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Life Expectancy at Birth in the Americas

In adopting the Plan of Action for the implementation of the regional strategies,[1] the Member Governments of PAHO defined six minimum goals for achieving health for all by the year 2000. Three of these are aimed at reducing mortality in the countries of the Region, and two refer to mortality in specific age groups: the infant mortality rate and the death rate in children from 1 to 4 years of age. The third, which refers to overall mortality, stipulates that by the year 2000 no country of the Region should have a life expectancy at birth of less than 70 years.

Life expectancy at birth is the average number of years that a newborn can hope to live if age-specific death rates remain constant. It is an indicator of the level of mortality, and at the same time, one of the most widely used indicators for characterizing the level of well-being and, therefore, a country's degree of social development.

There is a large number of indicators of overall mortality. The simplest to obtain is the crude death rate, which relates the total deaths occurring in a year with the existing population at the mid-point of that same year. Since the risk of dying is higher at the extreme stages of life, the value of this rate depends heavily on the age distribution of the population and not solely on mortality itself, which detracts from its usefulness for comparative purposes. This drawback is resolved by directly comparing the specific death rates for each one of the different age groups; but the laboriousness of this procedure has motivated the search for methods that make it possible to summarize this information in a single figure. Such is the purpose of age-adjusted rates which, calculated by direct or indirect methods, attempt to eliminate the effect of age distribution by using a standard reference population. However, the death rates adjusted by these methods produce different

[1] See *PAHO Official Documents 173* (1981) and 179 (1982).

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results, depending on the age distribution of the standard population utilized, thus leading to sometimes different and even contradictory conclusions.

One adjustment procedure that does not require a standard population is based on a statistical model called the life table, designed for making analyses of mortality and survival but also used for other demographic studies on population growth and structure, fertility, migrations, etc., as well as for making projections on the size and characteristics of a population. One of the most common applications of the life table is life expectancy at birth, which represents the reciprocal of the "crude" mortality rate of the life table and which results from summarizing in a single figure the mortality experience of all the age groups of the population.

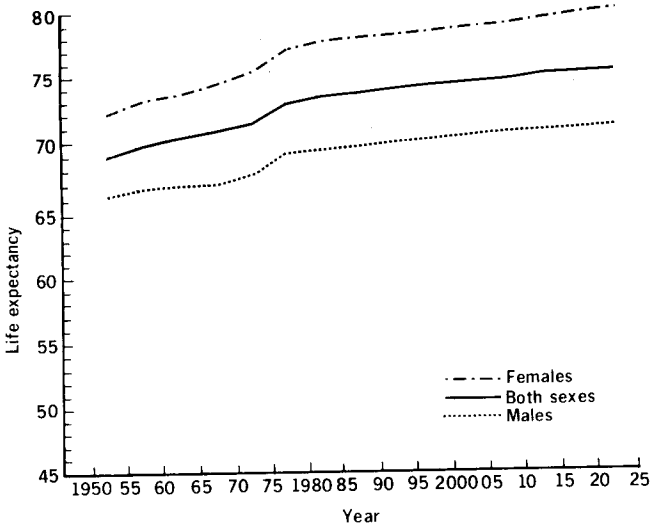
The development of the life table and the estimation of life expectancy do not require the definition of a standard population, but, like most other adjustment procedures, they are both based on age-specific death rates computed with data from vital statistics registries and population censuses. These data tend to suffer shortcomings: omission of certain population groups, especially children under one year of age; errors in the specification of age, affecting mostly extreme ages; omissions or delays in the registration of deaths and births, and others. These deficiencies in the mortality and population data affect the validity of the life table and of all the indicators based on it, including life expectancy at birth. However, demographic analysis procedures exist which permit the construction of life tables based solely on census data and on techniques derived from population theory. These procedures offer the possibility of making approximate estimates for those countries that do not have age-specific mortality data or else, computing estimates that make it possible to correct (at least partially) the information of those countries whose mortality and population data are not of the desired quality.

The analyses that follow are based on the values for life expectancy at birth published by the Population Division of the United Nations, which have been prepared and projected based on the aforementioned procedures.

Figures 1 and 2 show estimated and projected life expectancy at birth for both sexes in the countries of the Region, from 1950 to 2025. Accordingly, it is expected that the countries of Latin America and the Caribbean will reach in the period 2000-2005 the level of life expectancy at birth that the countries of Northern America had in 1950-1955. However, not until after the year 2010 will they achieve the average figure of 70 years which the countries of Northern America had reached in 1960).

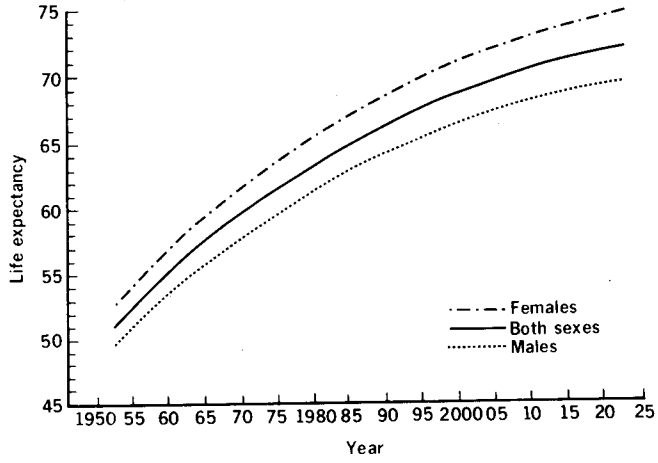
Table 1 shows that these subregional averages mask large differences among the countries, some of which

Figure 1. Estimated and projected life expectancy at birth, both sexes, Northern America,* 1950-2025.



Canada and United States of America.
Source: World Population Prospects as Assessed in 1980. New York. United Nations. 1981.

Figure 2. Estimated and projected life expectancy at birth, both sexes, Latin America and the Caribbean, 1950-2025.



Source: World Population Prospects as Assessed in 1980. New York. United Nations. 1981.

already had surpassed a life expectancy at birth of 70 years in the period 1975-1980. According to recent projections of the Population Division of the United Nations,[2] other countries will attain the minimum goal by the end of the century, but 11 countries should make

[2] *World population Prospects as Assessed in 1980.* New York, United Nations, 1981.

