, Nicaragua, and Panama (89) are the only countries with maternity homes. Chile has a system that brings women near maternity facilities, which functions in a way similar to the maternity homes. Cuba has the most extensive system: in 1993, Cuba had 176 maternity homes that sheltered 44,513 at-term women (29% of total expected pregnancies), housing them near hospitals. Brazil, Dominica, El Salvador, Guate-

TABLE 22
Prenatal and delivery coverage (%) by trained personnel,
countries in the Region, 1990–1995.

Country	Prenatal coverage		Delivery coverage	
	1990	1995	1990	1995
Anguilla	100	...	100	...
Antigua and Barbuda	100	...	100	...
Argentina	96	96	95	95
Aruba	97	...	97	...
Bahamas	99	...	99	...
Barbados	100	100	100	100
Belize	92	95	83	80
Bolivia	38	53	29	28
Brazil	65	86	84	92
Canada	100	98	100	98
Cayman Islands	89	...	100	...
Chile	91	100	99	100
Colombia	59	83	59	96
Costa Rica	91	92	94	97
Cuba	100	100	100	100
Dominica	90	...	100	100
Dominican Republic	43	96	44	90
Ecuador	47	75	26	59
El Salvador	69	56	66	62
Grenada	100	75	100	...
Guatemala	34	54	23	35
Guyana	95	95	93	95
Haiti	45	68	33	46
Honduras	77	84	63	54
Jamaica	67	73	79	>90
Mexico	89	93	89	74
Montserrat	100	...	100	100
Nicaragua	87	87	42	87
Panama	83	89	86	86
Paraguay	76	69	32	36
Peru	68	67	46	56
Puerto Rico	99	96	100	...
Saint Kitts and Nevis	100	...	100	100
Saint Vincent and the Grenadines	100	...	100	...
Saint Lucia	100	100	100	100
Suriname	91	...	90	...
Trinidad and Tobago	95	98	98	99
United States	98	98	99	99
Uruguay	95	98	100	99
Venezuela	74	74	82	95
Virgin Islands (UK)	100	...	100	...

Sources: Pan American Health Organization, Division of Health and Human Development. *Basic Indicators 1995*. Washington, DC: PAHO; 1995. Pan American Health Organization. Third Evaluation of the Application of the Strategy of Health for All by the Year 2000. Washington, DC: PAHO; August 1997. (Document CD40/24 Eng.).

mala, Grenada, Honduras, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and the United States reported having functional birthing centers. Some national experiences indicate that women still do not have much faith in the care provided in such facilities, and for this reason the homes are not used to capacity.

During the 1988–1992 period, several countries experienced a modest increase in the percentage of births by cesarean section, but in Mexico and Paraguay the percentage doubled. The variance of this indicator among countries stands out: in Jamaica it is 4.5% and in Brazil, 45.9%. Brazil also shows important differences between low-income (27%) and high-income (77%) areas. In Jamaica, there is a marked difference between public (4.5%) and private (19%) facilities (90).

Information provided by the countries shows differences in the types of birth control methods available. Methods least available are barrier methods (except the condom), followed by Norplant and progesterone or combined injections. Most family-planning services provide oral contraceptives and intrauterine devices, and the permanent methods are limited by the surgical capability of the providers and legal standards and restrictions. In general, it has not been the cost of contraceptives, but rather occasional or frequent shortages that have been an obstacle to access. This is due to logistical problems of distribution, the purchasing capacity of the health systems, and the fact that contraceptives are not considered essential supplies in most countries. The level of care where users receive the service can also limit the choice of contraceptives.

In 1995, it was estimated that contraceptives were used by 64.7% of women of child-bearing age in Latin America and the Caribbean; usage ranged from 18% in Haiti to 86.2% in Cuba. In general, the use of contraceptives has increased in the recent past: of the 12 countries that provided information, Bolivia, Ecuador, Haiti, Mexico, Paraguay, and Peru reported increases up to 11% between 1986 and 1994, whereas Colombia, Costa Rica, the Dominican Republic, El Salvador, Honduras, and Jamaica reported increases around 6% (90). According to the same sources over the same period, there was also an important increase in the use of modern methods of birth control—although less than the figures for total use—except in Colombia, Costa Rica, and Mexico.

Progress in the acceptance and use of injections, combined injections, intrauterine devices, condoms, new techniques of nonsurgical vasectomies, and emergency contraception has enabled a large segment of the population to have greater access and opportunity to control fertility. However, there are still unmet contraceptive needs among broad sectors of the population in the Region. This warrants the use of new approaches and the expansion and reinforcement of existing ones with proven success to satisfy those needs; examples are social marketing and distribution of contraceptives in communities.

Imaging and Radiation Therapy Services

The status of radiology services in Latin America and the Caribbean has not significantly changed since it was reviewed in 1994 (91). Public health authorities in the countries still have not fully grasped how inadequate diagnostic imaging services prevent the early diagnosis of certain conditions and, consequently, eliminate the opportunity for effective early intervention. For example, the social costs associated with cardiovascular diseases and cancer, which, if detected early may be curable or at least require less expensive treatment, are overlooked. Imaging and radiation therapy services are plagued by a scarcity of well-trained staff, costly supplies (most of them imported), poor maintenance, expensive replacement equipment, and technological advances that, in turn, create demands for more sophisticated and costly equipment. In response, some countries are considering establishing health technology assessment programs and others have already set them up. These programs, however, focus on costly services such as computed tomography and magnetic resonance imaging.

Overall, most countries still lack well-defined policies for developing resources for imaging and radiation therapy services. The downsizing of the State and the trend toward privatization, coupled with an absence of policies for promoting balanced investments in the sector, have encouraged the importation of imaging and radiation therapy equipment primarily for use in private hospitals and other facilities. Technology usually is not selected according to its cost-efficiency, effectiveness, and appropriateness for dealing with the prevailing problems. Furthermore the radiation safety aspect—ensuring that the equipment and its use will not generate additional risks or dangers—is only considered in therapeutic, not in diagnostic, applications.

The ministries of health have not assumed the regulation and oversight of these processes as part of their leadership role within the framework of the public sector reform. A notable exception is Colombia, which has established mandatory “basic requirements” for health services at three levels of complexity; among them radiology and radiation therapy services.

Radiotherapy services in Latin America and the Caribbean continue to renew themselves cyclically every 10 to 15 years. For example, between 1988 and 1997, cobalt teletherapy machines have continued to be purchased, but at a diminishing rate. During the last few years, on the other hand, the services have been upgraded with the acquisition of linear accelerators and remote afterloading brachytherapy devices. Low energy accelerators also have become increasingly common, in part because existing cobalt bunkers sometimes have limited space and radiation protection.

The demand for higher energy photons and electrons has yet to show the same patterns of uptake as in North America

during the last two decades, and more sophisticated accessories, such as multi-leaf collimation, have only appeared in one or two leading centers, because they are expensive and place demands on hospital infrastructure.

Most of the countries are reviewing their existing radiation protection regulations, in an attempt to bring them in line with the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (92) that were endorsed by the XXIV Pan American Sanitary Conference. Regulations based on these standards have been enacted by Argentina, Bolivia, Brazil, Chile, Mexico, and Peru, and every other Latin American country is considering doing so. At the beginning of 1998, the English- and Dutch-speaking Caribbean countries held a regional workshop to consider the adoption of these standards.

Most regulatory authorities that deal in radiation protection are outside the health sector and, thus, lack clinical knowledge; as a result, the use of medical radiation sources, which are the most abundant radiation sources, is very difficult to control, especially in regards to patient protection. Exercising control is further complicated when regulatory responsibilities are split between two or more governmental agencies, as is the case in Argentina, Brazil, Chile, and Mexico, among others. It should be noted that these countries have tried to align their policies, coordinate efforts, and avoid duplications. The best example of these efforts took place in Mexico: in 1996, the Ministry of Health and the Ministry of Energy and Mines signed a formal agreement (which covered the National Commission on Security and Safety and the National Institute on Nuclear Research, both agencies under the latter Ministry) that clearly delineates each agency's responsibility and sphere of action.

Availability of Imaging Services. The availability, utilization, and complexity of imaging equipment varies widely between large, moderately industrialized countries with high levels of urbanization and less industrialized countries. In the former, hospital centers with more sophisticated equipment were already private. In the latter, government hospitals have been placed under the management of municipalities, and this shift in responsibilities has often led to a downgrading in the quality of services and to radiation protection policies being virtually ignored. Burdened with increasing costs, the smaller countries, such as those in the Eastern Caribbean, struggle with shared services schemes and explore the feasibility of teleradiology. The results of a 1995 survey (93) appear in Tables 23, 24, and 25. Table 23 shows that, while all the countries provide general radiology services, computed tomography, magnetic resonance, and nuclear medicine services are practically nonexistent. Even more worrisome is the paucity of available fluoroscopy services, which forces radiographers to perform "blind" barium studies, resulting in a

waste of materials and inadequate films from which to obtain accurate diagnoses. Table 24 shows the existing equipment and the number of studies performed annually. It is interesting to compare the number of examinations per bed, which ranges from 16 in Nevis to 115 in Antigua (the United States has more than 180). The data reflects the fact that the equipment in Nevis suffers frequent breakdowns, while Antigua's statistics include referrals from other Caribbean countries. The human resources involved in the services are listed in Table 25; clearly, there is a shortage of trained staff, particularly of radiologists; medical physicists also are insufficient.

Information regarding staff is difficult to obtain, and data on service utilization is even more so; most available data refer exclusively to installed equipment. Table 26 lists the number of X-ray units in the countries of Latin America and the Caribbean. The number of X-ray units per 1,000 persons ranges from 0.35 in Argentina (a value similar to the one in industrialized countries a decade ago) to an approximated 0.0028 in Haiti, a figure that is probably an overestimate.

Regarding diagnostic radiology standards, in 1996 the Secretary of Health of Mexico published four official norms for the country's medical diagnostic radiology, which covered health responsibilities, technical requirements for facilities, radiological safety and protection, and technical specifications for x-ray equipment. Other countries, such as Brazil, are incorporating similar standards in the regulations to be adopted by the ministries of health.

Availability of Radiation Therapy Services. Tables 27 and 28 summarize the megavoltage therapy facilities and resources in Latin America and the Caribbean; the following clarifications are necessary regarding the data. First, in instances where only a combined figure is available, the number of new cancer patients per year may include both new cancer patients and cancer mortality figures. Second, the figures for manual brachytherapy reflect number of treatment sources, whereas the figures for remote brachytherapy count only the treatment unit itself.

The following observations also are noteworthy. First, the average number of annual new cancer patients per million population for the Region is estimated at 1,480, a figure that is low compared to that of other regions. In light of such changes as increased urbanization, improved primary health care, and, more significantly, better diagnostic capabilities, this figure is expected to rise. Second, the availability of treatment facilities and equipment is low in terms of averages per million population. However, since this figure only covers recorded units, it only superficially measures real treatment capability, which can be considerably lower as source material and machines older than 10–15 years can be depleted. Third, more important than the apparent need for more treatment equipment capacity is the need for

TABLE 23
Summary of diagnostic imaging services in the public sector, 1995 Eastern Caribbean survey.

Country	General radiology	Fluoroscopy	Contrast studies	Mammography	Ultrasound	Computed tomography	Magnetic resonance imaging	Nuclear medicine imaging
Anguilla	FS	EX	EX	X	PS	X	X	X
Antigua	FS	FS	FS	FS	FS	FS	X	X
Barbados	FS	FS	FS	FS	FS	FS	X	FS
British Virgin Islands	FS	EX	EX	X	FS	X	X	X
Dominica	FS	X	X	X	PS	X	X	X
Grenada	FS	FS	FS	X	FS	X	X	X
Montserrat	FS	X	X	X	EX	X	X	X
Nevis	FS	X	X	X	PS	X	X	X
Saint Kitts	FS	X	X	FS	PS	X	X	X
Saint Lucia	FS	FS	FS	EX	FS	X	X	X
Saint Vincent	FS	FS	FS	FS	FS	X	X	X

FS, full service; X, no service; PS, partial service; EX, equipment/no service.

Source: Pan American Health Organization, Caribbean Program Coordination. *Shared radiological (imaging) services in the Eastern Caribbean*. Report of the Study Team. Bridgetown: PAHO; 1995.

TABLE 24
Public sector diagnostic imaging statistics, 1995 Eastern Caribbean survey.

Country	Population	X-ray units	X-ray exams	X-ray patients	Ultrasound exams	Barium studies	Hospital beds	Exams per bed	Exams per 10,000 population
Anguilla	8,960	2	1,100		230	1	36	37	1,484
Antigua	65,000	4	17,634	15,310	1,623	1,367	167	115	2,963
Barbados	250,000	9	43,421	35,881	4,416	1,531	606	79	1,914
British Virgin Islands	17,000	1	3,734		475		65	65	2,476
Dominica	80,000	2	14,802	12,500	3,605	665	195	94	2,301
Grenada	95,000	3	15,000	12,379	3,500		241	77	1,888
Montserrat	11,000	1	2,450	1,850		75	67	37	2,227
Nevis	9,500	1	800				50	16	842
Saint Kitts	36,000	2	7,295	6,665	544	212	167	47	2,178
Saint Lucia	140,000	3	18,700	10,000	800	772	337	55	1,336
Saint Vincent	110,000	1	16,221	12,000	3,000	253	207	93	1,747

Source: Pan American Health Organization, Caribbean Program Coordination. *Shared radiological (imaging) services in the Eastern Caribbean*. Report of the Study Team. Bridgetown: PAHO; 1995.

TABLE 25
Human resources involved in radiation services in the public sector, 1995 Eastern Caribbean survey.

Country	Radiologists	Radiographers	Trainee radiographers	Darkroom technicians
Anguilla	0	2	0	0
Antigua	2	4	2	1
Barbados	4	18	2	3
British Virgin Islands	0	1	0	0
Dominica	0	3	0	0
Grenada	1	6	0	1
Montserrat	0	1	0	0
Nevis	0	1	0	0
Saint Kitts	0	1	3	0
Saint Lucia	1	5	0	0
Saint Vincent	1	4	4	0

Source: Pan American Health Organization, Caribbean Program Coordination. *Shared radiological (imaging) services in the Eastern Caribbean*. Report of the Study Team. Bridgetown: PAHO; 1995.

human resources trained and experienced in existing and upcoming technologies. The patient load per radiotherapist, physicist, and technologist is very high, and the number of physicists and technologists per center or therapy unit is low. The scarcity of physics support is not only noticeable from a quality assurance point of view, but it also affects the uptake of new technology.

Quality Assurance and Control. In order to ensure quality in radiology services, it is essential for institutions to adhere to quality assurance programs voluntarily or by statute, regardless of whether there is a facility accreditation program in place. PAHO has evaluated and supported quality assurance programs in diagnostic radiology in Argentina, Bolivia, Brazil, Cuba, Honduras, and Mexico.

Table 29 summarizes the results of three studies: a pilot study conducted on 21 units in Havana, Cuba; a study covering 62 units in four Bolivian cities (La Paz, El Alto, Cochabamba, and Santa Cruz); and a study that comprises data on 21 units in Anguilla, Antigua, British Virgin Islands, Dominica, Grenada, Nevis, Saint Kitts, Saint Lucia, and Saint Vincent. The table shows that even though resources differ from country to country, most of the units surveyed exhibited serious deficiencies.

The results of the darkroom evaluations, which also were conducted as part of these studies, are even bleaker: most film is processed manually; many darkrooms are not hermetically sealed; and films, screens, and processing chemicals are often incompatible, leading to substandard image quality. Currently, image quality and radiation dose are standard parameters in all quality assurance programs. Once these programs are implemented, not only will diagnosis become more

accurate, but the overall cost to the services will go down, as X-ray tubes will last longer and less film will be used.

PAHO has continued to participate in joint projects with the International Atomic Energy Agency (IAEA) as a way to promote quality assurance programs in radiotherapy. The IAEA/WHO Postal Dose Intercomparison Program verifies the calibration of 90 high-energy radiotherapy units (cobalt-60 and linear accelerators) in the Region on an annual basis; unfortunately, only about 66% of the units tested comply within acceptable error tolerances. The efforts of some projects that are part of the Regional Cooperative Agreements for the Development of Nuclear Science and Technology (ARCAL) in Latin America, which are coordinated by the IAEA, are expected to improve this situation.

Medical physicists are critical for providing expertise in both normative and service-related activities, but these professionals are limited, particularly in the area of imaging. Table 30 shows the estimated number of medical physicists, including those working in universities, hospitals, and industries, in Latin America and the Caribbean (countries not shown did not have physicists at the time of the survey) (94). New postgraduate programs in medical physics in Argentina, Brazil, Colombia, Mexico, Peru, and Venezuela, some of which are partially financed by the IAEA, will improve medical physicists' qualifications and availability.

Human Resource Development

The development of the health sector's human resources has experienced major changes in terms of labor market dynamics, demands imposed on training institutions, organization of

TABLE 26
Diagnostic X-ray units in the public and private sectors in Latin America and the Caribbean, 1994.

Country	Population (in thousands)	X-ray units (excluding dental)	No. of X-ray units per 1,000 population
Anguilla	9	2	0.022
Antigua	65	4	0.061
Argentina	34,318	12,000	0.35
Bahamas	272	5	0.018
Barbados	250	20	0.080
Belize	210	12	0.057
Bolivia	7,238	1,458	0.20
Brazil	157,022	18,000 ^a	0.11
British Virgin Islands	17	1	0.059
Chile	13,994	1,350	0.096
Colombia	17,459	1,500	0.086
Costa Rica	3,347	190	0.057
Cuba	10,906	1,000	0.092
Dominica	80	6	0.075
Dominican Republic	7,684	180	0.023
Ecuador	11,221	811	0.072
El Salvador	5,530	136	0.025
Grenada	95	3	0.032
Guatemala	9,715	95	0.0098
Haiti	7,035	20 ^a	0.0028
Honduras	5,494	87	0.016
Jamaica	2,429	30 ^a	0.012
Mexico	89,571	10,000 ^a	0.11
Netherlands Antilles	197	8 ^a	0.041
Nicaragua	4,008	50	0.012
Panama	2,585	216	0.084
Paraguay	4,703	100 ^a	0.021
Peru	23,130	1,286	0.056
Saint Kitts and Nevis	36	3	0.083
Saint Lucia	140	14	0.10
Saint Vincent and the Grenadines	110	4	0.036
Trinidad and Tobago	1,292	20 ^a	0.015
Uruguay	3,168	350 ^a	0.11
Venezuela	21,377	3,000	0.14

^a Estimated.

Source: Borrás, Cari, ed. *Organization, development, quality assurance and radiation protection in radiology services: imaging and radiation therapy*. Washington, DC: Pan American Health Organization; 1997.

social actors in the sector, and human resource management models. Many of the changes derive from broad economic and political determinants, such as the adjustment of economies to globalization trends of economic integration and State reform processes. Specifically, these transformations emerge from changes taking place in academia, the labor arena, social service financing, public administration, participation in health service management, and definition of the responsibilities for public activity in the health sector.

From this perspective, reform processes have highlighted the need for a more comprehensive understanding of human resource development without the limitations imposed by traditional analyses that embraced predetermined models without question; they also offer the possibility for innovative work in this area.

Because available information on human resources in health in the countries is scarce, it is difficult to make regional comparisons or answer significant questions. In the

TABLE 27
Megavoltage therapy facilities and resources, Latin America and the Caribbean.

Country	Cobalt units	Linear accelerators	Brachytherapy		Simulators	Treatment planning computers	Megavoltage treatment units (per millions)	Physicists per therapy unit	Technologists per therapy unit
			Manual	Remote					
Anguilla	...	...	...	...	...	...	...	...	...
Antigua	...	...	...	...	...	...	...	...	...
Argentina	100	35	100	4	12	16	3.9	0.42	1.8
Aruba	...	...	...	...	...	...	...	...	...
Bahamas	...	...	...	...	...	...	...	...	...
Barbados	1	0	2	1	0	1	3.8	1.00	3.0
Belize	...	...	...	...	...	...	...	...	...
Bolivia	7	0	2	2	0	1	0.9	0.71	2.6
Bonaire	...	...	...	...	...	...	...	...	...
Brazil	180	100	105	19	16	15	1.7	0.45	1.0
British Virgin Islands	...	...	...	...	...	...	...	...	...
Cayman Islands	...	...	...	...	...	...	...	...	...
Chile	21	14	19	1	7	12	2.5	0.06	0.7
Colombia	28	11	15	7	9	10	1.0	0.33	1.4
Costa Rica	3	0	7	0	1	0	0.9	0.67	3.0
Cuba	9	1	8	4	1	2	0.9	1.60	7.5
Curaçao	1	1	0	0	0	1	11.4	0.50	1.0
Dominica	...	...	...	...	...	...	...	...	...
Dominican Republic	8	1	3	2	1	2	1.1	0.22	1.4
Ecuador	9	0	1	1	3	5	0.8	0.67	3.3
El Salvador	3	0	9	0	0	1	0.5	0.67	2.7
Grenada	...	...	...	...	...	...	...	...	...
Guadeloupe	...	...	...	...	...	...	...	...	...
Guatemala	6	0	8	1	0	1	0.6	0.33	2.2
Guyana	...	...	...	...	...	...	...	...	...
Haiti	...	...	...	...	...	...	...	...	...
Honduras	2	0	2	0	0	0	0.3	0.50	2.0
Jamaica	2	0	0	0	0	0	0.8	0.50	1.5
Martinique	0	1	0	0	0	0	2.7	1.00	2.0
Montserrat	...	...	...	...	...	...	...	...	...

Mexico	92	24	65	7	15	14	1.2	0.29	2.2
Nicaragua	1	0	5	0	1	1	0.2	4.00	5.0
Panama	3	0	6	0	0	1	1.1	1.67	2.7
Paraguay	4	3	0	0	1	1	1.4	0.14	1.4
Peru	13	2	21	0	3	1	0.6	0.27	2.7
Puerto Rico	2	2	0	0	1	0	1.1	1.00	2.0
Saint Kitts and Nevis	...	...	...	...	...	...	...	...	...
Saint Lucia	...	...	...	...	...	...	...	...	...
Saint Maarten	...	...	...	...	...	...	...	...	...
Saint Martin	...	...	...	...	...	...	...	...	...
Saint Vincent and the Grenadines	...	...	...	...	...	...	...	...	...
Suriname	...	...	...	...	...	...	...	...	...
Trinidad and Tobago	2	0	2	0	0	0	1.5	1.00	2.0
US Virgin Islands	...	...	...	...	...	...	...	...	...
Uruguay	10	3	0	0	1	2	4.1	0.46	0.9
Venezuela	24	15	30	2	7	10	1.7	0.21	1.5
Total	531	213	410	51	79	97	1.5	0.41	1.6

Source: Friend, JK. Elekta Oncology System.

TABLE 28
Megavoltage therapy facilities and resources, Latin America and the Caribbean.

Country	No. of cancer centers	No. of new cancer patients, per year	No. of new cancer patients per year, per million population	No. of radiotherapists	Patients per radiotherapist	No. of physicists	Patients per physicist	Physicists per center	No. of technologists	Patients per technologist
Anguilla	0	15 ^a	^a	...	...	...	...	...	...	...
Antigua	0	96 ^a	^a	...	...	...	...	...	...	...
Argentina	100	46,584 ^b	1,339	170 ^b	274	57 ^b	817	0.57	240 ^b	194
Aruba	0	119 ^a	^a	...	...	...	...	...	...	...
Bahamas	0	450 ^a	^a	...	...	...	...	...	...	...
Barbados	1	783 ^a	3,000	8	98	1	783	1.00	3	261
Belize	0	314 ^a	^a	...	...	...	...	...	...	...
Bolivia	7	6,000 ^b	743	14 ^b	429	5 ^b	1,200	0.71	18 ^b	333
Bonaire	0	21 ^a	^a	...	...	...	...	...	...	...
Brazil	180	343,000 ^b	2,120	633 ^b	542	125 ^b	2,744	0.69	272 ^b	1,261
British Virgin Islands	0	26 ^a	^a	...	...	...	...	...	...	...
Cayman Islands	0	50 ^a	^a	...	...	...	...	...	...	...
Chile	26	30,000 ^b	2,113	40 ^b	750	2 ^b	15,000	0.08	25 ^b	1,200
Colombia	31	54,670 ^b	1,439	48 ^b	1,139	13 ^b	4,205	0.42	55 ^b	994
Costa Rica	2	4,000 ^b	1,168	6 ^b	667	2 ^b	2,000	1.00	9 ^b	444
Cuba	10	22,200 ^c	2,000	35 ^c	634	16 ^c	1,388	1.60	75 ^c	296
Curaçao	1	264 ^a	^a	2 ^a	132	1 ^a	264	1.00	2 ^a	132
Dominica	0	110 ^a	^a	...	...	...	...	...	...	...
Dominican Republic	5	14,600 ^c	1,845	11 ^c	1,327	2 ^c	7,300	0.40	13 ^c	1,123
Ecuador	8	400 ^b	35	10 ^b	40	6 ^b	67	0.75	30 ^b	13
El Salvador	2	11,200 ^c	1,942	6 ^c	1,867	2 ^c	5,600	1.00	8 ^c	1,400
Grenada	0	144 ^a	^a	...	...	...	...	...	...	...
Guadeloupe	0	621 ^a	^a	...	...	...	...	...	...	...
Guatemala	4	20,000 ^c	1,883	6 ^c	3,333	2 ^c	10,000	0.50	13 ^c	1,538
Guyana	0	1,251 ^a	^a	...	...	...	...	...	...	...
Haiti	1	13,000 ^c	1,811	...	...	...	...	...	...	...
Honduras	1	11,000 ^c	1,843	2 ^c	5,500	1 ^c	11,000	1.00	4 ^c	2,750
Jamaica	2	5,000 ^c	1,963	1 ^c	5,000	1 ^c	5,000	0.50	3 ^c	1,667

Martinique	1	566 ^a	^a	2 ^a	283	1 ^a	566	1.00	2 ^a	283
Montserrat	0	17 ^a	^a	...	...	...	...	...	...	...
Mexico	70	40,924 ^d	437	98 ^d	418	34 ^d	1,204	0.49	250 ^d	164
Nicaragua	2	8,800 ^c	2,000	4 ^c	2,200	4 ^c	2,200	2.00	5 ^c	1,760
Panama	3	5,200 ^c	1,956	6 ^c	867	5 ^c	1,040	1.67	8 ^c	650
Paraguay	4	10,000 ^b	2,041	6 ^b	1,667	1 ^b	10,000	0.25	10 ^b	1,000
Peru	12	20,500 ^b	872	19 ^b	1,079	4 ^b	5,125	0.33	40 ^b	513
Puerto Rico	4	5,537 ^a	^a	12 ^a	461	4 ^a	1,384	1.00	8 ^a	692
Saint Kitts and Nevis	0	63 ^a	^a	...	...	...	...	...	...	...
Saint Lucia	0	233 ^a	^a	...	...	...	...	...	...	...
Saint Maarten	0	48 ^a	^a	...	...	...	...	...	...	...
Saint Martin	0	38 ^a	^a	...	...	...	...	...	...	...
Saint Vincent and the Grenadines	0	161 ^a	^a	...	...	...	...	...	...	...
Suriname	0	695 ^a	^a	...	...	...	...	...	...	...
Trinidad and Tobago	1	1,958 ^a	^a	4	489	2	979	2.00	4	489
US Virgin Islands	0	162 ^a	^a	...	...	...	...	...	...	...
Uruguay	9	4,779 ^a	^a	8 ^a	597	6 ^a	797	0.67	12 ^a	398
Venezuela	31	34,275 ^b	1,537	100 ^b	343	8 ^b	4,284	0.26	60 ^b	571
Total	518	719,874	1,480	1,251	575	305	2,360	0.59	1,169	616

^a Hypotheses: 1,500 new cancer patients per year, per million population; total population: 487 million inhabitants.

^b Information from ARCAL Project XXIV, 1995, presented to the Latin American Curie-Therapy Group (GLAC).

^c INOR, Havana, presentation in Mexico, August 1997.

^d Presentation during the meeting of the Latin American Curie-Therapy Group-Radiation Oncology (GLAC-RO) in Aruba in December 1997.

Source: Friend, JK. Elekta Oncology System.

TABLE 29
Quality assurance diagnostic radiology results, percentage of tested units outside tolerance.

Parameter/X-ray unit (number)	Cuba ^a (21)	Bolivia ^b (62)	Eastern Caribbean ^c (21)
Light/radiation field congruence	15	21	11
Collimator scale accuracy	—	—	20
Light/radiation field alignment	57	16	11
Distance indicator	—	36	—
X-ray beam/patient table perpendicularity	21	19	6
Tube potential accuracy	26	8	52
Filtration	25	7	15
Timer accuracy	—	46	6
Exposure reproducibility	38	46	15
mAs linearity	57	7	40

^a Evaluation performed by Saez D, et al. of Centro de Control Estatal de Equipos Médicos, Havana, Cuba.

^b Evaluation performed by Miranda A, et al. of Instituto Boliviano de Energía Nuclear, La Paz, Bolivia.

^c Evaluation performed by Goodenough D and Butler P of George Washington University, Washington, DC, USA.

face of rapid change in the health sector, the weak existing information systems continue to describe traditional aspects without considering emerging trends that are of concern to decision-makers. (For example, mechanisms designed to regulate professional performance and training in order to foster flexibility in labor relations and increase competition in the labor market challenge traditional models of health personnel management, and present new hurdles for training institutions.)

Human resource development is one of the central elements in national health plans and health sector reforms, and it is considered a basic strategy for the development of health systems and services. While there is consensus in this regard, not all the countries' sectoral reform projects reflect this. Whenever human resources are considered to be the element that structures health organization and practice, their development is considered critical. If human resources are defined by their limitations in technical ability, motivation, or shortcomings in their distribution, however, they are deemed to be the cause for delay in bringing about the changes proposed in reform projects. The prevailing view of human resources encourages narrow corrective actions that aim at conducting fairly traditional training, administrative, and educational activities for health personnel.

Despite the difficulties, the reform process emphasizes human resource challenges and favors a comprehensive approach to solutions. Regarding regulation, the pursuit of a coordinated process is beginning to displace self-regulation models whereby each profession and institution made decisions in isolation. Strategic elements for human resources, such as access to employment, work performance, labor rela-

tions, and work force regeneration, also are gaining ground. In addition, managers of public and private systems are beginning to realize that increased competitiveness and deepening of the decentralization strategy will form a part of their agenda.

Availability of Human Resources

Between 1993 and 1996, the growth of the percentage of health workers in relation to the total work population was interrupted, and in some cases it decreased from previous figures. This represents a trend reversal, and reveals the impact of the adjustment process on the health sector.

The active work force in the health sector represented 7.89% of the total work force in the United States in 1995 and 7.55% in Canada in 1996. In the countries for which information is available, the portion of the economically active population (EAP) dedicated to health is 4.95% in Cuba, 4.51% in Brazil (4% in the previous period), and 2.81% in Costa Rica (3% in the previous period). In Panama, Bolivia, and Guatemala the values are 2.97%, 2.46%, and 2.08%, respectively, and in El Salvador, only 1.6%. These figures show how the influence that health workers have varies widely in the different countries of the Region, and they reveal a trend toward a slight reduction of this work force as compared with the previous period. Brazil, where numbers have increased, is an exception.

