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Basic Elements for the Study and Prevention of Maternal Mortality

Deaths from complications of pregnancy, childbirth, and the puerperium are among the principal causes of death in women of reproductive age in the countries of the Region *(1)*. Maternal mortality is understood to mean "death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy itself or its management, but not from accidental or incidental causes" *(2)*.

By international agreement the maternal death rate has been defined as follows:

$$\frac{\text{No. of maternal deaths in one year x 10,000 or 100,000}}{\text{No. of live births in the same year}}$$

In a strict sense this measure is a ratio and not a rate because the number of live births does not coincide with the number of pregnant women at risk of death from these causes. However, the use of this denominator has been preferred because it is very difficult to obtain reliable information of similar quality in the countries on the number of pregnancies that end in abortions or stillbirths.

The strategies of WHO at the world level and those of PAHO in the area of the Americas both assign high priority to reduction of these deaths as part of the social objective of Health for All by the Year 2000. The importance of such death extends beyond what official statistics show, inasmuch as in the geographical areas where they are most common, underreporting tends to be greater. Hence, frequently the severity of the situation is underestimated.

At the present time, however, there is growing evidence of the magnitude of the problem and greater concern is being shown by the governments of the Region, regarding its study and quantification and the reduction of deaths through health and intersectoral coordination measures. There is a growing awareness that most maternal deaths derive from preventable causes.

Despite the underreporting in Latin America and the Caribbean, there are countries in which the rates based on the available official data truly reflect the seriousness of the problem, since they point to maternal death rates in excess of 30 per 10,000 live births. Even the lowest figures in Latin America are several times higher than those observed in North America *(3)*.

During their reproductive period, women are exposed to risks in the absence of proper social conditions, sufficient nutrition, and coverage and quality of services. In geographical areas with high fertility, as

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in the majority of the developing countries, these risks are increased, since women begin their reproductive life at an earlier age, have a greater number of pregnancies, and have them into more advanced ages.

Demographic Importance

Women of reproductive age, from 15 to 49 years, represent approximately 25% of the population, both in the underdeveloped and developed countries, while the population from 0 to 14 years amounts to 39% in the countries of the Third World and less than 22% for the most advanced countries. Inversely, the elderly population, 65 and over, is greater in the developed countries, twice that of the developing countries (28% and 11% respectively).

In absolute numbers, it is estimated that the female population from 15 to 49 years (which currently approximates 86 million) will increase by 58 million in Latin America and the Caribbean between 1980 and 2000. For North America that increase would be only 11 million in the same period (Table 1).

If the population growth and the combined effect of current death and fertility rates in the Region are maintained, more than one million maternal deaths can be expected between 1980 and 2000 in Latin America and the Caribbean, whereas if overall levels of maternal mortality similar to those of Costa Rica and Cuba at the present time are attained, the number of deaths will be barely 60,000.

Relation between Fertility and Infant and Maternal Mortality

In the mortality structure in the Americas, complications of pregnancy, childbirth, and the puerperium figure among the first five causes of death; in some regions they occupy second place as the cause of death, both in women between 15 and 25 years of age and between 25 and 49 years of age *(1)*.

As in infant mortality, the maternal death rate reflects differences in the health and living conditions of populations, but it also constitutes a good indicator of the state of development of prenatal, delivery, and puerperium services.

In Latin America and the Caribbean, wide variation is observed in maternal death rates by country, ranging from 20 to 50/10,000 live births in Bolivia, Haiti, and Paraguay, and from 3 to 6/10,000 live births in Chile, Costa Rica, Cuba, Panama, and Uruguay in recent years (1980-1984) *(4)*.

A decline has been observed in maternal mortality in the last two decades and it has been reduced to half or less in countries such as Chile, Costa Rica, and Cuba. In Canada and the United States the current level of maternal mortality is from 0.5 to 0.8/10,000 live births respectively *(4)*. Despite these achievements, figures are still high. The maternal death rate is almost 100 times greater in the country with the highest figure as compared with the lowest recorded in the Region (Table 2). Despite its importance for the family and society, it would appear that maternal mortality has not been confronted with sufficient determination and has not been assigned the priority it deserves.

It has been observed that the maternal death rate is usually closely related to variations in infant mortality and in fertility. Thus, in countries where fertility is high, maternal death rates and infant mortality rates are also high. Inversely, in countries where fertility is low, infant and maternal mortality rates are also low (Figure 1). In part this is because the three indicators

Table 1. Total population of women of reproductive age (15 to 49 years) and percentage of women of reproductive age of the total population by subregion, 1980 and 2000.

	Population (millions)		Women 15 to 49 years			
			Number (millions)		Percentage	
Subregion	1980	2000	1980	2000	1980	2000
Latin America and the Caribbean	362	560	86.9	143.3	24.0	26.1
North America	252	298	65.2	75.6	25.9	25.4

Source: United Nations. *World Population Prospects. Estimates and Projections as Assessed in 1982*. New York, 1985.

Table 2. Fertility rate, infant mortality rate, and maternal mortality rate in selected countries in the Region of the Americas.

Country	General fertility rate (live births per 1,000 women 15-49 years)		Infant mortality (per 1,000 live births)		Maternal mortality (per 10,000 live births)	
	Year	Rate	Year	Rate	Year	Rate
Argentina	1983	98.7	1983	28.4	1981	6.9
Bolivia	1980-85	189.0[a]	1980-85	124.0[a]	1980-85	48.0
Brazil	1982	179.5	1980	87.3[b]	1980	7.0[b]
Canada	1983	56.1	1983	8.5	1983	0.5
Chile	1984	80.2	1984	20.6	1984	3.7
Colombia	1982	125.1	1983	55.4	1982	11.7
Costa Rica	1983	114.9	1983	18.6	1983	2.6
Cuba	1984	62.2	1983	16.8	1983	4.5
Dominican Republic	1982	145.4	1982	32.1	1982	6.6
Ecuador	1982	127.3	1980	63.9	1982	18.0
El Salvador	1983	125.0	1982	42.2	1982	8.5
Guatemala	1984	167.6	1983	81.1	1984	7.9
French Guiana	1983	121.9	1983	20.0	1983	23.8
Guyana	1979	113.1	1984	45.0	1979	3.5
Haiti	1983	227.6	1982	124.0	1984	23.0
Honduras	1983	179.4	1983	17.4	1983	5.0
Jamaica	1984	102.9	1978	16.2	1977	5.3
Mexico	1982	144.6	1982	33.0	1982	9.1
Nicaragua	1983	195.6	1983	75.2	1984	4.7
Panama	1983	110.0	1983	20.4	1983	6.0
Paraguay[b]	1984	107.0	1984	49.8	1984	27.5
Peru	1983	156.1	1982	31.8	1982	8.5
Puerto Rico	1983	77.9	1983	17.3	1983	0.6
Suriname	1983	157.0	1983	24.7	1982	8.9
Trinidad and Tobago	1980	104.0	1979	18.7	1979	7.1
United States of America	1984	59.7	1983	11.2	1983	0.8
Uruguay	1984	75.7	1984	30.4	1984	3.8
Venezuela	1983	127.6	1983	27.8	1981	5.2

Source: Official reports sent by countries to the PAHO's Health Situation and Trend Assessment Program, with the exception of data noted, whose source is indicated below.

[a]United Nations. *World Population Prospects. Estimates and Projections as Assessed in 1982*, New York, 1985.

[b]Information area.

Figure 1. Relation between the fertility, infant mortality and maternal mortality rates, in selected countries of the Region of the Americas.

FERTILITY	INFANT MORTALITY	MATERNAL MORTALITY	
		High (>5.0)	Low (≤ 5.0)
High fertility rate (>100)	High infant mortality (>35)	Bolivia Brazil Colombia Ecuador El Salvador Guatemala Haiti Paraguay[a]	Guyana Nicaragua
	Low infant mortality (≤35)	Dominican Republic French Guiana Jamaica Mexico Panama Peru Suriname Trinidad and Tobago Venezuela	Costa Rica Honduras
Low fertility rate (≤100)	High infant mortality (>35)		
	Low infant mortality (≤35)	Argentina	Canada Cuba Chile United States of America Puerto Rico Uruguay

Source: Official reports sent by countries to the PAHO Program of Health Situation and Trend Assessment.

[a]Information area.

are related to a country's development level; however, independently of this consideration, high fertility has a direct effect on the other two rates, since in the extreme ages of women, high parity and short intergenesic intervals, characteristic of high fertility, are associated with greater risks of maternal and infant mortality *(5)*.

Up to now mother and child care, as well as studies of maternal and infant mortality, have been carried out separately in most cases. However, from the point of view of services, they should be coordinated in order to promote a beneficial exchange of experiences. Such coordination of studies does not imply disregarding the fact that, owing to their different nature and frequency, different methodologies should be applied to these phenomena.

Avoidability of Maternal Mortality

If the level of maternal death rates in the more developed countries is taken as a point of reference and it is compared with the values in other countries, it may be concluded that most of the maternal deaths that occur in the Third World are avoidable. Still, in developed countries such as the United States, 50% of the deaths are considered preventable *(5)*. The situation in some Latin American countries (Chile, Costa Rica, Cuba) demonstrates such avoidability even in developing countries *(3)*. A study carried out in the Region showed that 94% of maternal deaths were avoidable *(6)*.