Table 1. Life expectancy at birth in the period 1975-1980, by country and sex, and percent increase from the period 1950-1955 in the countries of the Americas.

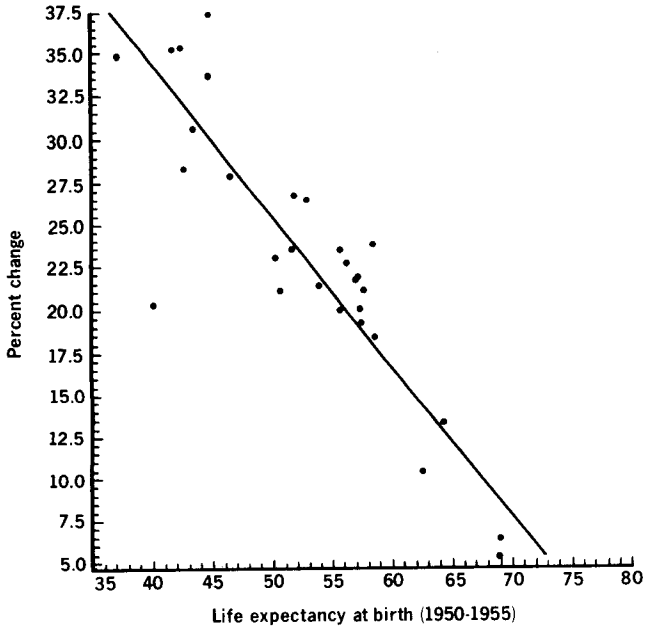
Country	Life expectancy at birth (years) 1975-1980			Percent increase from 1950-1955		
	Both sexes	Men	Women	Both sexes	Men	Women
Argentina	69.2	66.0	72.5	10.4	10.8	10.0
Barbados	70.0	67.6	72.5	21.7	22.3	21.2
Bolivia	48.6	46.5	50.9	20.3	21.3	19.3
Brazil	61.8	60.1	63.6	21.2	21.7	20.7
Canada	73.5	70.1	77.0	6.4	6.6	6.1
Chile	65.7	62.4	69.0	21.4	22.2	20.7
Colombia	62.2	60.0	64.5	22.9	23.8	22.1
Costa Rica	69.7	67.5	71.9	21.6	22.1	21.2
Cuba	72.8	71.1	74.4	23.8	24.7	23.0
Dominican Republic	60.3	58.4	62.2	33.7	34.9	32.5
Ecuador	60.0	58.0	62.0	27.9	28.5	27.3
El Salvador	62.2	60.0	64.5	37.3	38.3	36.3
Guatemala	57.8	56.9	58.8	35.4	35.9	34.9
Guyana	69.1	66.5	71.7	23.4	24.4	22.5
Haiti	50.7	49.1	52.2	34.8	36.1	33.7
Honduras	57.1	55.4	58.9	35.3	36.4	34.3
Jamaica	70.1	67.8	72.5	21.1	21.6	20.5
Mexico	64.4	62.4	66.5	24.3	25.0	23.6
Nicaragua	55.2	53.5	57.1	28.4	29.4	27.4
Panama	69.6	67.5	71.9	18.4	18.8	18.0
Paraguay	64.1	61.9	66.4	23.5	24.4	22.6
Peru	57.1	55.7	58.6	30.7	31.5	29.9
Suriname	67.2	64.8	69.8	20.0	20.6	19.4
Trinidad and Tobago	68.9	65.9	72.0	19.2	19.7	18.7
United States of America	72.9	69.1	77.0	5.7	5.9	5.4
Uruguay	69.5	66.3	72.8	4.8	5.1	4.6
Venezuela	66.2	63.6	69.0	26.6	27.6	25.6

Source: World Population Prospects as Assessed in 1980. New York, United Nations, 1981.

special efforts to reduce their mortality levels. On the other hand, these national values are also averages, and do not provide information on the differences among population subgroups within the same country, just as regional averages do not reflect differences among countries.

Life expectancy at birth for women is consistently higher than for men, and this difference appears to be greater in the countries of Northern America where it reaches approximately eight years, almost double the difference observed in Latin American and Caribbean countries (see Figures 1 and 2 and Table 1). Another salient point is that the progressive gain in life expectancy at birth slows down as its level increases; to gain one year is more difficult for the countries that already have a high life expectancy after eliminating most problems for which adequate knowledge and appropriate technologies are available. This can also be seen in Figure 3, which shows the percent change in the years of life expectancy attained in the period 1975-1980 relative to the period 1950-1955. That this percent change is a great deal larger for countries with low life expectancy at birth, some of which have achieved increases of more than 30 per cent in the period described. Although the regression line shown in the figure adequately reflects on the average declining relationship between initial level and percentage gain, it is also true that some countries have increased their life expectancy more

Figure 3. Percent change in life expectancy at birth, Region of the Americas, observed from 1975-1980, relative to values registered from 1950-1955.



Source: World Population Prospects as Assessed in 1980. New York, United Nations, 1981.

rapidly than the expected rate and that others have done so much more slowly, as reflected in the points that lie above and below that line, respectively.

Table 2 shows some selected indicators for 10 countries for which cause-specific mortality data were available: the five with highest life expectancy and the five with the lowest life expectancy for the period 1975-1980. The countries are sequenced according to their life expectancy at birth, from highest to lowest in the first group and from lowest to highest in the second. The second column shows the age-adjusted overall death rates. The comparisons made from them do not coincide exactly with those based on life expectancy at birth, since these rates do not follow a strict rising sequence for the countries of the first group, nor a falling sequence for those of the second. This confirms that different adjustment procedures can lead to different conclusions. The third column shows the infant mortality rate and its close relation to life expectancy at birth. Mortality in children under one year of age affects life expectancy at birth more than mortality at any other age. This has led to proposals to use the life expectancy at one year of age in conjunction with infant mortality rate to better describe the countries' social situation, health being one of its main components. The percentage of deaths in children under five years of age underscores observations made on previous occasions with

Table 2. Selected indicators for the five countries with the highest and lowest life expectancy, around 1978.