The growth pattern in the numbers of health professionals also has varied. For example, many countries, representing a total population of approximately 55 million persons, have less than 1 physician per 1,000 population (Belize, Dominica,

TABLE 30
Estimated number of medical physicists in
Latin America and the Caribbean, 1994.

Country	Medical physicists
Argentina	108
Barbados	1
Bolivia	3
Brazil	700
Chile	5
Colombia	17
Costa Rica	3
Cuba	20
Ecuador	4
Honduras	1
Jamaica	1
Mexico	30
Panama	2
Paraguay	1
Peru	6
Trinidad and Tobago	4
Uruguay	2
Venezuela	14

Source: Borrás, Cari, ed. *Organization, development, quality assurance and radiation protection in radiology services: imaging and radiation therapy*. Washington, DC: Pan American Health Organization; 1997.

Grenada, Guatemala, Guyana, Haiti, Honduras, Montserrat, Nicaragua, Peru, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the Turks and Caicos Islands). The growth in the number of physicians in different countries does not correspond to the availability of professionals: in Argentina, Canada, Cuba, the Dominican Republic, the United States, Uruguay, and Venezuela, countries with a significant availability of doctors (more than 1 per 500 population), the number of doctors tends to rise; but in Brazil, the British Virgin Islands, Grenada, Montserrat, Peru, and Suriname, countries with fewer doctors per inhabitant, the numbers tend to decrease (Table 31).

The ratio of professional nurses to the population shows an even greater variation among countries: for example, Canada, Cuba, and the United States report more than 65 nurses per 10,000 population, while Brazil, Chile, Colombia, the Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, and Paraguay have fewer than 5 per 10,000 population. In the 1992–1996 period, Bolivia, Dominica, Grenada, Nicaragua, Panama, Peru, and the United States have had a significant increase in nurses; in El Salvador, Guatemala, Jamaica, Paraguay, Suriname, and Venezuela, the absolute number of nursing professionals has diminished. In the case of the English-speaking Caribbean countries, there is a high availability

of nursing personnel, but a reduced number of physicians (Table 32).

The highest dentist-to-population ratio (more than 10 dentists per 10,000 population) is found in Uruguay, followed by Argentina, Brazil, Cuba, Ecuador, Mexico, and Panama; in Belize, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Suriname, and most of the English-speaking Caribbean countries, the number of dentists in no case exceeds 2 per 10,000 population. Mexico and the United States are showing a relative drop in the number of dentists, and Ecuador, Panama, and Venezuela, a considerable increase (Table 33).

Regulation of Human Resources in the Health Sector

Some of the salient unresolved or emerging issues in human resource development include the following:

- The limited capability of the sector's authorities to decide, plan, and act upon the human resource needs and to improve the distribution and performance capability of health institution personnel.
- The lack of coordination among institutions and the variety in human resource orientations in the countries, which illustrates the need for planning and regulation in the sector.
- Reduced budgets in health ministries and public institutions, resulting in a decrease in numbers of permanent positions for health workers and a drop in their remuneration. This translates into the inability of the institutions to attract and hold on to qualified workers (especially nurses, health service administrators, and pharmacists).
- The concentration of health professionals in large cities and in certain specialties.
- Moonlighting on the part of doctors, with underemployment of some specialists and lack of others.
- The shortage of professional nurses or nursing aides and the tendency to increase their workload by adding hours to the work day.
- The relative scarcity of professionals with the performance profiles required by reforms and by the decentralized and efficient health care management models.
- The migration of health workers and professionals to countries with greater work force demand, and the distortion of current labor markets as a consequence of economic integration and of common markets in which free labor exchange is possible.

The health ministries have seen their traditional responsibilities as direct providers of health services diminished and even abolished, and their traditional role as the main employer in the sector reduced. However, they are still re-

TABLE 31
Physicians per 10,000 population, by subregion and country, ca. 1997.

Subregion and country	Year	Physicians ca. 1997	Ratio per 10,000 population ca. 1992	Ratio per 10,000 population ca. 1997
Andean Subregion		149,863	11.65	14.42
Bolivia	1997	10,095	4.51	12.99
Colombia	1997	43,000	10.94	11.60
Ecuador	1997	20,243	14.24	16.96
Peru	1997	22,707	10.59	9.32
Venezuela	1997	53,818	16.16	23.63
Southern Cone		121,764	21.76	21.98
Argentina	1992	88,800	26.83	26.84
Chile	1994	15,451	11.04	11.03
Paraguay	1997	5,585	6.47	10.98
Uruguay	1996	11,928	36.84	37.03
Brazil	1996	205,828	13.39	12.72
Central American Isthmus		34,959	8.45	10.35
Belize	1996	119	6.24	5.48
Costa Rica	1997	5,044	12.62	14.11
El Salvador	1997	6,177	8.39	10.71
Guatemala	1997	10,485	7.80	9.33
Honduras	1997	4,975	6.96	8.32
Nicaragua	1997	3,725	4.36	8.56
Panama	1995	4,434	16.43	16.68
Mexico	1990	165,185	16.21	18.64
Latin Caribbean		76,725	20.53	29.60
Cuba	1997	58,701	43.34	53.04
Dominican Republic	1997	17,460	14.90	21.56
Haiti	1992	564	0.83	0.84
Caribbean		7,341	6.57	10.40
Anguilla	1997	14	11.11	17.50
Antigua and Barbuda	1996	75	7.66	11.36
Bahamas	1996	419	14.13	15.18
Barbados	1993	334	11.35	12.54
British Virgin Islands	1997	23	16.15	11.50
Cayman Islands	1997	64	17.04	19.39
Dominica	1996	35	4.58	4.93
French Guiana	1984	111	11.81	13.88
Grenada	1997	46	5.00	4.95
Guadeloupe	1984	459	11.48	13.78
Guyana	1997	153	1.71	1.81
Jamaica	1996	3,428	5.70	14.01
Martinique	1997	766	17.12	19.74
Montserrat	1997	2	5.00	1.82
Saint Kitts and Nevis	1997	48	8.86	11.71
Saint Lucia	1997	69	3.48	4.73
Saint Vincent and the Grenadines	1997	100	4.58	8.77
Suriname	1996	110	7.51	2.52
Trinidad and Tobago	1994	1,074	7.20	7.88
Turks and Caicos Islands	1997	11	5.29	7.33
North America		783,595	24.53	27.41
Bermuda	1997	113	12.03	17.66
Canada	1995	63,157	22.13	22.91
United States	1995	720,325	24.52	27.90
Region of the Americas		1,545,260	18.31	20.27

Source: Country reports.

TABLE 32
Nurses per 10,000 population, by subregion and country, circa 1997.

Subregion and country	Year	Nurses circa 1997	Ratio per 10,000 population circa 1992	Ratio per 10,000 population circa 1997
Andean Subregion		73,054	5.96	7.22
Bolivia	1997	5,393	2.48	6.94
Colombia	1994	16,560	4.56	4.83
Ecuador	1997	8,362	5.00	7.01
Peru	1997	28,063	8.74	11.52
Venezuela	1997	14,676	7.44	6.44
Southern Cone		36,184	4.92	6.42
Argentina	1994	26,000	5.44	7.68
Chile	1996	6,738	4.16	4.72
Paraguay	1997	1,216	3.04	2.39
Uruguay	1996	2,230	5.46	7.00
Brazil	1996	66,857	3.66	4.13
Central American Isthmus		18,630		
Belize	1996	178	5.48	8.20
Costa Rica	1997	3,902	9.46	10.91
El Salvador	1997	2,068	4.92	3.49
Guatemala	1997	3,031	3.20	2.70
Honduras	1997	1,528	2.48	2.55
Nicaragua	1997	4,000	5.56	9.19
Panama	1997	3,923	10.46	14.41
Mexico	1995	84,701	8.76	8.65
Latin Caribbean		78,212	26.53	29.45
Cuba	1997	75,000	68.07	67.76
Dominican Republic	1997	2,422	1.82	2.99
Haiti	1997	790	1.08	1.07
Caribbean		14,331	15.67	20.35
Anguilla	1997	29	22.22	36.25
Antigua and Barbuda	1996	218	23.25	33.03
Bahamas	1996	634	25.83	22.97
Barbados	1993	880	32.28	33.03
British Virgin Islands	1997	66	36.92	33.00
Cayman Islands	1997	197	51.85	59.70
Dominica	1996	295	26.27	41.55
French Guiana	1984	688	73.19	86.00
Grenada	1997	342	23.94	36.77
Guadeloupe	1984	997	24.93	29.94
Guyana	1997	713	8.76	8.42
Jamaica	1996	1,578	6.95	6.45
Martinique	1997	2,202	46.11	56.75
Montserrat	1997	32	38.00	29.09
Saint Kitts and Nevis	1997	204	59.09	49.76
Saint Vincent and the Grenadines	1997	272	18.67	23.86
Saint Lucia	1997	384	17.66	26.30
Suriname	1996	661	22.72	15.63
Trinidad and Tobago	1994	3,910	16.10	28.68
Turks and Caicos Islands	1997	29	17.65	19.33
North America		2,823,702	89.46	96.45
Bermuda	1991	523	88.64	89.55
Canada	1996	264,305	95.84	89.71
United States	1996	2,558,874	87.78	97.20
Region of the Americas		3,195,671	37.93	41.09

Source: Country reports.

TABLE 33
Dentists per 10,000 population, by subregion and country, circa 1997.

Subregion and country	Year	Dentists circa 1997	Ratio per 10,000 population circa 1992	Ratio per 10,000 population circa 1997
Andean Subregion		45,720	3.68	4.52
Bolivia	1997	1,643	2.18	2.11
Colombia	1994	13,815	4.13	4.03
Ecuador	1997	7,622	4.38	6.39
Peru	1997	9,640	3.18	3.96
Venezuela	1997	13,000	3.94	5.71
Southern Cone		32,946	5.84	5.95
Argentina	1997	21,900	6.62	6.62
Chile	1996	5,817	3.82	4.15
Paraguay	1997	1,610	2.57	3.16
Uruguay	1996	4,069	11.22	12.63
Brazil	1996	137,638	7.60	8.51
Central American Isthmus		8,995	1.80	2.66
Belize	1996	23	0.65	1.06
Costa Rica	1997	1,409	3.76	3.94
El Salvador	1997	2,053	2.19	3.56
Guatemala	1997	1,466	1.10	1.30
Honduras	1997	1,005	1.14	1.68
Nicaragua	1997	810	1.24	1.86
Panama	1997	1,397	3.81	5.13
Mexico	1990	58,348	6.79	6.59
Latin Caribbean		11,327	3.52	4.37
Cuba	1997	9,348	7.45	8.45
Dominican Republic	1997	1,898	2.54	2.34
Haiti	1992	81	0.12	0.12
Caribbean		790	0.99	1.13
Anguilla	1997	1	1.11	1.25
Antigua and Barbuda	1996	12	1.69	1.82
Bahamas	1996	70	2.20	2.54
Barbados	1993	43	1.27	1.61
British Virgin Islands	1997	4	0.77	2.00
Cayman Islands	1997	11	4.07	3.33
Dominica	1996	4	0.05	0.56
French Guiana	1984	24	2.55	3.00
Grenada	1997	8	0.74	0.86
Guadeloupe	1984	102	2.55	3.06
Guyana	1997	32	0.14	0.38
Jamaica	1994	220	0.89	0.90
Martinique	1997	121	3.29	3.12
Montserrat	1997	1	1.00	0.91
Saint Kitts and Nevis	1997	8	1.82	1.95
Saint Lucia	1997	9	0.57	0.62
Saint Vincent and the Grenadines	1997	6	0.50	0.53
Suriname	1996	4	0.50	0.09
Trinidad and Tobago	1997	109	0.86	0.84
Turks and Caicos Islands	1997	1	0.59	0.67
North America		170,670	6.22	5.97
Bermuda	1997	27	4.58	4.22
Canada	1997	16,163	5.34	5.86
United States	1996	154,480	6.26	5.98
Region of the Americas		466,434	5.88	6.14

Source: Country reports.

sponsible for implementing sector policies and, hence, the coordination, articulation, and regulation of public and private resources for health care and human resource development. The ministries have had to establish regulations on human resources and have been required to play a more active role in this field in order to cope with new labor market dynamics.

Currently, several countries have established technical units within their health ministries that are responsible for human resources. Many of them track their operations in sectoral and institutional areas. On the one hand, they carry out administrative functions and training for the ministry's own personnel, and on the other, they deal with sectoral planning, policy development, and coordination of institutions in the human resource field. In some countries, these units have exclusive responsibility for administration; other countries, recognizing the complexity of the issues and the political difficulties in the decision-making process, are evolving toward establishing permanent, inter-institutional commissions entrusted totally or partially with setting policy for human resource development. Some countries, such as Argentina, have commissions organized by professions or by groups to address specific problems. In Bolivia, Colombia, and Venezuela, the need for sectoral regulation in human resources at the regional level has led to the formation of departmental commissions that coordinate activities among training institutions, the health services, and professional associations.

The Labor Market in Health

Factors such as economic adjustment, the governments' financial and fiscal crisis, changes in configuration and dynamics of the health sector's labor markets and professions, the sector's complexity, and the increasing autonomy of health institutions, combine to strain decision-making and planning systems, management models, and human resource development.

In response, some countries have deregulated labor, in the belief that sustaining the traditional model of labor relations imposes high costs on companies and discourages productivity. Other countries have promoted reforms that tend to increase flexibility in the regulations of overall labor relations, including those corresponding to the health sector, considering that they generally fulfill positive functions.

Wages have tended to contract and the number of positions in public health institutions in many countries has decreased or been frozen. In addition, the number of temporary or third-party contracts has increased. While there are no regional statistics available, the countries report that although permanent staff in public institutions has tended to

decrease, the total number of workers has remained constant because of an increase in contract personnel, as is the case in Paraguay and Peru. In some cases, where projects are financed from abroad, personnel contracts are not renewed once the projects are completed. Nevertheless, in most countries the public sector continues to be the major health sector employer; the private sector, usually smaller, is expanding because of an increase in third-party contracting to public institutions.

Viewed this way, the labor market is increasingly competitive and complex, due to the reduction of the absolute number of positions and the saturation of the market for certain professions, particularly physicians. In cases where the medical labor market is fairly well saturated, certain coping strategies emerge. For example, cooperatives and companies that sell services are organized; new compensation methods such as prepayment in private practice in suburban areas are pursued; free public services linked with educational institutions are rendered as a way of obtaining stable work; and training for several specialties is conducted simultaneously as a means of multiplying sources of work.

In some countries, labor unions have been organized by occupational categories that address the technical and ethical aspects of their practice; in others, syndicates embrace all health workers. In Bolivia and Venezuela, unions are being restructured according to regionalization processes and to the organization of the workers of each institution or service. In the 1993–1996 period, professional associations gained greater importance than labor unions and they began to cover certain aspects in their agendas that they had not in the past. For example, they negotiate specific demands separately for each profession that result in more individualized regulations, differentiated compensation, organization of contracting commissions by discipline, and, on occasion, resolution of conflicts between professions.

Even though labor flexibility has been widely accepted, it tends to be seen as an exacerbation of labor instability for the workers and is generally rejected by the various unions. Many of the disputes about uncertain wage and working conditions, which are key union concerns, have generated a certain degree of union apathy and have tended to become protracted and ineffective.

Available information on salaries for health personnel in the public institutions is extremely variable in both absolute and relative terms, and, therefore, it does not permit general conclusions to be drawn. In general, nurses working in the public sector have salaries between 60% and 80% of physicians' salaries. In relation to the minimum wage in effect in the countries, in Brazil doctors receive 29 times the minimum wage, and nurses, 19; in Costa Rica, Cuba, Nicaragua, Panama, Suriname, and Uruguay, physicians get between 2.2 and 4.7 times the minimum wage, and nurses, between 1.5 and 4.3. In

general, because social security institutions administer their funds directly, their staff enjoy better salaries than their ministry of health counterparts.

Health Personnel Management

Currently there is no systematic evaluation of the scope or significance of new trends in the organization and dynamics of the health labor process. There are several new factors affecting the health services, however, especially in the public sector; these factors imply substantive changes in labor relationships as a result of government modernization processes. Prominent among these changes are:

- More efficient use of public sector personnel, which in the health sector is evident in the decrease in the number of permanent employees. As a way to maintain this approach, vacancies not covered by budgeted positions are not filled; in the case of Guyana, such vacancies have reached 40% of total positions.
- Significant growth of different types of temporary contracts, which weaken employer/employee relationships and lower workers' social benefits.
- Hiring third parties to provide services that were formerly entrusted to health institution personnel.
- Increased personnel turnover, which leads to management problems.
- Simultaneous use of different labor schemes for the same functions with similar categories in the same services.
- Creation of new types of private associations, such as labor cooperatives or professional groups that sell services to health establishments.
- Emphasis on labor flexibility, determined by institutional conditions (market changes and fluctuations) or by internal changes deriving from organizational and technological modifications in the production processes.
- Flexibility of working hours and shifts, generally through decentralized negotiation between management and professional associations.
- Changes in personnel remuneration, particularly by introducing different types of incentives for productivity and performance, whether or not they are related to evaluation systems.
- Introduction of new configurations for organizing work and of worker participation in identifying the service's problems and proposing solutions.
- Changes in public sector career systems so they rely on a worker's performance, productivity, and training more than they did in the past.
- Growing importance of professionalization as a determinant for accreditation, and increased competition in the labor markets.

These conditions demand new managerial skills and different approaches to resource organization, utilization, and management. They also require innovative ways to select, hire, and remunerate professionals and to apply new incentives and evaluation systems based on health personnel performance and stimulation of their productivity. The fragmented development of health institution personnel into different units and administrative processes (training of personnel, administration, and organization of the work) impedes an integral process in this area. While there has not been much evidence that human resource management has evolved into a coherent and integrated process in the Region, there has been some movement in this direction, as is the case of Chile and Colombia.

Until a short time ago, labor affairs in health service institutions involved only an administrative and routine approach involving recording, control, and payment. These functions were regulated by ministry of health offices, civil service units, or the like. In the English-speaking Caribbean countries, the ministries of health have no administrative control over health service staff, and human resource management rests with the government's general administrative units.

In all countries, difficulties in personnel administration exist because of the lack of specificity in general public administration regulations about the work and staffing of health services. Operational responsibility, integration of teams, participation in management, and planning receive low priority. Furthermore, technical and administrative supervision, monitoring, and evaluation of the performance of personnel are only incipient. This situation stands in the way of building the health workers' commitment, and reinforces inequitable distribution of work and low productivity.

Decentralization and the purchase of services lead to changes in labor relations and require that management be flexible enough to simultaneously administer multiple labor systems and that it be located in the same institution as the staff. Most sectoral reform plans in the Region embrace decentralization of the decision-making power of the ministries of health, in order to strengthen the development of human resources at different health management levels. In addition, reform plans support the reorientation of the central level toward execution, leadership, or regulation of the decentralized units and support and supervision of personnel management functions in these units.

In most countries, the decentralization of personnel management is the aspect of the reform process that tends to lag. Even in countries that are shifting toward autonomous regional or operational health service units, personnel administration tends to remain centralized, or formal labor relations remain with the government's central administration. Existing legislation that tends toward centralized control, the inability of decentralized units to assume the

management of transferred responsibilities, information system limitations regarding the support of decentralized decision-making, and institutional bureaucracies that hinder operations all help explain the delay. Consequently, some countries have acknowledged the need to come up with formulas that combine management needs—such as more flexible contracts and employer/employee relations, and increased productivity—with the demands of work performance—such as participatory management and improved working conditions.

Despite difficulties, Brazil, Chile, and Colombia are making progress in decentralizing personnel management through processes that stimulate workers and encourage their participation in management of health services.

Health sector reform also creates problems due to reduction of personnel or development of new operations. In an environment of budgetary restrictions, problems are resolved using emergency measures, and personnel contracts are governed by new mechanisms. In Colombia, third-party hiring has led to the creation of companies by professionals who sell their services to public institutions; multinational firms also are beginning to provide and insure health services.

Personnel in Public Health Institutions

Public institutions remain the major health personnel employers in the Region. On average, 70% of their personnel perform tasks directly related to health and 30% perform administrative or general service duties. Administrative and general service staff account for 55% of health sector employees in Guatemala, 46% in Honduras, 43% in Ecuador, and 43% in Costa Rica. Only in Belize, Jamaica, Nicaragua, Suriname, and Uruguay do more than 75% of the personnel perform health care activities in the public health sector or in one or more of the largest institutions. In general hospitals in all of the countries, more than 55% of the personnel perform health care activities. These figures indicate that some countries may have an excess of staff in non-care functions, which would limit the possibilities of recruiting health personnel (Table 34).

Professionals comprise more than 35% of public health institution staff in very few countries (Colombia, Guyana, Jamaica, Mexico, Peru, and Suriname); there are also few countries with more than 10% of public health institution staff in technical positions (Costa Rica, Cuba, El Salvador, Nicaragua, Paraguay, and Peru). Training and recruitment must be increased for health institution personnel to overcome this pattern in staff composition.

Available data on staff involved in direct care indicate that the English-speaking Caribbean countries give preference to nursing care, having more than 4 nurses for each doctor: there are 7.3 nurses per doctor in Belize, 9.27 in Guyana, 4.71

in Jamaica, and 11.22 in Suriname. Canada has 4.24 nurses per physician and Brazil, Chile, Cuba, and Nicaragua have less than 1 nurse for each physician.

Regarding the qualifications of nursing care personnel, in the Bahamas, Belize, Canada, Chile, Cuba, Jamaica, Mexico, Nicaragua, and Suriname, more than half of the nurses are professionals. Brazil, Guatemala, Honduras, Paraguay, and Uruguay have fewer than one professional nurse per four nursing aides. In the Dominican Republic, 40% (7,000 workers) of all nursing staff in the Secretariat of Public Health and Social Welfare are nursing aides (with in-service training); in Guyana these staff represent 39% of the total; in Mexico, of about 15,000 nurses with the Secretariat of Health, 25% are nursing aides with in-service training; in Brazil these personnel represent only 2% (about 5,000 workers). Nursing aides comprise 4% of nursing staff in Belize, 5% in Guatemala, 1% in Haiti, and 7% in Panama. These figures indicate problems in the quality of some countries' nursing teams, due to the disproportionate ratio of in-service-trained nursing aides to professional nurses (Table 35).

There are serious inequities in the countries regarding the availability of health personnel, since health workers tend to concentrate in large cities and in the more developed areas. In comparing the numbers of physicians and health personnel per 10,000 inhabitants by region, there are countries in which the maximum values reached in areas with maximum concentration of resources do not approach the minimum values available in areas with the lowest coverage in other countries. Within each country, the relative difference between regions with maximum and minimum values shows that there are countries with 10 times the availability of doctors in some regions compared with others (e.g., Belize, Panama, Paraguay, and Peru). There is more uniformity observed in the availability of health personnel in general than in the distribution of physicians.

In countries for which information is available, difficulty in recruiting and assigning personnel to the relatively less developed areas can be seen by greater uniformity in the concentration of general health personnel, as compared with the distribution of doctors; this would indicate that vacancies exist but that there is a shortage of physicians (Table 36).

Training of Health Personnel

Regular budgets and programs in public health institutions tend not to include personnel training activities, or do so only marginally, even though these activities have been acknowledged to improve the health services. Consequently, most health personnel training activities are supported through outside assistance, and, in the most recent reporting period, through sectoral reform projects being carried out in

TABLE 34
Composition of public health institution personnel in selected countries.

Country	Health personnel								Administrative and general service personnel		Total no. of personnel
	Professionals		Technicians		Aides		Total		No.	%	
	No.	%	No.	%	No.	%	No.	%			
Bahamas	1,252	34.8	27	0.8	1,205	33.5	2,484	69.1	1,113	30.9	3,597
Belize	280	29.7	32	3.4	448	47.6	760	80.7	182	19.3	942
Bolivia	7,869	34.3	1,182	5.1	5,675	24.7	14,726	64.1	8,230	35.9	22,956
Brazil	447,703	31.5	95,027	6.7	475,078	33.4	1,017,808	71.6	404,340	28.4	1,422,148
Chile	11,264	4.8	222,664	95.2	0	0.0	233,928	100.0	0	0.0	233,928
Colombia	84,240	38.1	8,699	3.9	41,760	18.9	134,699	60.9	86,414	39.1	221,113
Costa Rica	6,367	20.2	4,262	13.5	7,431	23.5	18,060	57.2	13,506	42.8	31,566
Cuba	69,232	29.3	80,858	34.2	2,004	0.8	152,094	64.3	84,384	35.7	236,478
Dominican Republic	17,478	30.9	714	1.3	22,384	39.5	40,576	71.7	16,028	28.3	56,604
Ecuador	21,323	32.7	0	0.0	15,651	24.0	36,974	56.7	28,196	43.3	65,170
El Salvador	2,773	31.0	1,581	17.6	1,338	14.9	5,692	63.5	3,267	36.5	8,959
Guatemala	823	16.6	141	2.8	1,260	25.4	2,224	44.8	2,743	55.2	4,967
Guyana	1,093	37.8	20	0.7	940	32.5	2,053	70.9	842	29.1	2,895
Haiti	1,068	24.9	522	12.2	1,021	23.8	2,611	61.0	1,670	39.0	4,281
Honduras	2,905	16.9	1,361	7.9	4,977	29.0	9,243	53.9	7,916	46.1	17,159
Jamaica	3,134	42.4	682	9.2	2,491	33.7	6,307	85.4	1,077	14.6	7,384
Mexico	204,135	42.5	29,772	6.2	111,305	23.2	345,212	71.8	135,324	28.2	480,536
Nicaragua	5,068	28.3	3,161	17.7	5,271	29.5	13,500	75.5	4,389	24.5	17,889
Panama	4,766	20.9	2,123	9.3	8,421	37.0	15,310	67.2	7,467	32.8	22,777
Paraguay	2,953	25.9	1,848	16.2	2,986	26.1	7,787	68.2	3,635	31.8	11,422
Peru	51,500	40.3	35,945	28.1	4,627	3.6	92,072	72.0	35,754	28.0	127,826
Suriname	1,684	36.8	154	3.4	1,743	38.1	3,581	78.3	991	21.7	4,572
Trinidad and Tobago	...	...	...	...	...	...	5,053	55.2	4,098	44.8	9,151
Uruguay	4,158	32.4	1,264	9.8	4,464	34.8	9,886	77.0	2,958	23.0	12,844

Source: Country reports.

TABLE 35
Composition of health services nursing personnel in public institutions.

Country	Institution	Total nurses/doctor	Professional nurses/total nurses	Nursing aides/total nurses
Bahamas	Ministry of Health	3.29	0.57	0.43
Belize	Ministry of Health	7.30	0.56	0.40
Bolivia	Ministry of Health	2.09	0.24	0.76
	Social Security	1.21	0.34	0.66
Brazil	Sector	0.86	0.16	0.82
Canada	Sector	4.24	1.00	0.00
Chile	Ministry of Health	0.47	1.00	0.00
Colombia	Social Security	1.64	0.28	0.72
Costa Rica	Ministry of Health	3.04	0.21	0.79
	Social Security	1.96	0.32	0.68
Cuba	Ministry of Health	0.18	0.99	0.01
Dominican Republic	FFAA ^a	0.34	0.06	0.94
	Ministry of Health	2.07	0.07	0.52
	Social Security	0.93	0.22	0.78
Ecuador	Ministry of Health	2.04	0.28	0.72
	Social Security	1.10	0.33	0.67
El Salvador	Various	1.47	0.34	0.66
Guatemala	Social Security	3.80	0.17	0.78
Guyana	Ministry of Health	9.27	0.50	0.11
Haiti	Ministry of Health	3.11	0.27	0.72
Honduras	Ministry of Health	3.13	0.13	0.87
	Social Security	2.05	0.19	0.81
Jamaica	Ministry of Health	4.71	0.66	0.34
Mexico	SSA ^b	1.81	0.48	0.29
	IMSS ^c	2.13	0.72	0.28
	ISSSTE ^d	1.15	0.59	0.41
Nicaragua	Ministry of Health	0.40	1.00	0.00
Panama	Ministry of Health	2.30	0.44	0.45
	Social Security	1.48	0.49	0.51
Paraguay	Ministry of Health	2.00	0.17	0.83
Peru	Ministry of Health	2.99	0.31	0.69
	Social Security	1.44	0.58	0.42
Suriname	Ministry of Health	11.22	0.53	0.47
Uruguay	Ministry of Health	1.22	0.10	0.90

^a Armed Forces.

^b Secretariat of Health.

^c Mexican Social Security Institute.

^d Social Security and Services Institute for Government Employees.

Source: Country reports.

a large number of countries. There is a wide distribution and variety of training activities conducted by different divisions, programs, and administrations in the health institutions, with little coherence in methods, content, or interpretation of the health policies they propose. The multiplicity of financing sources and projects supporting these activities is

another factor contributing to the dispersion of efforts in this field.

Current health sector reforms have opened new opportunities for health personnel training. Alternative approaches to finance and organize the health services and the process of change depend on health personnel training. Many countries

TABLE 36
Distribution of public health service personnel in selected countries.

Country	Doctors per 10,000 population			Health workers per 10,000 population		
	Maximum value in a region	Minimum value in a region	Ratio	Maximum value in a region	Minimum value in a region	Ratio
Belize	4.12	0.30	13.7	56.60	23.62	2.4
Bolivia	8.34	4.49	1.9	55.11	22.61	2.4
Brazil	26.41	7.15	3.7	81.10	36.65	2.2
Canada	23.66	9.16	2.6	133.91	108.10	1.2
Chile	10.24	2.85	3.6	49.83	18.57	2.7
Costa Rica	9.59	3.56	2.7	17.72	6.26	2.8
Cuba	76.87	33.92	2.3	189.06	84.47	2.2
Ecuador	22.92	5.72	4.0	58.46	16.72	3.5
Haiti	0.95	0.23	4.1	6.84	2.06	3.3
Honduras	5.12	1.06	4.8	42.12	10.07	4.2
Nicaragua	11.62	2.89	4.0	75.26	23.53	3.2
Panama	38.43	0.72	53.4	198.88	9.54	20.8
Paraguay	10.76	0.57	18.9	51.32	5.65	9.1
Peru	11.25	0.24	46.9	79.24	2.41	32.9
Uruguay	15.95	3.90	4.1	48.79	10.28	4.7

Source: Country reports.

had never had so much money available for training (in some cases training accounts for 50% of total project financing), and they had never before tried to train so many people in so short a period. This situation is producing changes in the orientation, organization, and development of the educational strategies directed at health personnel. Because of the limited ability of health ministries to manage training components, national and international institutions are invited to bid for contracts to conduct programs and courses.

The reduced number of courses offered by the health services and the process of contracting institutions to assume responsibility for them, has stimulated an attractive market for private entities in the area of training. These new approaches to the organization and execution of training activities require that health institutions establish terms of reference, organize bidding competitions, supervise activities, and evaluate results.

Education of Health Personnel

The direct participation of universities in improving public health services is still incipient. Health sector authorities perceive educational institutions as lagging behind the changes taking place in health services. The changes in the health services and labor markets should chart the course for training institutions, as they redefine their mission to increase their participation in the health development process and reformulate their teaching outlines in accordance with proposed changes.