Maternal deaths are closely linked to the characteristics of the health services, such as coverage, quality of care provided, and accessibility to institutional care, which increases the responsibility of the health sector when such deaths occur. In this sense, maternal mortality constitutes an indicator of the quality of the services. It is, in addition, an indicator of extreme damage done to women with respect to the reproductive process, since it conceals morbidity and cases of psychic and biological disability in women who survive. It is also of great social significance for the family and society.

Evolution of Maternal Mortality in the Americas

Problems stemming from deficiencies in the quality of vital statistics records, certification, and determination of the causes of death constitute formidable obstacles to achieving progress in the study of maternal mortality.

In general, the overall underdevelopment of the countries also places limitations on their statistical registration systems; consequently the less advanced countries frequently obtain incomplete and often unreliable information. For these reasons, available information should be analyzed with caution and the conclusions derived from it should be formulated prudently while awaiting better data. This also increases the need to carry out more detailed studies on the topic.

Trends in maternal mortality. In accordance with the information provided by the countries to the Health Situation and Trend Assessment Program of PAHO, the levels and trends of maternal mortality in the Americas show great differences from one country to another (Table 3). In most of them a downward trend is observed in the rates per 10,000 live births, with marked reduction in some countries: in Chile, from 29.9 in 1960 to 7.3 in 1980; in Costa Rica, from 12.6 in 1960 to 2.3 in 1980; in Uruguay, from 11.7 in 1960 to 5.0 in 1980; in Canada, from 4.5 in 1960 to 0.8 in 1980; and in the United States, from 3.7 in 1960 to 0.9 in 1980 *(3)*.

It should be pointed out that in 1960 a great number of countries showed high rates of more than 20 per 10,000 live births (Chile, Colombia, Ecuador, Guatemala, Honduras, Jamaica, Paraguay). In 1970, 10 years later, only Ecuador, Paraguay, and Peru remained in this category. In 1980, only Paraguay persisted with figures higher than 20 per 10,000 live births *(3)* (Table 3). However, these figures refer to countries that report on their vital statistics. Other countries that do not present annual reports are not included. Among the countries with low maternal mortality and a tradition of reliable statistical data in 1983 were Canada with 0.5 per 10,000 live births, Chile with 4 per 10,000 live births, Costa Rica with 2.6 per 10,000 live births, Cuba with 4.5 per 10,000 live births, the United States with 0.8 per 10,000 live births, and Uruguay with 3.9 per 10,000 live births *(3)*.

Criteria for the Analysis of the Causes of Maternal Death

For a better comprehension of the problem different classifications of the causes of maternal death may be employed:

From the obstetrical standpoint, the direct obstetric deaths are "those resulting from obstetrical complications of the pregnant state (pregnancy, labour, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above" *(2)*; indirect obstetric deaths, which

Table 3. Maternal mortality per 10,000 live births in selected countries of the Americas for 1960, 1970 and 1980.

Country	1960	1970	1980	Percent reduction[a] 1960-1980	Percent reduction[a] 1970-1980
Argentina	10.8	13.9	7.0	2.1	6.6
Canada	4.5	2.0	0.8	8.3	8.6
Chile	29.9	16.8	7.3	6.8	8.0
Colombia	25.9	15.9	12.6[b]	3.4[b]	2.1[b]
Costa Rica	12.6	9.5	2.3	8.2	13.2
Cuba	11.6	7.0	6.0	3.2	1.5
Dominican Republic	10.1	10.2	7.2	1.7	3.4
Ecuador	27.0	23.0	19.1	1.7	1.8
El Salvador	17.4	10.1	6.9	4.5	3.7
Guatemala	23.2	15.7	9.1	4.6	5.3
Honduras	31.0	17.4	9.4	5.8	6.0
Jamaica	20.0	10.6	3.6[c]	7.5[c]	8.6[c]
Mexico	19.3	14.3	8.7[b]	3.7[b]	4.4[b]
Nicaragua	18.6	...	4.7[d]	5.8[d]	...
Paraguay (Information area)	32.7	55.9	36.5	(0.6)	4.2
Peru	...	21.5	10.8	...	6.7
Trinidad and Tobago	13.1	13.5	6.4	3.5	7.2
United States of America	3.7	2.2	0.9	6.8	8.6
Uruguay	11.7	7.7	5.0	4.2	4.2
Venezuela	10.4	9.2	6.5	2.3	3.4

Source: Official mortality reports sent by the countries to PAHO's Health Situation and Trend Assessment Program.

... Data not available.

[a]Geometric reduction rate expressed as percent. Data in parenthesis indicate an increase.

[b]Data from 1981.

[c]Data from 1982.

[d]Data from 1983.

re "those resulting from previous existing disease or lisease that developed during pregnancy and which vas not due to direct obstetric causes, but which was aggravated by physiologic effects of pregnancy" *(2)*, and nonobstetric deaths, which occur from an accidental or incidental cause related to pregnancy or its management. Although in accordance with the rules of the International Classification of Diseases, Ninth Revision, (ICD) these are not included among the causes of maternal mortality for international comparisons, certain countries with low rates may be interested in this information.

From the clinical standpoint, the principal causes of maternal death are classified in the ICD (630-676) *(2)*.

From the standpoint of avoidability through the actions of the health services, maternal deaths may be classified as:

Avoidable: Deaths preventable by actions carried out by the health services (prenatal care, adequate care at delivery, and family planning).

Probably unavoidable: Deaths occurring even though correct and timely actions have been carried out.

Unknown: Deaths of unknown cause not included in the previous categories, but related to pregnancy, childbirth, and the puerperium.

The concept of avoidability is oriented toward the administration of services, improvement of care, and decision-making in order to guarantee an adequate supply of services to the population, particularly in the areas of perinatal care and family planning.

Factors Associated with Maternal Mortality

In the different classifications of the causes of maternal death the influence of certain factors cannot be disregarded. Some of them are directly related to the organization of services, while others are indirectly related. Among the former the following may be cited: accessibility to services (sociocultural, economic, and geographical) in relation to pregnancy, childbirth, and puerperium care; the availability and quality of resources and services (human, physical, and financial), and the regionalization of services with a risk approach that allows for an appropriate referral system.

In addition, consideration should be given to the socioeconomic determinants that act with varying impact upon maternal mortality. The association, although very close, is considered to be indirect. Included among these factors are poverty, malnutrition, suburban or rural residence, composition of the family and its edu-

Table 4. Percent distribution of maternal mortality by cause of death[a] in selected countries of the Americas, for the most recent year with available data.

Country (year)	Total maternal deaths	Percent distribution of deaths					
		Direct obstetric causes					Indirect obstetric causes
		Abortion	Haemorrhage	Toxemia	Complications puerperium	Others	
Argentina (1981)	472	35.8	14.4	13.1	14.4	20.6	1.7
Brazil[b] (1983)	2,116	13.5	19.6	31.6[c]	14.7	17.7	3.0
Chile (1984)	94	40.4	6.4	20.2[c]	13.8	11.7	7.4
Colombia (1981)	969	17.2	18.6	23.5[c]	6.5	31.3	2.9
Cuba (1984)	77	15.6	3.9	–	13.0	35.1	32.5
Dominican Republic (1984)	120	21.7	18.3	31.7	–	17.5	10.8[d]
Ecuador (1984)	384	8.9	21.4	27.9	8.6	32.0	1.3
El Salvador (1984)	99	7.1	7.1	5.1	8.1	71.7	1.0
Guatemala (1981)	326	8.6	4.6	3.4	9.2	74.2	–
Honduras (1982)	149	6.0	3.4	0.7	1.3	88.6	–
Mexico (1982)	2,166	8.2	21.2	5.9	8.6	53.0	3.0[d]
Paraguay[b] (1984)	155	12.3	27.7	18.7	16.1	21.3	3.9
Peru (1982)	576	12.5	29.3	7.5	12.3	38.0	0.3
United States of America (1983)	290	17.2	10.3	13.8	29.0	26.9	2.8
Venezuela (1983)	303	19.8	15.8	20.5	18.8	18.2	6.9

Source: Official mortality reports sent by countries to the Program of Health Situation and Trend Assessment, PAHO.
– Data not available.
[a]Causes of maternal death include the following ICD codes: Abortion, 630-639; Haemorrhage, 640, 641, 666; Toxemia, 642.4-642.9, 643; Other direct obstetric causes, 642.0-642.3, 644-646, 651-665, 667-676; Indirect obstetric causes, 647-648.
[b]Information area.
[c]Also includes codes 642.0-642.3, that for other countries are included under "Other direct obstetric causes."
[d]Includes one death due to normal childbirth (ICD code 650).

cational level, marital status, and the disadvantageous cultural and social situation of women in accordance with each type of society.

Both direct and indirect factors affect maternal mortality but their effects vary according to how they combine with biological variables such as age, parity, and intergenesic interval.

Characteristics and Determinants of the Principal Groups of Causes of Maternal Death

The complications of pregnancy, childbirth, and the puerperium persist as a major cause of death in the developing countries for women between 15 and 49 years of age *(1)*.

Most maternal deaths are due to direct obstetric causes and among them the most significant are those associated with hemorrhage, complications of the puerperium, and toxemia. Induced illegal abortion must be added to these, particularly in Latin America. These four groups of causes represent 75% or more of maternal deaths in some countries of Latin America and the Caribbean. Such is the case in Argentina, Chile, and Venezuela, among others (Table 4).