Country	Life expectancy at birth	Age-adjusted mortality rate per 1,000 population	Infant mortality rate per 1,000 live births	Percentage of deaths under 5 years	Percentage of the population under 15 years	Percentage of the population 65 years and older	Maternal mortality rate per 10,000 live births	Crude reproduction rate[a]
Canada	73.5	3.8	10.4	3.1	23.2	8.9	0.6	0.91
United States of America	72.9	4.1	12.1	2.8	22.9	10.7	1.0	0.94
Cuba	72.8	4.3	20.4	7.6	31.3	7.3	4.6	1.06
Barbados	70.0	4.6	25.5	7.4	28.9	6.5	6.9	1.30
Costa Rica	69.7	4.1	25.7	19.8	37.9	3.6	3.8	1.74
Nicaragua	55.2	5.4	84.5	36.5	48.0	2.4	8.5	3.20
Peru	57.1	5.0	81.9	41.1	42.3	3.4	15.3	2.68
Honduras	57.1	5.1	81.5	36.3	47.8	2.7	11.3	3.48
Guatemala	57.8	9.2	67.7	50.7	44.1	2.9	12.1	2.77
Ecuador	60.0	7.4	72.2	42.3	44.4	3.5	21.6	3.07

Source: Pan American Health Organization. *Health conditions in the Americas, 1977-1980.* Washington, D.C., Scientific Publication 427, 1982.

[a] *World Population Prospects as Assessed in 1980.* New York, United Nations, 1981.

Table 3. Proportional mortality for the five leading causes of death and for ill-defined symptoms and causes in countries with the highest life expectancy, around 1978.

Country	1st cause (%)	2nd cause (%)	3rd cause (%)	4th cause (%)	5th cause (%)	Total, five leading causes (%)	Ill-defined symptoms and causes (%)
Canada	Diseases of the heart	Malignant neoplasms	Cerebro-vascular disease	Accidents	Influenza pneumonia		
	34.5	22.1	9.0	7.1	3.1	75.9	1.4
United States of America	Diseases of the heart	Malignant neoplasms	Cerebro-vascular disease	Accidents	Influenza pneumonia		
	38.1	20.6	9.1	5.7	3.0	76.5	1.6
Cuba	Diseases of the heart	Malignant neoplasms	Cerebro-vascular disease	Accidents	Influenza pneumonia		
	29.8	17.5	11.3	9.5	7.9	76.0	0.3
Barbados	Diseases of the heart	Malignant neoplasms	Cerebro-vascular disease	Diabetes mellitus	Influenza pneumonia		
	22.4	16.8	14.5	5.5	5.1	64.4	3.4
Costa Rica	Diseases of the heart	Malignant neoplasms	Accidents	Causes of perinatal mortality	Cerebro-vascular disease		
	16.7	16.3	10.6	6.5	6.0	56.0	9.3

Source: Pan American Health Organization. *Health Conditions in the Americas, 1977-1980.* Washington, D.C., Scientific Publication 427, 1982.

respect to the importance of deaths of the groups under one year and 1-4 years, respectively.[3] The following two columns show that, in general, the countries with low life expectancy have a "younger" population than those with high life expectancy. In this connection it should be remembered that the life table procedure practically eliminates the effect of age structure on the level of life expectancy. The two last columns of the table suggest that the great differential observed in favor of women in the countries with high life expectancy could be explained in part by a reduction of the causes of morbidity and mortality associated with a woman's reproductive period.

Tables 3 and 4 show proportional mortality due to the five leading causes of death and the proportion of deaths from symptoms and ill-defined conditions in the countries with high and low life expectancy at birth, respectively. In the countries with higher life expectancy at birth, the first three causes correspond invariably to diseases of the heart, malignant neoplasms, and cerebrovascular diseases, that is, to chronic diseases associated with adult or advanced age. These three causes of death are responsible for more than half the deaths in all but one country. In contrast, all the countries with lower life expectancy at birth except one exhibit enteritis and other diarrheal diseases as the main cause of death; in one country this cause ranks second, while influenza and pneumonia is first. Among the four remaining causes are influenza and pneumonia and diseases of the heart, although the latter cause is proportionally much less important than in the previous group of countries. With a single exception, the three leading causes in the first group of countries account for a greater proportion of deaths than the total of the five causes in the countries of the second group; this latter group, on the other hand, has a much larger proportion of deaths due to symptoms and ill-defined conditions, which if adequately classified, could alter

[3] See PAHO *Epidemiological Bulletin*, Vol. 4, No. 2, 1983.

Table 4. Proportional mortality for the five leading causes of death and for ill-defined symptoms and causes in countries with the lowest life expectancy, around 1978.

Country	1st cause (%)	2nd cause (%)	3rd cause (%)	4th cause (%)	5th cause (%)	Total, five leading causes (%)	Ill-defined symptoms and causes (%)
Nicaragua	Enteritis and other diarrheal diseases	Diseases of the heart	Accidents	Homicides, legal interventions, and operations of war	Influenza/ pneumonia		
	13.6	11.2	7.5	5.5	4.1	41.9	27.0
Peru	Influenza/ pneumonia	Enteritis and other diarrheal diseases	Malignant neoplasms	Diseases of the heart	Accidents		
	15.8	11.4	7.0	6.5	5.1	45.8	8.4
Honduras	Enteritis and other diarrheal diseases	Diseases of the heart	Homicides, legal interventions, and operations of war	Influenza/ pneumonia	Causes of perinatal mortality		
	9.4	8.9	7.2	3.8	3.3	32.7	31.8
Guatemala	Enteritis and other diarrheal diseases	Influenza/ pneumonia	Causes of perinatal mortality	Accidents	Diseases of the heart		
	17.7	14.4	9,4	7.1	3.8	52.3	15.3
Ecuador	Enteritis and other diarrheal diseases	Diseases of the heart	Accidents	Influenza/ pneumonia	Bronchitis, emphysema, and asthma		
	12.2	8.6	8.2	8.1	6.3	43.4	16.5

Source: Pan American Health Organization. *Health Conditions in the Americas, 1977-1980.* Washington, D.C., Scientific Publication 427, 1982.

the content of Table 4 considerably. In general, the proportion of deaths in this category is used as an indicator of not only the quality of mortality information but also of the coverage of medical care available for the disease that caused the death. Another indicator of this type is given by the proportion of medically certified deaths which tends to be inversely related to deaths from ill-defined causes. The four countries of the second group that have these data report percentages that range from 11 to 67 percent, corresponding to the countries with the largest and smallest proportion of ill-defined causes, respectively.