The persistent demand for personnel capable of developing and performing functions at the primary care levels (generalists, family and community medicine specialists, and primary care assistants) conflicts with the tendency among higher-learning institutions of encouraging specialization, which fosters competitiveness among professionals and technological growth. Public and private higher-education institutions have been slow to meet the needs for trained technical health personnel in the areas of nursing, pharmacy, medical records, nutrition, laboratory, and radiology.

The objectives of continuing training and education of the work force aim more toward individual technical ability of each professional, rather than to the development of public health. Thus, in several countries, private schools and colleges have been created without conducting labor market research or establishing an accreditation process for the new programs, and, overall, the mechanisms for evaluating and supervising these institutions are lacking. Available information indicates that there has been an increase in the number of private schools and colleges specializing in medicine and dentistry. In some countries, private investment in health education is oriented towards programs requiring lower operating costs and quality requirements and greater short-term profitability, resulting in an accelerated growth in training institutes at the auxiliary and technical level, which operate with only limited regulation.

The number of medical schools and colleges in the Region has shown a moderate increase: during the 1988–1992 period there was a 6% increase, and by 1992–1996 it had reached

TABLE 37
Number of medical schools or colleges in
selected countries in the Region, 1988–1996.

Subregion and country	Years		
	1988	1992	1996
Andean Region			
Bolivia	3	6	9
Colombia	21	21	40
Ecuador	5	7	10
Peru	12	16	18
Venezuela	10	10	10
Southern Cone			
Argentina	9	13	19
Chile	6	7	9
Paraguay	1	2	2
Uruguay	1	1	1
Brazil	78	80 ^a	81
Central American Isthmus			
Costa Rica	2	3	4
El Salvador	5	5	6
Guatemala	3	3	3
Honduras	1	1	1
Nicaragua	2	2	3
Panama	1	1	3
Mexico	59	58	60
Latin Caribbean			
Cuba	22	23	24
Dominican Republic	12	11	10
Haiti	1	1	1
Caribbean			
Antigua and Barbuda	0	1	1
Dominica	1	1	1
Granada	...	...	1
Guyana	1	1	1
Jamaica	1	1	1
Saint Vincent and the Grenadines	1	1	1
Suriname	1	1	1
Trinidad and Tobago	1	1	1
North America			
Canada	16	16	12
United States	127	126	125
Overall total	403	431	460

^a 1994.

Source: Country reports.

TABLE 38
Number of nursing schools or colleges in
countries of the Region, 1988–1996.

Region and country	Years		
	1988	1992	1996
Andean Region			
Bolivia	5	6	9
Colombia	21	21	34
Ecuador	7	10	13
Peru	33	34	41
Venezuela	5	7	7
Southern Cone			
Argentina	88	92 ^a	25
Chile	10	12	5
Paraguay	5	5	5
Uruguay	1	1	1
Brazil	93	107 ^b	108
Central American Isthmus			
Belize	1	1	1
Costa Rica	2	2	2
El Salvador	1	3	5
Guatemala	4	4	4
Honduras	3	3	3
Nicaragua	11	11	10
Panama	2	1	2
Mexico	...	37	35
Latin Caribbean			
Cuba	24	24 ^c	13
Dominican Republic	7	6	5
Caribbean			
Antigua and Barbuda	1	1	1
Barbados	1	1	1
Bahamas	2	1	1
Dominica	1	1	1
Grenada	1	1	1
Guyana	4	4	4
Jamaica	4	5	5
Montserrat	1	1	1
Saint Kitts and Nevis	1	1	1
Saint Lucia	1	1	1
Saint Vincent and the Grenadines	1	1	1
Suriname	3	3	3
Trinidad and Tobago	...	...	3
North America			
Canada	43	45	36
United States	1,465	1,484	1,516

^a In addition to these, there are 89 technical schools.

^b 1994.

^c In addition to these, there are 52 technical schools.

Source: Country reports.

7%. This general increase masks two opposite trends: Canada and the United States have experienced slight decreases, while other countries of the Region have seen stability or some growth (Table 37). During the last period, the largest increases were recorded in Bolivia, Colombia, Ecuador, El Salvador, and Panama. While 83% of the schools or colleges created during the period (and for which information is available) are private, 62% of the total are public and generally larger than the private institutions.

The incorporation of new physicians into professional practice has increased in Colombia, Cuba, Jamaica, Nicaragua, and Peru; decreased in Ecuador, Guatemala, Panama, Paraguay, and Uruguay; and remained stable in Canada and the United States. There is also a decreasing trend in the numbers of newly graduating doctors because of the availability of professionals: saturation of the labor market tends to discourage students from a medical career, thereby balancing the market. In turn, the tendency toward labor market segmentation, whereby professionals opt for specialization, is reflected in medical education: the vigor of educational development lies in graduate education, and the actual time of entrance into the labor market is being shifted from the time one completes undergraduate education to leaving graduate school.

In most countries, graduates must complete a one-year internship as a prerequisite for obtaining professional certification. In some countries, the internship must be completed before beginning specialization, while in others, it can be done whenever a student decides to enter a profession. Social service, as implemented in most countries, is facing an uncertain future in the Region, as its original purpose has become distorted: there are insufficient posts and a lack of academic supervision, and working conditions often are unsuitable in outlying areas. Given the absence of other opportunities for remuneration, social service is considered an employment opportunity for recent graduates, and can provide access to positions in the public sector.

The education of professional nurses is characterized by sparse enrollment, a high drop-out rate, a low entrance coefficient, and the exodus of students and professionals to other careers with greater social and economic prestige. Emigration of these professionals to other countries, especially to the United States and to European countries, further reduces their numbers. There are two levels of education: the first, for general nursing, lasts two and one-half to three years, and the second, for the degree in nursing, lasts four to five years. Brazil, Chile, Colombia, Mexico, Panama, and Peru offer master's programs in nursing; Canada and the United States also offer doctoral programs. Most nursing education is furnished in public institutions (70% of cases for which information is available) (Table 38).

The number of nursing schools and colleges has remained virtually stable in the Region throughout the latest period.

There are increases in some countries and decreases in Canada, Chile, the Dominican Republic, Mexico, and Nicaragua. The employment of new nursing graduates shows a slight upward trend (Cuba, Suriname, the United States, and Uruguay), but decreases are noted in some cases (Ecuador, Honduras, and Nicaragua). Countries with large deficits in nurses are pursuing programs to elevate the existing work force's educational level. These programs emphasize training of personnel who do not have formal education through courses for certification of nursing aides and professional training using distance education methods.

The number of dental schools and colleges increased in almost all countries, with the exception of Canada and the United States, where they tended to decrease. While 53% of the schools are public, 94% of the schools established during the most recent period are private, confirming increased privatization in the education of dentists (Table 39).

The demand for training programs and for professionals who have studied health services management has helped to increase the number of educational institutions (Table 40) and fostered distance education and in-service programs directed at personnel already working in the health services. Public health teaching differs from other processes of professional specialization and qualification processes for professionals entering the labor market, in that it gives priority to staff who already work in management positions. Professionals who pursue postgraduate education in public health in all the countries tend to diversify; in the United States, the number of graduates with master's degrees in public health is on the rise, while the number of physicians in that specialty is decreasing (Table 41).

Certification of Personnel and Accreditation of Teaching Institutions

The increase in labor-market competition favors the accreditation of teaching institutions and the certification and recertification of health personnel. Moreover, there is concern about the potential effect that the processes of economic integration and the development of common markets that introduce the free exchange of labor can have on each country's labor market, especially for some health professions. This particularly affects those countries that are part of MERCOSUR and NAFTA.

In response to the above-mentioned concerns, efforts are under way to improve education through accreditation of educational institutions and processes. Defining and applying quality categories, standards, indicators, and variables will permit the actual or potential performance of educational institutions to be evaluated. In terms of professional and specialized practice, which is regulated in most coun-

TABLE 39
Number of dental schools or colleges in
countries of the Region, 1988–1996.

Subregion and country	Years		
	1988	1992	1996
Andean Region			
Bolivia	0	3	6
Colombia	12	12	16
Ecuador	...	...	4
Peru	...	...	12
Venezuela	6	6	7
Southern Cone			
Chile	...	...	6
Paraguay	1	1	1
Uruguay	1	1	1
Brazil	...	83 ^a	87
Central American Isthmus			
Costa Rica	1	1	3
El Salvador	...	...	5
Guatemala	1	3	3
Honduras	...	...	3
Nicaragua	1	1	2
Panama	1	1	1
Mexico	...	...	54
Latin Caribbean			
Cuba	4	4	4
Dominican Republic	...	...	8
North America			
Canada	10	10	8
United States	58	55	54

^a1994.

Source: Country reports.

tries to protect the public and guarantee quality professionals, certification of professionals and their specialties is generating new interest in terms of increasing mechanisms for market and professional competitiveness. Several countries are modifying their certification and recertification requirements to ensure competence of health professionals. Mexico and Suriname have established programs for continuing education and for recording participation in training activities.

Medicinal Drugs

Drugs in the Health Services

During the 1993–1997 period, the drug situation in the health services was contradictory. On the one hand, drug

TABLE 40
Public health schools and programs in selected
countries of the Region, 1990–1996.

Country	1990	1991	1992	1993	1994	1995	1996
Brazil	29	46	47	57	62	63	67
Canada	15	18	18	18	19	13	14
Chile	1	1	1	1	2	2	2
Dominican Republic	2	3	3	3	3	3	3
Guatemala	1	1	1	2	2	1	2
Honduras	...	...	...	1	1	1	1
Nicaragua	1	1	1	1	1	2	2
Panama	1	1	1	1	1	1	1
Paraguay	...	...	1	1	1	1	1
Peru	1	1	1	1	1	2	3
United States	24	25	27	27	27	27	27
Uruguay	1	1	1	1	3	3	3
Venezuela	4	4	4	6	6	6	6

Source: Country reports.

TABLE 41
New master's degrees and physicians specializing
in public health in the United States, 1985–1995.

Professionals	1985	1990	1994	1995
New master's degrees in public health	2,744	3,136	4,042	4,154
Physicians specializing in public health	2,060	2,015	1,910	1,760

Sources: Association of Schools of Public Health. *Annual Data Report 1995*; American Medical Association. *Physician Characteristics and Distribution in the U.S., 1996–1997*.

availability became more stable because of measures that reduced concern over the countries' economies and allowed some relaxation of budgetary restrictions, but problems of access, particularly for the poorest population segments, persisted in most countries and worsened in many. Moreover, reform of the State and the health sector have required that many of the mechanisms traditionally used to improve access to drugs and promote their rational use be adapted to new processes, sometimes leading to profound changes.

Structural adjustment programs have had various consequences in the Region's pharmaceutical sector. In Bolivia, Nicaragua, and Peru, for example, drugs became virtually unavailable in public institutions in the late 1980s and early 1990s. After that, the situation began to improve, and this recovery is ongoing in many countries. The most widely used approach in this recovery process has been to establish basic

drug packages within essential drugs lists, in combination with systems for the sale of outpatient drugs to the public.

Elsewhere, the economic crisis has led to cutbacks in long-standing pharmaceutical services. In Cuba and Venezuela, patients now must pay for outpatient medicines that used to be free of charge, and cost recovery or copayment mechanisms have been instituted. Drug shortages due to foreign exchange problems also have led to restrictions. A third group of countries have instituted somewhat different mechanisms, such as various means of incorporating drugs under universal insurance systems; for example, in Chile and Colombia, drugs are part of mandatory or contract service packages.

Most of the countries that have either formulated an explicit essential drug policy on essential drugs or that have included these inputs in their health regulations and services, have had to identify novel approaches that are adapted to decentralization, citizen participation, efficient utilization of resources, and new ways of financing and subsidizing public services (common characteristics of State reform). For this reason, essential drugs policy has become a key issue within the reform agenda. In addition, essential drugs have been reflected in the selection of drugs, included in basic baskets of health services, and covered under health insurance.

Many countries also have endeavored to establish policies on generic drugs, which usually include such provisions as mandatory prescription of generics, obligatory use of the International Nonproprietary Name (INN) in bids and other administrative operations, inclusion of generic names on labels and advertisements, and interchangeability of brand names and generics at the pharmacy. The bioequivalence of similar products has become a topic of intense debate, as it is the backbone of generic drug policies. Argentina, Brazil, Colombia, Ecuador, and Venezuela have made great strides in this regard, but opposition from physicians and industry has presented formidable obstacles to bringing generic drug policies into full operation. In Chile and Nicaragua, which have been using generic drugs for some time, interchangeability is common. This policy has been incorporated into laws and regulations in several countries, but the degree to which it is mandatory and the criteria for applying it vary. As the processes of economic integration move forward, this topic will become a priority.

In some cases, generic drug programs have involved the importation of massive amounts of these products to supply public institutions, which has led to serious logistical problems. Flaws in distribution have left vast quantities of expired products sitting in central warehouses, and then being rejected by the local industry, physicians, and, ultimately, patients. These problems are fostered by the public's view of generic products as poor quality, because of their low cost. This image has proved difficult to combat, even with public disclosure of the results of quality control analyses.

Both the essential drugs policy and the generic drugs policy, especially the use of generic names, have played key roles in reducing public expenditure. However, these policies must be applied in conjunction with administrative and financial policies, such as the selection of basic packages based on risks associated with age, sex, and income level; the organization of revolving funds through community participation and user cofinancing systems; the establishment of health insurance plans; and the search for new sources of financing.

Drug Supply. One of the most notable changes in the period under review was the strong trend toward decentralization in the public sector's supply systems. Although this trend has certainly been influenced by the decentralization of the State, it has just as surely been driven by an acknowledgement of the deficiencies of the centralized systems, including their high operating costs, their slow response to needs in outlying areas, and their generally poor management. In some countries, the changes have been limited to authorizing regions or institutions to acquire certain well-defined groups of drugs—usually those for which use is high, cost is low, and the supply is highly competitive. In others, the central purchasing office must compete with other providers in supplying drugs to health institutions, which decide on their supplier based on price and quality of service.

Another very important movement has been the search for new legal options to govern drug acquisition, since the traditional periodic bidding process is lengthy, rigid, and formal, producing final results far removed from the original objective. For this reason, new systems are being explored, such as open auctions, framework bids that allow for negotiation of reference quantities and prices, and, in some cases, purchasing arrangements similar to those used in the private sector. The decentralization of the State for some countries has meant that the allocation of resources and responsibilities has been devolved to the department and municipality level, which increasingly requires suppliers to offer less costly and more timely service.

Entities outside the public health sector are playing growing roles in providing drug supply alternatives. For example, nongovernmental organizations, special programs of the countries' heads of government, and international cooperation organizations and like-minded international banks are becoming involved.

Guatemala has designed a bidding system whereby the Ministry of Public Health and Social Services opens up a price competition on reference quantities. This incipient system seeks to increase openness and improve the timeliness of deliveries and payments and the management of inventories. Colombia has implemented a regional hospital association plan, known as hospital cooperatives. These entities acquire drugs from the national providers and offer them to hospitals

within a competitive framework. To maintain their position, the cooperatives strive to improve their commercial operations and management so that they function as a valid supplier of drugs and provide support in other areas (maintenance, managerial development, etc.), since they must reinvest any profits in their affiliates.

Bolivia has undertaken a regionalization scheme whereby the central agency continues to function as the importer, coordinator, and compensation agent for the various regional supply units directly charged with meeting the needs of health institutions. In this case, the central level competes with other providers for the business of the regional units, which, in turn, compete for the institutions' purchases. In Brazil and Chile, countries with a strong tradition of centralized purchasing, competition and decentralization are being introduced so that the states or departments can assume responsibility for supplying drugs. Some countries' social security systems have begun to decentralize by granting regions or institutions autonomy to acquire certain types of medicines.

In many countries, changes in the drug acquisition systems have been accompanied by the emergence of community pharmacies (also known as co-managed drugstores) and institutional pharmacies. These ventures acquire their drugs from various vendors and then sell them to health service users at low prices and with a small profit margin, in an effort to guarantee the sustainability of this supply method. Institutions outside the health sector—such as agencies in other governmental sectors, nongovernmental organizations, and international cooperation agencies—have participated in starting and maintaining these pharmacies, which have been tried in Colombia, Dominican Republic, Ecuador, Guatemala, Haiti, Peru, and Venezuela. In almost all cases, these programs have been fostered by the trend toward broader community participation in health care management, which is now a well-established and widely accepted principle. Results have been mixed; many of the pharmacies have failed owing to factors such as the absence of a drug policy, insufficient coordination, low sales, poor training in accounting and management, and weak control.

Globalization of Markets. The current opening and globalization of markets have produced profound changes, with mixed effects. While drug supply has increased and, in some cases, prices have stabilized or fallen, the new market forces have added pressure on drug registration systems, inspection and quality control functions, and State surveillance activities, which have already been weakened by budgetary restrictions. The impact of economic internationalization on the pharmaceutical industry in the Region's countries has differed by country and according to the degree of development of the industry. The most significant changes have been the acceptance of patents, the removal of tariff barriers, and the

streamlining of the registration process, as well as a greater demand for conformity with quality standards—a product of harmonization agreements on the application of good manufacturing practices (GMP).

Argentina, Brazil, Chile, and Mexico, which have large-scale pharmaceutical industries that have been competing in international markets for several years, have felt these changes less than some other countries (except with regard to patents). In fact, they have used the situation as an opportunity to increase sales to neighboring countries. Nations with a moderately developed industry, such as Colombia, Ecuador, and Venezuela, have felt the effects of competition with the new providers more keenly and have had to restructure their processes and procedures. Without a doubt, industries in countries with small markets have been the most affected, having seen their usual sales and profits fall because of external competition.

Viewed from a different perspective, there have been companies in all of the countries that have taken advantage of the market changes by responding with investments in infrastructure and technology, seeking strategic partnerships, and steering their operations toward increased productivity and the search for new export markets. Other businesses, however, have held on to traditional protectionist schemes and a captive market niche and have resisted making investments to update technology and improve quality.

The appropriate and effective use of drugs is threatened by the growing number of products released into the market each year and by advertising pressure directed at the public and at those who write prescriptions. On the other hand, budgetary pressures have made the rational use of drugs a critical factor in the choice of pharmaceutical technology. This situation highlights the foresight embodied in the essential drugs policy formulated in the 1980s.

Expenditure on Drugs. Overall, public sector expenditure has declined. Yet, this reduced level of spending must respond to a greater demand for services by people who are ever more aware of their rights. As a result, there is added pressure for greater efficiency in the allocation of resources.

There can be significant differences among countries in spending on medicinal drugs. The country with the highest expenditure, US\$ 291 per capita, is the United States of America; the countries with the lowest, at US\$ 9 per capita, are Honduras and Nicaragua. Intermediate values are found in Argentina (US\$ 150), Uruguay (US\$ 97), Brazil (US\$ 61), Colombia and the Dominican Republic (\$30), Peru (US\$ 25), Ecuador (US\$ 24), Venezuela (US\$ 22), Costa Rica (US\$ 16), Guatemala (\$12), and Bolivia (\$10).

The Pharmaceutical Market. In 1995, the Latin American pharmaceutical market amounted to US\$ 18,058 million, representing around 7% of the world market. Of this figure, 76%

TABLE 42
Latin American pharmaceutical market, ex-factory
price in millions of US dollars, 1995.

Country	Private market	Total market
Brazil	5,416	6,908
Argentina	3,173	3,681
Mexico	2,205	3,223
Subtotal	10,794	13,812
Colombia	1,047	1,341
Venezuela	512	620
Central America	441	586
Peru	356	517
Chile	369	424
Uruguay	252	303
Ecuador	200	254
Dominican Republic	170	201
Total	14,141	18,058

Source: Pharmaceutical Research and Manufacturers of America. Washington, DC: Pharma; 1996.

corresponded to Argentina, Brazil, and Mexico, with a total public and private market of \$13,800 million. In the same year, Canada represented 1% and the United States 31% of the world prescription drug market. Table 42 shows the private market and the total national market (which includes the public sector) for pharmaceuticals in various Latin American countries.

In past decades, the State generally imposed direct price controls and, in almost all cases, this control was exercised by the health ministry. From an economic perspective, this was a response to the suppliers' search for the highest possible profit and the State's attempt to provide balance by keeping consumer prices as low as possible through administrative controls. Although, in theory, the principle was and remains valid, the control systems tended to become politicized, corrupt, and inefficient and to cause market distortions (preferences for more costly products, shortages of unprofitable essential drugs, orphan drugs, and incentives for new drugs). In conjunction with reforms of the State, deregulation of production activities has gained popularity. This has meant a shift to pricing freedom in virtually every country of the Americas.

Because the medicinal drug market is highly imperfect (the consumer does not select the drug, the one who selects it does not pay for it, and advertising distorts the market by creating "prestige" brands with higher prices), the State must promote better market mechanisms and then monitor the situation closely. Mixed pricing schemes are being seen more frequently; in these cases, the State's role in determining prices is limited to special groups of drugs that meet certain criteria, such as products with few suppliers, essential drugs

on the national formulary, and drugs included in the basic basket. Administrative price controls are combined with efforts to stimulate competition, such as systems for providing cost information to consumers and policies to promote generic drug use, reduce tariffs, facilitate registration and importation, and strengthen demand.

The countries are trying to strengthen and improve their selection and cost control mechanisms in the realization that resources will remain scarce. Two examples stand out. One is Nicaragua, where implementation of a mixed system has been proposed; one of the system's key components involves the direct control over the most widely used drugs through a schedule of price limits. The other is Colombia, which also is using a mixed system but placing greater emphasis on strengthening market mechanisms. In Nicaragua, the proposal calls for fixing a price ceiling for each product, based on the average price from all supply sources plus a profit margin. It is believed that this method will eliminate the most costly products from the market (or cause their prices to fall), until the average price comes very close to the cost. This system is still being designed and discussed. Likewise, Colombia has combined an active policy of generic drug use (including interchangeability at the pharmacy) with significant strengthening of demand. The social security system functions through health promotion entities, which are insurance companies that sell consumers a mandatory health plan that includes the requirement of providing essential drugs. These institutions have become very adept at negotiating with drug manufacturers and sellers. In the public sector, the hospital cooperatives also have increased their bargaining power by pooling their purchases. The result has been a sustained decline in prices coupled with increased coverage.

Drug Financing. As a direct result of the adjustment and reform processes, financing schemes have undergone substantial changes. In the past, medicines could be obtained through social security systems by contributors to those systems, could be purchased in the private sector by the high-income population groups, or were subsidized for delivery in State institutions to the poor. One of the consequences of the 1980s economic crisis was that the poor—who have the greatest risk of becoming sick and dying—had to cover a large portion of their drugs out-of-pocket. This trend was most pronounced in the lowest-income countries that have high levels of poverty, such as Bolivia, Honduras, and Nicaragua. Only selected drugs are supplied with State resources, such as drugs to treat certain chronic diseases and malaria and medications that are used in programs for pregnant women, children, and adolescents. However, even in these instances, resources are not always sufficient.

Within the context of decentralization, drug financing by municipalities and departments is becoming increasingly

popular in the countries. Another mechanism that is used consists of covering medicines under insurance plans. For example, the health maintenance institutions in Chile (ISAPRES) cover drugs used in hospitals, Colombia includes essential drugs in its universal insurance, and Bolivia offers insurance that covers drugs used for conditions that carry high health consequences, such as childbirth, acute diarrheal diseases, and acute respiratory infections. Finally, some countries (Bolivia, Ecuador, Guatemala, Haiti, and Venezuela) have established revolving funds or direct drug purchasing systems with financing from multilateral cooperation or credit agencies; the results of these efforts have not been sufficiently evaluated.

As a result of increased competition and greater emphasis on management and quality of care, the State's role as the provider of medical services and drugs has changed, and the overhaul of the supply systems is the most critical modification. Other changes have included the development of better pharmaceutical care plans in institutions and the community. For example, the United States of America has managed care plans in which alternative therapies, diagnostic and treatment protocols, substitution of generics, and studies of drug utilization have proved useful for cost containment.

The rise in the for-profit and nonprofit segments of the private sector has been yet another trend in the provision of medical and drug services that was observed during the period under review. A prime example—especially notable in the poorest countries, such as Bolivia, Haiti, Honduras, and Nicaragua—is the growing role of nongovernmental organizations in the provision of services, including the supply of low-cost medications through privately run pharmacies. Their share of the market is modest but significant (in Bolivia it is about 5% of the total). Community pharmacies constitute another mode of private-sector participation; these enterprises attempt to expand the availability and accessibility of drugs by selling them at lower prices than traditional pharmacies. The effectiveness of this strategy also needs further evaluation.

Another new option is competition between public and private institutions. In Colombia, for example, hospitals buy their drugs and other supplies through cooperatives, in order to take advantage of discounts for large-scale purchases. In Chile, the central supply authority (which had been the only drug supplier for public health institutions) became just another competitor along with commercial drug companies; institutions may decide whether or not to buy its products based on certain provider selection criteria.

Regulation and Registration

All the countries of the Americas have adopted regulations governing drug registration, licensing of manufacturing

plants and sales outlets, and inspection and control, and the official agencies charged with these tasks have been reorganized. Many of the changes were spawned by criticisms of the bureaucratic trappings, lack of transparency, and slowness of formal procedures, mainly those surrounding drug registration. Pressure for change was also exerted by the deregulation of economic activities that resulted from the neoliberal influence of adjustment programs.

These perspectives have brought about the reevaluation of legal and operational mechanisms in many countries: innovative approaches have been sought, some of which have demonstrated enormous utility, while others have been abandoned as inappropriate. Such was the case of the Provisional Medicinal Drug Registry, which was in place in Colombia for one year. It led to an overload of approval requests and the appearance on the market of products of questionable utility and quality. Unfortunately, some countries are still considering the possibility of using this system, despite its demonstrated failings. Other proposals designed to improve responsiveness have included automatic registration, fixed time limits on registration, and “administrative default” regulations. This last mechanism refers to the establishment of a period during which the registration authorities must announce a decision to either accept or reject a registration request; if an authority issues no decision by the end of the period—which may range from a week to 30 days—the product is registered by default and can be sold in the country. (If this rule is used by agencies that are vested with subregional decision-making power under multilateral agreements, the drug would become available throughout a subregion.)

Internal pressures generated by internationalization or by commitments rooted in regional cooperation agreements have compelled many countries to significantly alter drug registration requirements and procedures. In almost all cases, reforms have been aimed at strengthening technical requirements, improving the accuracy of documentation, and streamlining the formal process. Among the most consistently applied measures are the following: adoption of different procedures and documentation requirements depending on whether a product is new or is similar to one already approved; the use of reference lists of drugs approved in other countries to streamline recognition or approval; the requirement that imported products have a Certificate of the Quality of Pharmaceutical Products Moving into International Commerce from the World Health Organization; certification that national production is conducted in accordance with good manufacturing practices; elimination of preregistration analyses; and the establishment of a fixed time limit for completion of the formal process. In some cases, essential drugs or generic brands are entitled to expedited procedures or receive special tariff reductions.

The most noteworthy example of streamlined registration is that of Peru, which since 1992 has had in place a system with a minimum of technical requirements and a high degree of responsiveness; approval of a registration request takes no more than 15 days. Although this system was initially very well received by the import sector, experience has shown that it allows deficient products of little use to enter the national market. These flaws not only hurt the population at large but also hinder work on quality assurance reference standards. In an effort to rectify this situation, a law to resolve the problem and harmonize Peru's legislation with the rest of the Andean Group countries is under discussion.

Almost all the countries are trying to streamline procedures. To that end, they have invested in equipment, supplies, and training of human resources and are using monies from tariffs to finance the drug evaluation process and to expedite registration. However, the health ministries have encountered substantial legal and operational problems when trying to invest funds derived from tariffs in modernization activities. The biggest obstacle has been fiscal centralism, seen frequently in State reforms, which mandates that all public income be placed in the nation's General Treasury and then redistributed as the public budget.

Argentina and Colombia have created decentralized national institutions for regulating pharmaceuticals. These agencies, which answer to the health ministry but are autonomous and have their own capital resources, are the National Drug, Food, and Medical Technology Administration (ANMAT) in Argentina, and the Drug and Food Surveillance Institute (INVIMA) in Colombia. Both are responsible for the medicinal drug registry and surveillance, and their work is financed in large measure by the fees they charge for registration, certification, analyses, and other required procedures. Canada also has considered establishing a semi-independent institution to regulate the registration of prescription drugs and medical devices, similar to the Medicines Control Agency of the United Kingdom.

The existence of sizable indigenous populations in the countries of the Americas, together with the increasing influence of alternative therapies worldwide, has led many countries to attempt to regulate the use of medicinal plants. Regulatory criteria are similar to those used for drugs, but they are adapted to the characteristics and traditional uses of these products and the need to ensure that they are properly identified and of high quality. In some cases lists of authorized and prohibited natural products have been compiled, based on worldwide experience and international and national literature on medicinal plants. Some national legislatures and interparliamentary bodies are discussing proposed regulations on traditional medicine, but because this issue is extremely complex, few regulatory advances have been made.

In response to the trend toward globalization, three large subregional cooperation forums have been created in the

Americas: the Central American Common Market, the Andean Group, and MERCOSUR. These entities are advancing with plans to harmonize regulatory statutes in order to gradually allow for the free circulation of pharmaceutical products among the countries.

The Central American Common Market is holding ongoing negotiations on harmonizing criteria and requirements for drug registration and quality control. The technical agreements have still not been reflected in the laws of some countries, however, nor is there any mechanism for follow-up on the agreements. The Andean Group has proposed an Andean registry that focuses on common essential drugs. It also has formed technical commissions on subjects such as the harmonization of essential drugs lists and pharmacological standards, good manufacturing and inspection practices, and quality control, but the decisions by these commissions have not been clearly defined. In contrast, Decision 418, adopted in July 1997 by representatives of the ministries of the economy and trade of the Andean Group, clearly stated that any product accepted on the health registry of one Andean country could be registered in any of the others within 30 days, after which the administrative default rule would apply.

MERCOSUR has notably advanced in the creation of technical working groups and a formal decision-making agency called the Common Market Group. Through these mechanisms, resolutions have been approved regarding good manufacturing practices, rules for registration of interchangeable products, and stability and bioequivalence requirements. However, the process by which the signatories will adopt these resolutions is still difficult and fraught with delays.

Although GMP have proven to be an excellent mechanism for standardizing products on the market and for quality assurance, few countries had incorporated them into their legal and technical requirements by the late 1980s. This delay may be due to the existence of policies designed to protect national industries. Almost all the countries of the Region have adopted the guidelines proposed by WHO and, in many cases, have set timetables for their gradual application by industry.

The situation is more diverse with regard to drug quality and drug surveillance. The countries fall into three fairly distinct groups. Countries of the first group—Argentina, Brazil, Chile, Costa Rica, Mexico, and Venezuela—have legal and administrative mechanisms that function more or less efficiently. Those in the second, or intermediate, group—such as Colombia, Ecuador, and Panama—have recently defined new legal and operational tools and have begun to take some actions. Countries in the third group—comprising Bolivia, Haiti, Peru, and most of the Central American countries—are showing incipient advances and have not yet developed the tools for quality control of the pharmaceutical market.

Drug quality is on the agenda in the Caribbean, where the Caribbean Regional Drug Testing Laboratory is responsible

for analyzing drugs for the member countries of the Caribbean Community (CARICOM). This laboratory, located in Jamaica, was established by the countries to monitor drug quality in the subregion and advise the health ministers of the results. Its 1997 report indicates that 35% of the samples tested were found to be unsatisfactory.