Although in many cases available information does not lend itself to detailed analysis of levels and trends, on the other hand it does provide a general overview that is useful in guiding subsequent studies and proposals for health interventions. A profile of maternal mortality is thus obtained which makes it possible to establish priorities for action in maternal health programs.

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(*Source:* Reference Document on Study and Prevention of Maternal Mortality, Maternal and Child Health Program and Health Situation and Trend Assessment Program, PAHO.)

Mortality from Acute Respiratory Infections in Children under 5 Years of Age: Global Estimates

Introduction

Acute respiratory infections (ARI) have long been recognized as a leading cause of morbidity and mortality, especially among the very young and the very old.

The analysis of information available to WHO relating to the situation in the 1950s and 1960s published in 1973 *(1)* showed that ARI were among the most important causes of death in all age groups and particularly in children under 1 year of age. A more recent analysis of the problem *(2)* shows that in developed countries ARI are the cause of about 10 to 15% of all infant deaths and deaths in those over 65 years of age; they also account for around 30 to 40% of outpatient attendances and 20 to 30% of hospital admissions in these two age groups.

As regards developing countries, the available health services statistics and data from special surveys indicate that the magnitude of the ARI problem in terms of morbidity is more or less the same as in developed countries, but that mortality from ARI, particularly in infants and young children, may be 30 or more times higher than in developed countries. For most developing countries, however, data on mortality and on causes of death are lacking.

It is well known that while 65 to 75% of all deaths in developed countries are in persons 65 years and older, in developing countries 50% of all deaths are in children under 5, who represent 15% of the total population. In many developing countries the average life expectancy at birth is still around 50 years. The life expectancy of children who survive to age 1 increases to 56-57 years, and those who survive to age 5 enjoy a life expectancy of over 60 years, a level not markedly dissimilar from that of developed countries *(3)*. For most developing countries, in fact, the levels of infant mortality and life expectancy are the only available estimates that can be used for delineating existing public health problems.

Infant mortality is widely recognized as a sensitive indicator of general health conditions and is often used as a substitute for or as an index of life expectancy. It may also indicate, although with limitations, the differences in the structure of mortality according to major causes of death due to differential fatality rates of various diseases, particularly in children from poor socioeconomic and environmental conditions. This certainly applies to deaths caused by acute respiratory infections.

In an attempt to estimate the global magnitude of mortality from acute respiratory infections in children under 5, an analysis was undertaken of data on reported deaths, mainly from developed countries, and of estimates concerning infant and early childhood mortality from the rest of the world, including, where available, the distribution of deaths according to major causes.

Estimates of the Annual Number of Infant and Child Deaths in the World

Although reliable data on the total number of deaths in children 0 to 4 years of age do not exist, an estimate based on available demographic information has been calculated as a basis for reference purposes to provide a global estimate of ARI-related deaths.

Infant mortality is one of the indicators available for nearly all countries, mostly as an estimate based on surveys or indirect methods of measurement. UNICEF publications *(4, 5)* present these estimates on infant mortality together with other relevant indicators, including estimates of total number of deaths in children under 5. A summary of these data is presented in Table 1, with countries grouped according to infant mortality levels. Estimates of the annual number of births and of the child populations in the 1 to 4 age group are also given. The figures refer to 1981, the year for which data on ARI-related deaths from 39 reporting countries were available.

The figure of 10 million deaths per year in infants and another 4.6 million in children 1 to 4 years, or 40.000 daily deaths of children under 5 is, most probably, a reasonable estimate. Gwatkin *(6)*, for example, prepared a set of estimates based on the most recent and authoritative data available and concluded that during the late 1970s the range of the annual number of infant and child deaths in the world would be from 12 to 13 million to about 17 to 18 million, with an average of around 15 million.

For many years to come, this type of estimate of the magnitude of childhood mortality will be the only one

Table 1. Annual number of deaths in children 0 to 4 years according to levels of infant mortality (global figures for 1981).

Level of infant mortality (per 1,000 live births)	Number of countries	Estimated total population (millions)	Estimated births per year (millions)	Estimated child population 1-4 years (millions)	Estimated global number of deaths (millions)	
					In infants	In children 1-4 years
25 and less	51	1,127	16.0	67.5	0.3	0.10
26-50	27	1,451	31.3	122.0	1.3	0.35
51-75	9	190	6.5	21.7	0.4	0.15
76-100	20	470	17.4	55.8	1.6	0.60
101-125	18	1,110	41.2	120.0	4.6	2.40
126 and over	25	252	11.6	33.0	1.8	1.00
Total	150	4,600	124.0	420.0	10.0	4.60

available. It must be borne in mind that more than 40% of the world's infants and nearly 40% of the world's children 1 to 4 years old live in countries with an infant mortality level of 100 and more per 1,000 live births, and where no data whatsoever exist in regard to vital events. There is little doubt that the very high infant and childhood mortality in these countries results from the combined effect of infections, parasitic, diarrhoeal and respiratory diseases on the one hand, and of nutritional deficiencies on the other hand. The same holds true for many countries with infant mortality levels between 50 and 100 per 1,000 live births.

ARI-related Deaths in Countries Reporting Causes of Death

Data on ARI-related mortality in children under 5 were tabulated for 39 countries reporting causes of death given separately for infants and children 1 to 4 years old. The following causes of death, according to the Ninth Revision of the International Classification of Diseases, were considered as ARI-related deaths: tuberculosis, diphtheria, pertussis, measles, otitis media, upper respiratory tract diseases, other respiratory tract diseases, acute bronchitis and bronchiolitis, pneumonia, influenza, and pleurisy. The year to which most of the reported data referred was either 1979, 1980 or 1981, but in a few instances figures for 1982 or 1983 were available. However, the differences in the annual number of deaths reported, if available for several of the above years, were very small, and it can be assumed that the data presented here represent the annual number of ARI-related deaths in children under 5 reported in 1981.

Among the 39 countries for which data on causes of death were available for computation were: Canada and the United States (Northern America), 11 Latin American and Caribbean countries (Argentina, Chile, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Panama, Paraguay and Peru), 8 countries/territories from Asia (Hong Kong, Israel, Japan, Kuwait, Singapore, Sri Lanka, Syrian Arab Republic and Thailand), Australia and New Zealand (Oceania), and 16 European countries (Austria, Belgium, Bulgaria, Czechoslovakia, France, Federal Republic of Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Rumania, United Kingdom, and Yugoslavia).

The total number of reported ARI-related deaths in these 39 countries was 111,877, of which 74,268 (66.4%) were in infants and 37,609 (33.6%) in children 1 to 4 years old. All these deaths are presented in Table 2, with countries grouped according to level of infant mortality.

Although nearly two-thirds of the 39 reporting countries belong to the group with an infant mortality level of 25 per 1,000 live births or less, the differences in the ARI death rates are striking. ARI death rates range from 0.85 to 4.75 per 1,000 infants, and from 0.06 to 0.39 per 1,000 children 1 to 4 years old. Death registration in all these countries has to be considered as complete, according to the accepted definition of completeness, i.e., 90% or more of all deaths are recorded. The same range of differences in ARI death rates is seen in the remaining one-third of reporting countries with higher levels of infant mortality. Here, however, the completeness of vital registration may be questioned. In many Latin American countries, for example, which represent the majority of this second group of reporting countries, despite fairly complete death registrations, serious defects exist in the registration of causes of death, with a sizeable percentage of deaths assigned to ill-defined causes.

Table 2. ARI-related deaths in children 0 to 4 years in 39 countries or areas reporting causes of deaths, according to level of infant mortality (in or around 1981).

Level of infant mortality (per 1,000 live birth)	Reporting countries/areas	Number of countries/ areas	Total popula- tion (millions)	Number of births per year (thousands)	Child population 0-4 years (millions)	Reported ARI-related deaths					
						Absolute figures			Rates per thousand		
						In infants	Children 1-4	Total	In infants	Children 1-4	Total
	Northern America										
	United States, Canada	2	256.5	4,100	20.3	3,483	985	4,468	0.85	0.06	0.22
	Central America										
	Costa Rica	1	2.4	74	0.3	352	97	449	4.59	0.39	1.43
	Asia										
25 and	a) Hong Kong, Japan, Singapore	3	126.0	1,638	9.0	2,003	1,097	3,100	1.2	0.20	0.34
less	b) Israel, Kuwait	2	5.5	154	0.8	732	163	895	4.75	0.25	1.20
	Oceania										
	Australia, New Zealand	2	18.3	296	1.5	291	88	379	1.00	0.07	0.30
	Europe	13	344.4	4,637	22.4	11,679	2,364	14,043	2.52	0.20	0.63
	Subtotal	23	753.1	10,899	54.3	18,540	4,794	23,334	1.70	0.11	0.43
	Americas	4	46.1	1,183	4.9	8,804	2,118	10,922	7.44	0.6	2.23
26-50	**Asia**	2	63.9	1,817	8.5	7,831	6,927	14,758	4.3	1.1	1.7
	Europe	3	55.2	945	4.6	15,722	2,972	18,694	16.6	0.8	4.1
	Subtotal	9	165.2	3,945	18.0	32,357	12,017	44,374	8.20	0.86	2.47
51 and	**Americas**	6	46.9	1,800	7.6	22,873	20,071	42,944	12.7	3.46	5.65
over	**Asia**	1	9.5	443	1.8	498	727	1,225	1.12	0.54	0.68
	Total	39	974.7	17,087	81.7	74,268	37,609	111,877			

Table 3 shows the percentage distribution of ARI-related deaths in children in 39 reporting countries, according to specific causes of death. It can be seen that even within these causes the highest proportion is attributed to "other respiratory tract diseases".