The preceding discussion illustrates the value of using life expectancy at birth as an indicator of mortality, and its usefulness for the health planner and administrator, since it provides indirect information about the age distribution of the population and its most important health problems in a single figure. The analysis of life expectancy can be enhanced by calculating survival expected at certain ages, notably, life expectancy at one year of age; this value is in general much higher than that at birth, since it deals with those who have survived infant mortality. In addition, when census information and suitable mortality data are available, one can construct life tables for certain subgroups of the population, according to cause-specific of mortality or according to geographic, social, occupational, or other criteria, taken separately or jointly, to analyze and monitor the survival of population groups with risks of different types and magnitude. Similarly, so-called "decremental" life tables can be constructed, which make it possible to estimate the number of years of life that would be gained if it were possible to eliminate one or several causes of death.

The minimum goals and objectives adopted by the Member Governments are aimed at ensuring that the

health sector contribute to the reduction of economic and social inequalities among the countries of the Region and within each of them. The figures analyzed reflect differences among the countries, but they do not provide information with respect to internal inequalities. Except for data referring to geographic subdivisions, the necessary information for documenting these differences and monitoring the process of their reduction tends to be more difficult to obtain in the least developed countries, where it can be assumed that these differences may be more pronounced. This situation requires that decisions be made to strengthen the efforts of the health sector in attaining information, be it by censuses and ongoing registration of mortality, or by periodic studies, to achieve a more effective and efficient use of the knowledge and resources available in the prevention and control of disease.

(*Source:* Epidemiology Unit, Health Programs Development, PAHO.)

Diseases Subject to the International Health Regulations

Cholera, yellow fever, and plague cases and deaths reported in the Region of the Americas up to 31 August 1983

Country and administrative subdivision	Cholera cases	Yellow fever		Plague cases
		Cases	Deaths	
BOLIVIA	—	*10*	*10*	*20*
Beni	—	1	1	—
Cochabamba	—	7[a]	7	—
La Paz	—	2	2	20
BRAZIL	—	*7*	*7*	*36*
Bahía	—	—	—	6
Ceará	—	—	—	30
Pará	—	2	2	—
Rodônia	—	5	5	—
CANADA	*1*	—	—	—
Ottawa	1[b]	—	—	—
COLOMBIA	—	*1*	*1*	—
Santander	—	1[b]	1[b]	—
ECUADOR	—	*4*	*1*	—
Chimborazo	—	1	1	—
Pastaza	—	3	—	—
PERU	—	*18*	*17*	—
Huanuco	—	1	1	—
Junín	—	3	3	—
Madre de Dios	—	4	4	—
San Martín	—	10	9	—
UNITED STATES	*1*	—	—	*28*
Arizona	—	—	—	9
California	—	—	—	1
New Jersey	1[b]	—	—	—
New Mexico	—	—	—	16
Oregon	—	—	—	1
Utah	—	—	—	1

[a]Revised data.

[b]Imported.

Epidemiological Surveillance of Foodborne Disease in the Caribbean

The Caribbean Epidemiology Center (CAREC) is responsible for assisting countries in developing national surveillance systems. Since the first meeting of national epidemiologists in May 1975, there has been an agreement that foodborne disease or "food poisoning" should be reported, and that reporting within 24 hours is essential if follow-up investigations are to be meaningful. All countries, therefore, report foodborne disease to their national surveillance system and to CAREC as a standard procedure.

The Ministers Responsible for Health in the Caribbean met in Grenada in July 1980 and recommended that countries develop food safety policies (which include establishing continuing education programs in food safety), prepare guidelines in cooperation with PAHO, and formulate a regional policy that could be incorporated in the food and nutrition strategy.

It must be pointed out that reported foodborne disease is only the very tip of the iceberg; special emphasis should be given to suspected foodborne disease as well. As part of the development of primary health care, the community must be adequately educated in food safety, including where to make reports and seek advice from the public sector. Hotel/guest house managers and managers of government and private institutions such as youth camps, schools, and hospitals should be motivated to report immediately any outbreaks of disease to the health authorities.

CAREC has developed, in cooperation with national epidemiologists, forms to use when investigating foodborne disease and, specifically, the problem of fish poisoning. These forms are printed at CAREC and are supplied to member countries as part of its service .

CAREC has provided training to health personnel (including some veterinary public health assistants) in the investigation of outbreaks and in the utilization of equipment for such investigations. On request, it supplies on-site epidemiologists and laboratory personnel to work with the national team and/or undertake laboratory testing at the Center.

The capacity to investigate epidemics has improved considerably, but underreporting of foodborne disease still weakens and constrains that capacity. Nevertheless, more outbreaks are being detected than in previous years and the Caribbean experience is being used to identify priority problems.

The most common causes of foodborne disease in the Caribbean are bacterial contamination by *Staphylococci, Salmonella,* and *Clostridium perfringens*. However, several outbreaks with registered fatalities have occurred due to contamination from chemical pesticides such as parathion and trithion, and food poisoning by ciguatera, clupeoid, and fruits (ackee).

Outbreaks of bacterial foodborne disease are attributable to food handling defects which include failures in storing high-risk foods outside the danger temperature zone at which bacilli multiply (140° F/60° C to 45° F/7° C) and poor personal hygiene practices in food handlers.

The general trend in the Caribbean has been toward an increased use of restaurants, superimposed in some countries by the rapid growth of facilities catering primarily to tourists. The result is an expansion of food service operations in terms of quantity, diversity, and complexity, for which existing resources are inadequate. This accelerated expansion and the new equipment and procedures introduced by the food trade highlight the need for new approaches to food establishment inspection such as:

- using standardized inspection forms and a point system;
- equipping inspectors with the appropriate training and tools needed to do the required work;
- ensuring that the emphasis of food establishment inspection is on monitoring correct cooking and cold and hot food storage, and encouraging self-inspection by management as a supporting activity (but not a substitute) for Government inspection;
- organizing coordinated trade and consumer food safety education programs which encourage management to train its employees and to educate food handlers to be their own "medical examiners" by knowing those conditions which make them unfit to handle food, and
- developing laboratory resources to support food inspection and epidemic investigation.