Information and Education

One of the most common tools for disseminating information about drugs continues to be the therapeutic formulary. Many countries have revised their basic lists or national formularies. Mexico recently updated its list, and the English-speaking Caribbean countries and Suriname also have prepared basic lists and therapeutic formularies. Table 43 shows the date of the latest revision of the formulary in selected countries.

The practice of traditional medicine, with its use of medicinal plants, is very widespread in the Region of the Americas; efforts to integrate these resources into formal health systems have met with little success, however. Medicinal plants have not been included on basic lists, even though some advances have been made in regulating their use and in researching their effectiveness, as is the case with *uña de gato* (cat's claw) in Peru.

Drug advertising is an issue that is related to drug information, and it has a particularly important bearing on the rational use of drugs. While some countries have adopted the ethical criteria for drug advertisements proposed by WHO, and some (such as Bolivia) have even incorporated these criteria into legislation, compliance has been minimal overall. Visits to doctors continue to exert a strong influence on prescription habits, as evidenced in market studies that show that the most advertised drugs are the best sellers and, usually, the most expensive.

It should also be mentioned that advertising of nonprescription drugs in the mass media has increased notably, as has the practice of allowing them to be sold in supermarkets and other stores throughout the Region. In the United States, advertising of prescription drugs in the mass media has intensified; in the future, other countries where such advertising is now prohibited may follow this example. Owing to the strong influence of the developed countries and the pharmaceutical industry, literate and well-informed consumers are being encouraged to make decisions about self-medication based on responsible criteria. This trend is not appropriate for most of the less-developed countries, let alone the poorest ones.

Consumer protection movements have not yet gained the political respect they deserve in economies that are increasingly competitive and market-oriented. In addition to the United States, where the role of consumer groups as watchdogs in drug policy and management is well established, such

TABLE 43
Basic lists of essential drugs in selected
Latin American and Caribbean countries.

Country	Basic list (year of revision)	No. of drugs on list	No. of presentations	Therapeutic formulary (year of revision)
Bolivia	1995	252	...	1997
Brazil	1990	316	472	1997
Colombia	1990	300	450	1997
Costa Rica	1997	400	547	1997
Cuba	1996	...	910	1994
Dominican Republic	1996	229	392	1997
Ecuador	1992	297	458	1996
Guatemala	1997	310	432	1992
Honduras	1992	310	432	None
Nicaragua	1993	210	266	1994
Panama	1994	...	485	1993
Peru	1992	319	442	1993
Venezuela	1991	349	547	1997

groups have played a role in Bolivia and Peru and, to a lesser extent, Brazil and Nicaragua. In the rest of the countries, their role is small or nonexistent.

Some countries such as Argentina, Chile, Costa Rica, Puerto Rico, and Venezuela—which have had a variety of experiences with hospital-based drug care and unit dose drug distribution systems—have begun to establish ambulatory and community-based pharmacy care, influenced to varying degrees by the examples of North America and Spain. Bolivia, Colombia, Ecuador, and some Central American countries are stressing hospital-based drug care, which was practically nonexistent up to a few years ago.

The medical community has not played a positive role in managing and promoting the rational use of drugs in almost every country; in fact, the drug industry seems to have considerable power to influence the behavior of professional groups, as reflected in their systematic rejection of policies calling for the use of generic drugs on prescriptions and substitution of generics at the pharmacy. Argentina provides a case in point: these measures were reversed despite their obvious appropriateness from a health standpoint. Resistance to prescribing essential drugs also persists, usually because the list is seen as an intrusion in the doctor-patient relationship. An example is the failure of community pharmacies because physicians did not prescribe the drugs available through them. In addition, the inappropriate use of many products, especially antibiotics, has been amply demonstrated in drug utilization studies in both hospitals and outpatient facilities.

All the countries have modified their pharmacy studies programs, and some have made comprehensive changes in curriculum in order to respond to the new demands on pharmacists in the health services. The goal is for these professionals to assume more responsibility for the drug therapy of patients.

In some countries drug information centers function as independent sources of scientific and technical information about medicines, with varying degrees of success. A few new centers have been established, mainly in Brazil; however, although the number of centers has not increased significantly, the availability of information services has grown, especially in hospitals committed to improving the quality of hospital pharmacy services. This change has occurred because more hospitals in all the countries have adopted and maintain a formulary of drugs authorized for use in the institution; have implemented unit dose distribution systems; have begun follow-up studies of the drug therapy received by hospitalized patients and have established clinical pharmacokinetics programs; have carried out drug utilization studies; and have designed hospital-based drug surveillance programs.

The main problems facing the information centers are poor financial sustainability, low demand, and the challenges imposed by new information technologies. In response, drug information centers are focusing their services toward selected target populations, but the effectiveness of this strategy has not yet been evaluated.

Health Information Systems

Role of Information Systems in Health Care

The provision and management of health care services is a complex enterprise that is highly dependent on information. Modern information technology can assist in addressing challenges faced by the health sector for planning, operation, supervision, and control of health care provision; evaluation and monitoring of the health status of populations; measurement of outcomes of clinical and managerial interventions; expansion and improvement of service coverage, quality, and efficiency; support of health promotion activities; increased access to knowledge; and education of providers and consumers.

Information Systems Components

Information systems depend on the existence of two components: information infrastructure and technology. The information infrastructure is defined by the information needs, sources, system of data collection, and information management in particular organizational settings. A wide array of is-

suues must be considered when planning and operating information systems. These include: the objectives and purpose of the system; information requirements; indicators used to measure program effectiveness and efficiency; operations and procedures for collecting, processing, reporting, and communicating data; selection and deployment of technology; and personnel requirements for operating and utilizing the systems.

There are a variety of cost-effective options for the deployment of technology in each area of application. The selection of systems must be done in accordance with the existing organizational and technological infrastructure and specific local requirements. In nearly all cases, social, organizational, and human resource issues are more significant than technological considerations.

Effect of Health Sector Reform on Information Systems

Health sector reform entails major changes in the way organizations provide, regulate, and finance health interventions. Most reform initiatives are grounded in the universality of services, standardized public health interventions, cost containment and recovery, decentralization of administration and operation of services, and the recognition of the intersectoral nature of health interventions. Health service clients and providers are taking on different roles and there is increased involvement of new professional categories and local government. Increasing competition among provider organizations and greater involvement of employer and government purchasers characterize changes in the health management process and require intensive information management.

Present trends in the organization of health care require that information systems be realigned to accommodate them to the shift from an illness-based focus to a wellness-based model of care delivery, a change from a retrospective to concurrent approach to using information, and the ability to capture and deliver data at the point of service. Changing use environments, the variety of professional and institutional objectives, and the multiplicity of settings in which the sector's reform is being conducted represent a challenge to information systems developers. In this new environment, information systems must be capable of supporting diverse regulators, managers, payers, providers, and clients.

Status of Health Information Systems in the Region

The health sector of Latin America and the Caribbean lags behind other sectors in the adoption of modern computer and telecommunications-based information systems, and there is wide disparity among countries in technological in-

infrastructure, investment, and deployment of information systems. Despite the recognized need for information systems to assist operations and management, and the size of the health information market, the range and penetration of applications is still limited. Most of the technology currently in use corresponds to relatively simple business applications, and the deployment of advanced telecommunications applications is still in its infancy.

There are inadequate national policies and strategies regarding health informatics, and poor understanding of how to consolidate and assess cost-effective use of modern data processing and telecommunications resources. Standards on data and information communication are either lacking or in conflict. Information systems are not aligned to institutional goals, and few systems are oriented toward improving health status or to the needs and interaction of health care providers, clients, payers, and regulators. Potential users have little knowledge or experience in the field, and the number and quality of technical and educational programs and professionals in health informatics are lacking.

Data Collection, Processing, and Information Utilization

The greatest challenge faced by information systems operators is the timely collection and recording of good quality data. In 1996, PAHO conducted the Health Services Information Systems Resources Survey in 24 countries of Latin America and the Caribbean, which revealed constraints related to data collection, information utilization and dissemination, and human resource development and training.

The survey's analysis of nine core information system functions showed that nearly all countries conduct systematic health data collection using standards defined at the national level (Table 44). Most of the information collected relates to services provided and epidemiological surveillance. In two-thirds of the countries this information was considered to be of an intermediate level of detail and data organization; about one-sixth of the countries reported a low level of detail and data organization and about one-sixth reported an advanced level. Data about health system users and their families, the environment, health risk factors, user satisfaction with health services, and violence toward women and children were either absent or sporadically collected in about two-thirds of the countries surveyed.

Once data are processed and information is available, its utilization by health professionals presents another challenge. In seven areas of application studied (see Table 45), information use was consistently reported as being absent or low, with the exception of service evaluation and support to service operation, where levels were intermediate or advanced in one-third of the countries. The survey showed that very little

use is made of data in the areas of clinical decision-making, cost of services, and clinical and administrative research.

The following problems in using health data and information are characteristic of most of the information systems in the Region:

- Much of the required data are not used in case management or administration of facilities, which results in an unnecessary recording and reporting burden on service staff. Extensive reporting results in excessive accumulation of data at all levels of the system, little of which are analyzed or used.
- There is low demand for information because health policy-makers and program managers are not aware of the strategic importance and practicality of health information for planning and management.
- Data routinely reported by health services are considered of dubious quality and are frequently not used. Information on the health of those without access to services, or who use private sector services is often missing from government health information systems.
- There is increasing use of general and special-purpose surveys (often supported by international agencies) to capture data, which lessens reliance on routine data. Some of these data should be available within routine reporting systems.
- In many countries, disease surveillance systems do not function adequately.
- Data capture at the point of care, and data entry or recording in manual or automated databases represent two significant problem areas in health data management.
- Despite considerable investment in computers and data processing, inadequate use is being made of available technology for improved management and communication of health data.
- Departments, programs, and institutions in the health sector tend to develop their own data collection systems.
- Without effective coordination, duplication or gaps in the information often result.
- Analysis, reporting, and feedback of health data and information from the central level to the services are rare and often not well executed. Reports to international agencies are often inconsistent, and dominated by indicators promoted by the agencies, which may or may not be relevant for national use.

The greatest need remains the establishment of information systems that enable the recovery of patient-oriented, problem-oriented, and procedure-oriented data to assist in the assessment of the impact of health services on the health status of individuals and populations.

Dissemination of Health Services Information. While most public health data are disseminated through print and

TABLE 44
Degree of development of information activities in 24 Latin American and Caribbean countries, by percentage of respondents, 1996.

Functions	Level of detail and data organization (percentage of respondents)			
	Absent	Low	Intermediate	Advanced
Systematic data collection following national standards	4.2	20.6	62.5	12.5
Recording and archiving	4.2	12.5	66.7	16.7
Information about services provided	0.0	20.8	62.5	16.7
Information about users and their families	29.2	50.0	20.8	0.0
Information related to epidemiological surveillance	0.0	12.5	75.0	12.5
Information about the environment	12.5	41.7	37.5	8.3
Information about health risk factors	20.8	50.0	25.0	4.2
Information about violence (women and children)	20.8	70.8	8.3	0.0
Information about user satisfaction with health services	25.0	54.2	20.8	0.0

Source: Pan American Health Organization, Health Services Information Systems Program. *Health services information systems resources survey*. Washington, DC: PAHO; 1996.

at programmed meetings, electronic networking was reported to be used at an intermediate or advanced level by one-third of the countries surveyed (Table 46). One-third of the countries reported that they do not use the Internet to disseminate health information, and one-third reported a low level of use of this resource.

Training Human Resources in Health Information Systems. Nearly one-third of the countries surveyed do not have training programs in health information systems for mid-level and higher management (Table 47). When programs do exist, one-half of the countries reported them to be inadequate. In about two-thirds of the countries, training is conducted at the local, regional, and national levels. Very few countries participate in international training schemes.

Hospital Information Systems. The hospital subsector is the area best served by information systems. Of the 16,566 hospitals registered in PAHO's *Directory of Latin American and Caribbean Hospitals, 1996–1997* 6,267 (37.8%) indicated that they had formal information systems in place. Most information systems are automated; of those with information systems 5,230 (83.5%) reported using computers. There are no details available regarding the type and level of applications. Public hospitals account for 44.5% of all hospitals; 47% are private, 7.8% are philanthropic, and 0.8% are military hospitals. There are significant differences in the existence of information systems among institutions according to ownership. In absolute numbers, nearly 60% of hospitals with information systems are private, and 32% are public. The relative distribution of information systems and computer utilization, however, provides a different picture. Although the social security

hospital facilities constitute only 5.3% of all establishments, they have a proportionately higher number of information systems (467 of 876 hospitals, or 53.3%), followed by private (47.7%), philanthropic (40.0%), military (24.0%), and public non-social security (23.8%). Information systems are computerized in 94% of social security hospitals and 90% of public non-social security hospitals. Only about 40% of philanthropic hospitals have information systems, but considered as a group, computer utilization is highest (98.2%) in this category, followed by military (96.7%) and public hospitals (91.3%). Private hospitals reporting having information systems, on the contrary, have the lowest utilization of computers (77.1%).

Of all Latin American and Caribbean hospitals, 10,027 (60.5%) have 50 or fewer beds, and of those, 5,621 (56%) are private, 3,806 (38%) are public, 529 (5.3%) are philanthropic, and 71 (0.7%) are military. Smaller hospitals have fewer information systems, but except for philanthropic and military hospitals, small size (50 or fewer beds) does not appear to significantly alter the relative proportion of hospitals with systems (see Table 48).

Table 49 shows the distribution of hospitals with and without information systems grouped by country. Group 3 comprises the largest number of facilities (5,447 hospitals), representing 40% of facilities having information systems. Only 439 institutions (7% of the hospitals with information systems) comprise Groups 1 and 2 (countries with information systems in more than 51% of their facilities).

It is interesting to note that there is no association between clinical residency programs and the existence of information systems. Of 16,566 hospitals, 5,764 (34.8%) have clinical residency programs; of the 6,267 hospitals with information systems, only 1,735 (27.7%) reported having residency programs.

TABLE 45
Utilization of data and information by areas of application in 24 Latin American and Caribbean countries, by percentage of respondents, 1996.

Application	Level of data utilization (percentage of respondents)			
	Absent	Low	Intermediate	Advanced
Type of service provided	16.7	62.5	16.7	4.2
Support to service operation	4.2	58.3	33.3	4.2
Clinical decision-making	25.0	50.0	25.0	0.0
Evaluation of service processes	12.5	54.2	29.2	4.2
Evaluation of staff performance	33.3	41.7	25.0	0.0
Cost of services	45.8	29.2	16.7	8.3
Clinical and administrative research	37.5	50.0	12.5	0.0

Source: Pan American Health Organization, Health Services Information Systems Program. *Health services information systems resources survey*. Washington, DC: PAHO; 1996.

Scientific and Technical Information

Scientific and technical information plays an important role in the development process of the Region of the Americas. The Latin American and Caribbean Health Information Center (BIREME) has contributed to the increase in access to current scientific and technical information. BIREME has consolidated the Latin American and Caribbean Health Information System, a library network infrastructure that strengthens country cooperation in improving the ability of health professionals to access information. The system exists in 37 countries of the Region, and more than 600 libraries and information centers participate. Its decentralized structure allows countries to access information technology, and to develop human resources at the local and national levels.

Telecommunication networks began in the Region of the Americas, as elsewhere, with electronic correspondence among scientists. In the early 1980s, networks developed among academic institutions, one of the first being the Bitnet. New technology, the Internet being the most impressive example, can vastly improve the accumulation and dissemination of information on public health.

Specialized Databases. The number of institutions providing knowledge databases on the Internet is growing exponentially. BIREME maintains the LILACS database (Latin American and Caribbean Information in Health) which indexes over 540 Latin American and Caribbean journals. LILACS is distributed on CD-ROM as well as through the World Wide Web.

On-line Electronic Publications and Literature Searches. Electronic journals and books have shown their potential for improving dissemination of information and re-

ducing publishing and delivery costs. Besides internationally recognized medical journals, certain Latin American scientific periodical publications are available in electronic format or on the Internet. For example, Mexican medical journals are available on a CD-ROM known as ARTEMISA, and Cuban medical journals are available on the World Wide Web.

With the goal of reducing costs, PAHO, in collaboration with the U.S. National Library of Medicine (NLM) and the University of Chile, developed a search and retrieval protocol (BITNIS) that allows Latin American and Caribbean users to access the NLM databases using electronic mail. BITNIS has been successful in the Region of the Americas and is also widely used in Africa and the newly independent States of the former Soviet Union.

Distance Education. Computer-based distance education is rapidly improving, serving increasing numbers of people. Reading materials, video, pictures, and sound can be transmitted at low cost. While real-time interaction is possible, interactivity requires fast transmission channels and entails higher costs. Hundreds of schools are connected to networks, and, in 1996, PAHO sponsored the first electronic epidemiology and biostatistics course for the Caribbean. Similar courses have been conducted in Brazil, Chile, Costa Rica, Cuba, Mexico, and Venezuela.

Status of Information Infrastructure in the Region

Investment in information systems and technology, if they are to achieve long-term benefits, must be linked to the right strategy. Greater value and longer life cycles can be achieved in information systems projects if efforts are directed to the development of shared information functions, data stan-

TABLE 46
Development of tools for health information dissemination in 24 Latin American and Caribbean countries, by percentage of respondents, 1996.

Tool	Level of development (percentage of respondents)			
	Absent	Low	Intermediate	Advanced
Newsletters/bulletins	12.5	29.2	50.0	8.3
Programmed meetings	8.3	37.5	37.5	16.7
Electronic networking	20.8	37.5	29.2	12.5
Access to the Internet	37.5	33.3	16.7	12.5
Other form	25.0	25.0	37.5	12.5

Source: Pan American Health Organization, Health Services Information Systems Program. *Health services information systems resources survey*. Washington, DC: PAHO; 1996.

TABLE 47
Development of user training in the generation and use of health information in 24 Latin American and Caribbean countries, by percentage of respondents, 1996.

Training level	Development of user training (percentage of respondents)			
	Absent	Low	Intermediate	Advanced
Operational level	13.0	52.2	30.4	4.3
Mid-level administration	26.1	43.5	26.1	4.3
Upper management	26.1	43.5	21.7	8.7

Source: Pan American Health Organization, Health Services Information Systems Program. *Health services information systems resources survey*. Washington, DC: PAHO; 1996.

dards, and data manipulation methods across all applications, regardless of which technology is used.

Systems Specifications. A persistent ambiguity regarding the objectives and functions desired is one of the major problems in systems specifications. Health sector applications may reflect the sector's chronic problems: a lack of consensus on priorities, an uncoordinated approach to problem solving, poor definition of service contents, and minimal data sets to support decision-making. A shared mission statement, a reliable standard-setting process, peer reviewed critical specifications, and user involvement in the design process will go a long way to preventing problems. Given today's rapid and often unpredictable changes in the economics of health and in the organization and strategies of health services, as well as the growing competitiveness among health care providers and the changing requirements for information, health organizations must expect that their information systems will change accordingly. The goal is to be able to carry the knowledge-sharing assets across different generations of systems without suffering from losses due to technology-induced innovations, as, for instance, the introduction of a new database management platform or operating system.

Promoting the Use of Standards for System Specifications. In designing applications for health, the goal should be to promote a common set of content specification standards for the functional content of data for the entire health sector. These standards should be established at a national or even international level, as has been done in the European Union. This implies the definition of characteristics of systems application modules, the establishment of desired functionality, and the selection of core data elements in the context of an integrated, scalable, and platform-independent logical solution. Appropriateness of the technology, cultural and language issues, models of institutional organization and health care delivery, and cost-benefit ratios of systems are major concerns for developers and users.

The use of common specification standards will enable those who develop health applications to draw from a pool of common knowledge and avoid redundant or repetitive developments. These specifications will help in the exchange of data among different providers, financing agents, and governmental agencies. They will further assist systems professionals to focus on particular areas of application within a general framework that will ensure consistency across different applications. This is especially valuable for corporate approaches

TABLE 48
Hospitals with 1–50 beds and information systems, by ownership category, 1996.

Ownership	Hospitals	1–50 beds	With information system	Percentage with information system
Public non-social security	6,498	3,382	603	17.8
Public social security	876	424	199	46.9
Private	7,783	5,621	2,325	41.4
Philanthropic	1,284	529	120	22.7
Military	125	71	5	7.0

Source: Pan American Health Organization, Health Services Information Systems Program. *Health services information systems resources survey*. Washington, DC: PAHO; 1996.

to management, integration of information systems, and longer life cycles for applications.

Access and Deployment of Technology. A significant issue in Latin America and the Caribbean continues to be access to technology and the availability, level, quality, and cost of telecommunications services. Infrastructure is generally of poor quality compared with that of other regions. The human and organizational resources and capabilities vary widely among different countries. In most places only a limited number of computers or old equipment are available for users providing patient care, and most health professionals lack basic computer knowledge.

The Region has an obsolete telecommunications infrastructure with low coverage and poor quality communication lines. Although monopolies are gradually disappearing, or being significantly reduced, many countries still have a monopolistic telecommunications market with regulations and tariff structures that inhibit the utilization of the type of services that are required by health and health care telecommunications applications. Another significant issue in most developing countries, besides access to technology, relates to the availability, quality, and cost of technical staff support and services. While information technology expenditures in Latin America and the Caribbean represent only about 5% of the world total, the growth of information technology in the Region has been the world's highest since 1985.

Many ministries of health have begun to computerize their services, in order to provide better information for health service management and delivery. While most initiatives have been centered in health information units, there is a growing trend towards decentralization. However, systems have only rarely been implemented at the level of primary or community health care centers. In the Eastern Caribbean countries a project funded by the Inter-American Development Bank was initiated in 1995 to deploy community health services information systems, but its impact has yet to be evaluated.

Countries with significant ongoing information systems projects that consider a broad scope of information utilization include: Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Grenada, Guatemala, Jamaica, Mexico, Panama, Saint Lucia, Saint Vincent and the Grenadines, Uruguay, and Venezuela. In Costa Rica and Mexico important telecommunications-based projects have been recently initiated.

In the past three years there has been brisk growth in Internet connectivity in Latin America and the Caribbean. In January 1997 there were 164,051 "hosts" (computers connected to the Internet) that were registered by country or under the corresponding geographic domain. The numbers do not reflect the total number of hosts in each country (organizations were not included in this figure), but they do demonstrate the growth in the Region.

An analysis of the distribution of Internet hosts exhibits wide variation, which becomes more evident when one considers the corresponding country population. The number of inhabitants per host is a good indicator of the penetration of Internet-related technologies in the Region (Table 50). The number of telephone lines per 100 inhabitants is still low (an average of 11.7 lines per 100 persons), compared with the United States (57.4 per 100 persons) or Canada (59.2 per 100 persons). Similar ratios exist for television and radio receivers. Increased connectivity and access to the Internet will require a major expansion of the telecommunications infrastructure in nearly every country.

Sustainability. The continuity and sustainability of information systems projects continues to be a major problem in the Region. Externally funded projects frequently collapse when funding is terminated, demonstrating the importance of justifying cost-benefits and long-term financial sustainability for such projects, as well as developing the organizational capacity to develop and use information systems. Spreading the financial risk among several

TABLE 49
Information systems in 16,566 hospitals of Latin America and the Caribbean, grouped by percentage
of hospitals with systems implemented and in operation, 1996.

Group	Country or territory	Total no. of hospitals	Number without information systems	With information system		With computer	
				No. of hospitals	%	No. of hospitals	%
Group 1, above 71%	Turks and Caicos	1	0	1	100.0	1	100.0
	Bahamas	5	1	4	80.0	4	80.0
	Puerto Rico	90	20	70	77.8	64	71.1
	Subtotal group 1	96	21	75	78.1	69	71.9
Group 2, 51%–70%	Guadeloupe	10	4	6	60.0	6	60.0
	Uruguay	111	45	66	59.5	66	59.5
	Peru	443	180	263	59.4	262	59.1
	Costa Rica	33	14	19	57.6	19	57.6
	Netherlands Antilles	11	5	6	54.6	6	54.6
	Bermuda	2	1	1	50.0	1	50.0
	Martinique	6	3	3	50.0	3	50.0
	Subtotal group 2	616	252	364	59.1	363	58.9
Group 3, 31%–50%	Paraguay	236	121	115	48.7	57	24.2
	Mexico	3,033	1,603	1,430	47.2	693	22.9
	Colombia	1,053	618	435	41.3	417	39.6
	Brazil	6,124	3,786	2,338	38.2	2,313	37.8
	Chile	385	241	144	37.4	144	37.4
	Argentina	2,780	1,801	979	35.2	812	29.2
	Saint Lucia	6	4	2	33.3	2	33.3
	Suriname	13	9	4	30.8	4	30.8
	Subtotal group 3	13,630	8,183	5,447	40.0	4,442	32.6
Group 4, 11%–30%	El Salvador	77	54	23	29.9	23	29.9
	Honduras	89	66	23	25.8	23	25.8
	Panama	55	41	14	25.5	13	23.6
	Guatemala	145	109	36	24.8	36	24.8
	Venezuela	348	271	77	22.1	54	15.5
	U.S. Virgin Islands	23	18	5	21.7	5	21.7
	Ecuador	299	240	59	19.7	59	19.7
	Nicaragua	78	66	12	15.4	12	15.4
	Cuba	243	206	37	15.2	37	15.2
	Bolivia	385	327	58	15.1	58	15.1
	Dominican Republic	213	183	30	14.1	30	14.1
	Barbados	8	7	1	12.5	1	12.5
	Subtotal group 4	1,963	1,588	375	19.1	351	17.9
Group 5, less than 10%	Belize	10	9	1	10.0	1	10.0
	Haiti	103	99	4	3.9	3	2.9
	Trinidad and Tobago	64	63	1	1.6	1	1.6
	Subtotal group 5	177	171	6	3.4	5	2.8
Group 6, none	Anguilla	2	2	0	0.0	0	0.0
	Antigua and Barbuda	3	3	0	0.0	0	0.0
	British Virgin Islands	2	2	0	0.0	0	0.0
	Dominica	1	1	0	0.0	0	0.0
	Grenada	5	5	0	0.0	0	0.0
	Guyana	35	35	0	0.0	0	0.0
	Jamaica	31	31	0	0.0	0	0.0
	Montserrat	1	1	0	0.0	0	0.0
	Saint Kitts and Nevis	3	3	0	0.0	0	0.0
	Saint Vincent and the Grenadines	1	1	0	0.0	0	0.0
	Subtotal group 6	84	84	0	0.0	0	0.0
	Total	16,566	10,299	6,267	37.8	5,230	31.6

Source: Pan American Health Organization, Division of Health Systems and Services Development, *Directory of Latin American and Caribbean hospitals, 1996–1997*. Washington, DC: PAHO; 1997.

TABLE 50
Internet hosts, telephone lines, and television and radio receivers in selected Latin American and Caribbean countries, ranked by population/host.

Countries	Population (thousands)	Registered hosts ^a	Percent of total	Population per host	Telephones per 100 persons ^b	TV receivers per 1,000 persons ^c	Radio receivers per 1,000 persons ^c
Antigua and Barbuda	66	169	0.103	396	28.9	356	417
Chile	14,641	15,885	9.683	922	11.0	210	344
Costa Rica	3,575	3,491	2.128	1,024	11.1	141	258
Dominica	71	55	0.034	1,291	19.1	72	587
Bahamas	284	195	0.119	1,456	30.3	225	592
Uruguay	3,221	1,823	1.111	1,767	16.8	166	232
Brazil	167,046	77,148	47.027	2,165	7.5	208	386
Argentina	35,405	12,688	7.734	2,790	12.3	221	683
Mexico	97,245	29,840	18.189	3,259	8.8	149	255
Dominican Republic	8,098	2,301	1.403	3,519	7.4	87	171
Panama	2,722	751	0.458	3,625	10.2	167	224
Colombia	36,200	9,054	5.519	3,998	11.3	117	177
Peru	24,691	5,192	3.165	4,756	2.9	98	254
Saint Lucia	146	21	0.013	6,952	15.4	190	759
Nicaragua	4,731	531	0.324	8,910	1.7	66	262
Venezuela	22,777	2,417	1.473	9,424	9.9	163	448
Trinidad and Tobago	1,335	141	0.086	9,468	15.0	316	494
Jamaica	2,483	249	0.152	9,972	10.6	134	421
Barbados	264	21	0.013	12,571	31.8	280	876
Honduras	5,981	408	0.249	14,659	2.1	73	387
Guyana	854	52	0.032	16,423	5.1	40	493
Bolivia	7,774	430	0.262	18,079	3.0	103	613
Ecuador	11,937	590	0.360	20,232	5.3	85	318
Saint Kitts and Nevis	41	2	0.001	20,500	29.6	206	648
Paraguay	5,220	187	0.114	27,914	3.1	52	66
Guatemala	11,241	274	0.167	41,026	2.3	82	171
El Salvador	6,027	132	0.080	45,659	3.2	93	413
Suriname	432	4	0.002	108,000	11.6	132	639
Total	474,508	164,051	100	2,892 ^d	11.69 ^d	151.14 ^d	413.86 ^d

^a Internet hosts represent the number of hosts registered under geographic domains and do not include hosts registered in organizational domains (.com, .org, .net, etc.). Data for January 1997.

^b Data for telephone lines are for 1993.

^c Data for television and radio receivers are for 1992.

^d Average values.

Sources: Organization of American States, RedHUCyT Project. United Nations. 1995 Statistical Yearbook. New York: UN; 1985.

interested parties may be appropriate, as cost-sharing increases overall awareness, utilization, and long-term potential for success.

Market Issues

Major gaps in health care information systems make it impossible to create an effective information infrastructure

without the collaboration of many stakeholders. Health information projects are characterized by a variety of potential participants. Public and private stakeholders include: payers, providers (individual health professionals and health care organizations), consumers, developers, service and equipment suppliers, funding agencies, researchers, nongovernmental organizations, communities, and governments at the local, regional, and national levels. This variety of interests stems from the complexity of the health care system, the penetra-

tion of the telecommunications industry into health care, and the recognition that consumers, payers, regulators, and providers are stakeholders as well.

Technology service companies, consultants, and providers must understand the specific nature of health care markets. A culturally sensitive approach and knowledge of the local sociopolitical environment is essential to market development. The allocation and evaluation of costs, time, and responsibilities as well as potential litigation issues require consideration when transferring applications developed for other implementation environments. It may be difficult to locate international expertise or hire appropriately skilled counterparts at the country level.

Governments have the responsibility for assuming an active leadership role in educating the medical community and in coordinating and encouraging a more rapid and effective implementation of clinically relevant applications of wide-area networking. Policy and regulatory norms are needed, but they also can complicate the delivery of innovative technologies and applications. There are five areas for possible government involvement:

- convening groups for the development of standards;
- providing funding for research and development;
- ensuring the equitable distribution of resources, particularly to places and people considered by private enterprise to provide low opportunities for profit;
- protecting rights of privacy, intellectual property, and security; and
- overcoming the jurisdictional barriers to cooperation, particularly when there are conflicting regulations.

Partnerships As a Solution to Systems Development and Deployment

The technical knowledge, experience, and financial investment needed to establish large and complex information systems projects require tapping into resources and expertise that no single organization has. Public and private institutions, academic organizations, the industry, and financing agents must find ways to pool their assets through project partnerships, and add social value to informatics applications by providing new employment opportunities, socioeconomic development, and educational opportunities, while promoting health and supporting cost-effective health services. In line with these objectives, PAHO's mission in terms of information systems technology and management primarily involves transferring knowledge, providing technical support, facilitating the exchange of experiences among Latin American and Caribbean countries, and fostering the use of appropriate technology and knowledge assets.