The known magnitude of ARI-related mortality in developed countries represents only a fraction of its global magnitude. It cannot be assumed that unregistered deaths, or even those due to ill-defined causes, have the same distribution as the ones which have been reported and for which the cause of death has been determined.

Worldwide Mortality from ARI

The figures for ARI-related deaths from 39 countries reporting causes of death, presented in Table 2, are certainly not representative, since these countries comprise only 21% of the total world population, 18% of the total number of children 0 to 4 years old, and 14% of infants born each year. For the rest of the world reliable

Table 3. Percentage distribution of ARI-related deaths in children in 39 reporting countries according to specific causes of death (in or around 1981).

Causes of death	Percentage distribution of deaths		
	In infants	In children 1-4 years	Total in children under 5 years
Tuberculosis	0.33	1.40	0.69
Diphtheria	0.22	0.90	0.45
Pertussis	2.20	3.70	2.70
Measles	2.83	12.84	6.19
Otitis media	0.64	0.15	0.48
Upper respiratory tract diseases	3.52	8.57	5.22
Other respiratory tract diseases	47.93	39.74	45.18
Acute bronchitis and bronchiolitis	3.16	2.01	2.78
Pneumonia	37.26	27.15	33.86
Influenza	1.88	3.44	2.40
Pleurisy	0.03	0.10	0.05
Total	100.00	100.00	100.00

Table 4. Estimated annual number of ARI-related deaths in children 0 to 4 years, according to level of infant mortality (global figures for around 1981).

Level of infant mortality	Number of countries	Number of infants (millions)	Number of children 1-4 years	Estimated ARI-related deaths Rates per 1,000		Absolute figures (thousands)	
				Infants	Children 1-4 years	Infants	Children 1-4 years
25 and less	51	16.0	67.5	2.5	0.2	40	14
26-50	27	31.3	122.0	8.0	1.0	470	122
51-75	9	6.5	21.7	16.0	3.5	130	76
76-100	20	17.4	55.8	25.0	5.0	435	279
101-125	18	41.2	120.0	28.0	6.0	1,154	720
126 and over	25	11.6	33.0	30.0	7.0	348	231
Total	150	124.0	420.0			2,577	1,442

data on causes of deaths are either very limited or nonexistent.

The differences in ARI death rates among reporting countries however, together with other published data on ARI-related deaths in children, seem to present a reasonable basis for an assessment of the worldwide magnitude of ARI-related mortality in children under 5. Table 4 presents the results of such an assessment in which ARI death rates were applied to the world child population grouped according to level of infant mortality.

The figure of 4 million ARI-related deaths per year in children under 5 may well be an underestimation rather than an overestimation, as the ARI death rates used for calculations might be lower than the actual ones. This is certainly the case for some countries with a very high overall level of infant mortality.

The limited data published on ARI-related deaths show vast differences in levels of mortality. For example, in Peru, with regard to influenza and pneumonia only, the level of mortality is 37 times higher in infants and 43 times higher in children 1 to 4 years than in Canada or the United States *(7)*. In the Philippines these rates are 24 and 73 times higher, respectively, for infants and children 1 to 4 years than in Australia *(8)*. Other examples of these differences in mortality from influenza and pneumonia, only between selected developed and developing countries, have been presented by Pio *et al. (2)*. All these examples relate to countries with an infant mortality level below 100 per 1,000 live births, and there is no doubt that similar, if not still higher, differences must exist between countries with overall infant mortality above 100 per 1,000 live births and those below 50 per 1,000.

The margin of error, however, cannot be very high in view of the fact that the figure of 4 million deaths due to ARI represents 27% of all deaths in this age group. The same proportion of ARI-related deaths to total deaths in children under 5 was found in a few mortality surveys currently undertaken by the WHO Program on ARI in selected areas of developing countries. The same proportion has also been reported by Bulla and Hitze *(9)*.

Discussion

As far back as 1960, a Committee of the American Public Health Association *(10)* stated that "...in an oversimplified fashion four levels of public health concern and effort can be delineated: (1) mortality, (2) serious morbidity, (3) minor morbidity, (4) positive health". The Committee saw the United States in 1960 as ready for level (3), and used acute respiratory infections, among others, as an example of minor morbidity. Using the same oversimplified classification to delineate public health problems in developing countries in the 1980s, there is full consensus that all these countries are still at level (1), and that traditional health indicators, such as infant mortality and life expectancy, remain most useful.

For most developing countries, in fact, these indicators are the only ones available, and this explains why the level of infant mortality has been used as a basis for the global assessment of ARI-related deaths. The limited evidence available seems to indicate that there is a relationship between the level of infant mortality and ARI-related deaths.

In the developed countries there has been a steady decline over the last 20 to 30 years in both infant and childhood mortality as well as in the rates of deaths due to respiratory diseases.

Some developed countries have recently reached the

level of infant mortality of 7 to 8 per 1,000 live births, considered the lowest possible limit of infant mortality under the present state of the art of medicine. In regard to ARI-related deaths, data presented in the Joint United Nations and World Health Organization Study on Levels and Trends of Mortality since 1950 *(3)* as well as in several other publications *(2, 11)* confirm that between the 1950s and 1970s death rates due to respiratory diseases were reduced by more than 50% in infants and by more than 60% in children 1 to 4 years old.

For more developed countries it was also found that there is a close relationship between infant mortality and GNP per capita. The coefficient of correlation is -0.89 *(3)*. This degree of correlation is impressive as it is well known that the value of GNP per capita does not take into account differences in the international distribution of income, or differential levels of government spending on health and welfare items, both of which could be expected to influence mortality levels *(3)*. Due to lack of data, such a relationship cannot be assessed for developing countries, although there is little doubt that it exists there too. Survey data from some developing countries indicate huge within-country differences in the levels of infant and childhood mortality. In some countries, children from urban areas experience lower mortality than rural children. This may be particularly true for infant mortality which, in some developing countries, was found to be 40% higher in rural than in urban areas. It was claimed that better access to health facilities in urban areas, with a ratio of physicians and hospital beds per population ten times higher on average, may be responsible for this difference.

It was found that childhood mortality was twice as high when mothers had no education compared to mothers with elementary education, and four times as high when compared to mothers with secondary education. Obviously, many factors contribute to an extremely high level of mortality in children, particularly infants from lower socioeconomic groups in developing countries: poor nutrition, low income, poor environmental sanitation and personal health practices, inadequate preventive health measures and inaccessibility of health facilities. Culturally determined attitudes with respect to health and medical care also contribute to the high level of infant and childhood mortality observed among the poorest classes, in addition to poverty and privation. Often there is a lack of knowledge and awareness of health problems among these groups.

Differences in socioeconomic conditions within developing countries imply the coexistence of population groups enjoying radically different mortality levels. The lower socioeconomic groups, apart from outnumbering the better-off, have the highest fertility, so that the overall level of infant and childhood mortality is declining very slowly, if at all, in those countries. The limited evidence available also seems to indicate that in most developing countries the rate of decline in ARI-related deaths is small or nonexistent.

Conclusion

Although the inadequacy of existing health information systems worldwide is well known, the limited data available on ARI-related deaths in children under 5 clearly indicate the magnitude of the problem. Out of nearly 15 million children under 5 dying each year, 4 million die of acute respiratory infection, and two-thirds of both these figures are infants. More than 90% of all these deaths occur in developing countries where children under 5 represent about 15% of the total population and contribute to over 50% of all deaths. In all these countries, acute respiratory infections together with diarrhoeal diseases and malnutrition constitute the main cause of high childhood mortality. This presents a strong rationale for focusing the attention of the WHO ARI program on deaths among children under 5.

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(*Source:* Jerzy Leowski, Tuberculosis and Respiratory Infections Unit, Division of Communicable Diseases, WHO, Geneva. This article was first published in the *World Health Statistics Quarterly/ Rapport Trimestriel de Statistiques Sanitaires Mondiales* 39(2):138-144, 1986.)

Epidemiological Activities in the Countries

Meeting in Costa Rica on a Program to Strengthen Epidemiological Instruction in Schools of Public Health

From 23 to 25 July 1986 representatives from PAHO/PASCAP and some Latin American schools met in San José, Costa Rica, in order to draw up a plan for strengthening epidemiological instruction, which will initially focus on the Schools of Public Health of Rio de Janeiro, Medellín and Mexico City. The project, sponsored by PAHO/WHO, includes the development of a network of national and regional epidemiologic research centers that will constitute the unifying axis of the program, under which schools and health services will work in collaboration. The program, which will begin in the three aforementioned schools, will gradually be extended to others.

With the recommendations of the Buenos Aires Seminar on the Uses and Prospects of Epidemiology as a frame of reference, the essential features of teaching practice in Brazil, Colombia, and Mexico were examined at the meeting. Proposals prepared by these countries were discussed with a view to devising a plan of work for the short term.

The delegation of ***Brazil*** presented the recommendations of the Seminar on Epidemiology Applied to Health Services recently held at Itaparica and stressed the need to concentrate on health professionals holding higher degrees. Brazil's proposal also calls for a) the preparation of teaching materials and organization of bibliographical support; b) a survey of manpower resources in epidemiology; c) the identification and support of teaching units that are part of research and service establishments, and d) periodic surveys and meetings for continuing education and program evaluation.