Apart from slaughterhouses in which veterinary and health personnel have an immediate joint interest, there has been a significant and continuing growth of canneries and other processing plants. This growth raises the question of whether trade has exceeded its resources to provide adequate monitoring. In order to maintain food quality and safety, sufficiently trained

and equipped inspectors and laboratory support both in the private and public sector are needed.

The dynamic nature of the food trade and the increasing national awareness of actual and potential problems, uncovered as countries improve their surveillance systems, serve to highlight the need for comprehensive food safety legislation. Such legislation should be capable of rapid modification to meet new trade activities, or newly recognized hazards in existing operations.

(*Source:* Caribbean Epidemiological Center, Epidemiology Unit, Health Programs Development, PAHO.)

Infectious and Chronic Disease Epidemiology: Separate and Unequal?

Definitions

As applied to disease or illness, the word "chronic" means slow progression and long duration. It is the opposite of "acute," a term which implies a swift onset and short course. Despite the simplicity of definition, no one has satisfactorily classified all diseases on the basis of duration. Indeed, most diseases on any list are sometimes acute and sometimes chronic. A cerebrovascular accident may be immediately fatal or produce sequelae which persist for months or years. Heart disease, usually classified as chronic, is acute for those myocardial infarct victims who die before reaching the hospital. The tendency to consider infection as synonymous with acute is equally misleading. Many infections or their sequelae are chronic: sinusitis, cystitis, syphilis, tuberculosis, paralytic poliomyelitis, congenital rubella, and rheumatic heart disease, to name a few.

Acuteness or chronicity are often not permanent attributes of a disease. An acute disease may be redefined when scientific advances permit identification of the preclinical phase. A chronic condition may be transformed into an acute illness when early treatment aborts sequelae. In the Baltimore study of chronic diseases *(1)*, one in 10 "substantial conditions" would have had complete recovery with appropriate care.

Latency

A long interval between exposure to the putative risk factor(s) and disease onset is believed to characterize most chronic illnesses. But many infections appear after latent periods as long as those proposed for chronic diseases. Thus, infection with a tubercle bacillus acquired in childhood is often first manifest in late adult life. Herpes zoster represents reactivation of childhood chickenpox in many, if not all, cases. A large proportion of infections in the compromised host undoubtedly reflects activation of dormant infection. Indeed, the incubation period for the majority of infections afflicting adults today is either delayed or poorly defined.

Transmissibility

Many infectious diseases are propagated from person to person. However, this is by no means true of all infectious agents: blood poisoning caused by preformed toxins, Legionnaires' disease, and coccidioidomycosis are not transmitted from person to person. Some chronic diseases of as yet unknown etiology may turn out to be transmissible. Clusters of leukemia and lymphoma suggest a transmissible agent as do the recent studies of residents of households in which victims of multiple sclerosis reside *(2)*. It would be premature to divide epidemiologists into those who deal with transmissible or nontransmissible conditions. If leukemia, cervical cancer, multiple sclerosis, arthritis, and diabetes prove to be caused by a transmissible agent—as many now suspect—persons now classified as chronic disease experts may find themselves to be infectious disease epidemiologists.

Etiology

At the turn of the century, infectious disease was the major area of research in medicine. The discoveries of specific agents which produced specific diseases were straightforward and satisfying, and led to one of the

basic tenets of medicine: a single disease process has a single causation. Clinical observation, bacteriologic investigation, and the development of the antimicrobials in the early 1940s led to the preeminence of infectious disease as a medical problem whose etiology and management were established. In contrast, chronic disease epidemiology has attended the study of diseases of unknown cause, conditions which are increasingly recognized as multifactorial in origin. Thus, the dichotomy became cause-known/unifactorial vs. cause-unknown/multifactorial.

Although it is true that the necessary cause of most acute diseases is a known agent, and the necessary cause of most chronic diseases remains unknown, this is surely more a function of the state of the art than the nature of disease. All diseases have multiple causes. The necessary microbial agent is not the sole determinant of outcome. As Stewart *(3)* has written, "If two susceptible subjects are exposed to equal doses of the same germ, and one develops infection while the other does not, the factor governing the development of the infection clearly lies outside the germ."

For most diseases, the frequency of exposure exceeds the frequency of illness. Only the availability of the necessary agent has provided the reagents required to demonstrate that most of those infected with the tubercle bacillus or the poliomyelitis virus are not sick. We are just at the threshold of understanding why most of those who smoke cigarettes do not develop lung cancer *(4)*. Heritable and environmental determinants of chronic diseases may well precede comparable discoveries in the arena of infection.

Behavioral Considerations

Evidence accumulated in the United States during the last 20 years indicates that the most important chronic diseases are caused by a variety of personal and social habits, such as improper diet, excessive drinking and smoking, lack of exercise, and unsafe driving and working practices. Behavioral considerations also determine the distribution of many infectious diseases. For example, venereal disease, the most important epidemic infection in the United States today, does not occur among the chaste, and active tuberculosis is disproportionately frequent among those who abuse alcohol.

In neither acute, infectious, nor chronic disease is a complete understanding of cause required for prevention. Smallpox was prevented before isolation of the virus; lung cancer can be prevented before identification of the specific carcinogen in cigarette smoke. When an infectious disease is transmitted or maintained because of attitudes, behavior, or surroundings, a purely germ-oriented approach is unlikely to provide effective control.

Study Design

No study design is unique to any branch of epidemiology. The epidemiological study of both acute and chronic conditions usually requires a denominator and/or a comparison group, can be done retrospectively or prospectively, and can examine prevalence or incidence. The search for causality in a food poisoning outbreak, examining the attack rates of those with and without exposure to the suspect food, applies the same principles as those used in a comparison of the incidence of uterine cancer among those with and without the suspect hormone. Cross-sectional or case-control comparisons are used to validate or refute clinical tenets of acute and chronic disease. Such studies led to the delayed recognition that most of the symptoms attributed to pinworm are equally frequent in uninfected children *(5)*, that splinter hemorrhages traditionally attributed to bacterial endocarditis are equally common in hospitalized patients without endocarditis *(6)*, and that the symptoms attributed to gallbladder disease are equally prevalent in women without gallbladder disease *(7)*. The same principles of study design that apply to clinical trials of vaccine or prophylactic antimicrobials apply to the study of lipid lowering drugs or antihypertensive agents.