Technological Development in Health

The two highly industrialized countries in the Americas, Canada and the United States, produce and export health technology that includes equipment and devices, drugs, procedures, and support systems. The remaining countries of the Region are mainly recipients of this technology, although Argentina, Brazil, and Mexico do some exporting. In the mid-1990s, the health technology situation in Latin America and the Caribbean presented great challenges.

First, there were no consistent and accessible data on the introduction, distribution, and use of the most common health technologies, even in middle-income countries, with the exception of some information relating to drugs and diagnostic imaging equipment.

Second, and as a result of the economic crises in the late 1980s and early 1990s, many countries did not set aside the funds needed to maintain and repair facilities and equipment, especially in the public sector. In addition, there were few staff involved in these tasks, and most of them lacked the necessary skills. In any case, some nations, particularly low- and middle-income countries, continued to receive equipment (as donations or as conditions of loans) that did not address their needs or that was not adapted to local regulations. Often the nations had neither the required organizational or operating capabilities, nor the financial resources to cover the operating expenses of the equipment.

Third, the availability and utilization of equipment (for diagnostic imaging, radiation therapy, laboratories, or blood banks) varied greatly. In middle-income countries there were highly complex services, almost always in hospitals located in large cities and often privately owned. The levels of use and quality were similar to those in the developed countries. In smaller cities and in less-developed countries, however, the situation was substantially worse.

Fourth, there were two processes operating in the area of medicines. As a result of globalization and subregional integration, there was a tendency to deregulate registration requirements and prices. At the same time, there was an insistence on promoting the rational use of pharmaceuticals and improving the quality of drug therapy. Only a minority of the countries, however, had issued official manufacturing standards; the sale of unprescribed medicines was increasing in all the nations; the sale of generic drugs had risen in only a few of them; and the information physicians received continued to be essentially what the industry provided them. Further, fewer than half the countries had national drug commissions or similar organizations, and the organizations that did exist lacked management capabilities.

Finally, the evaluations published or under way on the effectiveness of promotional and preventive interventions, or of

diagnostic, therapeutic, or rehabilitative procedures, were very limited.

Nonetheless, since the mid-1990s, new developments have emerged that point to positive trends. Some of the developments that relate to physical infrastructure, staffing and maintenance of buildings and equipment, and the evaluation of health technologies are analyzed below.

Physical and Technological Infrastructure

From the 1960s through the mid-1970s, Latin American and Caribbean countries increased the physical and technological capacity of their health services by constructing, remodeling, expanding, and equipping facilities. This expansion, however, was not accompanied by the application of strategies and mechanisms to ensure an ongoing, reliable, safe, and economical operation of the physical and technological infrastructure during its useful life cycle, to ensure the delivery of health services to the population, and to protect that investment. As a result, since the mid-1980s facilities and equipment have rapidly deteriorated. Economic crises have led to cuts in operating budgets for facilities and in maintenance funds. Paradoxically, this was a period of widespread promotion and utilization of sophisticated equipment. Countries often purchased or put into place equipment without having an infrastructure capable of ensuring its operation and maintenance, thus making the situation even more critical.

Studies PAHO conducted in 1986 in the public sector in the Central American and Andean countries, and projected to the remaining countries, found that, on average, 50% of the medical and industrial equipment in hospitals was out of service or operated without meeting safety standards or the manufacturers' guidelines (95). Buildings showed a similar level of deterioration. These studies found an absence of nationwide policies, standards, and programs; a lack of physical-operational records in health facilities that offered complete information on the condition, quantity, and type of equipment; a scarcity of needed personnel, with those available insufficiently trained to conduct and carry out programs according to the requirements of the equipment being used (75% of the technical staff is self-taught, and equipment operators needed technical training); and low budgets for maintenance (between 1% and 4% of the operating budgets of the health facilities).

In the 1980s, health authorities in the seven countries of Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) set a high priority on developing and strengthening engineering and maintenance services in their health care facilities (96). Based on a project funded by the Government of Holland, with joint efforts and technical exchange among the ministries of health and the

social security institutions in these countries and under PAHO's coordination, the Central American Network for Technological Management of Health Services was created. In 1986, only 49% of the 60,000 pieces of equipment examined in Ministry of Health and Social Security hospitals in this region were in good working condition. This figure rose to 75% in 1996. In addition, emphasis was placed on personnel training, and budgets for maintenance were increased.

In the 1990s, as part of health sector reforms and of efforts to develop and utilize technology, Latin American and Caribbean countries acknowledged the need to redefine the role of engineering, maintenance, regulatory, and technological management programs in health services. Another cause of change has been that most of the countries, through external loans or internal investments, have replaced, remodeled, and re-equipped their hospitals. Bearing in mind the lessons learned in the 1980s, the countries are further strengthening their hospital engineering and maintenance programs by outsourcing maintenance services, creating cooperatives in Colombia and elsewhere, and organizing companies made up of hospital consortia in order to provide these services, as in Canada and the United States.

The accelerated development and use of health technologies, particularly in the areas of physical infrastructure and equipment, comes with a need for new expertise. For example, in the field of physical and biological sciences, there is a demand for hospital engineers, clinical engineers, and biomedical equipment maintenance technicians. During the last decade, universities and technical schools in Argentina, Brazil, Colombia, Cuba, Mexico, and Venezuela started programs to train professionals in these fields. This is a slow process, and in the meantime, the responsibility for maintaining the health services of the public sector continues to lie with personnel with low educational levels and who have learned on the job.

In 1993, Latin American and Caribbean countries began certifying clinical engineers and biomedical equipment maintenance technicians. In this, they are supported by the American College of Clinical Engineering (ACCE) and the International Certification Commission (ICC), under PAHO's coordination. The Brazilian Clinical Engineering Commission was established, as was the Mexican Clinical Engineering Commission, which is supporting the certification of professionals in Spanish. Engineers have been certified in Colombia, Costa Rica, Panama, and Venezuela, and certification for biomedical equipment maintenance technicians is being organized in Central America.

Along with incorporating new professional profiles, the countries have sought a comprehensive perspective in the use and maintenance of physical and technological infrastructure. In their health care facilities, countries are incorporating engineering processes and programs in maintenance services

management, equipment technology management, safety and biosafety, efficient energy use, hospital sanitation, and structural and nonstructural vulnerability to disasters. These efforts support hospital accreditation programs and improve risk management programs; they also are fundamental for quality assurance of the health services.

As part of the movement to renovate and re-equip the physical and technological infrastructure of the services, countries are organizing and developing interdisciplinary groups to manage information on the selection, purchase, operation, maintenance, and replacement of medical and hospital equipment. These groups, called "technological management groups," are supported by the Emergency Care Research Institute (ECRI), a PAHO/WHO collaborating center for health technologies. The seven Central American countries are now exchanging information over the Internet through the Network for Technological Management of Health Services, national engineering and maintenance commissions of the ministries of health, and social security institutions. Colombia and Venezuela also have initiated technological management groups in their ministries of health (97). As part of this effort, PAHO/WHO and ECRI recently signed an agreement to translate the *ECRI Health Technology Monitor* into Spanish.

In addition, the globalization of markets, the worldwide standardization of quality systems, the growing complexity of health technologies, and processes of health sector reform have emphasized the need for countries to organize and strengthen programs to regulate and control medical equipment and devices. Along these lines, Canada began a process in 1994 to change its system for regulating medical materials. The aim was to ensure safety and efficacy, while retaining consistency with the regulations of its trading partners and recovering the costs of these activities in order to sustain them. The Medical Device Bureau of Canada made this information and experience available to the countries of the Region. Together with PAHO, Canada is providing technical assistance to Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, and Panama so these countries can develop their own programs to regulate medical equipment and devices (98).

Finally, it should be pointed out that over the last five years technical cooperation among the countries has increased as a way to strengthen equipment and facilities maintenance programs. Of particular note are the exchanges among the Central American countries and the technical cooperation provided by Cuba and Mexico (Cuba has primarily supported the English-speaking Caribbean countries). In addition, this same period saw an increase in the support provided to the countries of the Region by the PAHO collaborating centers in the fields of maintenance engineering, equipment technology management, and regulation of medical equipment and devices.

Health Technologies and Their Evaluation

Some evidence suggests that due to demographic changes and improvements in some of the Region's major economies, the market for health technology in Latin America and the Caribbean has been expanding for some time and will probably continue to do so in the coming years. This presents numerous challenges for the different actors in the sector. As the experience of the industrialized countries demonstrates, directing current or future resources toward the most appropriate and cost-effective technologies is far from easy. The evaluation of health technologies may be a way to meet this challenge.

In Latin America and the Caribbean, the term "health technologies" used to mean expensive and sophisticated equipment, and a series of administrative procedures prior to their registration and marketing was considered adequate evaluation of such technologies. Recently, a more modern concept has taken root. Proper evaluation of health technologies is now seen as comprehensive analysis of the direct and indirect effects of their use, including technical (nearly always clinical), economic, and social consequences of utilizing them, both in the short and long term. Such evaluation of these technologies can be useful at one or more levels of the health system: at the "macro" level (e.g., when allocating funds for levels of care or purchasing specific equipment), at the "meso" level (e.g., when selecting benefits for a health insurance package or when training health personnel), and at the "micro" level (e.g., when reorganizing a clinical service or formulating treatment options for patients). It is no accident that better evaluation procedures occur when most countries begin to reform their health systems and services or are considering doing so in order to promote fairness, increase efficiency in resource allocation and management, improve the effectiveness and quality of care, ensure financial sustainability, and promote community participation and intersectoral action.

There is often a lack of consistency in clinical procedures, as well as excessive haste in introducing and spreading new health technologies. In one developed country, it is estimated that 20% to 25% of health spending goes for clinical procedures that are based on inappropriate or dubious medical advice (99). By merely eliminating useless procedures and inappropriate guidelines, it would be possible to improve quality of service and make health expenditure more cost-effective. The preparation and dissemination of clinical practice guidelines and treatment protocols has often been the first step in this direction and can affect the delivery of services. In addition, making explicit the benefits included in insurance policies has forced private insurers first and public insurers later to determine what is technically possible and what is actually necessary and useful for each patient or group of patients, and to select private or public providers based on their efficiency. Strengthening the leadership role of health authorities is one

of the strategies of the reform process. Identifying essential public health functions, regulating public and private facility operations, and channeling public financing based on cost-effectiveness and cost-utility are all activities that can benefit from comparing alternative health technologies.

Finally, the group of people who need to be knowledgeable about health technologies has grown and diversified. In addition to service providers, it now includes legislators, government officials, managers, researchers, and, above all, patients, family members, and the public. As a result, the variety of information required also has expanded. In addition to knowledge about safety, risk, and efficacy, awareness is needed on effectiveness; economic implications; the quality of life associated with the use of a technology; and the ethical, cultural, and social consequences of technology's spread. Thus, we are now moving past (although still in the early stages in Latin America and the Caribbean) an evaluation based on the needs of health technology producers to one that emphasizes to the individual and collective needs of users.

To face these challenges, since the mid-1980s many developed countries in Europe, America, and Asia have established committees or bodies specializing in the evaluation of health technologies, financed totally or partially with public funds. In 1993, the International Network of Agencies for Health Technology Assessment (INAHTA) was created, and its membership has been increasing slowly but steadily since then.

Since 1989, Canada has had a federal coordinating body, as well as organizations with total or majority public funding in some provinces. In 1972, the United States became the first country with a public body of this type. There are now more than 50 U.S. organizations involved in evaluating health technologies, most of them private for-profit or nonprofit groups. In 1997, the U.S. Government, through the Health Care Policy and Research Agency, launched an ambitious program to support centers promoting principles of medicine based on evidence.

In Latin America and the Caribbean there are hardly any public or private organizations specializing in the evaluation of health technology. A worldwide survey conducted in 1994 and 1995 revealed that of the 103 organizations in 24 countries that responded, only one was in a Latin American or Caribbean country (100). During 1994 and 1995, Argentina, Chile, Colombia, Cuba, and Mexico took steps in this direction. Chile and Cuba established small units within their ministries of health, and Argentina created an autonomous body under the aegis of the Ministry. Both methods seek to form a stable, multidisciplinary, independent, and highly qualified team, connected to international networks and capable of working in close contact with national health groups and institutions at the highest level. In addition, the MERCOSUR countries created a coordination group for medical care and the rational use of technology, with a 1998 agenda that includes various activities in this area.

Alone or with such partners as INAHTA and its collaborating centers such as the Department of Medicine of the University of Ottawa (Canada), ECRI, and the International Society for Technology Assessment in Health Care, PAHO is supporting the countries of Latin America and the Caribbean in establishing appropriate policies and mechanisms for evaluating health technologies in the context of sectoral reform. Workshops and seminars on the basic concepts and methodology of health technology assessment have been held in Havana (for Cuba, 1996), Mexico City (for Mexico and Central America, 1997), and Santiago, Chile (for Argentina, Chile, Paraguay, and Uruguay, 1997), and there are plans to hold other similar events in Colombia (for Colombia and the Andean countries) and Argentina (for the MERCOSUR countries) during 1998. Some countries have received support to create specific health technology assessment units and cooperation in the design of their action plans. The possibility of promoting joint projects to evaluate some high-impact technologies is being explored. Current challenges in Latin America and the Caribbean include persuading political decision-making agencies that conducting effective health technology evaluations could strengthen the leadership role of the ministries of health, and building a critical mass of full-time personnel trained in the methodology and practice of such evaluation who are linked at the national and international levels. To meet these challenges, in the short and medium term PAHO will continue to direct its technical cooperation toward both those political agencies and evaluation personnel.

NATIONAL EXPENDITURES ON HEALTH

Current Situation and Recent Trends

This section analyzes the amount and composition of national expenditures on health in 1995 in the countries of Latin America and the Caribbean. Estimates refer specifically to public and private spending on health goods and services, including spending on public health programs (goods for collective consumption or services with high externality) and personal spending on health care (private goods or goods for individual consumption). The definitions and classifications of health expenditures are comparable to those used in industrialized countries and published regularly by the Organization for Economic Cooperation and Development (OECD) (101).

Amount and Participation in Gross Domestic Product

In 1995, national spending on health (public and private) in all countries of the Americas combined, including the United States and Canada, was US\$ 1,184,840 million. This

TABLE 51
National health expenditure in the countries of the Americas, in 1995 U.S. dollars.^a

Region/country	Population (millions)	Per capita income (US\$)	National health expenditure as % of GDP	National health expenditure (millions of US\$)	National health expenditure per capita (US\$)
Latin America and the Caribbean	474.2	3,289	7.3	113,834	240
Canada	29.5	19,380	9.8	56,123	1,899
United States	263.1	26,980	14.3	1,014,884	3,858
Total for the Americas	766.8	12,036	12.8	1,184,840	1,545

^a Figures in 1995 dollars are based on studies of per capita income in dollars for that year and were calculated following the World Bank Atlas method.

Sources: World Bank, *World Development Report, 1995*. New York: Oxford University Press, 1996. Pan American Health Organization, Division of Health and Human Development, Public Policy and Health Program; OECD (data from 1996); International Monetary Fund, *International Financial Statistics* (data for 1995). Data for Canada and the United States are part of 1994 estimates expressed in 1995 dollars.

represented 12.8% of GDP. Average per capita income was US\$ 12,000 and annual per capita expenditure on health was US\$ 1,545 (see Table 51). There are large differences both in income levels and spending on health between the United States and Canada, on the one hand, and the countries of Latin America and the Caribbean, on the other. Per capita income in the United States and Canada was more than 6 times greater than that of the Latin American and Caribbean countries, and their per capita spending on health was more than 14 times greater (almost double the difference in income levels). Per capita spending on health in 1995 was approximately US\$ 3,800 in the United States and US\$ 1,900 in Canada, while annual national per capita spending on health in the countries of Latin America and the Caribbean was approximately US\$ 240. Despite this relatively low level of per capita spending on health, overall spending on health goods and services in the countries of Latin America and the Caribbean was substantial. In 1995, the overall market for health goods and services in these countries reached approximately US\$ 113,000 million, which represents about 10% of total spending in the countries of the Region of the Americas, including the United States and Canada (see Table 51).

National Spending on Health in Latin America and the Caribbean

The amount and composition of national health spending are indicators of the economic and financial limitations that countries face in developing health policies. These indicators are useful for defining and evaluating the scope of public health policies and the financial viability of proposals for uni-

versal coverage of health programs and services. They also reflect characteristics of health sector financing and the ability of different institutional reform policies to improve efficiency and equity in the distribution of health sector resources.

Table 52 shows the vast disparity that exists among countries of Latin America and the Caribbean in national health spending. The weighted average of per capita spending on health was approximately US\$ 240 and the average level of health spending as a proportion of GDP was 7.3%.² National health spending as a proportion of GDP ranged from 3.5% (Haiti) to 10% (Uruguay). Per capita spending on health also varied considerably from country to country. At one extreme is Haiti, which has the lowest income level in the region, with annual per capita expenditures of US\$ 9. At the other extreme are Argentina, with US\$ 795 annually, and the Cayman Islands, with US\$ 1,284 annually.

Composition of Public-Private National Spending on Health: Extent of Inefficiencies

Data on the public and private share of national health expenditures provide some perspective on the challenges faced by those responsible for developing policy in the countries of the Region. The amount of resources channeled through the

² Unless otherwise specified, all regional averages presented in this section are weighted averages. Arithmetic averages of per capita spending and expenditure levels as a proportion of GDP were US\$ 243 and 6.42%, respectively, in Latin America and the Caribbean. Average per capita expenditures weighted by population and average spending levels in relation to GDP have been calculated as a proportion of GDP in the countries in relation to total GDP of the Region.

TABLE 52
National spending on health in the countries
of the Americas, 1995.

Country	National health expenditure as % of GDP	Per capita national health expenditure in 1995 US\$
Anguilla	5.1	336
Antigua and Barbuda	6.1	496
Argentina	9.8	795
Bahamas	4.3	518
Barbados	6.4	421
Belize	3.9	106
Bolivia	6.0	48
Brazil	7.6	280
Canada	9.8	1,899
Cayman Islands	4.4	1,284
Chile	8.0	331
Colombia	7.3	140
Costa Rica	8.6	224
Cuba	9.0	106
Dominica	6.6	198
Dominican Republic	5.3	77
Ecuador	5.1	71
El Salvador	6.8	158
Grenada	5.0	150
Guatemala	4.2	56
Guyana	7.5	44
Haiti	3.5	9
Honduras	7.4	44
Jamaica	5.0	76
Mexico	4.8	160
Montserrat	6.5	383
Nicaragua	9.2	35
Panama	9.2	253
Paraguay	5.0	85
Peru	5.5	128
Saint Kitts and Nevis	5.6	289
Saint Lucia	5.0	167
Saint Vincent and the Grenadines	5.5	125
Suriname	8.0	95
Trinidad and Tobago	4.7	176
United States	14.3	3,858
Uruguay	10.0	516
Venezuela	7.6	229
Regional average ^a	7.3	240

^a Regional average does not include Canada or the United States.

Source: Estimates by the Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997.

public and private sectors gives an idea of the inefficiency that results from the so-called failures of the government and the market that controls these resources. Resources channeled through public institutions are vulnerable to the failure of government (that is, the unanticipated incongruity of the models for providing service and social policy goals of the government) to achieve the best health indicators and universal access of the population to services, or efforts to ensure that these resources produce the best social welfare possible for the population (allocative efficiency). A second type of inefficiency results from the underutilization or low productivity of public resources due to the lack of adequate mechanisms or incentives (operative efficiency). Resources transferred between consumers and providers through the purchase and sale of health goods and services, including the purchase of health insurance, are subject to market failures.

One of the main causes of suboptimality in resource allocation through the free market is the poor exchange of information between consumers and providers of health goods and services. Information sharing is needed to guarantee the efficiency of the market as a resource allocation mechanism. In this case, the concept of suboptimality refers specifically to market choices that do not provide consumers with the greatest possible satisfaction. This applies as much to current consumption decisions regarding health goods and services (parallel markets) as to longer term decisions or optimal levels of insurance to address health problems.

Policies to correct shortcomings in the allocation and utilization of resources channeled through public institutions differ from those required to correct market failures. Similarly, there are important differences in the policies directed toward correcting inefficiency that affects market transactions of health goods and services. The relative importance of these two aspects of spending allows the scope of public policies to be evaluated in terms of its ability to improve the allocative efficiency of health sector resources.

The Public-Private Mix in National Spending: Variations Between Countries

Table 53 shows the relation of public to private spending on health in countries according to per capita income. The data in the table show that the regional average of the public-private composition of spending is 41/59: that is, 41% corresponds to public sector spending and 59% to private spending. This distribution refutes the generally accepted idea that in the lowest-income countries government expenditure is the most important component of national spending on health. The less developed the country and the lower its per capita GDP, the less important public spending for health is as

a proportion of GDP. Both extremes in the range of public-private spending on health are occupied by countries with per capita income levels below the regional average: Cuba, with per capita income of US\$ 1,175, and El Salvador, with per capita income of US\$ 1,610.

A more detailed analysis of the nature of the composition of national spending on health allows evaluation of the amount of resources that are subject to various types of shortcomings in the optimal allocation of resources. These include government failures, that is, public resources spent directly or indirectly (through public insurance) on producing and providing health services; and market failures that affect private health service markets (direct purchase and sale of health goods and services), as well as markets for prepaid medical plans and health insurance. The nature of inefficiencies in each of these market segments, as well as the policies necessary to correct them, are different.

Table 54 shows that the proportion of resources spent on health that are affected by market failures is larger than the amount subject to government failure. Thus, the market for health goods and services (direct purchase and sale of health goods and services) is more important than the market for health insurance and prepaid medical schemes. The absolute amount spent directly, indirectly, or through the public or private sectors gives an idea of the possible breadth of policies oriented toward correcting the different types of shortcomings.

Nearly two-thirds of private expenditure, which represents 59% of total health spending in all the countries of Latin America and the Caribbean, is direct payment (formal or informal) to providers of health goods and services. The remaining third comprises indirect health expenditures, which include spending by households and businesses to purchase health insurance, or voluntary contributions to prepaid medical schemes. This has been one of the most rapidly expanding items of health spending in recent years, reaching 19.5% of national health expenditures in 1995.

It is estimated that in the 1991–1992 period, 48 million people in Latin America and the Caribbean were affiliated with private health insurance systems and prepaid medical schemes. That figure represents approximately 12.3% of the total population of the Region (102, 103). By 1996, this number had reached nearly 70 million, about 15% of the population of the Region.

Direct or out-of-pocket spending is subject to the typical problems of market failures that result from skewed information between consumers and providers of health services. Such failures can lead to a demand for, or an excess consumption of, health goods (medicines and prostheses) and services; inefficiency resulting from misdiagnosis and ineffective treatment; or self-medication. Information problems that affect indirect health spending or health insurance markets and prepaid medical schemes are different. In these cases, ineffi-

TABLE 53
Public-private composition of national health expenditure in the Americas, by country per capita income levels, 1995.

Country	GDP per capita in 1995 US\$	Public-private composition (%)		
		Public	Private	Total
Haiti	250	37	63	100
Nicaragua	380	63	37	100
Guyana	590	69	31	100
Honduras	600	49	51	100
Bolivia	800	55	45	100
Suriname	1,118	75	25	100
Cuba	1,175	87	13	100
Guatemala	1,340	45	55	100
Ecuador	1,390	32	68	100
Dominican Republic	1,460	38	62	100
Jamaica	1,510	49	51	100
El Salvador	1,610	27	73	100
Paraguay	1,690	34	66	100
Colombia	1,910	30	70	100
Saint Vincent and the Grenadines	2,280	64	36	100
Peru	2,310	51	49	100
Costa Rica	2,610	74	26	100
Belize	2,696	46	54	100
Panama	2,750	78	22	100
Grenada	2,980	53	47	100
Dominica	2,990	60	40	100
Venezuela	3,020	37	63	100
Mexico	3,320	47	53	100
Saint Lucia	3,370	52	48	100
Brazil	3,700	34	66	100
Trinidad and Tobago	3,770	45	55	100
Chile	4,160	50	50	100
Saint Kitts and Nevis	5,170	57	43	100
Uruguay	5,170	78	22	100
Montserrat	5,893	63	37	100
Barbados	6,560	62	38	100
Anguilla	6,584	53	47	100
Argentina	8,100	45	55	100
Antigua and Barbuda	8,110	61	39	100
Bahamas	11,940	58	42	100
Canada	19,380	71	29	100
United States	26,980	44	56	100
Cayman Islands	29,309	55	45	100
Weighted average	3,289	41	59	100

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997.

TABLE 54
Composition of national health expenditure by subsector,
Latin America and the Caribbean, 1995.

Expenditure by subsector	% GDP	Percentage of total national health expenditure
Public	3.0	41.5
Central government	1.1	15.8
Local government	0.6	8.5
Social security	1.3	17.2
Private	4.3	59.5
Direct expenditure	2.9	39.0
Indirect expenditure	1.4	19.5
Total	7.3	100.0

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997.

ciency of market solutions associated with asymmetry of information relates to problems of adverse selection and moral hazard.

The absence of public policies on the certification and recertification of health service providers, nearly unrestricted sale of “controlled” medicines, and the deficiency of regulation of the quality of health services and medical practices suggest that there is suboptimality in the processes of production and consumption which affects this segment of the health services market. In addition, the lack of policies to regulate health insurance markets in most of the countries of the Region suggests that a failure in their performance affects an important part of their health markets.

Correction of market failures, of direct purchase and sale of goods and services, and of health insurance practices that lead to “perverse” behavior of both the insurers and the insured represents a new challenge for decision makers in the countries of the Region. Policies designed to correct inefficiency in allocating government health sector resources will have a limited effect on inefficiency in allocating health sector resources deriving from failures in the market.

Health expenditure by public social security institutions is the most important component of public spending, representing around 40% of total public resources, or US\$ 18,500 million. A portion of these resources would be affected by policies that privatize health funds in public social security systems. In 1995, compulsory contributions to health funds administered by private institutions (which benefit 5.2 million people) amounted to approximately US\$ 1,900 million, and represented less than 0.1% of regional GDP (3% of total public expenditure).

Health expenditures by health ministries, other ministries, and decentralized public institutions under direct control of the central government represented 1.1% of GDP (US\$ 17,500 million, or 37% of total public resources). A portion of these resources, particularly those channeled through health ministries, will be affected by financial decentralization policies. Health spending by local governments represented 0.6% of GDP, 8.5% of national health expenditure in the countries of Latin America and the Caribbean, and 23% of total public spending in these countries as a whole (see Table 54). The significance of this expenditure, however, is due to its importance in two federal republics, Argentina and Brazil, which account for more than 95% of total spending on health by local government (approximately US\$ 9,600 million). In most countries of the Region, local government spending on health amounts to little or nothing.

Central and Local Government Spending on Health

Information about the relative importance of different components of public health expenditures, the resources channeled through the central or local governments, and compulsory contributions to social security schemes illustrate the variety of public health systems and types of financing in the countries of Latin America and the Caribbean, as well as the variety of benefits provided by government health programs. This information also characterizes the scope of policy reform of State institutions in different countries: separation of the financing and provision of public services, decentralization of public institutions, cost recovery, autonomous hospital facilities, privatization of the administration of compulsory contributions to health funds, etc.

Table 55 presents indicators for health expenditures by central and local governments. These estimates include aggregated expenditure on health by the central government through the health ministries, decentralized public institutions, and public institutions that operate with their own or autonomous budgets, and spending on health by decentralized governments (provinces, states, and municipalities). In contrast to social security schemes, in which a participant's affiliation determines the benefits received, most central and local government programs are universal. Inequities in access and use of health services are due primarily to transportation costs related to the location of services, waiting times, racial and cultural barriers, and service-use quotas that have to do with cost-recovery policies or community participation in financing.

In 1995, health expenditures by central and local governments represented 60% of public spending on health. Two-thirds of those expenditures were made through institutions under central-government control, and the remaining third

by local governments. However, the overall share of spending on health by decentralized governments in Latin America as a whole is atypical of what is seen in most individual countries.

Table 55 presents per capita government health expenditures as an indicator of the benefits or contributions of government health services, revealing large disparities among countries in the Region. The regional average for per capita health expenditure by central governments was US\$ 58, with figures ranging from US\$ 3 in Haiti to more than US\$ 700 in the Cayman Islands. In the most populated countries of Latin America and the Caribbean, central and local government health expenditures fluctuated between US\$ 95 in Brazil, under US\$ 20 in Mexico and Colombia, and approximately US\$ 140 in Argentina. With the exception of Belize, Guyana, and Jamaica, government spending on health in Caribbean countries was above the average for Latin America and the Caribbean.

Spending and Coverage by Social Security Health Programs³

Table 56 provides selected indicators of public spending on health by social health insurance systems (the system of compulsory contributions to insurance funds to cover medical expenses). This category includes expenditures for both illness and maternity financed through compulsory contributions to health funds. These funds can be administered by public institutions (generally social security institutions, cooperatives, welfare, or mutual aid funds) or private ones, such as the Institutes for Collective Medical Assistance (IAMC) in Uruguay or the Institutions for Health Insurance (ISAPRE) in Chile, and are typical of public health insurance in the countries of Latin America. In the case of English-speaking Caribbean countries, which have national health service systems with universal access and free care, social security systems only provide benefits in the form of monetary contributions that are generally meant to cover lost wages associated with illness and maternity. This type of benefit is not included in health expenditure estimates. In several countries of the Region, compulsory insurance covers less than 20% of the population (see Table 56). In these countries, access of the population to health services is closely related to ability to pay.

In 1995, total spending on health by social security systems was approximately US\$ 19,500 million (1.3% of GDP). Public institutions administered more than 90% of these resources. Resources administered by private institutions totaled ap-

TABLE 55
Public health expenditure: spending on health by central and local governments, 1995.

Country	% GDP	National health expenditure (%)	Public health expenditure (%)	Expenditure per capita in 1995 US\$
Anguilla	2.70	52.8	100	178
Antigua and Barbuda	3.70	60.6	100	300
Argentina	1.71	17.4	39	139
Bahamas	2.53	58.3	100	302
Barbados	4.00	62.3	100	262
Belize	1.80	45.6	100	49
Bolivia	1.43	23.7	43	11
Brazil	2.56	33.8	100	95
Cayman Islands	2.40	54.8	100	703
Chile	0.46	5.8	12	19
Colombia	1.80	10.9	36	15
Costa Rica	0.50	5.8	8	13
Cuba	7.80	86.7	100	92
Dominica	4.00	60.3	100	120
Dominican Republic	1.51	28.6	75	22
Ecuador	0.78	15.3	47	11
El Salvador	1.18	17.1	62	19
Grenada	2.70	53.5	100	80
Guatemala	0.97	23.4	52	13
Guyana	5.21	69.1	100	31
Haiti	1.32	37.4	100	3
Honduras	2.96	40.0	81	18
Jamaica	2.43	48.6	100	37
Mexico	0.58	12.0	25	19
Montserrat	4.10	63.2	100	242
Nicaragua	4.01	43.4	69	15
Panama	3.77	40.9	53	104
Paraguay	1.02	20.3	60	17
Peru	1.46	26.4	52	34
Saint Kitts and Nevis	3.20	57.3	100	165
Saint Lucia	2.60	52.4	100	88
Saint Vincent and the Grenadines	3.50	64.1	100	80
Trinidad and Tobago	2.10	45.0	100	79
Uruguay	2.24	22.4	29	116
Venezuela	1.82	24.0	64	55
Total for Latin America and the Caribbean	1.8	24.3	60	58

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997.