The proposal made by ***Colombia*** focuses on a) the need to train 150 additional epidemiologists in the near future (target established by the National Meeting of Epidemiologists held in Medellín from 21 to 22 April 1986); b) the need to use epidemiology in the planning and administration of health services, and c) the conduct of research programs through the urban units of Barranquilla, Cali, Bucaramanga, Bogotá and Medellín. As a short-run strategy, it proposes the organization of national-level seminars on subjects of interest to the country (general mortality, chronic diseases, accidents and violence, drug addiction, the evaluation of health services, and others).

The proposal put forward by ***Mexico*** has five major components: a) a national continuing education program based on regional networks; b) strengthening of master's degree programs in epidemiology; c) the design of teaching and reference materials; d) promotion of instruction standardization workshops for educators, and e) research projects.

As a result of these proposals, it was necessary to extend the period originally set aside for diagnosing personnel training needs in epidemiology. Features common to the proposals of the three countries are concern for the training of personnel at the regional and intermediate levels, research-based instructions; emphasis on the use of epidemiology in the evaluation of services, and finding the means to provide continuing education for personnel previously trained.

Establishing and developing a regional network implies the countries', as well as PAHO's commitment to institutional strengthening (appraisal of public health schools, inventorying of resources, development of the schools' capabilities to provide technical cooperation, and an information and documentation system); academic strengthening (exchanges of faculty among schools, teacher training, and the development of methodological and technological infrastructures); development of training proposals (policy, service and operational elements for project development, types of manpower, and evaluation indicators), and the

strengthening of research (defining of policies and priority areas, articulation with services, improving methodologies, identification of sources of financing, and assimilation of findings into services).

Establishment of an Epidemiological Analysis and Information Unit in Ecuador

In response to one of the recommendations of the Seminar on the Uses and Prospects of Epidemiology in Ecuador, held in Ibarra from 28 to 30 August 1985, and to the proposal of the National Directorate for Epidemiological Control and Surveillance, the Ministry of Public Health has established an Epidemiological Analysis and Information Unit. This unit will be part of the Ministry's regular statutory organization and its purpose will be to maximize the use of epidemiological information and the epidemiological method in disease control. Among its functions are the following:

- Improve the information system, particularly for notifiable diseases, so as to reduce underrecording and improve the promptness of reports in order to provide information that may be of use in establishing effective surveillance and control measures.
- Streamline the processing of routine information generated in provincial units and establish mechanisms for its rapid analysis.
- Make complete analyses and adopt new indicators so that the information generated may be of use in evaluating and monitoring programs.
- Feed processed information back to operational units. It is hoped to double the number of copies of the *Boletín Epidemiológico* produced in the first year and to increase its distribution.

This action has given legal standing to some of the operations promoted in recent years as part of the modernization of epidemiological practice in the Ministry of Public Health. However, for this effort to produce the desired results, the activities for strengthening training and research in epidemiology will have to be undertaken soon.

Journal of the Peruvian Epidemiological Society

To contribute to the understanding of leading national problems and their causes and at the same time to circulate local and foreign information on public health, the Peruvian Epidemiological Society is publishing a quarterly *Revista de la Sociedad Peruana de Epidemiología*. This journal contains the following sections: Trabajos originales (Original Papers), offering unpublished papers on epidemiological and public health aspects of national interest; Recordando epidemiología (Epidemiological Reminders), which presents concepts of epidemiology and epidemiological methodology not in frequent use; Revistas (Journals), which contains articles of unusual interest originally published in other journals; Contribución (Contributions), presenting notes conveying information on some specific subject and commentary on epidemiological problems; and finally, Editorial (The Editorial), in which the management of the journal states the views of the editorial board. In addition to this publication, there is the *Boletín de Enfermedades Transmisibles* (Communicable Diseases Bulletin), prepared by the Ministry of Health.

Persons interested in receiving this publication should write to: *Revista de la Sociedad Peruana de Epidemiología,* Av. Lima 701, Lima 32, Peru.

Epidemiología: New Mexican Bulletin

The bulletin *Epidemiología* is the product of a series of coordinating actions being carried out in Mexico by the Inter-Institutional Epidemiological Surveillance Committee, and has been appearing monthly since January 1986. It is based on information generated by the leading institutions of the National Health System and its primary purposes are to advise on the frequency and distribution of diseases subject to epidemiological surveillance, publish epidemiological studies of good technical and scientific quality, and disseminate current knowledge on the epidemiology, prevention, and control of diseases whose nature and frequency make them major health problems.

This bulletin does not replace other epidemiological notification and surveillance arrangements needed for immediate decision-making and maintained by each institution. The information presented is of a more general nature, useful for medium-and long-term planning. The publication also serves as a vehicle for conveying information on academic events in the area of epidemiology. It is aimed chiefly at the physicians and personnel who generate the epidemiological information in health institutions, in hopes that the material published will encourage and in some manner reward their efforts. It also supplies data and disseminates knowledge useful to all health workers, and especially to those responsible for the planning and implementation of programs for the study, prevention, and correction of the country's health problems.

Persons interested in receiving this publication should write to: *Epidemiología,* Boletín Mensual, Aniceto Ortega 1321, 7° piso, México 03100, D.F., Mexico.

Status of AIDS in the Americas

In 1983 PAHO initiated regionwide surveillance for acquired immunodeficiency syndrome (AIDS). Because AIDS was confined almost exclusively to the United States and certain high risk population groups, a very simple reporting system was installed based on the Centers for Disease Control's case definition. Member countries were requested to report the total number of cases of AIDS and deaths due to AIDS every six months. Since the objective was to follow the spread of AIDS within the Region, no attempts were made to distinguish AIDS-related complex from advanced AIDS cases, nor to include AIDS infection once antibody testing became available.

This report summarizes the available data based on the PAHO surveillance system, as well as data from several special studies carried out in some of the countries. The data are sufficient to define the overall picture of AIDS in the Americas, although the exact magnitude of the AIDS problem is not known precisely.

Table 1 presents the total number of AIDS cases and deaths through 31 December 1986, by subregion and country. Mexico and Brazil are considered to be separate subregions. Since the initiation of surveillance, a total of 32,560 cases and 17,910 deaths have been reported. The overall case fatality rate (number of deaths as a proportion of the number of cases) is 56%. However, this rate varies from a low of 24% in the Latin Caribbean Region to a high of 61% in Central America and Panama. In countries where there is a sufficient number of cases and deaths to stabilize the rate, it ranges between 40 and 55%.

Four countries, Brazil, Canada, Haiti and the United States have the most cases and contributed a total of 31,357 cases or 96% of the total. Neither incidence

Table 1. Number of AIDS cases and deaths reported in the Americas through 31 December, 1986.

Subregion and country	No. of confirmed cases	No. of deaths	Subregion and country	No. of confirmed cases	No. of deaths
Latin America	*2,119*	*919*	***Caribbean***	*464*	*225*
Andean Group	*116*	*80*	Antigua and Barbuda	2	2
Bolivia	1[a]	1[a]	Bahamas	85	29
Colombia	30	15	Barbados	15	9
Ecuador	7[a]	4[a]	Belize	1	0
Peru	9[a]	6[a]	Cayman Island	1	1
Venezuela	69	54	French Guiana	58	41
Southern Cone	*100*	*57*	Grenada	3	3
Argentina	69	37	Guadeloupe	40	23
Chile	22	14	French Antilles	92[e]	...[e]
Paraguay	1	1	Jamaica	6	6
Uruguay	8	5	Martinique	16	10
Brazil	*921*	*497[b]*	St. Christopher and Nevis	1[a]	0[a]
Central American Isthmus	*62*	*38*	Saint Lucia	3[a]	2[a]
Costa Rica	16	11	Saint Vincent and the Grenadines	3[a]	2[a]
El Salvador	6	3	Suriname	2[a]	2[a]
Guatemala	15	8	Trinidad and Tobago	134	93
Honduras	13	7	Turks and Caicos Islands	2	2
Panama	12	9[c]			
Mexico	*316*	*100[d]*	***North America***	*29,977*	*16,766*
Latin Caribbean	*604*	*147*	Bermuda	48	29
Cuba	1[a]	1[a]	Canada	926	436
Dominican Republic	96	35	United States of America	29,003[f]	16,301[f]
Haiti	507[a]	111[a]			
			Total	32,560	17,910

[a]Did not report for second semester of 1986 (1 July through 31 December).
[b]Through 20 November 1986.
[c]Through 30 September 1986.
[d]Through 15 January 1987.
[e]Through 15 September 1986.
[f]Includes 76 cases diagnosed prior to 1981; of these 63 are known to have died.

nor prevalence rates are calculated since it is difficult to determine which cases are new and which cases are prevalent during a given time period. Cumulative evidence rates have not been calculated outside of the USA and Canada due to uncertainties regarding the validity of both the numerator and denominator. Excluding North America, there have been 2,583 cases in all the remaining 40 countries in the Americas.

Figure 1 presents the proportional distribution of AIDS cases in the Americas, by geographical subregion excluding North America. The Latin Caribbean subregion contributed 23% of the cases (604) due to the large contribution by Haiti, 507 cases. It is worrisome that the Caribbean (excluding the Latin Region) contributed 464 cases or 18% of the total from a population of approximately 6 million people, while Brazil contributed 921 cases or 36% from a population of approximately 130 million, that is, 20 times the population but only 2 times the number of cases.