A major tool of the chronic disease epidemiologist has been the population survey, a prototype of which has been the Framingham Study *(8)*. In community-based studies, entire populations of persons, including a majority who are presumably well, are examined for a variety of characteristics and diseases. Cross-sectional studies define the usual, if not normal, and prospective studies define putative risk factors. Observations such as those made in Framingham led to the recognition that blood pressure and plasma cholesterol were important predictors of coronary artery disease.

In the past, infectious disease epidemiologists worked from the vantage of sick persons. Epidemics were described in terms of the ill, and the well population was used primarily for age- and sex-specific denominator data. But community-based studies of the distribution of disease and its precursors are by no means the purview of chronic disease epidemiologists alone. The Seattle Virus Watch Study *(9)*, which has added important information to our knowledge of the transmission and frequency of respiratory infections, is a case in point.

Analytic Methodology

One phenomenon which perhaps best distinguished the chronic from the infectious disease epidemiologist is the use of more sophisticated mathematical methods feasible with computer-assisted analysis. Because neither the etiology of chronic disease nor its manage-

ment was as simple or obvious as the situation which appeared to exist in infectious disease, progressively sophisticated mathematics were developed by epidemiologists and biostatisticians, at a time when most research in the field of infectious disease involved clinical observations or experiments conducted in the laboratory. The danger is that goodness of fit sometimes substitutes for common sense or biologic plausibility *(10)*. Chronic disease epidemiologists are often in the awkward position of analysis without hypothesis; in the absence of either an agent or a unique outcome, they must perform hypothesis-seeking exercises. As good statisticians and epidemiologists know, the pitfalls of data dredging greatly exceed those of hypothesis testing. The multiple possible analyses render almost a certainty that some variables will be significantly associated with some diseases.

In the days before linear regression and multiple logistic function, many infectious disease epidemiologists personally gathered and manually tabulated their data. This experience clarified the sometimes remarkable limitations of data—which by virtue of categorization and computerization may gain unwarranted credibility. Experience gained in the shorter time-frame of some infectious processes also provide valuable insights about the hazards of early assumption. Farr *(11)* demonstrated a remarkable correlation of cholera mortality and altitude in 19th century London but failed to consider water as the variable of interest. A recent report *(12)* of an excess of hepatitis among young women using oral contraceptives would have profited by a consideration of the probable differences in lifestyle among women who chose oral contraceptives as compared to those without such contraceptive practices.

Many infectious disease epidemiologists come from the ranks of clinicians and laboratorians, and lack the skills traditionally considered in the purview of the chronic disease epidemiologists. These skills are now essential to the discovery of those variables which, in the presence of the necessary agent, determine infection, disease, and outcome. Whereas the infectious agent can usually be isolated and enumerated with precision, the extraneous factors which determine morbidity and mortality are more difficult to quantify. It is the task of epidemiology to find other methods to assess with precision the contribution of these factors to infectious disease. The arbitrary separation of infectious disease from chronic disease epidemiology in teaching and research does disservice to this need.

Conclusion

Some scientific disciplines are best able to answer certain questions in medicine. Much of modern epidemiological effort has been directed toward investigating problems regarding which the rest of science has few useful leads. Any disease, acute or chronic, which lacks either a logical structure or a plausible hypothesis is difficult to study. But the identification of a necessary agent, microbial or otherwise, does not answer all relevant and important questions any more than demonstration of an associated variable confirms causality or predicts prevention.

Epidemiologically, acute diseases differ from chronic diseases in two major aspects: immediacy of response and uniqueness of observation. The lessons learned in infectious disease, where the agent and outcome were more readily available to test predictions, must be shared with those epidemiologists who—in their haste to assign causality—sometimes abandon biologic wisdom in favor of quantitative ideology. Many of the unanswered questions in acute/infectious disease epidemiology need to be addressed by those techniques currently attributed to and taught with chronic disease epidemiology. Acute and chronic disease epidemiologists have important lessons to offer each other. A sharing of experience and methodologies could avert the unfortunate plethora of truly terrible data analyzed ad nauseam, or good data poorly interpreted. Once these lessons have been learned, we should discard the qualifiers and call an epidemiologist an epidemiologist. Acute and chronic disease epidemiologists are not separate and unrelated species, any more than acute and chronic diseases can be neatly categorized.

(*Source:* Reprinted from Elizabeth Barrett-Connor, "Infectious and Chronic Disease Epidemiology: Separate and Unequal?". *Am J Epidemiol* 109(3):245-249, 1979.)

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Editorial Comment

Dr. Barrett-Connor's article has been summarized for the *Epidemiological Bulletin* because it makes a substantial contribution to the application of epidemiology in the field of disease prevention and control. It addresses a subject of current controversy and discussion in many Latin American and Caribbean countries, and is important for the organization of services, teaching of epidemiology, and research in the countries of the Region.

National Registry of Tumor Pathology in Brazil

During the VI International Cancer Congress, held in São Paulo, in 1954, a discussion was held on the need for an international coding system for neoplasms. As a result, the Nomenclature and Statistics Committee of the International Union against Cancer accepted the *Manual of Tumor Nomenclature and Coding* (MOTNAC), published by the American Cancer Society in 1951, as the basis for an international coding system. MOTNAC was revised in 1968. In 1976 it was succeeded by the *International Classification of Diseases for Oncology* (ICD-O), published by the World Health Organization.

Recognizing the importance of a uniform coding system for neoplasms, the Pan American Health Organization published a Portuguese language version of MOTNAC in 1972 and a Spanish version in 1974. These translations were widely distributed in Latin America. Spanish and Portuguese language versions of ICD-O were published by PAHO in 1977 and 1978, respectively.

Because of a lack of national statistics on cancer, the existence of only a small number of tumor registries (hospital and population-based), and the need for data on the incidence of cancer in Brazil, the National Division of Chronic Degenerative Diseases in 1975 developed a program for oncological coding.

In 1975 and 1976, 50 courses were held in 49 cities, describing the methodology and value of the National Registry of Pathology. These courses were attended by 2,912 participants: 283 pathologists, 516 physicians from other specialities, 1,200 medical students, and 913 paramedics. Subsequently, didactic kits for coding diagnostic information were provided to the 109 laboratories which participated in the initial phases of the program. The results of this initial phase, with all the histopathological data collected in 1975, were published in the "Registro Nacional de Tumores" (Brazilian Ministry of Health, 1978).