³Estimates in this section summarize the results reported in Gordillo, A., Suárez, R., *Gasto en salud y cobertura de las instituciones de seguridad social en América Latina y el Caribe en 1994: metodología y fuentes de datos*. Washington, D.C.: Pan American Health Organization, Division of Health and Human Development, Public Policy and Health Program; 1997.

TABLE 56
Public health expenditure on social insurance systems, Latin America and the Caribbean, 1995.

Country	Services covered	Percentage of national health expenditure	Percentage of public health expenditure	Percentage of population covered	Per capita expenditure on social insurance systems (\$US)
Anguilla	...	...	...	...	...
Antigua and Barbuda	IM	...	...	...	...
Argentina	IM	28	61	59	375
Bahamas	X	...	...	...	...
Barbados	X	...	...	...	...
Belize	X	...	...	...	...
Bolivia	IM	31	57	19	80
Brazil	IM	...	...	...	...
Cayman Islands	...	...	...	...	...
Chile	IM	44	88	87	169
Colombia	IM	19	64	11	243
Costa Rica	IM	68	92	85	178
Cuba	IM	...	...	...	...
Dominica	IM	...	...	...	...
Dominican Republic	X	9	25	7	104
Ecuador	IM	17	53	19	64
El Salvador	IM	10	38	14	82
Grenada	X	...	...	...	...
Guatemala	IM	21	48	16	74
Guyana	X	...	...	...	...
Haiti	...	...	...	...	...
Honduras	IM	9	19	14	30
Jamaica	...	...	...	...	...
Mexico	IM	35	75	49	115
Montserrat	...	...	...	...	...
Nicaragua	IM	19	31	18	37
Panama	IM	37	47	61	153
Paraguay	IM	14	40	19	61
Peru	IM	25	48	30	105
Saint Kitts and Nevis	X	...	...	...	...
Saint Lucia	X	...	...	...	...
Saint Vincent and the Grenadines	X	...	...	...	...
Trinidad and Tobago	X	...	...	...	...
Uruguay	IM	56	71	63	461
Venezuela	IM	13	36	36	85

Note: X = Monetary contributions for illness or maternity. IM = Medical treatment or hospitalization in addition to monetary contributions for illness or maternity.

Sources: Based on data from Suárez (102), Gordillo (103), and data from Tables 52 and 54.

proximately US\$ 1,800 million. The number of beneficiaries of compulsory health insurance administered by public and private institutions was estimated at 112.3 million people, approximately 23.7% of the total population of Latin America and the Caribbean. The average expenditure per beneficiary

was estimated at US\$ 174.2 annually. However, there are large differences between the countries of Latin America and the Caribbean in terms of spending levels as a proportion of GDP and the resources spent on health that are channeled through these social insurance schemes.

Table 56 also shows a direct relationship between the share of expenditure of social health insurance schemes and levels of coverage attained by these systems. Countries with higher levels of health spending by social security systems as a proportion of GDP (approximately 3% or more) have the highest coverage levels—more than 60% of the population (as in the cases of Argentina, Chile, and Panama). Countries with relatively low expenditure levels (less than 1% of GDP) have less than 20% coverage. In the Dominican Republic, the country with the lowest level of health spending by the social security system as a proportion of GDP, coverage reached only 7% of the population. In countries with low coverage levels, access of the population to health services is closely related to ability to pay. In countries with higher coverage levels, health expenditure by social security systems is the principal component of public (more than 70%) as well as of national spending on health.

Table 56 examines the benefits received by those insured under social security systems in terms of expenditure per beneficiary. There are large differences between countries in Latin America and the Caribbean. Expenditure per beneficiary is US\$ 30 in Honduras, US\$ 375 in Argentina, and US\$ 461 in Uruguay. In Chile and Costa Rica, the two countries with the highest coverage levels, health spending per beneficiary was approximately US\$ 180. The differences are even greater if one considers that these national averages do not reflect differences between the beneficiaries of different insurance schemes, particularly in countries with many such programs, such as Argentina, Bolivia, Chile, Colombia, and Uruguay. There are also important contrasts between expenditure per beneficiary or funds administered by public institutions and those channeled through private institutions. Expenditure per beneficiary by compulsory health insurance programs administered by private institutions is almost double the amount spent by public institutions. The average expenditure per beneficiary of insurance systems administered by public social security institutions was US\$ 165, compared with US\$ 356 per beneficiary of privately administered insurance.

Characteristics of Private Spending on Health

Private spending on health (direct and indirect spending) in 1995 reached US\$ 67,142 million, which represents 59% of national expenditure on health and 4.3% of GDP in the Region. Private per capita expenditure on health was US\$ 142. Direct spending, which includes household spending to purchase health goods and services, represented two-thirds of this total. Indirect spending, that is, spending by households and businesses on private health insurance or prepaid medical schemes, made up the remaining third. The importance of indirect spending on health in the Region is due exclusively

to the weight of private indirect expenditure in Argentina and Brazil, which account for 46% and 42%, respectively, of total national private expenditure on health, and represent 50% of private expenditure in the Region. In the remaining countries, indirect spending is considerably lower, representing less than 5% of total private expenditure.⁴

Most estimates of direct spending by households were obtained from surveys of income and spending or household budgets (for estimates on the demand), and refer specifically to expenditures on goods and services to get over an illness, including paramedical and medical consultations, medicines and pharmaceutical products, hospitalization and diagnostic services, and other types of medical services. Other estimates were based on insurance company income.

These results on the relative importance of private health expenditure coincide with the low proportion of public sector spending on direct provision of health services (through ministries of health), and with the fact that less than one-fourth of the population would be “protected” with compulsory health insurance (social security, including the population covered through mandatory contributions to health funds administered by private institutions). The proportion of private spending in the countries of Latin America and the Caribbean, taken together, is similar to that of the United States, where public health insurance programs are limited, and publicly financed health insurance programs (Medicaid and Medicare) cover some 70 million people, less than 30% of the total population. The United States is the only industrialized country where private expenditure on health (direct and indirect) is the most important component of national health spending. It reached 56% of the national total for health in 1995.

The lower the income levels in countries, the higher the level of private expenditure as a proportion of national health spending. Table 57 shows that in 11 of the 21 countries with per capita incomes below the regional average (US\$ 3,289 annually), private spending is the largest component of national health expenditure. Private spending on health exceeds 50% of national health expenditure only in Argentina, Brazil, Mexico, and Trinidad and Tobago of the 12 countries in the Region with per capita incomes above the regional average. The proportion of private health spending is lower in countries with higher income levels.

⁴Part of the data on direct expenditure is taken from the database on health expenditure of the Public Policy and Health Program, Division of Health and Human Development, Pan American Health Organization, August 1997. The tables on the composition of private expenditure on health and spending according to income levels, along with the corresponding analysis, were developed in collaboration with Pamela Henderson and Fernando Montenegro. Estimates on indirect expenditures on health were based on information from Gordillo and Suárez (102, 103).

TABLE 57
Selected indicators of private health expenditures,
Latin America and the Caribbean, 1995.

Country	% of GDP	Per capita expenditure in 1995 US\$	Percentage of national health expenditures
Anguilla	2.41	159	47
Antigua and Barbuda	2.41	195	39
Argentina	5.38	436	55
Bahamas	1.81	216	42
Barbados	2.42	159	38
Belize	2.15	58	54
Bolivia	2.71	22	45
Brazil	5.01	186	66
Cayman Islands	1.98	581	45
Chile	3.96	165	50
Colombia	5.14	98	70
Costa Rica	2.26	59	26
Cuba	1.20	14	13
Dominica	2.63	79	40
Dominican Republic	3.27	48	62
Ecuador	3.45	48	68
El Salvador	5.00	81	73
Grenada	2.35	70	47
Guatemala	2.30	31	55
Guyana	2.33	14	31
Haiti	2.22	6	63
Honduras	3.75	22	51
Jamaica	2.57	39	51
Mexico	2.55	85	53
Montserrat	2.39	141	37
Nicaragua	3.46	13	37
Panama	2.04	56	22
Paraguay	3.30	56	66
Peru	2.70	62	49
Saint Kitts and Nevis	2.38	123	43
Saint Vincent and the Grenadines	1.96	45	36
Saint Lucia	2.36	80	48
Trinidad and Tobago	2.56	97	55
Uruguay	2.17	112	22
Venezuela	4.76	144	63
Regional weighted average	4.3	142	59

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997.

Differences in absolute levels of private health expenditure are closely related to country income levels. There is a positive relationship between per capita spending on health and per capita income. This coincides with empirical evidence that income elasticity of health spending is greater than 1 as implied by time series studies and cross-sectional studies. However, it is also clear that countries' per capita income levels only explain part of the difference. There are large differences in private health expenditure among relatively similar income levels. For example, in countries with per capita incomes of approximately US\$ 1,500, per capita health spending ranges from US\$ 30 to more than US\$ 110. Similar variations are found in levels of private spending on health as a proportion of GDP according to income level. Factors such as the organization of national health systems and absolute and relative levels of public sector spending on health play an important role in determining the absolute and relative levels of private expenditure on health.

Expenditure on Private Insurance and Coverage

Estimates on coverage and expenditure for private health insurance for the Latin American region as a whole are taken from 11 countries: Argentina, Bermuda, Brazil, Chile, Costa Rica, Dominican Republic, Ecuador, El Salvador, Mexico, Peru, and Uruguay. These countries represent nearly 90% of the Region's population and GDP. It is estimated that in 1995–1996, some 48 million people (11.4% of the population of the Region) had health service coverage through some type of voluntary affiliation with private health insurance or pre-paid medical plans.

Coverage through voluntary affiliation with private insurance varies considerably by country: 26% of the population in Brazil (1996), 7.5% in Argentina (1992), and 1.6% in Ecuador (1995). The level of voluntary spending on private health insurance schemes as a proportion of family income/spending varies between about 3.5% in Argentina and Brazil to less than 0.03% in Costa Rica. These figures should be considered to be minimum amounts, because they are based on only partial reports of coverage of one or two of the possible private health insurance schemes in the selected countries. The data do not distinguish the types of services covered by the different insurance schemes, which vary considerably, nor the fact that persons or families can have double coverage. The estimates on the percentage of the population covered through health insurance or medical plans, and the amount of resources channeled through different plans present major challenges to health policy. In 1995, expenditure on private health insurance plans represented 19.5% of national spending on health. This proportion is higher than the total spending on health by the central governments that is channeled

through ministries of health or other central government health institutions (15.8% of national health expenditure).

National Expenditure on Health: Trends and International Comparisons

Trends in National Health Spending: 1980, 1990, and 1995

Over the past 15 years, and especially over the last five, the most important trends in national health expenditure in countries of the Region have been the explosive growth of spending, the change in the public-private composition of national health expenditure, and the rapid expansion of spending on private insurance and in contributions toward prepaid medical schemes. In the 1980s, Latin America and the Caribbean experienced major growth in health spending and an important change in the public and private proportion of those expenditures. Between 1980 and 1990, during the so-called "lost decade," regional GDP increased by an annual average of only 1%, a level considerably lower than population growth (2.1% annually). Per capita income in the Region declined from US\$ 3,678 in 1980 to US\$ 3,299 in 1990 (in constant 1995 prices). In contrast, national health spending during the decade increased by an annual average of 2.8%. National health expenditure as a proportion of GDP increased from 5.8% in 1980 to 6.9% in 1990. In absolute terms, national spending on health increased by more than 20%—from approximately US\$ 72,800 million in 1980 to more than US\$ 95,700 million in 1990. Per capita spending on health increased from US\$ 213 in 1980 to nearly US\$ 220 in 1990 (Table 58).

The 1980s also brought important changes in the public-private composition of national health expenditures: private spending grew to 64% of total health expenditure. Between 1980 and 1990, public sector expenditure on health decreased by approximately 5% (from about US\$ 36,400 million in 1980 to US\$ 34,700 million in 1990), and in per capita terms decreased from US\$ 107 to US\$ 82. The reduction in public sector health spending during the decade was more than compensated for by the rapid increase in private expenditure, which increased by 67%, from US\$ 36,400 million in 1980 to nearly US\$ 61,000 million in 1990, or 64% of national health expenditures. The per capita ratio of private-to-public expenditure went from 1:1 in 1980 to nearly 2:1 in 1990.

The rapid growth in national health expenditure seen in the 1980s continued in the 1990s. Between 1990 and 1995, the recovery of economic growth in the countries of the Region was accompanied by an even larger increase in national expenditures on health. Economic growth over this period averaged 3.7% annually. Per capita income increased from US\$ 3,200 in 1990 to US\$ 3,300 in 1994, to a level nevertheless lower than that seen at the beginning of the 1980s

TABLE 58
Level and composition of national health expenditure in Latin America and the Caribbean, 1980, 1990, and 1995.

National health expenditure indicators	1980	1990	1995
Total national health expenditure (billions of US\$)	72.8	95.7	113.8
As % of GDP	5.8	6.9	7.3
Per capita (in US\$)	213.0	220.0	240.0
Composition (%)			
Public	46	36	41
Private	54	64	59
Total national health expenditure	100	100	100

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997. Estimates for 1980 and 1990 based on Suárez (102).

(US\$ 3,600). Over this same period, national health expenditure increased by an average of more than 4% annually, rising to US\$ 113,800 million, representing 7.3% of GDP. Per capita health spending increased from US\$ 220 in 1990 to US\$ 240 in 1995 (see Table 58).

An analysis of economic trends in the Region over the past 15 years shows that the explosion in spending on health goods and services in most countries was associated with a reduction in the relative cost of private health services (price effect) and an increase in the demand for health services (demand effect). The income effect has little significance as an explanation for the increase in health spending. In 1994, per capita income was less than that of 1980, while per capita health expenditure over the same period rose by 25%.

Increased consumption of health services is the expected result of a reduction in relative prices of health goods and services, drugs, auxiliary diagnostic services, and health service labor costs. Increased expenditure is compatible with a price demand elasticity that is greater than 1, which seems to characterize demand for health-related goods and services.⁵ This increase in demand coincides with a change in the population's preferences associated with the demand for services that is induced by providers as a strategy to hold on to their income and expand the private market for health-related goods and services. The reduction in the relative cost (price effect) of health services seems to coincide with the contin-

⁵ That is, the increase in spending on health services is consistent with a price demand elasticity for health services that is greater than 1. The increase in consumption of health services is greater than the proportion of the reduction in the price/cost of those services. There is abundant empirical evidence suggesting that values of price demand elasticity are greater than 1.

ued increase in the availability of health professionals, medical unemployment, reduction in salary levels of health personnel (particularly in the public sector), and the rapid growth of private medical practices that serve different segments of the market and income strata.

The decline in the availability and quality of public health services and the widespread introduction of fee-for-service systems have affected the relative cost of access to public services in relation to that of private services. The economic crisis most countries suffered in the 1980s resulted in a deterioration in real incomes of workers in the public health sector. The availability to charge on a fee-for-service basis and the adaptability exhibited by health sector personnel to complement low public sector salaries with income from private practice also contributed to the rapid expansion of the private market. An increasing number of these personnel combine their public functions with private practice, thus reducing the availability and quality of services of public institutions. The increased availability of private services staffed by professionals with mixed practices seems to have contributed to a relative decline in the cost of private services, strong expansion of direct and indirect health spending, and the consolidation of the private market for health-related goods and services.

The rapid increase in health expenditure and the excessive consumption of medical services coincide with the above-mentioned changes in population preferences, the absence of regulatory policies, and the failure to put into effect standards for the sale and purchase of drugs and auxiliary diagnostic services.⁶ Within the relationship between patient and service provider, the provider is able to monopolize on excesses in consumer demand, and can also direct that demand toward services that he or she has available. Data on usage patterns and expenditure on health services and the rapid increase in insurance schemes show the importance of this factor.

The estimates in Table 59 on the relative share of different components of expenditure give an idea of the magnitude of the resources that can be subject to misallocation. These failures include those of the government and the market, of direct purchase and sale of health goods and services, and of the performance of the public and private insurance market. The greatest challenge for public policy in light of spending trends is the possible excess consumption of personal health goods and services resulting from failure in the performance of this market, particularly as related to induced demand (preferences). While most industrialized countries exercise strict control over private practice and have established regu-

TABLE 59
Components of national health expenditure
as percentage of GDP, Latin America and the
Caribbean, 1980, 1990, and 1995.

Expenditure by subsector	1980	1990	1995
Public expenditure	2.7	3.1	3.0
Central and local governments	1.3	1.7	1.7
Social security	1.4	1.4	1.3
Private expenditure	3.1	3.8	4.3
Direct	3.1	3.1	2.9
Indirect	...	0.7	1.4
Total national health expenditure	5.8	6.9	7.3

Source: Estimates by Division of Health and Human Development, Public Policy and Health Program, Pan American Health Organization, November 1997. Estimates for 1980 and 1990 based on Suárez (102).

lations to resolve problems in the health service marketplace, in Latin American and Caribbean countries such regulations do not exist or are not enforced. The significance of these two effects—the price effect and the induced demand effect—will loom large as long as substantial unemployment of health personnel persists.

International Comparisons

Table 60 illustrates the growth of national health expenditure as a proportion of GDP and its public-private composition in 1980, 1990, and 1995 in the countries of Latin America and the Caribbean, the Organization for Economic Cooperation and Development (OECD) member countries, and in selected European OECD countries that, for the most part, provide universal coverage through their health systems. What stands out in the data is the relatively small difference in expenditure levels between the OECD countries and the countries of Latin America and the Caribbean, the large disparities in the public-private composition of national expenditure, and the variation in recent growth trends between 1990 and 1994–1995 in national health spending.

In 1995, the average share of national health spending as a proportion of GDP in the Latin American and Caribbean countries (7.2%) was slightly higher than that of the OECD countries in 1980 (7.1%). This proportional spending level for countries of the Region is relatively high, considering the per capita income in Latin America and the Caribbean (US\$ 3,300). In 1980, per capita income in the OECD countries was five times higher (US\$ 16,000) than that of Latin America and the Caribbean.

⁶ Inefficiency due to excessive consumption of health services results from suboptimality of consumption decisions caused by a lack of information on the costs and benefits of services consumed. Such information is necessary to assure the efficient functioning of the market in allocating resources.

TABLE 60
National health expenditures as a percentage of GDP,
1980, 1990, and 1994–1995.

Expenditure	1980	1990	1994–1995
Latin America and the Caribbean ^a			
Total, billions of 1995 US\$	72.8	95.7	113.8
% of GDP	5.8	6.9	7.3
Public	46.0	36.0	41.0
Private	54.0	64.0	59.0
OECD ^b			
Total, billions of 1995 US\$	1,035.6	1,832.3	2,123.1
% of GDP	7.2	7.9	8.4
Public	78.0	77.0	76.0
Private	22.0	23.0	24.0
European countries of the OECD			
Total, billions of 1995 US\$	440.2	665.3	696.1
% of GDP	7.1	7.6	8.0
Public	82.0	80.0	80.0
Private	18.0	20.0	20.0

^a Estimates are based on data in Table 59; IDB (data for 1990, 1993, 1996); World Bank Annual Report (New York: Oxford University Press; 1997); International Monetary Fund/International Financial Statistics (data for 1995, 1996).

^b The countries of the OECD include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Japan, Luxembourg, Mexico, New Zealand, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Arithmetic averages, except for Luxembourg, Portugal, and Turkey.

Sources: Data for the OECD refer to arithmetic averages and are taken from Oxley H and Maitland MacFarlan, *Health care reform, controlling spending and increasing efficiency*. Paris: Organization for Economic Cooperation and Development, Economics Department; 1994:60–62 (Working Papers 149). The figures for the European countries of the OECD are weighted averages based on these data (*OECD health data 97: A software for the comparative analysis of 29 health systems*, OECD Publications Services, 1997), and from the International Monetary Fund/International Financial Statistics (data for 1995, 1996).

Table 60 also reveals the large differences in the public-private composition of national health expenditure between the countries of Latin America and the Caribbean and those of the OECD. In OECD countries, public spending is the principal component of national health expenditure. In general, since the beginning of the 1980s, public spending on health in these countries represented more than three-fourths of national health expenditure. This proportion is even higher than that of the selected group of European countries. In the countries of Latin America and the Caribbean, on the other hand, private health spending during the 1980s became the principal component of total national health expenditure.

From the 1980s through the middle of the 1990s, national spending on health increased more rapidly than the rate of economic growth in both the countries of Latin America and the Caribbean and those of the OECD. However, the rapid increase in national health spending as a proportion of GDP in Latin America and the Caribbean stands in contrast with the relative stability or modest growth of health spending in the more industrialized countries. Furthermore, the data show that during the 1990s there was an explosive growth of health spending in Latin America and the Caribbean. From 1990 to 1995, while average annual health spending in the OECD countries increased by 1.1%, the increase in Latin America and the Caribbean was 3.5%.

The fact that most of these systems were financed with public resources was one of the principal concerns in the search for policies to control costs. In these countries during the 1980s and the beginning of the 1990s, health expenditure grew slightly more than the level of economic growth. In the case of the OECD countries, this dynamic seems to reflect the relative success of cost containment policies that were applied at the start of the 1980s.

In contrast with health spending trends in the OECD countries, which increased at a significantly higher pace during the years following implementation of universal coverage, skyrocketing health expenditure in the Region of the Americas is not related to more equitable access to national health systems. Few countries have made progress in achieving universal access to health services. Similarly, characteristics of the financing of national health care expenditure, particularly of private systems, explain why there is little concern for the impact of exploding health expenditure on public finances.

The tendency of national health spending to increase in the countries of Latin America and the Caribbean is similar to growth of national health spending in the United States. In Latin America and the Caribbean, as in the United States, health spending has increased at levels significantly higher than levels of economic growth. In Latin America and the Caribbean the increased expenditure occurred despite stagnant economic growth in most countries during this period.

The difference between the composition of health spending in the Region of the Americas (including the United States) and that of the OECD countries seems to explain the relative success of the latter in controlling explosive national health expenditure. While in the industrialized OECD countries (except the United States) the major part of that expenditure is channeled through public institutions, in the countries of Latin America and the Caribbean, as in the United States, the private market for health-related goods and services is the most important component. Fiscal policies that use budget ceilings to control spending have a more limited effect when the principal component of spending is private.

Challenges for Developing Health Sector Reform Policies

The information on national health spending in the Americas presented in this section serves as the basis for understanding the scale of the economic problems related to the performance of health systems in countries of the Region. Knowledge of the magnitude and composition of national health expenditure is essential for the design of public policies that address problems of efficiency and equity in the allocation of resources for the sector. Suboptimal expenditure and inequitable access to health services are some of the concerns that will have to be addressed by those who develop health policies in the countries of the Region.

State reform and modernization policies that contribute to improving the operational efficiency of health sector institutions will have only a limited effect on resolving problems of inefficiency and inequity in the allocation of resources. The limited reach of these reform policies is closely related to the structure of national health spending. Policies or processes of reform, restructuring, or modernization that are limited to reforming public health sector institutions will affect a relatively small part of total national health expenditure. When these policies are aimed at modernizing ministries of health, they have a direct effect on less than one-sixth of the total resources spent on health. Even when reforms include all of the health institutions of central and local governments (provinces, states, municipalities, etc.), as well as decentralized public institutions, they affect less than a third of the total amount of resources.

Except in countries where compulsory insurance programs for illness and maternity have relatively broad coverage (more than 60% of the population), reform policies of social security institutions will have a limited impact on correcting problems of efficiency in allocating resources and of equitable access of the population to health services. In Latin America and the Caribbean, health spending through public health insurance (principally social security) represents less than one-fifth of total national health expenditure in the Region.

Policy reforms directed at social security will have a greater impact in countries with compulsory health insurance systems that are administered by public and private institutions and have achieved high coverage (more than two-thirds of a country's total population). In these countries, public health expenditure represents approximately 70% of total health spending (Canada, Chile, Costa Rica, Panama, Uruguay).

Despite the predominance of direct private spending on health-related goods and services and the growing importance of indirect private spending in the purchase of health insurance and contributions to prepaid medical schemes, in only a few cases do health sector reform policies provide a precise definition of policy for correcting failures in the performance of these markets.

Finally, contrary to what is observed in industrialized countries, where cost containment policies or reduction in national health spending relative to growth of the economy are among the principal objectives of sector reform policy, very few countries in Latin America have shown concern for rapid growth of health spending as a proportion of GDP.

Two factors seem to explain the paradox that countries with higher incomes are more concerned with spending less on health than are countries with lower incomes. The first is the general perception that health spending in the countries of the Region is too low and is insufficient to meet the needs of the population. Second is the perception that during the years of economic recession and adjustment in the Region, national spending on health declined considerably. The argument regarding the decline in health expenditure seems to be based on the behavior of public health expenditure. The data presented in the first section indicate that the contraction of public spending during the economic crisis and the subsequent adjustment period was more than compensated for by the spectacular increase in private expenditure.

The argument that health expenditure is insufficient does not consider the balance that must exist between consumption of health-related goods and services and consumption of other goods (food, housing, education) that contribute to social and individual well-being. Without knowing the benefits of the alternative use of a dollar or resource unit spent on health programs or services, it is impossible to come to conclusions about the sufficiency or insufficiency of spending on health. From the public welfare standpoint, the optimality of levels of health or any other type of expenditure is evaluated not by the absolute level of spending but by the relative contribution to collective or individual well-being in relation to what could be achieved were those resources allocated to another use.

Some of the principal challenges facing the countries of the Region that are seeking to overcome problems of efficiency and equity in national health expenditure include the definition of the optimal levels and structure of national expenditures and investments in public health programs and personal health services, including public and private components, and the design of policies to correct government and market shortcomings that affect medical services and insurance markets.

HEALTH SYSTEMS REFORM

Impact of Economic Policies

In the early 1990s, while most of the countries in the Region of the Americas began pursuing economic policies aimed at restarting economic growth and social progress, regional and international agencies such as the United Nations Economic

Commission for Latin America and the Caribbean, the Inter-American Development Bank, and the World Bank were drawing attention to the importance of following models that would allow for economic growth with equity. This marked a major departure from the policies of the 1980s and their almost exclusive focus on reestablishing macroeconomic equilibrium.

The new priority assigned to social concerns can be seen at the macroeconomic level. Public social spending as a percentage of gross domestic product rose by 1.8% between 1990–1991 and 1994–1995. Indeed, public spending on social services (especially education and social security, as well as other, similar assistance programs) increased in many countries between 1990 and 1995. In some instances expenditures were higher than they had been in the early 1980s, before the social and economic decline began in the Region (104). In response, multilateral lending institutions made additional funds available to the countries to be earmarked for the social sectors. The countries thus faced a double challenge: giving priority to social services (and to the health sector, in particular) in their external debt portfolios, while ensuring that new projects revamped the health sector's structure and operations in order to enhance its performance.

When they analyzed the infrastructure needed to meet the increased health care demands, the countries saw a wealth of opportunities in terms of better access and quality that would become available if service delivery were to be reorganized. Accordingly, the bulk of new credits went to financing sectoral reform. Systems were reorganized, network management was upgraded, and coverage was expanded. Despite economic recovery, however, neither poverty levels nor the number of poor has fallen in the Region (105). Demand for public health care services has risen; and, according to available data, no decline in demand is likely in the foreseeable future.

As part of their efforts to combat poverty, the countries stepped up their health sector investments through social investment funds in the early 1990s. Financing came mainly from multilateral lending agencies and was supplemented by local and other international sources. Social investment funds do not finance health programs directly, but rather are targeted at upgrading the infrastructure. Available studies indicate that the resources these funds have channeled into the health sector mainly have been used to improve existing primary health care facilities or put them back into areas where most poor people are concentrated; a much smaller share has been used to build new facilities (106). The social investment funds have enhanced coordination between health ministries and local authorities in investment planning.

Consequences of State Reform

Consensus on the structural causes of the economic crisis and the scant social progress made under the policies initially

pursued for economic stabilization, adjustment, and growth has led to a more comprehensive view of the link between economic growth and development (107). Achieving sustainable environmental and human development ought to provide equal opportunities to all people to achieve their full potential as human beings, thus encouraging the commitment and participation of everyone (108, 109).

The search for such a model of human development, coupled with globalization, the spread of market economies, and other macro trends, has brought with it the need to reform the State, to enable it to promote and put into place the new paradigm. This has entailed rethinking the State's traditional structures, its role in the economy, and its relationship with civil society. The general strategy has been to free the State from all unessential duties, thus allowing it to play an effective role in the mobilization and allocation of national resources so as to achieve this type of development.

Most proposals to modernize the State have centered on redefining relationships among government, the market, and the citizenry (110, 111). Many of the other elements of the reform processes have been built around this central objective, including strengthening government's regulatory role and capacity to formulate public policy; restructuring economic relations; boosting public- and private-sector productivity and thus enhancing competitiveness; paring back social spending and targeting it towards the neediest sectors; tax reform and greater openness, efficiency, and control in public spending; decentralizing production of specific public goods and services; consolidating participatory democracy through electoral reform and stronger political parties; resizing government institutions; and involving citizens more.

Against the backdrop of prevailing inequity in the Region and long-standing shortfalls in social services, the extreme stance of privatizing public social services has encountered resistance. It is feared such privatization would not guarantee coverage for the neediest groups, and privatization's real benefits to users are not clear. This is especially true in the health sector, where there is a growing acceptance that certain core public health functions are an irrevocable responsibility of the State and are, by definition, part of the State's role as regulator and health authority. In many countries, these functions include health care delivery at public facilities or publicly financed private facilities.

Consequences of the Modernization of Civil Service

Efforts to modernize government structures in the Region have focused on building governmental capability to manage public policy. Participatory and democratic approaches have been preferred in the design, implementation, and evaluation of regulatory and productive processes in specific areas of societal interest that affect human development. Structures

need to be streamlined, the workings of government need to be revamped, and human resources need to be upgraded, if management is to become more transparent, responsible, and productive (112, 113).

Productivity, decentralization, and social participation are all needed to achieve efficiency, quality, effectiveness, and equity in the public management of social policies and, by extension, in health services. On that same basis, decentralization and community participation have been acknowledged to be essential for the framing of sector plans and policies.

The countries of the Region, then, need a new kind of public health manager, one whose role is not only service producer and administrator but also promoter, leader, and guarantor of society's participation in the adoption, implementation, and evaluation of public policies for the general well-being.

This creates a series of challenges for the Region's health systems. First, health must be considered a basic component of development and not merely as an ancillary or accessory aspect of human development. Second, universal coverage with good quality basic services must become a reality. Third, the financial and social sustainability of public health systems and services must be guaranteed. In responding to these challenges, the basic thrust of sectoral plans and policies has been the search for fairness, as made clear by most of the countries of the Region. New approaches are accordingly being adopted for resource allocation and accountability.

Effect of Labor Reform

One of the characteristics of today's industrial world is the increasingly rapid pace of technological innovation. This has contributed to the downsizing of production units, flatter management structures, employee participation in specific decision-making procedures, less concentrated and less centralized production patterns, and the outsourcing of major components of the productive process. Personnel and institutions are being called upon to adjust to market shifts and uncertainties. Production processes are becoming more flexible as well, thanks to microelectronics, new forms of productive organization, and narrower product lines geared to consumer preferences. This highly competitive atmosphere makes it increasingly necessary to provide higher quality, shorter delivery times, and better designs, all at a lower price.