The occurrence of opportunistic infections as markers for AIDS is variable throughout the Region. The specific frequencies of certain infections are essentially the same as in the United States, with some exceptions which still need further clarification. Diarrheal illness is more common in Haiti and generalized *Mycobacterium tuberculosis* infection is more common in Brazil and the Dominican Republic.

Table 2 is a composite of data obtained from multiple studies with varying methodologies. It presents the percent distribution of AIDS cases by patient categories. Not all countries use the different patient groups used by the United States as listed in column one. Numbers in parentheses represent the total number of cases on which the percentages are based. These studies

Figure 1. Percentage distribution of AIDS cases in the Americas by geographic subregion, through 31 December 1986 (excludes North America).

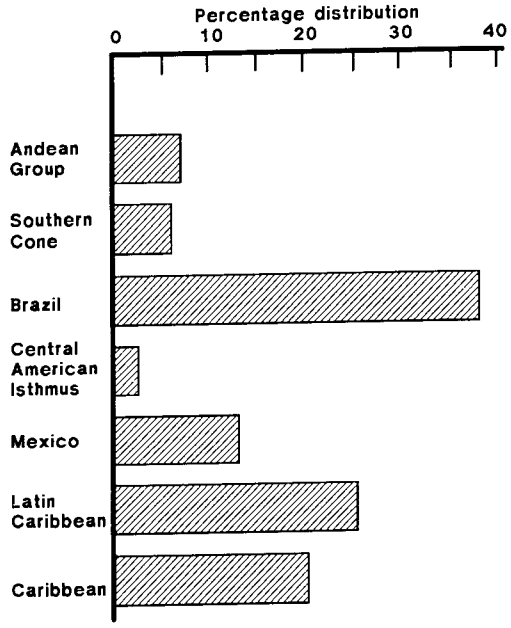


Table 2. Percent distribution of AIDS cases by patient characteristics.

Categories	USA (25,814)	Canada (743)	Brazil[a] (825)	Argentina[a] (40)	Costa Rica[a] (9)	Puerto Rico (32)
1. Adults	100	100	100	100	100	100
Homosexual/bisexual	66	80	70	96	35	55
Intravenous drug users	17	<1	2	2	–	36
Homosexual male/drug users	8	3	–	–	–	–
Hemophilia/coagulation disorder	1	–	5	–	65	<1
Heterosexual cases	4	2	2	–	–	–
Transfusion	2	3	2	–	–	–
None/unknown	3	10	15	2	–	8.5
2. Children	100	100	–	–	–	–
Hemophilia/coagulation disorder	4	–	–	–	–	–
Parents with/at risk for AIDS	81	82	–	–	–	–
Transfusion	13	18	–	–	–	–
None/unknown	2	–	–	–	–	–

[a]No data on 16 children <10 years old.

were done between 1984 and 1986. Although many blanks appear in this table, some conclusions can still be drawn:

1. The patient profile in the United States is clear and well known. There has been little deviation from this pattern since the beginning of the epidemic. Sixty-six% of cases are homosexual or bisexual men, while 17% are intravenous drug users. Eight% are both. Only 4% are men or women who acquired their disease through heterosexual means. Most of these 1,033 cases are women who were contacts of bisexual men or intravenous drug users. In most children acquiring the disease one parent has AIDS or belongs to a group at high risk of acquiring AIDS.

2. In Canada and Brazil, the pattern is slightly different; there is a greater proportion of homosexual and bisexual men and a much smaller proportion of intravenous drug users. In Brazil, 15% of the cases are not classified. Nevertheless, this proportion is decreasing as Brazil increases its case investigations.

3. In Costa Rica, almost all the initial cases were in hemophiliacs who received blood products from the United States. More recently, this proportion is falling as seroprevalence studies and case-finding efforts document the spread of the disease to other population groups at risk. In contrast, in Argentina nearly all cases have been homosexual men.

In the Americas AIDS is predominantly a sexually transmitted disease which has remained concentrated in the homosexual/bisexual male population. Haiti is an exception. The best available data indicates a male to female ratio of 2-3:1 compared to 12-14:1 in the United States.

With the advent of ELISA technology for AIDS, many countries began limited and sometimes sporadic antibody testing for blood donors, symptomatic persons and people in certain risk groups. The data in Table 3 were obtained from PAHO's Caribbean Epidemiology Center (CAREC) whose viral laboratories serve as reference laboratories for 19 English speaking Caribbean countries. During the period January 1 through December 31, 1985, CAREC tested a total of 967 adults and 103 children less than 15 years old, all from Trinidad and Tobago. These blood samples were not obtained in any systematic way and are not representative of particular risk groups. Nevertheless, it was possible to group the patients into various categories. Thus among the 390 symptomatic adults tested, 50 or 12.8% were positive by ELISA and Western Blot techniques. Of these, 99 were women who had a positivity rate of 5.1% compared to 15.5% in men. Asymptomatic homosexual men had a positivity rate of 28.4%. In a limited sample, none of 17 prostitutes were positive.

Table 3. Antibody testing in Trinidad and Tobago, by reason for testing 1 January to 31 December, 1985.

Categories	Male			Female			Total		
	No. tested	No. positive	%	No. tested	No. positive	%	No. tested	No. positive	%
1. Symptomatic adults	291	45	15.5	99	5	5.1	390	50	12.8
Homosexual	47	20	42.6	–	–	–	47	20	42.6
2. Asymptomatic adults	213	49	23.0	58	11	19	271	60	22.1
Homosexual	162	46	28.4	–	–	–	162	46	28.4
Contact	42	5	11.9	34	10	29.4	76	15	19.7
Prostitute	–	–	–	17	0	0	17	0	0
Transfused	–	–	–	4	1	25	4	1	25.0
Subtotal	755	165	21.8	212	27	12.7	967	192	19.9
3. Symptomatic children	–	–	–	–	–	–	78	6	7.7
4. Asymptomatic children	–	–	–	–	–	–	–	–	–
Parent with/at risk AIDS	–	–	–	–	–	–	11	1	9.0
Transfused	–	–	–	–	–	–	14	1	7.1
Subtotal	–	–	–	–	–	–	103	8	7.8

Source: CAREC.

Blood donor screening is variable in the Region, ranging from screening of all blood donors in the United States to very limited screening in other countries. A special study was undertaken in the Dominican Republic early in 1986 (Table 4). A total of 968 donors were screened during a 3-month period, yielding 14 confirmed positive or 1.5% overall. Recent data from the Bahamas revealed that three persons of 2,600 screened were positive, that is 0.1%. In the Dominican Republic none of the 35 women were positive. Paid donors had a slightly higher positivity rate, 1.8%, and a history of travel was significantly correlated with seropositivity (3.5% vs 1.3%). In this limited survey, a history of sexually transmitted diseases was not correlated with seropositivity.

Table 4. Blood donor screening results in the Dominican Republic, March 1986.

Donor characteristic	No. positive	%
Men	14	1.5
Women	0	0
Volunteer donor	6	1.4
Paid donor	8	1.8
No external travel	10	1.3
External travel	4	3.5
No homosexual contact	13	1.5
History previous STD	1	<1
No history previous STD	13	1.6

STD = Sexually transmitted diseases.

In conclusion, AIDS is a growing problem in the Americas. It is clearly a sexually transmitted disease, whose overall pattern, with the exception of Haiti, appears to be following the one established in the United States. The occurrence of disease in the intravenous drug user, however, is less prominent. The homosexual, and perhaps the bisexual, male accounts for most of the cases, but in some countries, e. g., Brazil, heterosexual cases are one of the fastest growing groups. Since it is firmly established in Africa that AIDS can be transmitted predominantly among heterosexual persons, it is possible that AIDS may spread into the general population in Latin America and the Caribbean. AIDS is a growing concern in Brazil, Mexico, and the Caribbean area and public health measures to prevent further transmission must be established urgently.

(Source: Health Situation and Trend Assessment Program, PAHO.)

Recommendations for Individuals Likely to Have HIV Infection

An individual judged most likely to have the human immunodeficiency virus (HIV) infection should be provided the following information and advice:

1. The prognosis for an individual infected with HIV over the long term is not known. However, data available from prospective studies indicate that most persons will remain infected.

2. Although asymptomatic, these individuals may transmit HIV to others. Regular medical evaluation and follow-up is advised, especially for individuals who develop signs or symptoms suggestive of AIDS.

3. Infected persons should refrain from donating blood, plasma, body organs, other tissue, or sperm.

4. There is a risk of infecting others by sexual intercourse, sharing of needles, and possibly exposure of others to saliva through oral-genital contact or intimate kissing. The consistent and adequate use of condoms may reduce the transmission of HIV.

5. Toothbrushes, razors, or other implements that could become contaminated with blood should not be shared.

6. Women with a seropositive test, or women whose sexual partner is seropositive, are themselves at increased risk of acquiring AIDS. If they become pregnant, their offspring are also at increased risk of acquiring AIDS.

7. After accidents resulting in bleeding, contaminated surfaces should be cleaned with household bleach freshly diluted 1:10 in water.

8. Devices that have punctured the skin, such as hypodermic and acupuncture needles, should be steam sterilized by autoclave before reuse or safely discarded. Whenever possible, disposable needles and equipment should be used.

9. When seeking medical or dental care for intercurrent illness, these persons should inform the individuals responsible for their care of their positive antibody status so that appropriate evaluation can be undertaken and precautions taken to prevent transmission to others.