The success of this endeavor by the National Division of Chronic Degenerative Diseases and the interest of pathologists in the program stimulated continued work. As a result, the registry expanded into a national program designed to obtain information on the incidence of cancer throughout the entire country; this program is known as the National Registry of Tumor Pathology (NRTP).

In 1978 an Agreement was signed by the Ministry of Health and PAHO's Latin American Center for Health Sciences Information (BIREME) in São Paulo, for the development of a computerized registry which facilitates storage and rapid analysis of large amounts of data.

As the coordinating and executive center, in 1978 BIREME contacted a large number of laboratories, in

order to update information from those involved in the initial phase of the program, and to recruit new members.

Between February and December 1979, each participating laboratory received training in the use of ICD-O, available in Portuguese as of 1978.

The number of laboratories enrolled in the program in 1975-1976 was 109. That number has increased to 306 in 1981 and covers 106 cities in 26 states. The laboratories are distributed as follows: 50 in medical schools (16.3 per cent) 14 in schools of dentistry (4.6 per cent), 22 in cancer hospitals (7.2 per cent), 10 in other specialized hospitals (3.3 per cent), 66 in general hospitals (21.6 per cent), and 144 private laboratories (47.0 per cent).

It has been estimated that the program involves 90 per cent of all laboratories and that it has collected information from more than 95 per cent of all cancer cases histologically diagnosed in Brazil.

Data collected by the program include the primary histological diagnoses from all anatomical sites as well as dysplastic lesions of the uterine cervix. These data originate from two sources: surgical pathology examinations and autopsies.

Cervical dysplasia data were collected because of the increasing number of cervical cancer detection programs started throughout the country. Data were collected from 279 laboratories (91.2 per cent of all those who participated) and represent 401,851 diagnoses (369,767 primary cancer diagnoses of all anatomical sites and 32,084 of uterine cervical dysplasia). Of all diagnoses, 99.5 per cent were obtained from surgical pathology examinations and 0.5 per cent from autopsies. Because of the large percentage of surgical pathology diagnoses, any overlap between surgical and autopsy diagnoses would not be significant.

The small number of diagnoses recorded for the leukemias were obtained chiefly from autopsies. The cytohematological diagnoses of the peripheral blood and myelograms are not included, since they were not under study in this phase of the program.

The data covering the period 1976-1980 have recently been published (in Portuguese and English in *Cancer in Brazil: Histopathological Data*) by the Ministry of Health of Brazil. The main purpose of the publication is to present information on the nature and extent of cancer in Brazil. It gives detailed information on laboratory findings on the various cancer types by geographical area, sex, and age. Table 1 presents a general view of the percent distribution by sex of the 10 leading primary cancer sites.

The NRTP program has as its immediate objectives to increase diagnostic precision and plan for future requirements for services and training in pathology. These data should provide excellent information leading to the identification of research areas and add to the knowledge on cancer incidence in Brazil by relating these histologically diagnosed cases to the population at risk.

Table 1. Percent distribution of the 10 leading primary cancer sites, according to the National Registry of Tumor Pathology, Brazil, 1976-1980.

Male		*Female*	
Cancer site	*Percentage*	*Cancer site*	*Percentage*
Skin	28.9	Cervix uteri	23.7
Stomach	10.6	Skin	23.4
Oral cavity	8.5	Breast	16.5
Prostate gland	6.0	Large intestine	4.3
Large intestine	4.3	Stomach	3.9
Esophagus	4.3	Corpus uteri	3.0
Larynx	4.2	Oral cavity	2.3
Urinary bladder	3.8	Ovary	1.8
Trachea, bronchus and lung	3.8	Lymph nodes	1.7
Lymph nodes	3.5	Thyroid gland	1.7
Others	22.1	Others	17.7

Requests or correspondence should be addressed to: Programa RNPT, Instituto Nacional de Cancer, Caixa Postal 22018, CEP 20237 - Rio de Janeiro, R.J., Brazil.

(*Source: Cancer in Brazil: Histopathological Data 1976-80.* Rio de Janeiro, National Cancer Control Campaign, Ministry of Health, Brazil, 1982.)

Editorial Comment

The amount of data collected from diagnostic information sheds light on the magnitude of the cancer problem among the Brazilian population. The distribution of relative frequencies proceeding from the various pathology centers has epidemiological value because it probably represents a great proportion of diagnostically confirmed cases. Even though indicators of risk in the population to the various types of cancer should be expressed in incidence rates, these data expressed in percentages are useful in order to approximate knowledge of frequencies and, mostly, to direct epidemiological research. The data presented in relative frequencies for each state in Brazil by age group and sex reveals interesting geographic patterns of pathology which could spark research interest.

Regarding organization of cancer registries, the publication referred to above is an indication of the efforts

needed to collect case data, that is, data that would become the numerator in an incidence rate. These efforts would justify the total collection of data which would include sources other than pathology laboratories, such as x-rays for the diagnosis of lung cancer. If the infrastructure of statistical data is well developed, then knowledge of other aspects such as population at risk, can be obtained.

This study in Brazil stimulates and motivates the intention to repeat the experience aimed at developing population-based registries in large cities which will point to research areas, indicate trends, aid in the follow-up of patients, and finally, be useful for evaluating control programs, one of the central objectives in public health.

Reports on Meetings and Seminars

Fourth Meeting of the Technical Advisory Group on Diarrheal Diseases Control Programs[1]

At its fourth meeting, held in Geneva on 14-18 March 1983, the Technical Advisory Group (TAG) of the Diarrheal Diseases Control (CDD) Program reviewed in depth the activities of the Program during 1981 and 1982[2]. It noted with satisfaction the progress made to date and made recommendations[3] with regard to future activities. Some of these recommendations are highlighted below:

Health Services Component

- The Program should continue to support the preparation of plans of operation for national CDD programs, ensuring full integration with planning for primary health care (PHC).
- Increased emphasis should be placed on national training of health workers, including the development of additional national training centers, and efforts should be made to promote the inclusion of diarrheal disease control in the curricula of training institutions for health workers.
- Governments should maximize their commitment to hasten the implementation and expansion of national CDD programs.
- The highest priority should continue to be given to the reduction of diarrheal mortality through oral rehydration therapy (ORT), while other control strategies to reduce diarrhea morbidity should also be promoted in cooperation with governments and other agencies and WHO programs.
- Every effort should be made to obtain better quality data on morbidity and mortality due to diarrheal diseases; arrangements for surveillance and reporting of control activities should be built into national programs from their onset.