Against this backdrop, the labor relations model that had prevailed into the mid-1980s went through a structural crisis. The situation has changed so much that labor and social relationships now need to be entirely rethought within the broader framework of "flexibility." Regulation, too, has moved into a new phase characterized by a flexibility in labor relations called "post-Taylorism" by some authors and "post-Fordism" by others (114).

Flexibility is a complex concept that can embrace at least two dimensions and various specific definitions (115). On the one hand, there is the so-called external (or numerical) flexibility, which applies mainly to the relationship between a company and the labor market and the expression of that relationship in employment contracts. A typical example of this flexibility is the replacement of open-ended contracts with "flexible" contracting arrangements. The other dimension is referred to as internal flexibility (i.e., technical and organizational). It has to do with staffing, the adaptability of the structuring of work, the formation of flexible work teams, and job multi-tasking. Health reform efforts in many Latin American and Caribbean countries have emphasized the first aspect, external flexibility. Accordingly, they have promoted or set up plans to institute greater flexibility in labor relations under the generic heading of "labor reform," with the stated goal of creating a better climate for investment and productivity by reducing labor costs.

The trend towards more flexible labor relations has also worked its way into the public sector's structure. Most proposals for public-sector modernization or reform are based on dismantling rules governing job stability and security in the sector, as well as regulations for hiring arrangements, advancement along career tracks, and pay and incentives. Public-sector staffing grades are being scaled down throughout the Region, and the health sector has not been immune to this process.

The institutional climate in Latin America's public sector, and especially in the health sector, has shown a certain propensity for more flexible labor relations that, in some cases, could lead to more job insecurity. But just as job stability is not always warranted, flexibility does not always create insecurity. Greater flexibility often means updating or retraining personnel, adopting new models for service delivery, and devising new compensation mechanisms. In the health sector, there are numerous examples of all these.

As a result, the social actors—especially public- and private-sector managers, professional associations, and unions—need to use negotiations to rise to new challenges, such as preventing widespread job instability while embracing the kinds and degrees of flexibility that are required to deliver better services to the public. Since human resources are a critical element in and the focus of many reform efforts, ongoing dialogue between employers and employees to find points of consensus is often a prerequisite for the proper unfolding of this process.

Health Sector Reform

By the mid-1990s, virtually every Latin American and Caribbean country had either embarked upon health sector reform or was considering doing so (116). Health sector re-

form has been defined as the introduction of substantive changes in the sector's various levels and activities, in order to achieve more equitable service delivery, more efficient management, and more effective impact, thereby meeting the population's health needs. This is an intensified transformation stage for the health systems; it is an outgrowth of conditions that both warrant it and make it feasible, and it will play itself out for a fixed period (117).

Of course, not all the countries' initiatives fully fit this definition, since there are differences in each country's specific objectives and in its breadth and pace of change. Nor is it easy to identify how far along the path of reform each country is (e.g., design, negotiation, implementation, or evaluation), when and how the passage is made from one stage to the next, and who, in practice, the main players are in each stage.

The following sections distinguish between the reform process per se and the outcomes of that process. The "process" component is examined in terms of its dynamics (phases and actors involved) and its elements (legal, organizational, financial, and other changes that have been or are being implemented).⁷ For the process's outcomes, it is important to analyze—while making allowance for the problems posed by their evaluation—the extent to which structural and functional changes have increased fairness, effectiveness and quality, efficiency, financial sustainability, and societal participation.

Dynamics of the Reform Process

Initially, the design of health sector reforms was characterized by a strong reliance on State reform processes, a predominance of strictly financial considerations, and a very limited involvement by health ministries. Subsequently, the process has come to increasingly acknowledge the complexity and specific characteristics involved, a balance between national and international players, and a certain renewal of national health authorities' leadership capabilities. This has been due, in part, to the fact that health policies and sector reform have increasingly been included in social development national plans and programs. The health sector also is beginning to be seen not merely as a "spending" sector but also as a generator of wealth. On occasion, though, health sector reforms have been launched without a careful, concrete assessment of the issues, risks, and opportunities. Rather, the process has tended

to follow global trends, without the necessary commitment and political will of the health authorities and the government.

In some nations, the basic aspects of sectoral reform were framed within a broader constitutional reform debate. In others, national reform commissions with broad mandates were set up by the president. In still others, health sector reform was treated simply as another component of the modernization of the State. Finally, in some instances, sectoral reform was built into national development plans. A few countries set up special units (often with foreign funding) to conduct preliminary studies for the design stage.

Negotiation stages also varied from country to country. In some cases, all the negotiating was done at the level of the national legislature; in others, a national reform commission with broad mandates performed this task. In almost all instances, there has been an identifiable phase of negotiation carried out within the government and another between the government and the various political and social players. At the beginning of or over the course of this stage, national authorities often have published documents to present relevant issues, objectives, strategies, and suggested actions in full or in part.

Experience has shown that, while not always easy, it is important to involve the largest possible number of political and social players in reaching agreement on the objectives, strategies, and pace of reform. This is a critical element not only before and during legislative initiatives to transform the proposed reforms into law, but also as a permanent exercise designed to build trust once the reforms have been enacted. To do this, some countries have set up advisory commissions or regularly convening national-level gatherings. There, health authorities, insurance companies, health care providers, practitioners, and users can come together and discuss priority issues and strategy options.

Implementation is a gradual process that often takes several years. This stage often must be overseen by successive administrations of different political leanings, thus reinforcing the need for ongoing forums of political and social negotiation. As can be expected, the Region presents a broad diversity of situations in this regard.

Reform was—or sought to be—quite far-reaching at times: basic health legislation was rewritten or replaced, dramatic effects were felt in other sectors, most of the health sector's own operations were affected, and public and private players had to adjust to new working relationships. In other cases, the impact was more limited, either because the area targeted was itself more limited (e.g., health care services of only one of the country's public subsystems) or because of the sector activity involved (e.g., service delivery and its performance under a new management model for hospitals operated by social security administrations). Even in this latter case, however, debate has been broad-based and there is an awareness of the potential impact of such initiatives. One

⁷This section draws heavily on an analysis of information taken from the following sources: (i) country reports submitted for the third revision of the Strategy of Health for All, 1997; (ii) country reports for *Health in the Americas*, 1998 edition, vol. II; (iii) Basic Health Indicators Series for the years 1995 to 1997; and (iv) information provided by PAHO Country Offices for the preparation of the *Baseline for the Monitoring and Evaluation of Sector Reform Processes*, PAHO, Division of Health Systems and Services Development, October 1997.

shortcoming with many initial designs was that they rarely set specific time frames to achieve all or a portion of the proposed objectives. This creates a greater risk of reduced expectations and less accountability as time goes by, and evaluation also becomes more difficult.

In some countries, health reform has been linked to new or renewed international funding. The Inter-American Development Bank and the World Bank have played a very active role over the last decade in this area, and all indications are that they will continue to do so in the future. The ministries for economic affairs have also played a key role, indicating the acknowledged importance of the social sectors, and especially the health sector, in the national economic and social life.

The health authorities, however, have not always fulfilled their duty to define national policies on sector expenditure and financing, nor priority areas for the use of international credits. The management of funded activities is often entrusted to special technical implementation units whose coordination with the health ministry has not always been smooth, at times sparking public debate on the management of such loans and the operation of these units. The trend recently has been towards a more balanced approach guided by two central ideas: (i) reforming the health sector is not a concern of that sector alone, and (ii) health ministries, as the governmental agencies specializing in health matters, should take a leadership role.

Lastly, it is worth noting that initial proposals usually do not include mechanisms to evaluate the reform's impact on health equity or on access to effective quality services, nor do they provide for monitoring the progress of the reform process itself.

The Reform Content⁸

In general, each country's constitution establishes the rights and responsibilities of the State and of the citizens in regard to health. In some cases, reform of the health sector

grew out of amendments made to the constitution; in others, it was the sector's basic policy framework that was modified, such as health laws or codes. The changes often acknowledge the number and variety of public and private players involved and attempt to reformulate their relationships. In many cases, health ministries were entirely restructured and new agencies were created, such as the health superintendencies of Argentina, Chile, and Colombia; regulations were introduced governing private health insurance; public hospitals were allowed more self-management; new approaches were devised for human resource management; and emphasis was placed on programs for vulnerable groups and for protection from the most common risks and injuries.

These changes, however, were rarely carried out in a coherent and well-articulated manner. Sometimes, preference was given to a less global, systemic strategy, which consisted of gradual steps that were intended to be scaled up later. At other times, the reform was influenced by changing political situations. In fact, only one country carried out global, sequential changes in its sector's legal framework, progressing from constitutional reform to the passage of legislation and the drafting of regulations for implementation.

Most of the countries espouse the universal right to health and attempt to fulfill that commitment through a mix of public and private insurance programs, with the State assuming responsibility for uninsured persons, especially the poor. By mid-1997, however, between 10% and 50% of the population (depending on the country) lacked regular access to basic health services or had no effective coverage. With very few exceptions, this percentage does not appear to have changed substantially since the beginning of the 1990s.

The situation is most serious, of course, for health ministries and, on occasion, provincial or state governments. They are nominally responsible for covering from 10% to 100% of the population. Social security institutions normally cover between 10% and 90% of the population, while private programs cover between 10% and 15%. One strategy to expand coverage has involved the design and implementation of publicly funded packages of basic benefits or basic health plans. Their content varies from one country to another and sometimes even within the same country. Another approach involves programs targeted to maternal and child health, occupational health, and very complex diseases.

Such "basic packages" (or "guaranteed plans") must respond to the needs and characteristics of the target population, with all the complex technical issues and costs in terms of time and money that this entails. From a political standpoint, these initiatives have usually been well received when they are perceived as extending and improving public health coverage for population groups that have little or no access to care services. The initiatives, however, have encountered resistance and generated opposition when they are seen as a

⁸In addition to Sanckiewicz's work (114), the following sources were consulted in drafting this section: (i) Caribbean Group for Cooperation in Economic Development (CGCED). *Caribbean Regional Health Study*, IDB, PAHO, Washington, DC, 1996; (ii) Convenio Hipólito Unzué. *Reforma del sector salud en el Área Andina. Memoria del Foro Subregional de Ministros de Salud de la Región Andina*, Quito, April 1996; (iii) final reports of meetings of the Ministers of Health of Central America (1995–1997); (iv) México, Poder Ejecutivo Federal. *Programa de reforma del sector salud 1995–2000*, México, DF, 1995; (v) Chile, Ministerio de Salud. *Resumen de la Primera Reunión del Grupo de Apoyo a la Reforma*, Viña del Mar, October 1996; (vi) Colombia, Ministerio de Salud. *La reforma de la seguridad social en salud*, tomos I, II y III, Santa Fe de Bogotá, 1994; (vii) Cuba, Ministerio de Salud. *Análisis del sector salud*, Havana, April 1996 (unpublished); and (viii) Paraguay, Ministerio de Salud. *Análisis del sector salud*, Asunción, March 1998.

strategy to contain public health spending through rationing and without a sound technical basis.

At the same time, the number of private insurance companies and the forms of insurance have increased, pointing to sweeping changes in a very vibrant market. Authorities must respond by providing more effective regulation of these companies and the private insurance plans they offer, as well as setting guidelines for relations between the businesses and preexisting public insurance programs. The interface between the new models of publicly funded compulsory insurance and preexisting social security programs is often a critical issue in countries with low levels of coverage. This is especially true in cases where the compulsory insurance plans are decentralized but the social security programs have maintained their centralized management structures.

There is a growing awareness that health ministries are, by definition, responsible for a series of essential public health functions, such as deciding on a basic policy framework, planning, evaluation, coordination, and promotion of intersectoral actions (118). Even countries that do not explicitly charge their health ministries with this leadership role, nevertheless assign high priority to coordination, priority-setting, and decentralization. In some cases, this responsibility to provide guidance is written into law but not carried out in practice. When health ministries and social security administrations are able to coordinate and complement each other's work, reform has progressed much more smoothly.

The public funds that health ministries manage have often been redirected in line with reform proposals, as a means of shoring up the ministries' leadership function. This has underscored the need to modernize information systems on the health situation, insurance programs, and the distribution and operation of services, adapting such systems to the specific requirements of the various decision-making authorities.

Several countries tend to separate responsibilities, with planning and leadership, insurance, financing, delivery, and evaluation functions being placed in different organizational units. Some countries have already conducted the relevant preliminary studies and negotiations, and others have made some progress in this direction. In some cases, the duties have been divided among different agencies, such as leadership and essential public health actions being placed under the ministry of health and care delivery under the social security administration. In other cases, tasks have been divided within a given agency, such as separating health insurance financing and coverage within the social security administration. Even so, the most common situation continues to be assigning the three activities of financing, insurance, and delivery to a single institution or small group of institutions that split the population according to employment status or ability to pay and offer differentiated programs for insurance and service coverage.

Decentralization is one of the elements that is present in almost all health reform proposals. Health reform has generally been a gradual process and has lacked coordination with such other social sectors as education or with efforts aimed at shifting more authority to regions or provinces. Most of the countries are still striving to clarify the roles of the central, regional, and local governments. Some nations have emphasized strengthening coordination mechanisms and management training programs in order to minimize the risks associated with local political manipulation, inadequate management capacities, and fragmentation of networks (119). Often these risks—some of which also are present in centralized models—have been cited as reasons to stop or slow down decentralization and to maintain the status quo.

Another feature of health reform in the Region has been that, even in countries with federal forms of government, social security institutions tend to be more reluctant than the health ministries themselves when it comes to decentralizing health services and transferring management to state or provincial authorities. That said, recently there have been some countries with federal forms of government where health ministry agencies and social security health programs have been simultaneously decentralized to the state or local levels.

Societal participation and control are key components in any decentralization effort, creating a commitment and involving people in their role as citizens and the community as a cornerstone of the modern State. This process also helps to shift the focus of services towards the needs of the population and the evaluation of management. Societal participation and control are present in most reform proposals, although the form differs significantly from one country to another, ranging from national health councils with varying mandates to local committees having budgetary and management authority over care facilities and programs. Precisely because these mechanisms are so varied, it is important to be able to recognize how much talk translates into actual reform. Some countries have launched programs to boost the planning and management capacities of local governments and community groups. Other countries are seeking to adapt participation arrangements to the political and administrative levels (national, regional, and local) and to the nature of the activities to be carried out (e.g., environmental health, health promotion and prevention, primary health care, specialized care).

The sources of financing and the level and focus of spending are very sensitive issues in health sector reform. National sources cover the full gamut of possibilities: government, individual, and employer contributions are pooled in different percentage mixes to cover full or partial payment for services, including full public-sector financing from general tax revenues.

The separation of tasks seen in many health sector reforms has affected sector financing in three ways. One has been the

creation of national autonomous funds outside the health ministry's sphere. These funds pool contributions from the public sector, employers, and employees in an effort to combine health spending by social security administrations with general allocations from the State. A second change has been an increase in the share of public health financing provided by the local and intermediate levels of government. A third shift is the growing presence of private financing, in the form of private insurance and various prepaid medicine schemes. In some countries, external sources support a high percentage of program operations, investments, and opportunities, while in others these sources' role has been important but not overriding.

The two main budgeting methods are historical budgeting and program budgeting. Some countries, however, use forecast budgeting, tying payments to outcomes, sometimes in association with capitation-based systems. Reform efforts seek to improve the identification and control of the various sources of revenue, while also promoting more independent budgetary management and the increased financial self-sustainability of public facilities. Two separate markets have been taking shape, subject to different and as yet incomplete regulatory frameworks. One, an insurance market, consists of compulsory, voluntary, and combined programs that cover not only treatment and care for disease but also the prevention of work-related accidents and occupational illnesses. The other is a service providers' market, made up of public, private, and combined forms.

Although most of the countries have seen an increase in overall health sector spending since the beginning of the 1990s, the exact amounts and distribution by subsector, category, and activities have yet to be calculated. This task is all the more complicated given the lack of a calculation methodology that would make it possible to draw comparisons between, or even within, countries. In any event, indications are that public spending for health has gone back up somewhat since the early 1990s, while private spending, although still accounting for the largest share, has dropped. Spending is concentrated in the major cities and is not always directly related to health needs. Payroll costs continue to account for a large portion of the expenditures. Although rising, rates of investment are still low, with hospitals representing a high percentage of the spending.

It is difficult to know exactly what impact reform has had on the volume and quality of services. Available data are incomplete, but suggest that the public-sector supply has increased at the expense of primary health care where programs are being launched or strengthened to target specific groups or provide more equitable distribution of resources, especially human resources. Public services could be reduced when reform is limited to facilitating the buying and selling of existing services. Private-sector supply appears to have grown as well, due more to a rise in the number of outpatient facili-

ties than an increase in the number of hospitals. In addition, much of the existing private supply, particularly with specialized care, continues to be underutilized in some countries. Various reform initiatives have sought to enhance the service supply by standardizing the physical infrastructure, improving maintenance, boosting the output of existing services, accrediting establishments and services, assigning staff to remote areas, and strengthening referral systems.

Programs and spending are being increasingly targeted at the more vulnerable population groups. Proper identification of these groups involves several technical and political challenges, and the criteria adopted for this purpose vary from one country to another. Aside from the groups recognized on the basis of income, specific risk, gender, and employment status, it is surprising that ethnic groups and geographical remoteness often are not explicitly included, although specific programs addressing them do exist in some countries. The proposed strategies include universal comprehensive coverage, free care for people without coverage, basic compulsory plans, and building local operating capacities. Some countries have pursued such strategies as strengthening the network for maternal and child care, providing care for workers affiliated with different types of insurance plans, and covering war veterans and victims of abuse. Some countries have conducted burden-of-disease studies in an effort to define the basic services that should be included to target or extend coverage.

It is widely acknowledged that care models are affected by demographic and epidemiological changes and by the constant upsurge in new health technologies. Attempts are being made to redefine these models by stressing comprehensive care, intersectoral coordination, outpatient care, and health prevention and promotion. In some cases, family medicine has been proposed as the best option, with emphasis being placed on projects that promote self-care and healthier lifestyles and living conditions, as well as a "healthy communities" strategy.

Management models are being redesigned with an awareness of the increase in pre-hospital care, shorter hospital stays, short-stay surgery, the use of mobile-care units, and the role of communications systems in guaranteeing the continuity of care, home care, and maintenance of the care network, as well as in the training of personnel for these new approaches to professional practice.

Most of the reforms have focused on changes in the financing and organization of care for individuals. Few of the reforms have included specific components for environmental health, thus creating a very real risk that this area might be left just at the discussion stage.

Management models display considerable variety in terms of separation of functions, competition, and complementarity. In the public sector, the idea of management contracts or agreements is spreading rapidly, and many countries have al-

ready adopted this model. Care networks are being designed to tap the full range of public and private resources available in a given area based on a joint definition of needs and on a demand-driven allocation of public funds. Some countries have authorized local or other subnational levels of government to design, implement, and evaluate health plans, and to organize or coordinate the networks in their areas. However, organizing service provider networks to guarantee the continuity of care—one of the core features of some reform proposals—is often hindered by misunderstandings and problems stemming from the various legal and administrative chains of command involved in the respective public- and private-sector institutions.

Here again, experience in the Region varies greatly. Some countries are looking at extending coverage by having trained, supervised volunteers provide basic services or by creating mobile brigades and proactive care models. Other nations are promoting efficiency by allowing patients, whenever feasible, freedom of choice in primary health care services and, at times, at the specialized level as well. There is also some experience with turning over management of one or more public health establishments (normally new hospitals) to private institutions, subject to regulation and supervision by the health authorities. One country went a step further and used an international bid process to sell public health institutions. All these experiences require careful evaluation in terms of equity, cost-effectiveness, and user satisfaction in the medium term, before they can be held up as a model to be replicated.

Training and managing personnel is a crucial element in the management models promoted by reform efforts in the Region. One of the reasons for this has been the recognition that the content and methods of traditional undergraduate training, and many graduate programs as well, are inadequate for many of the challenges posed by the new realities of health systems and services. Focus has shifted to modern public health concepts and methods, family and community medicine, the role of nurses and other health professionals besides doctors, and basic training in health economics and management. Secondly, an attempt is being made to instill greater flexibility in working relations between health personnel and their public-sector employers, including new kinds of performance incentives. Thirdly, health personnel are being reassigned, to better serve high-risk population groups or geographical areas that lack coverage. Other countries have centered their reform efforts on training auxiliary personnel and community health workers. Fourthly, graduate and continuing education programs have been inaugurated, targeting primary health care and local-level hospitals. Lastly, the topics of certification of professional qualifications, accreditation of facilities and services, continuous quality improvement, and health technology management and evaluation have moved to the forefront, as service providers diversify and health au-

thorities step back from their role as direct providers of services and assume their responsibilities to regulate markets and ensure citizens' rights.

In some countries, the traditional administrative authorization granted to provide services is being reoriented towards an evaluation of efficiency—of public and private establishments through accreditation and of health practitioners through certification—as a means of assuring quality. Although conflicts occur, work is under way to regulate the training of personnel and to design information systems for this purpose.

Greater attention is being paid to quality as perceived by the user and to humanizing care. These are often present in reform declarations and are being incorporated (albeit very slowly) into systems and facilities (120). Even so, low priority goes to designing and introducing incentives that promote continuous quality improvement. The countries have also been stepping up their initiatives in the area of quality control of food, drugs, and medical inputs; and many countries have maintained the campaigns they launched in the 1980s to promote rational drug use.

Systems to buy, distribute, control the use of, and maintain biomedical equipment and materials are in less than sound condition, and investments for new purchases and replacements are often inadequate and do not reflect actual needs. The tools of clinical epidemiology, such as clinical practice guidelines and care protocols, are rarely consulted when deciding on the incorporation, use, or phasing out of equipment, procedures, and drugs. Just as rare is an orderly evaluation of the successes and failures of the health care system. Some countries have set guidelines and appointed official agencies, such as special health-technology evaluation units, to oversee this task. And while some other nations have expressed their intent to do so, the great majority have not yet looked into this possibility.

Outcome Evaluation

Reform is not an end in and of itself; rather, it is a process that seeks to enhance the performance of health systems and services in terms of fairness, effectiveness and quality, efficiency, sustainability, and societal participation. Accordingly, outcomes should be evaluated by analyzing how changes have affected these basic categories and their most commonly accepted operating variables. Equity outcomes, for instance, should be assessed in terms of equity in access to basic health services. At least four factors contribute to the difficulty of evaluation: the inherent complexity of most of the relevant variables, weak information systems, the too few that have had reform processes under way long enough to produce a measurable impact, and the lack of a commonly accepted methodology to evaluate the results of reform.

Evaluating the results of reform must be, above all, a country-level activity. Each nation needs to define its own sets of variables and associated indicators. That said, regional benchmarks can help. Following the mandates of the Summit of the Americas (121) and of PAHO's Governing Bodies (122), and in close contact with national authorities and other technical cooperation agencies, PAHO is developing a reference framework based on five broad objectives that underlie health reform. The framework is expected to be ready at the end of 1998.

Some Provisional Conclusions

With the information available so far, some general observations can be made with regard to the dynamics, content, and, to the extent possible, results of health sector reform in Latin America and the Caribbean:

(1) Some of the reasons for reform are common to many countries, including the impact of demographic, epidemiological, and technological change; continued inequities in health conditions and access to services; inefficient management and resource allocation; quality deficiencies; and the difficulty of sustaining certain public health services. Despite these commonalities, reforms have taken diverse forms, and strategies for solutions need to consider geographic and sociological realities, administrative and cultural traditions, prevailing political and economic situations, and the widely varying levels of technology. Analyzing and exchanging experiences is indispensable in order to learn from the successes and errors of others and to compare them with one's own. There is much to be learned and dogmatic attitudes are likely to be unproductive.

(2) Health authorities should clearly state the long-term general objectives of reform programs, as well as the specific objectives of each of the stages. This is not always done, even though it is essential to the leadership role and to evaluating the impact of reform. Experience appears to validate strategies that combine clarity and high aspirations in the design of overall objectives with sound judgement in setting realistic intermediate objectives that can be evaluated and whose attainment provides feedback for the process. Also, objectives need to be described in detail in order to build consensus among all the players involved.

(3) The political and technical linkage of all actors, both external and internal, in the reform process needs to be assured. Recognizing the important role taken by external players in many cases, some countries have set up forums for consensus-building and discussion. Such forums are sometimes organized at two different levels, one that is mainly political and the other that provides secretariat or technical support. This makes it possible to progressively validate strategies and

actions and minimize the lack of coordination between the various cooperating agencies.

(4) Information systems are a crucial resource for policy-makers and the general public, for public and private insurers, and for managers of care-delivery facilities. In each of these three groups, weaknesses have been observed that need to be corrected before health systems can be overhauled. For instance, proposals to design basic service packages, introduce competition in the insurance industry, or launch hospital self-management programs could end up being both costly and risky without adequate information systems and staff trained in their operation.

(5) Most of the countries are either in the design or negotiation stage, or they have already launched reform programs but have not yet evaluated their impact or explicitly acknowledged their plans to do so. Despite the argument that the projects have not had enough time to mature, such a situation can represent a serious limitation in the medium term.

(6) Reform has generally focused on the financing and organization of health care services. Very few of the reform processes have sought—from the beginning and with the necessary emphasis—to strengthen the essential functions that fall to the health authorities. Once the emergency needs of the cholera outbreaks of the early 1990s had passed, intersectoral coordination with environmental health authorities was left at the talking stage in many countries.

(7) While taking various forms and occurring in differing degrees, the increased presence of the private sector in health insurance and care delivery offers a broad range of opportunities and challenges that need to be addressed. Having more players does not mean a reduced presence for the public sector, but rather different ways of conceiving and exercising that presence. Strategies should focus on regulation, reallocating public funds in support of equity, accreditation and certification, fostering citizens' participation, improving quality, coordinating services among providers, and evaluating outcomes.

(8) New legislation, a basic tool of a State in which the rule of law prevails, is often a prerequisite to health reform. Such new laws, however, are not sufficient in and of themselves to bring about health reform. Technical and political considerations must be analyzed in detail in order to construct the most likely scenarios for the future and to forge crucial alliances to make them viable. This is particularly important when updating health legislation and sanitary codes, since reform in this area touches on citizens' fundamental rights and the basic conditions under which health professionals work.

Reform needs to reflect society's true aspirations and should be explained in clear terms that can be understood by the entire population. This calls for very active policies of public information, education, and linkage with the various social players and the media, as well as conflict-management skills. Even the best technical and political proposal will cause

conflict at some point, and it will ultimately fail if it cannot generate adequate and continued public support.

Lastly, it bears repeating that health sector reform is a policy of the State and, accordingly, it lies beyond the sphere of political alliances in any given administration or among sectoral authorities. This is one reason why health sector reform is so complex and why good judgement should be applied in pursuing such reform. At the same time, health sector reform is a process that needs to draw on its own experience and from the lessons of others in order to correct and, to the extent possible, prevent mistakes.

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V. TECHNICAL AND FINANCIAL EXTERNAL COOPERATION ON HEALTH

This section covers external cooperation in health in the Region of the Americas, including bilateral and multilateral cooperation and cooperation provided by non-governmental organizations.

In 1994, with support from the Carnegie Corporation and the Rockefeller Foundation, PAHO conducted a study of technical cooperation in 16 countries within five of PAHO's six regions. The study showed a proliferation of institutions and other players engaged in technical and financial cooperation within the health sector. It also pointed up the fact that governments are limited in their ability to establish priorities and secure the means to act on them. Lack of oversight and evaluation mechanisms in the technical cooperation process also was evident. In further work, PAHO collaborated with nine countries in analyzing how international technical cooperation on health is managed, an analysis that included identifying players and processes.

The technical cooperation model has evolved over the years. In the 1940–1950 period, the emphasis was on a north-south vector, whereby the richer countries, with greater technical expertise, provided aid for the poorer countries. Since then, the model has shifted to a view of cooperation as a mutual exchange, whereby all countries, regardless of size and level of development, can profit from sharing experiences and knowledge with one another.

The current view holds that the basic aim of technical cooperation is to develop human resources and increase institutional capabilities. This view's key concept is sustainable development, with an emphasis on three basic elements: the formation of human capital, participation by the private sector and civil society, and environmental protection.

Trends in technical cooperation on health in the Americas during the 1990s include:

- Arriving at a critical mass in terms of individual countries' capabilities to deal with health issues on their own. This development would be reflected both in a greater number of

courses and seminars being given within the countries and in a decreasing demand for scholarships abroad.

- Decreased demand for short-term consultancies and better prospects for opportunities to share experiences and to learn about alternative solutions to shared problems. This is a result of the development of capabilities at a national level, as well as greater ease in accessing information electronically.

- The emergence of multiple providers of international resources for the health sector. This is a result of the fact that multilateral funding organizations have adopted policies that favor the social sectors for development investments.

- The appearance of multiple health-sector players on the national level as a result of incorporating democratization and decentralization as criteria in setting priorities and in formulating cooperation requests.

- Intensification of the intersectoral nature of health programs and projects. This is due to a recognition of the impact that factors outside the health sector have within the sector.

- Increased emphasis on the responsibility of national institutions in coordinating external cooperation efforts.

- A decision by the Member States to reform the United Nations system to increase the impact of cooperation for development and reduce inefficiency due to duplication of efforts. Interagency coordination, which is one of the basic elements of this reform, aims to provide a common framework for cooperation, assuring equitable distribution of resources and preventing waste.

EXTERNAL COOPERATION

Official Development Assistance

Development assistance complements developing countries' public and private domestic resources and their international earnings and investments.

The Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD)¹ was created to secure added resources for developing countries and to improve the effectiveness of these resources. The amount and nature of the contributions, as well as the principles that guide them are periodically reviewed.

DAC's most recent development strategy entails a global effort to improve the quality of life by attaining specific, measurable goals in terms of economic well-being, social development, and environmental sustainability and regeneration within a specific time frame.

It is within the framework of the social development goal that health becomes an important objective, particularly basic health care and family planning. Based on commitments agreed upon at the Cairo Conference on Population and Development in 1994, the Copenhagen Summit on Social Development in 1995, and the Beijing Conference on Women in 1995, DAC's goals for health are to reduce infant and child mortality rates by two-thirds from the 1990 level and to reduce maternal mortality by three-fourths by 2015, as well as to provide access through the primary health care system to reproductive health services for all individuals of appropriate ages, including safe and reliable family planning methods, also by 2015 (*1*). In addition, established in the Rio Conference, the need to move forward in the national strategies for sustainable development calls for supporting environmental actions that also have an impact on health.

DAC countries selected these goals because they considered it important to rely on conclusions that emerged from important international conferences where developing countries had actively participated. In this way, they wished to establish a global framework for dialogue and to foster participatory partnerships with locally owned sustainable development initiatives. The partnership strategy's main goal focuses on the developing country, ensuring that there will be a country-based review of the development cooperation, a country-based coordination of participatory development and good governance, and capacity development. Partnerships will be developed on the basis of a country-by-country dialogue that respects the ideas of the developing country and the opinions of its people, thereby avoiding a top-down, donor-driven approach. This approach also seeks to decentralize decision-making from donor-country capitals to donor-country embassies in the developing countries.