10. Testing for HIV antibody should be made available to individuals who may have been infected as a result of their contact with a seropositive person (e.g. sexual partners, persons with whom needles have been shared, and infants born to seropositive mothers).

(Source: Discussions of the Advisory Group on AIDS, PAHO, December 1986.)

Expanded Program on Immunization-Joint WHO/UNICEF Statement on Immunization and AIDS

The risk of transmitting HIV infection through immunization

Infection with human immunodeficiency virus (HIV) can occur when injections are given using unsterile needles or syringes. Under the Expanded Program on Immunization (EPI) and the stimulus of achieving the goal of Universal Childhood Immunization by 1990, national programs are now increasing the number of injections given to children for the purpose of immunization. What are the risks of HIV infection from injections given for immunization in countries where the EPI target diseases are serious health problems?

The risk of an injection transmitting HIV infection is zero if a sterile needle and a sterile syringe are used. The vast majority of persons who provide immunization are trained health workers who know how to sterilize needles and syringes. Correct sterilization practices are now receiving special emphasis in every country with an EPI. Injections for immunization are among the safest injections a child receives.

The potential for spread of HIV infection in childhood immunization sessions is low even when sterilization practices are below standard. First, the efficiency of HIV transmission through injection is quite low. Second, immunization entails only a small number of injections. Third, immunization involves small needles which do not become grossly contaminated with blood.

Immunization programs in developing countries are now preventing almost a million deaths a year from measles, neonatal tetanus, and whooping cough. Tragically, these diseases still cause some 3.5 million deaths each year in unimmunized children.

Halting immunization efforts because of the fear of AIDS would increase deaths among children, while doing little to stop HIV transmission. The major risk for HIV infection of children is infection of the mother, with spread to the child before, during or shortly after birth. A second risk is receiving blood transfusions which are not screened for HIV contamination. HIV may also be transmitted to children by injection. However, children thought to have been infected by this route usually have received a large number of injections for treatment. In the environment in which this was documented, many such injections were given outside of the health system with little or no attention to sterilization.

Immunization programs should continue to be vigorously pursued in all countries. All programs should ensure that each injection is given with a single sterile needle and a single sterile syringe.

The selection of injection equipment

WHO and UNICEF recommended re-usable syringes and needles for use in developing countries.[1] They should be steam-sterilized between uses. Disposable needles and syringes should only be used if it can be ensured that they will actually be destroyed after a single use. Jet injectors may also provide an alternative. However, until further studies clarify the risks of disease transmission, their use should be restricted to special circumstances where the use of needles and syringes is not feasible because of the large numbers of persons to be immunized within a short period of time.

Immunizing HIV-infected individuals

In October, the EPI Global Advisory Group considered the problem of immunizing children with AIDS.[2] They concluded:

"In countries where human immunodeficiency virus (HIV) infection is considered a problem, individuals should be immunized with the EPI antigens according to standard schedules. This also applies to individuals with asymptomatic HIV infection. Unimmunized individuals with clinical (symptomatic) AIDS in countries where the EPI target diseases remain serious risks should not receive BCG, but should receive the other vaccines (Table 1).

In general, live vaccines are not given to immunocompromised individuals, but in developing countries, the risk of measles and poliomyelitis in unimmunized infants is high and the risk from these vaccines, even in the presence of symptomatic HIV infection, appears to be low."

(Source: Weekly Epidemiological Record 62(9):53-54, 1987.)

Table 1. Recommendations on the use of EPI antigens in HIV-infected individuals in countries where the EPI target diseases remain important causes of morbidity.

	Vaccine	Asymptomatic	Clinical AIDS
Infants	BCG	yes	no
	DPT	yes	yes
	OPV	yes	yes
	IPV	yes	yes
	Measles	yes	yes
Women	Tetanus toxoid	yes	yes

[1]WHO/UNICEF Joint Guidelines: Selection of injection equipment for the Expanded Program on Immunization. EPI Technical Series No. 2, Document WHO/UNICEF/EPI.TS/86.2, October 1986.

[2]See *Weekly Epidemiological Record* 62(5):21-23, 1987.

Changes in Premature Mortality: United States of America, 1983-1984

Premature mortality in the United States of America, as measured by years of potential life lost before age 65 (YPLL), increased from 1983 to 1984 for the first time since 1980. Total YPLL from all causes of death increased from 11,712,000 in 1983 to 11,761,000 in 1984, a 0.4% increase. The rate of YPLL per 1,000 persons under 65 years old, however, decreased by 0.4% from 1983's level to 56.5/1,000 persons. An increase of 1.5 million persons under 65 years of age accounts for this discrepancy.

The relative rankings of the leading causes of YPLL did not change substantially from 1983 to 1984. The only change was cerebrovascular diseases replacing chronic liver diseases as the eighth leading cause of YPLL. Unintentional injuries (accidents) continue to head the list, accounting for 20% of the total YPLL, followed by malignant neoplasms (15%), diseases of the heart (13%), and suicides/homicides (11%).

The rate of YPLL per 1,000 persons increased for eight of the 12 leading causes (Figure 1). The largest proportionate increase in the rate of YPLL was recorded for cerebrovascular diseases, up 13.1%. Increases in YPLL rates were also noted for prematurity, up 3.3%, sudden infant death syndrome, 2.7%;

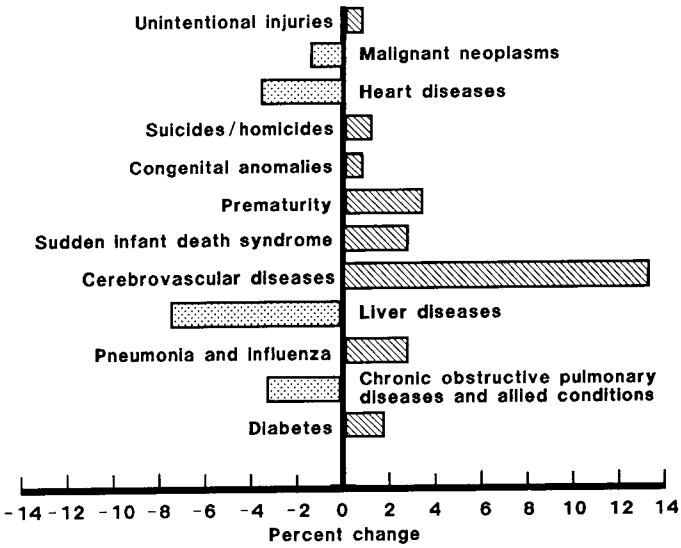
pneumonia and influenza, 2.6%; and diabetes mellitus, 1.8%. In contrast, the rate of YPLL for chronic liver diseases and cirrhosis decreased by 7.4%; diseases of the heart declined 3.6%; chronic obstructive pulmonary diseases and allied conditions, 3.3%, and malignant neoplasms, 1.3%.

Starting on January 17, 1986 the Centers for Disease Control changed the method of calculation of YPLL to include causes of mortality in the first year of life. The relatively high age-specific death rate of these infants, combined with the years of life remaining before age 65, adds two new causes to the list of leading causes of YPLL—sudden infant death syndrome (ICD code 798) and deaths attributable to prematurity, including neonatal respiratory distress syndrome (ICD code 769) and disorders relating to short gestation and unspecified low birthweight (ICD code 765).

The inclusion of deaths during the first year of life does not account for the increase in total YPLL from 1983 to 1984. Although total YPLL decreased each year from 1980 to 1984, the slight increase in 1984 is present when YPLL is calculated by either the birth–to–age–65–years or the age 1–to–65–years method. The rate of YPLL per 1,000 persons, however, has decreased each year since at least 1979 with both methods of calculation and now stands 12.3% below the 1979 level when measured from age 1 year to 65 years, and 14.1% when measured from birth to age 65 years.

Considerable variability continues to be demonstrated in the year-to-year comparison of YPLL rate due to specific causes of mortality. The rate of YPLL attributable to cerebrovascular diseases, for example, increased by 13.1% in 1984, reversing the 12.4% decline of the previous year. In contrast, the YPLL rate for unintentional injuries, which has consistently decreased from 1979 until 1984, increased by 0.4% in 1984, but remains 22.5% below the 1979 level.

Figure 1. Percent change from 1983 to 1984 in rates of years of potential life lost before age 65, United States of America.



(*Source:* Adapted from *MMWR* Vol. 35, No. 2, 1986.)

Brazilian Purpuric Fever

Brazilian purpuric fever (BPF) was first recognized in late 1984 in the town of Promissão, São Paulo State, Brazil *(1)*. The disease was characterized by the acute onset of high fever, vomiting, and abdominal pain, followed by purpura, vascular collapse, and death in children 3 months to 8 years of age. There was no evidence of meningitis, and blood cultures were negative when obtained, although some patients may have received antibiotics. *Haemophilus aegyptius (Haemophilus influenzae,* biotype III) was isolated from a nonaseptically obtained skin scraping of a petechia from an affected child.

Although the etiology could not be determined at the time of the outbreak, an epidemiologic investigation indicated disease was associated with preceding purulent conjunctivitis. *H. aegyptius* was the most commonly isolated organism from children with purulent conjunctivitis in Promissão; however, conjunctival

cultures had not been obtained from children who subsequently developed BPF. Surveillance for BPF also identified other cases, including an outbreak of 17 cases that had occurred in 1984 in a town in the neighboring state of Paraná. In addition, 12 sporadic cases in early 1985 and a cluster of 8 cases in February 1986 all occurred in towns in São Paulo State.