Research Component

- In the area of biomedical research, the Steering Committees should continue to play an active role in the management of the activities of the global Scientific Working Groups (SWGs); a particular effort should be made to stimulate activities in regions where such research is now receiving limited support.
- Operational research needs should be identified through meetings between national CDD program staff, national researchers, and WHO Program staff; greater attention should be given to research when formulating and evaluating national CDD programs. The Program should explore ways of strengthening national operational research capacity, particularly in countries with active CDD programs.
- The systematic reviews being carried out by the Program to define the most important of the potential interventions (in addition to ORT) for diarrhea control should be completed in 1983 and a full report presented at the next TAG meeting on their implications for research, for operations, and for linkages with other programs.

[1] *Wkly Epidem Rec* 58(24):181-188, 1983.

[2] Third Program Report, 1981-1982. Unpublished document WHO/CDD/83.8. See *Wkly Epidem Rec* 58(21):157, 1983.

[3] The full report of the TAG (unpublished document WHO/CDD/83.7) is available in English and French and may be obtained from: The Program Manager, CDD Program, WHO, 1211 Geneva 27, Switzerland.

- Further research is encouraged in the areas of:

  - double-blind clinical trials of new drugs (in collaboration with the pharmaceutical industry);
  - the use of an oral rehydration salts (ORS) formula containing citrate in place of sodium hydrogen carbonate (sodium bicarbonate); the effectiveness of cereal-based ORS; and the reasons why ORT is unable to prevent deaths in some situations despite the correction of dehydration;
  - nutritional consequences of acute diarrhea and nutritional benefits associated with ORT;
  - relationships between diarrhea and vitamin A malabsorption;
  - environmental ecology of enteric pathogens;
  - salmonellosis, especially its epidemiology and control in developing countries;
  - pathogenesis and epidemiology of enteropathogenic *Escherichia coli*;
  - causes and control of chronic diarrhea;
  - epidemiology of typhoid fever, cholera, and rotavirus to permit the eventual formulation of appropriate vaccination policies;
  - shigellosis, including studies of its interaction with measles and vaccine development.

- The planned establishment of a vaccine testing facility in a developing country is strongly encouraged and should be completed promptly.
- The plans for limited research strengthening activities through training courses and grants for scientists being supported by the Program and collaborative studies between investigators in developing and developed countries should be pursued.

Publications[1]

El control de las enfermedades transmisibles en el hombre, 13th ed. (1980). A.S. Benenson, ed. Washington, D.C., Pan American Health Organization, Scientific Publication No. 442, 1983. 518 pp. ISBN 92 75 31442 X (Translation of the English original, published by the American Public Health Association). US$10.00.

The great majority of diseases of known cause in man and animals in Latin America and the Caribbean are produced by biologic agents: bacterias, viruses, rickettsiae, microplasms, fungi, protozoa, and nematodes. The advances and developments in sanitary engineering, vector control, vaccine techniques, and specific chemotherapies have made a favorable impact on the situation. However, the importance of communicable diseases in the practice of medicine for physicians, nurses, technicians, and health team auxiliaries persists due to their immense frequency, the communicability of many of them, and the implications they have for public and individual health.

This publication is the result of a laudable and efficient effort by the American Public Health Association begun in 1917 to bring up-to-date needed information on the identification and occurrence, infectious agent, reservoir, mode of transmission, incubation period, period of communicability, susceptibility and resistance, and methods of controlling communicable diseases whose incidence and prevalence vary among the 37 countries in the Region of the Americas.

The editor, Dr. Abram Benenson—renowned former professor of the Department of Community Medicine of the University of Kentucky, and formerly Director of the Gorgas Memorial Laboratory in Panama—secured the contributions of 29 experts from medical centers and research and service institutes of the United States and Canada; in addition, he had the active participation of the Pan American Health Organization in Washington, D.C. and the World Health Organization in Geneva. This work has thus become a model of technical international cooperation.

The book is written in manual form on the "what" (diagnosis) and the "how" (management) of 168 communicable diseases, arranged in alphabetical order from "actinomycosis" to "yersiniosis", in a clear, concise, interesting, and readable style.

Although it retains the same goals, design, and format of the previous edition, this publication introduces nine new chapters on: anisakiasis, babesiosis, botulism

[1]Available at the listed price from the Distribution and Sales Service, PAHO, 525 Twenty-third Street, N.W., Washington, D.C., 20037.

in the newborn, pustular contagious dermatitis, fascioliasis, Ebola-Marburg virus disease, legionellosis, Lyme disease, and slow virus infections of the central nervous system. It also reflects changes in the names of diseases and in the numbers assigned by the Ninth Revision of the WHO International Classification of Diseases.

The work includes a glossary of technical definitions of 48 key terms used in infectology and epidemiology which are of great practical value. It concludes with a very complete cross-referenced alphabetical subject index.

The text has no references or general bibliography. The manual's very practical format notwithstanding, this remains a weak point in the publication.

Who should have this book at hand for quick and easy reference? The text addresses the reader who is familiar with the nomenclature; it is therefore most useful for bringing up-to-date general physicians, pediatricians, nurses, epidemiologists, veterinarians, other professionals specializing in the various public health disciplines, mid-level technicians, and primary health care auxiliaries. At the same time, this publication is very useful for medical, nursing, and public health students who have a basic knowledge and understanding of microbiology, epidemiology, pathology, and practical medicine.

To summarize, the manual precisely fulfills the urgent need to supply the health sciences student and the professional, technician, and auxiliary with clear, concise, and complete information on what is "basic" and what is "new" in the diagnosis of a specific infectious/communicable disease, its corresponding treatment, and the management of individual patients or communities in such a way that the disease does not spread.

This important volume is available to professionals and technicians through the PAHO Scientific Series and to some of the various health sciences schools through PAHO's Expanded Textbook Program.

The Portuguese edition will also be published by PAHO later this year.

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION
525 Twenty-third Street, N.W.
Washington, D.C. 20037, U.S.A.