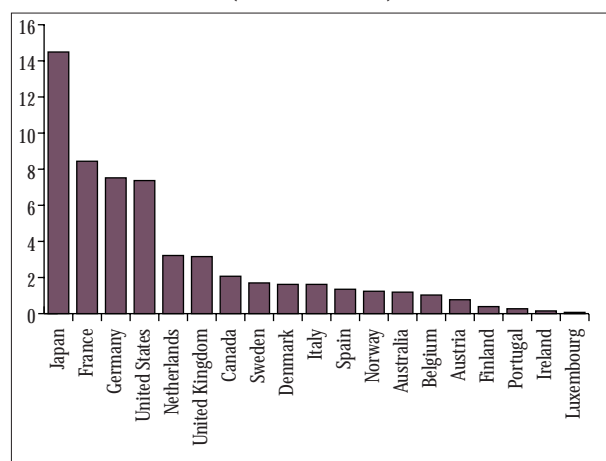
Although the flow of resources to developing countries continues to grow, the volume of official development assistance

(ODA) to poor countries is shrinking. The volume of private resources going to growing and dynamic economies that are able to attract capital is increasing, however. The overview presented to the Thirty-Fourth High-Level Meeting of the Development Assistance Committee in May 1996 stressed the need for the international community to sustain and increase the volume of official development assistance, in order to reverse the growing marginalization experienced by the poor and achieve progress toward realistic human development goals. Moreover, it was stated that domestic concerns notwithstanding, DAC member countries should not jeopardize the international development effort.

Trends in Official Development Assistance

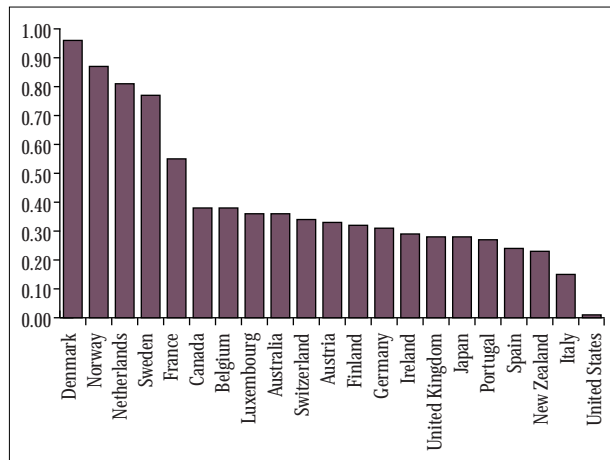
Even though DAC member countries are in agreement about the above-mentioned principles, in reality there was a 9% reduction (at 1994 prices and exchanges) in ODA between 1994 and 1995. Total ODA receipts amounted to US\$ 54.9 billion in 1995, compared to US\$ 60.5 in 1994 (*2*). The United States decreased its ODA allocation the most; after having been the world's leading aid donor for 40 years, it now has taken fourth place in absolute terms (see Figure 1). The largest ODA contributor is Japan, with US\$ 14.5 billion, followed by France and Germany; Japan's ODA is expected to be cut by 10% in 1998, however. Moreover, the ratio of ODA to GNP was only 0.27% in 1997. As shown on Figure 2, only four DAC member countries—Denmark, the Kingdom of the Netherlands, Norway, and Sweden—have consistently met the 0.7% GNP target as an appropriate level for ODA.

FIGURE 1
Net Official Development Assistance (ODA) in 1995, by
Development Assistance Committee (DAC)
(in US\$ billions).



¹ DAC members are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, the United States, and the European Union.

FIGURE 2
Net official development assistance (ODA) in 1995, by DAC country, as a percentage of GNP.



Total DAC official development assistance to multilateral institutions increased from an average of US\$ 14.8 billion in 1981–1982 to US\$ 15.8 billion in 1994–1995. The only absolute and relative increase took place in the contribution of the European Union, which went from US\$ 2.8 billion to US\$ 4.7 billion during that same period. United Nations institutions received an average of about US\$ 4.0 billion from DAC countries in 1994–1995, which represents about 6.8% of the total average ODA receipts in the same period.

Official Development Assistance for Health

Data on the allocation of ODA by sector shows that education receives the largest share, accounting for 16% to 18% of aid, while assistance for water supply and sanitation is around 8%. The only social sector where spending has not increased in recent years is health, accounting for only 5%–6% of total bilateral sector aid (3). Figure 3 shows the percentage of overall assistance that each DAC country allocates to health and population.

Geographical Distribution of Official Development Assistance

The geographical distribution of aid reflects the fiscal constraints of donors, as well as the comparative needs of the various continents. The largest recipient of total ODA in the world is Africa, with about 40%, followed by Asia, with about 30%. The Americas receive 12% of bilateral aid and 10% of total aid, with the largest recipients in the Region being Bolivia, Nicaragua, Haiti, and Peru, each with an average of US\$ 0.5 billion per year in net ODA (3).

FIGURE 3
Aid for health and population as a percentage of total aid.

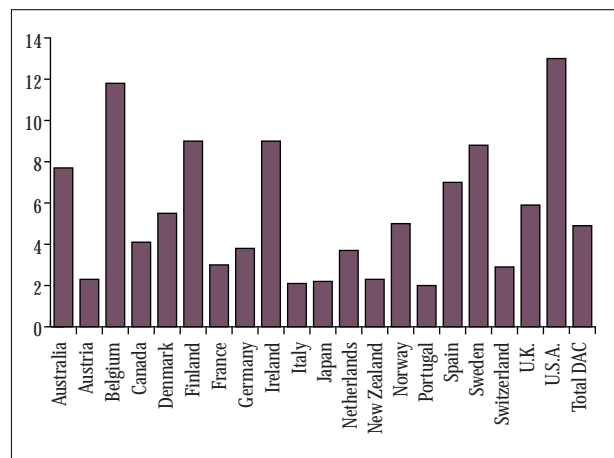


Figure 4 shows the distribution of total net ODA from DAC countries, multilateral organizations, and Arab countries in Latin America and the Caribbean, by subregion. Clearly, the Andean Subregion receives the highest absolute amounts of ODA, at a level of US\$ 3.5 billion during the 1992–1995 period, followed by Central America with around US\$ 2 billion. Regional projects received US\$ 500 million annually. In terms of percentages, the Andean Subregion received about 42% of total ODA in 1995, Central America, 23%; the Caribbean, 18%; the Southern Cone, 11%; and regional projects, 6%.

It is important to note that various DAC countries show different degrees of interest in the Americas. For example, whereas for Spain ODA for Latin America and the Caribbean represents more than one-half of total aid, for Australia it only represents 0.1% (see Figure 5) (3). In terms of percentages, the highest

FIGURE 4
Total net official development assistance (ODA) to Latin America and the Caribbean, by subregion.

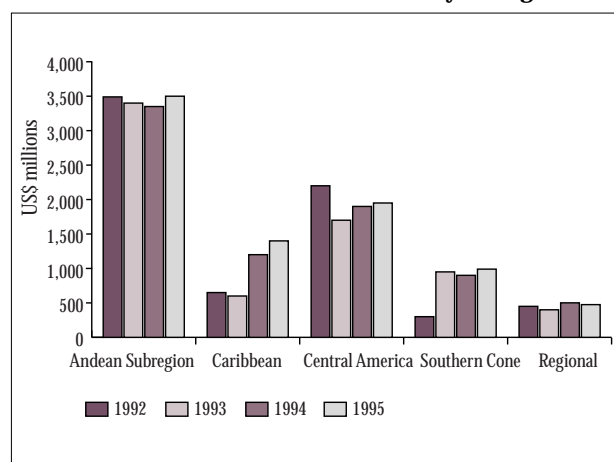
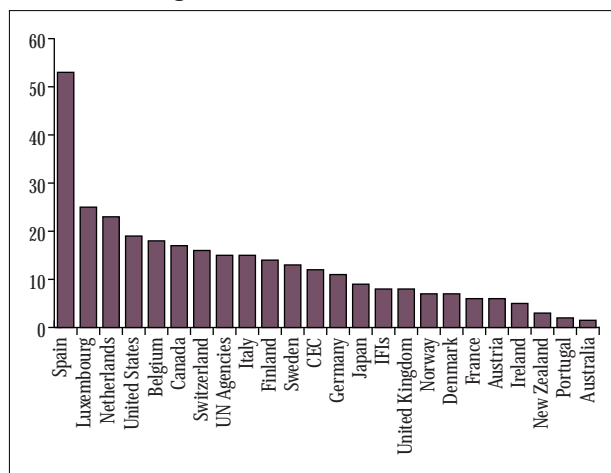


FIGURE 5
Percentage of total gross disbursements of official development assistance (ODA) by DAC country and multi-lateral donor organization to Latin America and Caribbean.



donors to Latin America and the Caribbean are Spain, followed by Luxembourg, the Netherlands, and the United States.

Figure 6 shows, however, that the largest absolute amounts of ODA come from Japan, followed by the United States, Germany, the Netherlands, France, and Spain.

Geographical Distribution of Official Development Assistance for Health

Figure 7 shows the 10 countries with the highest proportion of ODA destined to health and to water and sanitation in 1995—Argentina, Paraguay, and Saint Vincent and the Grenadines are above 50%. In many countries of the Region, however, there was no ODA going to health concerns.

Figure 8 shows the 11 countries with the highest share of ODA going to health alone. Argentina continues to rank first, followed by Montserrat, Haiti, and Suriname. Clearly, the percentages are considerably lower once the water and sanitation component is taken out.

Finally, Figure 9 shows the countries where the increase in the percentage of assistance going to health and to water and sanitation was highest during the 1991–1995 period. Paraguay moved from virtually zero to slightly more than 60% (mainly for the water and sanitation component), followed by Argentina and Saint Vincent and the Grenadines.

As seen previously, the largest recipients of total ODA in Latin America were Bolivia, Nicaragua, Haiti, and Peru, which is explained by their condition as least developed in the Region. This clearly is not reflected in the allocation to health, however. Worldwide, bilateral ODA for health accounts for only 5% to 6% of the total, yet 11 countries in the Americas

FIGURE 6
Percentage and absolute distribution of official development assistance (ODA) to Latin American and the Caribbean, by donor (1994–1995 average).

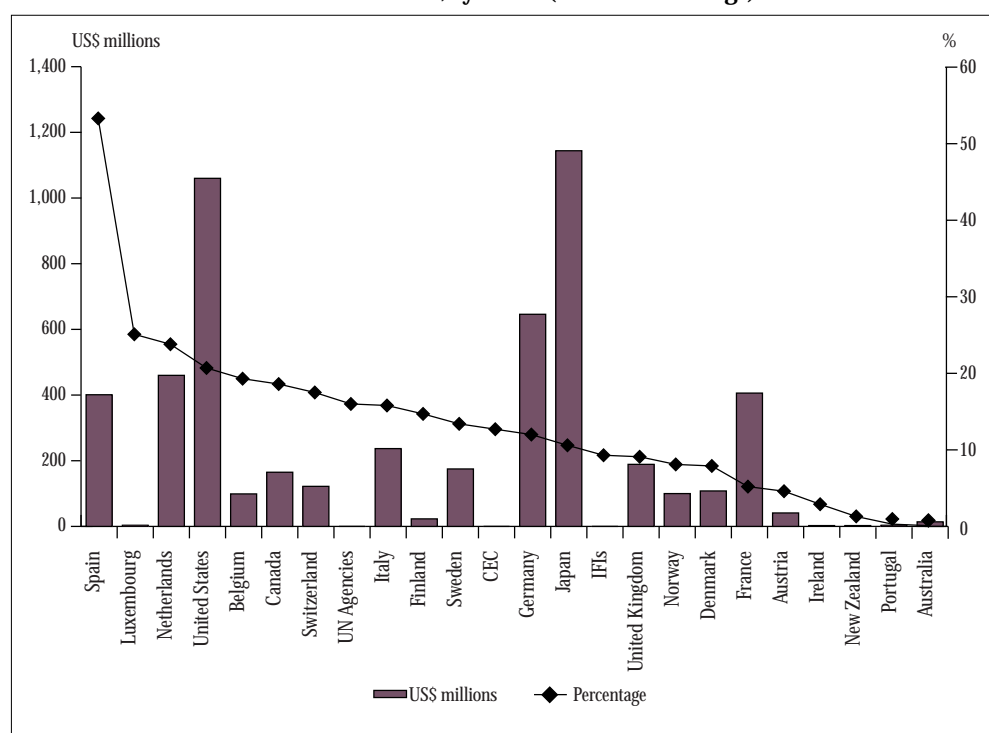
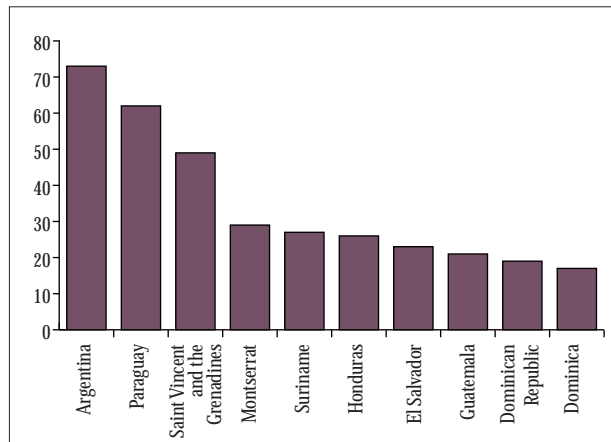


FIGURE 7
Countries with highest proportion of official development assistance (ODA) designated for health and water in 1995.



receive well above that average. Despite this fact, an increase in ODA for health to relatively poor countries in the Americas would be a crucial complement to the already high levels of ODA for education.

Resources from International Financial Institutions

Regional development banks as well as the Latin American and the Caribbean branch of the World Bank group remain as important suppliers of resources to the health sector in the Region, mainly through loans. The trend toward supporting improvements in the quality of services, mainly through sup-

FIGURE 8
Countries with the highest share of official development assistance (ODA) in health in 1995.

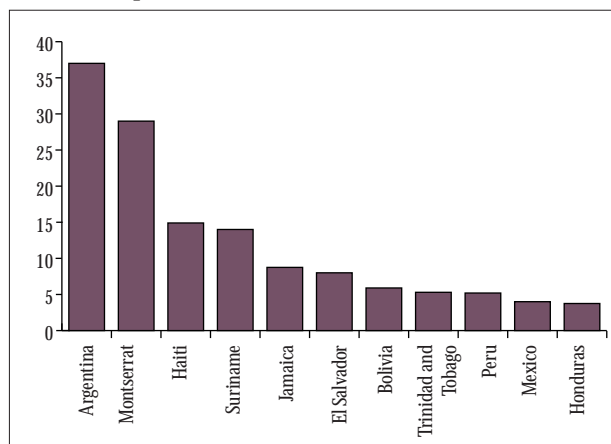
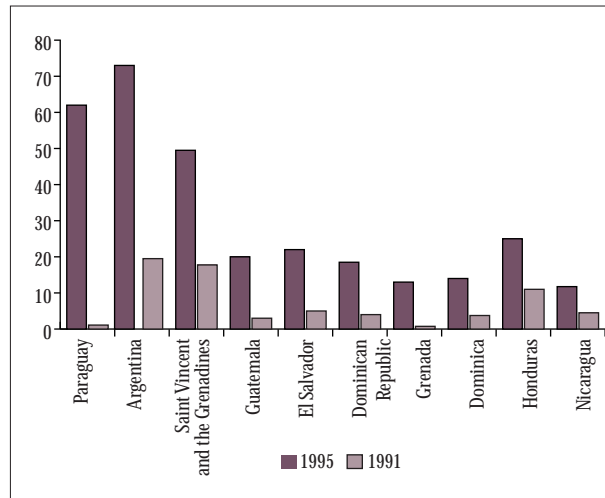


FIGURE 9
Countries with the highest increase in share of official development assistance (ODA) designated for health and water between 1991 and 1995.



port of State reforms and health sector reforms, in particular, has led to a shift away from the traditional projects that dealt with infrastructure and buildings and toward projects that deal with such issues as institutional strengthening and decentralization. The latter have traditionally been associated with technical cooperation services provided by other institutions, such as PAHO. This evolution is more apparent in the larger institutions such as the Inter-American Development Bank and the World Bank than in smaller, subregional ones such as the Caribbean Development Bank or the Central American Bank for Economic Integration.

The Inter-American Development Bank

The Inter-American Development Bank (IDB) continues to pursue its policies of support to the social sector (one of whose pillars is health) as mandated in its eighth capital repossession. Social equity considerations, a major social sector concern, have guided loans to sectoral reform programs designed to improve resource allocations within the countries and to counteract the services' inefficiency and lack of efficacy.

About US\$ 4.3 billion spread in 49 different loans were approved for the health sector between 1992 and 1996; 19 countries negotiated loans. These loans range in value from US\$ 650 million in Brazil to US\$ 425,000 in Nicaragua. On an aggregate basis for the 1992–1996 period, Brazil, with US\$ 1.6 billion, was the greatest borrower, and Honduras, with US\$ 298,000, the smallest. In terms of number of projects, Brazil

also headed the list, with 9. The average loan was for US\$ 87 million.

IDB's total portfolio of health and environment loans from 1992 to 1996 has undergone some change. Although the value of the yearly approvals has remained constant at around \$1 billion, the sectoral percentage of the total loan portfolio increased from a 10% level to an average of 15% in the period, reaching more than 20% in 1993. As noted previously, the proportion of loans allocated to health, rather than to water and sanitation, has increased significantly in the past few years, going from under 10% in 1994 to more than 40% in 1996. These trends are expected to continue into the next four years.

Caribbean Development Bank

Almost all of the Bank's investments are allocated to sanitation. It should be borne in mind that these data reflect a statistical classification that excludes multidisciplinary activities (which are handled separately). Thus, loans in disaster rehabilitation, which usually contain a health element that is difficult to specify, are not included. The Bank's more active role in the sectoral reform process in the Caribbean should be reflected eventually in its loan portfolio.

The World Bank Group

The World Bank Group has pursued an important role in support of reform strategies in Latin America and the Caribbean. In this regard, its assistance to the health sector in the Region focuses on the following three key areas:

1. Improving health outcomes for the poor by supporting programs that improve the equity and access to a range of preventive and clinical services; enhancing efficiency in the use of scarce resources, particularly by encouraging competition and decentralization; improving the effectiveness of interventions through such approaches as the design of basic preventive and clinical packages; and raising the quality of care through curriculum reforms in medical schools, training, and accreditation systems.
2. Fostering a balanced public/private mix that involves greater private sector participation in areas such as cofinancing, management, public sector service contracts, and trusts (for example, the transformation of public hospitals into autonomous institutions).
3. Improving health care financing through approaches that pool risk, secure sustainable sources of financing, contain costs, balance health budgets, and allocate resources according to priorities.

The World Bank's sector work and lending portfolio, which reflects the focus on these three key areas, has grown considerably in the past decade. At the beginning of fiscal year 1997, the Bank had 30 active health projects in 18 countries, for a total amount of US\$ 2.5 billion. The average loan was for US\$ 84.8 million, a figure remarkably similar to IDB's. Loan values ranged from US\$ 310 million in Mexico to US\$ 11 million in Nicaragua. The biggest borrowers were Argentina (US\$ 691 million) and Brazil (US\$ 677). In terms of number of loans, Argentina has received the most (6), followed by Brazil and Venezuela (3 each).

Between 1993 and 1997, loans for health for Latin America and the Caribbean have represented an average of about 30% percent of total health, nutrition, and population lending in the Bank as a whole. Brazil and Argentina are the second and fourth largest clients of the Bank in loans for health worldwide.

The health, nutrition, and population portfolio in Latin America and the Caribbean is varied, supporting interventions targeted to poor and vulnerable groups (including projects on maternal and child health, endemic disease and AIDS control, and nutrition) designed to enhance the performance of health care systems (particularly by rebalancing the public and private interface and strengthening ministries of health and social security institutes) and intended to secure sustainable health care financing (through, for example, more attention to adjustment operations aimed at reforming social insurance systems).

Actual Status and Trends in Cooperation with the European Union

The development program of the European Union (EU) aims to achieve sustainable economic progress and social equilibrium, objectives that underlie the framework of the EU itself. Article 129 of the Treaty of Maastricht stipulates that health considerations should form a constituent part of the Union's other policies.

The EU's support to the health sector in Latin America and the Caribbean is rapidly increasing. The health sector's share of all EU aid in 1995 amounted to 6%, and it is expected to approximate 9% in 1996. In addition, many of the EU's rural development programs include health-related components, such as water and sanitation and infrastructure improvements.

The total amount disbursed to the health sector in 1995 was ECU 54.5 million, mainly directed to Central America (ECU 27 million for specific local health projects and ECU 21 million for subregional projects).

As part of the framework to enhance cooperation between the EU and the Americas, the countries have agreed to establish a global warning system and response network for communicable diseases. Furthermore, initiatives have been

launched to foster bilateral cooperation as well as cooperation with international organizations on such issues as AIDS, cancer, and drug addiction. Many of the European Union's development efforts are executed through nongovernmental organizations.

The European Union has given health and AIDS special attention, focusing on prevention, the strengthening of health services, the socioeconomic impact of the epidemic, and scientific training. Major programs were adopted in 1995, particularly regarding the incorporation of the STD/HIV/AIDS strategy into the health systems. Attention also has been given to decentralizing the health systems.

The European Union's humanitarian office, ECHO, holds a special place in the aid policy. ECHO plans, implements, finances, monitors, and evaluates humanitarian aid operations. In 1995, 96% of ECHO's work dealt with man-made disasters, and the remaining 4% dealt with epidemics or natural disasters and their prevention.

International and National Nongovernmental Organizations

Over the past two decades, wide-ranging changes in the Americas have forced bilateral and multilateral cooperation institutions and nongovernmental organizations to reevaluate development practices and processes. For example, a growing number of international development agencies and government policymakers have come to recognize that larger-scale health and development work is more likely to succeed if civil society is strong and the average citizen can participate in the development processes.

In many of the Hemisphere's countries, nongovernmental and community organizations are searching for ways to have a greater interaction with the State, as well as to have their voices heard when national policies are developed, planned, and executed. As a way to make the partnership between governments and NGOs more effective for improving the population's health status and living conditions, the following strategies will be pursued: seek better ways to provide technical cooperation and program support in key areas such as primary health care; promote and support the exchange of information and experiences between governments and NGOs and among NGOs themselves through the formation of networks; link government and NGO services in order to avoid duplication and waste of resources; and provide technical training and develop national action plans for government-NGO collaboration by using small-scale success stories as examples for full-scale application. More recently, the trend has been to support Member States in their efforts to engage NGOs in an active analysis of the evolving national health reform.

The Changing Face of International Assistance Channeled through NGOs

The increased flow of international assistance that is currently being channeled through NGOs testifies to the growing importance of these organizations. Total development aid disbursed by international NGOs for developing countries increased from US\$ 0.9 billion in 1970 to more than US\$ 7.6 billion in 1992. It is now estimated that more than 15% of total official development assistance is channeled through NGOs, and, of a total of US\$ 4.7 billion destined for health, 22.9%, or \$1.1 billion, was directed through NGOs worldwide in 1990. In terms of emergency assistance, US\$ 11 billion is now being channeled through NGOs, compared to between US\$ 7 billion and US\$ 8 billion through the United Nations and its related agencies (4).

In general, donors have been interested in those nongovernmental organizations that have engaged in disaster relief and provision of services, service provider organizations specializing in training and technical assistance, and organizations performing development functions, conducting research and information exchange, networking, and providing advocacy services (5).

USAID Financing Trends Relating to NGOs

According to the USAID Budget Office, official United States development assistance funds programmed through NGOs, including US-based private voluntary organizations, rose from 27.7% in fiscal year 1994 to an estimated 33.9% percent in 1996. In 1994 and 1995, more than one-third of USAID child survival funds for immunization, oral rehydration supplies, and food and nutrition were provided to NGOs in the United States, which, in turn, are increasingly working with other NGOs in the Region (6). These figures reflect Vice-President Al Gore's statement issued during the 1995 Social Summit, committing the United States to channel up to 40% percent of USAID development assistance funds through private voluntary organizations/NGOs within five years. Even though overall funding for development programs has decreased over time, NGOs are receiving a larger share of the total.

Cofinancing: The European Union's Approach to Working with NGOs

The European Union maintains its respect for NGOs' pluralism, independence, and the specific nature of their activities. As a result, cofinancing of project activities is used as a flexible instrument without any economic and political interest. Between 1976 and 1994, the European Union cofinanced

6,178 projects with NGOs in developing countries, totaling ECU 935,000,000, of which ECU 306,651,421 (33%) were for activities in Latin America (7).

Work of Multilateral Lending Institutions with NGOs

Many multilateral lending institutions also have created special units to deal with NGOs and have set up new ways to fund their work.

According to figures submitted to PAHO from a 1997 World Bank study, between 1986 and 1994, 22.8% of all projects supported by the World Bank included NGOs as stakeholders. For 1995 and 1996, this figure climbed to 42% and 48%, respectively, dipping slightly to 46% by August 1997. In 1995, NGOs participated in 75% of all projects pertaining to population, health, and nutrition, a figure that dropped to 57% in 1996 before rising again to 60% in 1997. In addition, between 1986 and 1994, only 16% of projects related to water supply and sanitation incorporated NGOs, but this figure rose dramatically to 55% in 1995, 67% in 1996, and 69% in 1997.

The changing face of international cooperation also is reflected in the World Bank's significantly increased work in the project design and implementation process with nongovernmental organizations—such as community-based organizations and national and international nongovernmental organizations. In 1994, 41% of all World Bank projects incorporated the views of community-based organizations, rising to 68% in 1997. Cooperation with national NGOs has hovered around 75% of Bank projects, while dialogue with international NGOs has risen steadily from 11% in 1994 to 18% in 1995, and 20% by 1997.

American Foundations and International Cooperation

To date, there are 38,807 foundations in the United States, all of which act as donors. All told, they contributed an estimated of US\$ 10 billion to nonprofit organizations in 1996. That year, roughly 11% of the total of donations were directed to foreign and international activities (the amount of money contributed for health programs in the countries of the Americas is dramatically lower, however).

The area of health can be divided into four narrower categories—general and rehabilitative, mental health, medical research, and specific diseases or disorders. In 1996, these combined categories captured 17.3% of grant dollars, ranking health funding as the second highest after education among U.S. giving priorities. Yet, although the dollar share of funding for health has fluctuated in recent years, the share of number of grants has remained fairly constant, ranging from 12% to more than 13% of all grants in the Americas.

Given these facts, PAHO must strengthen its relationship with several United States foundations, in order to enlist their support for health projects in Latin America and the Caribbean. As a way to further enhance the collaboration of United States foundations, PAHO also must promote those programs or actions that are undertaken from within the U.S., such as border problems and migrant workers' health.

TECHNICAL COOPERATION AMONG COUNTRIES

In 1998, the Buenos Aires Plan of Action to Promote and Implement Technical Cooperation Among Developing Countries, which came out of the UN General Assembly, will mark its twentieth anniversary. Through the Plan's implementation, Brazil, Chile, and Colombia advanced in establishing national systems for external cooperation; Argentina and Mexico set up international cooperation organizations or secured funds to finance them; and Peru and Venezuela are exploring the creation of such institutions.

As economic integration processes in a world of globalization tend to blur national boundaries, cooperation between countries becomes a foreign policy tool that serves to reaffirm a country's identity, regardless of its size or stage of development. As a result, entities charged with the coordination of technical cooperation tend to move out of the aegis of ministries or offices of planning and into the purview of foreign ministries.

Starting with the 1988–1989 biennium, PAHO put a financing mechanism in place to stimulate technical cooperation between countries. For the first time it allocated an amount beyond the maximum authorized in the country programs budget, using the Technical Cooperation among Countries (TCC) item in regional funds. TCC monies can be allocated in response to proposals that are submitted by two or more countries and fulfill the relevant requirements.

Technical Cooperation among Neighboring Countries

Technical cooperation projects and activities among neighboring countries are designed to respond to health needs along border areas. Activities target the prevention, monitoring, and control of emerging and re-emerging communicable diseases, and at developing local health systems. These programs are usually based on local priorities and on bilateral commitments that are often supported by signed accords.

During the 1995–1998 period, practically all the Region's countries received support from PAHO to organize at least one such project with one or more neighboring countries. Some of these projects are:

- Cooperation between Colombia and Venezuela to prevent and control Venezuelan equine encephalitis.
- Cooperation between Bolivia and Brazil to prevent and control communicable diseases, particularly malaria along the border.
- Cooperation among most Central American countries to coordinate the surveillance and control of cholera and other vaccine-preventable diseases, monitor environmental sanitation, and, in some cases, create health service networks on both sides of a border.

Technical Cooperation among Countries in the Same Subregion

Technical projects and activities between countries that are geographically close but do not necessarily share a border aim to share experiences regarding health sector reform, share knowledge of innovative ways to decentralize and coordinate regulations in the interest of integration, and correlate drug registries and human resources development. These activities are based on national and subregional priorities, some of which have been set by official agencies involved with issues of economic integration. Some examples:

- Cooperation among Andean Area countries to set up an Andean drug registry. The goal is to facilitate trade in medications of proven safety and efficacy, while coordinating drug requirements and regulations.
- Cooperation among Caribbean Basin countries to set up shared tertiary care services and to exchange experiences in areas that are critical for strengthening health care, such as nursing services and drug supply systems.
- Cooperation among Central American countries for the control of environmental risks, such as excessive pesticide use.

Cooperation among Southern Cone countries to eliminate vector-borne and blood-borne transmission of the causal agent of Chagas' disease.

Scientific and Technical Cooperation among Countries

Projects include cooperation among countries in science and technology areas that are of common interest, timely, or very specific (for example, the transfer of diagnostic laboratory techniques); joint projects for strategic technical cooperation (for example, research and development for biological products, especially some vaccines); and other

cutting-edge technologies, such as the creation of systems for the maintenance of biomedical equipment. Projects include the following:

- Cooperation among several of the Region's countries to perfect diagnostic techniques for hantavirus, based on techniques developed in Argentina.
- Cooperation between Cuba and Nicaragua to strengthen Nicaragua's National Institute of Health (the country's diagnostic and reference center).
- Cooperation between Mexico and Cuba in the field of scientific health information.

Medium- and Long-Range Technical Cooperation among Countries in the Areas of Human and Technological Resources

These projects are set up to provide specialized services lasting more than a year and involving experts from one country; they are usually based on bilateral agreements. The projects have provided incentives for training human resources as a way to ensure that cooperation will be lasting and that national capacity will be built up. The cooperation whereby specialized personnel from Cuba helped to train health workers in Guyana is an example.

Conclusions and Outlook

The trends discussed above suggest that in the twenty-first century technical cooperation among countries will become even more prominent in the overall technical cooperation in health. This prospect is based on the accumulated critical mass of national health capabilities in the Region of the Americas, on the dissemination of information about these capabilities, on greater mutual trust among the countries as they work together to deal with common problems, and on the countries' wish to have options at their disposal, rather than relying on standardized or single approaches.

PAHO's technical cooperation with each of the Region's countries, as well as its support for and stimulation of cooperation among them, has significantly contributed to create the situation described above. Cooperation between countries is gathering strength as an international strategy, because it takes place within a framework of sovereignty and self-determination for each country and because the content of the programs is highly relevant and of relatively low cost. The content of the activities and projects shows a greater degree of reciprocity, as unidirectional technical cooperation activities among countries become less frequent.

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