In March 1986, an outbreak of purulent conjunctivitis occurred in Serrana, São Paulo State. Because of surveillance established for BPF and the development of protocols for collecting specimens, blood cultures were obtained from children in Serrana with fever and concomitant or recent histories of conjunctivitis and from those with clinical presentations consistent with BPF.

Ten children, 20 months to 6 years of age, had blood (8) or cerebrospinal fluid (CSF) (2) cultures positive for *H. aegyptius*. However, none had evidence of meningitis, and there was evidence that the two culture-positive CSF specimens may have been contaminated with blood. All had fever; only 5 had petechiae and/or purpura. Four of the 10 died. Five of the 10 fit the previously established case definition of BPF *(1)*, and 9 had recent histories of conjunctivitis. The majority had received antibiotic eye drops for treatment of conjunctivitis. Among the 10 culture-confirmed cases and an additional case that fit the BPF case definition, patients who received intravenous antibiotics (generally ampicillin with or without chloramphenicol) before the development of petechiae or purpura (5 of 6) were more likely to survive than those who did not (1 of 5). Four additional patients with BPF and blood cultures positive for *H. aegyptius* were reported from four other towns in São Paulo State between March and June 1986.

Accumulating evidence suggests that BPF is due to invasive *H. aegyptius* disease. The illness characteristically begins with purulent conjunctivitis caused by *H. aegyptius* and progresses in a small percentage of patients to fever and other systemic manifestations due to disseminated *H. aegyptius* infection. If untreated, some patients may develop petechiae and purpura and die from overwhelming endotoxemia and shock. The clinical presentation of BPF is similar to meningococcemia.

The observation that the majority of patients had initially received local antibiotic therapy for treatment of conjunctivitis suggests that topical treatment of conjunctivitis may be inadequate in preventing BPF. However, use of systemic antibiotics to treat BPF before development of hemorrhagic skin lesions may be effective in preventing progression of the disease and reducing the case-fatality rate.

It is unknown whether BPF occurs in areas other than southern Brazil. In many areas, blood cultures may not be drawn if cases are treated empirically for presumed meningococcemia. However, the occurrence of clusters in areas separated by 250 miles suggests the potential for spread.

Reference

(1) Centers for Disease Control. Preliminary report: epidemic fatal purpuric fever among children-Brazil. *MMWR* 34:217-219, 1985.

(Source: Adapted from: Centers for Disease Control. Brazilian purpuric fever: *Haemophilus aegyptius* bacteremia complicating purulent conjunctivitis. *MMWR* 35:553-554, 1986.)

Calendar of Courses and Meetings

The XIth International Scientific Meeting of the International Epidemiological Association

This meeting will be held from 8 to 13 August, 1987, in Helsinki, Finland. The main topic to be discussed will be epidemiology and health promotion. Other discussions will include health for all by the year 2000; national policies, general strategies, and assessment of prevention and health promotion. Fundamental aspects of epidemiology: methodology and ethics. Communicable disease epidemiology and control. Epidemiology of non-communicable diseases and functional limitations. Non-communicable disease prevention and health prevention. Health services research. Teaching and training of epidemiology.

Further information may be obtained from: IEA-Congress Secretariat, P.O. Box 189, SF-00171 Helsinki, Finland.

Diseases Subject to the International Health Regulations

Total cholera, yellow fever, and plague cases and deaths reported in the Region of the Americas in 1986.

Country and administrative subdivision	Cholera cases	Yellow fever		Plague cases
		Cases	Deaths	
BOLIVIA	–	*26*	*19*	*94*
Cochabamba	–	1	1	–
La Paz	–	25	18	94
BRAZIL	–	*9*	*8*	*57*
Bahia	–	–	–	20
Ceará	–	–	–	3
Goias	–	5	5	–
Mato Grosso	–	3	2	–
Paraiba	–	–	–	34
Roraima	–	1	1	–
CANADA	*1*	–	–	–
Ontario	1[a]			
COLOMBIA	–	*6*	*6*	–
Arauca	–	1	1	–
Guaviare	–	2	2	–
Meta	–	1	1	–
Putumayo	–	1	1	–
Santander	–	1	1	–
PERU	–	*118*	*98*	–
Ayacucho	–	3	3	–
Cuzco	–	5	4	–
Huánuco	–	7	7	–
Junín	–	26	18	–
La Libertad	–	1	1	–
Madre de Dios	–	18	13	–
Pasco	–	2	1	–
San Martín	–	55	50	–
Ucayali	–	1	1	–
UNITED STATES OF AMERICA	*21*	–	–	*10*
Arizona	–	–	–	1
California	–	–	–	3
Florida	1	–	–	–
Georgia	1	–	—	
Louisiana	18	–	–	–
Maryland	1[a]	–	–	–
Nevada	–	–	–	1
New Mexico	–	–	–	5

[a]Imported case.

Further Comments on Problems in Death Certification

Analyses of information recorded on death certificates or their predecessors comprise one of the oldest and most extensive public health surveillance systems. Numerous examples of the usefulness of this elementary form of surveillance can be cited, such as Farr's use of information from the Bills of Mortality to promote social reforms *(1);* Chapin's watch on infectious diseases in Providence, Rhode Island *(2);* and the charting of the rise and recent gradual fall in mortality from arteriosclerotic heart disease *(3, 4)*. Virtually all mortality statistics, however, deal only with the underlying causes of death and ignore most other conditions mentioned on death certificates. As Israel *et al. (5)* point out, multiple cause-of-death analyses could make good use of much of this discarded information.

Unfortunately, there are difficulties with the current mortality system that are much more fundamental than the failure to take into account all conditions that are mentioned. In our experiences, there are major problems:

1) Most physicians have had no training in the purpose and process of death certification. Only the exceptional few have had adequate instruction in what information is desired and how to record it.

2) Medical information on death certificates is often incomplete. In the period July 1983 through June 1984, 33% of the death certificates for residents of a county known to one of the authors (G.W. C.) had no indication of duration of any of the conditions mentioned in Part I of the death certificate. Numerous articles have reported that important medical conditions present at death did not appear on the death certificate, either through oversight or because the attending physician did not consider that the omitted condition contributed to death *(6)*.

3) Diagnoses on death certificates do not necessarily reflect information obtained after death. Physicians often feel compelled to complete death certificates promptly to expedite funeral arrangements. Although they have the privilege of amending the original certificate to take into account subsequent historical information or the results of necropsy and toxicologic examinations, this is apparently rarely done. One of the authors (G.W.C.) has been reviewing death certificates from three areas of the United States over a 32-year period and cannot recall that any physician, other than a medical examiner or coroner, ever submitted an amended certificate.

4) Physicians are not routinely queried regarding inadequate diagnoses (e.g., congestive heart failure as the only condition mentioned), unlikely sequences of diagnoses (e.g., bronchogenic carcinoma due to coronary heart disease), or missing information, most often the duration of conditions listed in Part I. Failure to query in such instances means that an important opportunity for postgraduate education in death certification is being missed.

5) Mortality statistics are not published promptly. The mortality section(s) of the Vital Statistics of the United States for 1950 appeared in 1953; mortality sections for 1960 appeared in 1963; for 1970, in 1974; and for 1980, in 1985. Mortality statistics for states and large cities may be published more promptly, but often not in adequate detail.

Correcting these defects will not be easy or quick. Given the importance of improved death certification to epidemiology and preventive medicine, should not the American College of Epidemiology, the American College of Preventive Medicine, the American Public Health Association, and the Society for Epidemiologic Research (together with others with similar interests) cooperate with the National Center for Health Statistics in efforts to improve this elementary and fundamental surveillance of the health of the nation? As citizens, we should demand that a system that entails untold amounts of money and time be made optimally productive. As preventers of disease, we need prompt reporting of the causes of death, and as scientists, we need accurate and complete information on that hardest of end points, death.

Some corrections could undoubtedly be made by the National Center for Health Statistics if they had adequate funding. Other corrections will require our combined influences as professionals and citizens on medical schools, and most importantly, on government. A nation that prides itself on being the leader in medical science should not neglect the basic form of evaluating the effects of that science.

All this is not to denigrate multiple cause-of-death analyses. Far from it. We should still try to get the most information out of our present imperfect system.

We should not, however, forget fundamental issues. Improving the basic raw material, the death certificate, will yield benefits at all levels of analysis and action.

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(Source: George W. Comstock,
Department of Epidemiology, School of Hygiene and Public Health, The Johns Hopkins University, Baltimore, Maryland, and
Robert E. Markush, Department of Psychiatry, University of Alabama, Birmingham, Alabama, United States of America.

Editorial Comment

This article joins several others in discussing the problems that hamper a wider utilization of the data from death certificates, even in those countries that have good vital statistics systems.[1] In the Latin American and Caribbean countries these problems are compounded by those stemming from under-registration of deaths and low coverage of the population with medical care services, with the ensuing low proportion of medical certification of cause of death. Nevertheless, the conclusions and recommendations of the authors have pertinence for all countries of the Region of the Americas, especially so the one that refers to trying "to get the most information out of our present imperfect system," while seeking to improve the coverage and reliability of the basic data.

On the other hand, it is stimulating to observe a resurgence of interest in the analysis of mortality statistics and the renewed stress on their importance to epidemiology and preventive medicine, as they offer one of the basic elements for the surveillance of health.

[1]See also: What the Vital Statistics System Can and Cannot Do, *Epidemiol Bull* Vol. 6, No. 4, 1985.

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