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Mortality Analysis – Some New Uses for Old Indicators

Death itself cannot be prevented. It can, however, be postponed. The public health importance of this fact has long ago motivated the development of measures for the analysis of mortality statistics, traditionally one of the main tools of public health planners and administrators for assessment of health status, definition of priorities and allocation of resources, and surveillance of specific health problems.

It is equally recognized that nonviolent death is but the last event in a continuum of progressively worse health; mortality statistics tell a very incomplete story about disease and suffering, and even less about individual and societal determinants of ill health. However, up to now a satisfactory operational definition of "good" health does not appear to exist, neither at the individual nor at the community level. Nor is it clear whether such a definition would be at all feasible, and if so, whether it would be the same for all members of a community and communties everywhere [1]. Furthermore, those variables that have been accepted as being both sensitive and specific enough to contribute to the assessment of health status are usually difficult to document and much too expensive to obtain for population-wide use.

Accordingly, and without giving up the search for appropriate indicators of positive health, increased efforts are being devoted to the development of indicators based on death statistics, thus acknowledging that the potential information on health status to be extracted from mortality data is still far from exhausted. Mortality rates specific for sex, age, cause, place of residence and other social and economic characteristics of the decedent continue to be the cornerstone of this information, but specific rates are cumbersome to analyze. Crude and age-adjusted (standardized) mortality rates, however, share the major shortcoming of being dominated by mortality at old ages, at which most deaths occur and disease is harder to prevent. Summary measures are needed that, while assessing the impact of mortality as a whole will better reflect changes in those problems that exact their toll at an early age, and highlight the age groups in which this impact is felt the most. Woolsey [2] and Uemura [3] in their search for achievable target rates for the United States of America (USA) and worldwide, respectively, have discussed numerous approaches and have given abundant references to this effect. They provided both background and stimulus for the discussion presented here.

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This renewed interest in mortality statistics can only be welcomed, as, in the words of Shapiro [4]:

> ...they represent the only continuous source of information on an unequivocal manifestation of health status that dates back many years and is assured of continuity into the foreseeable future, and the data can be examined on a geographically disaggregated level often down to subareas within a city, for example, or aggregated across civil subdivisions...

According to this author, the challenge of "how to maximize the utility of this resource" is of special relevance to public health officials in developing countries, who are understandably reluctant to use scarce resources for the gathering of additional information on health problems, rather than for their prevention or alleviation.

Objective

This paper will present a discussion of the scope and limitations of some simple procedures to analyze usually available data for (a) estimating gains in mortality from all causes assessed against a country's own past experience, and (b) quantifying the gap between the country's current mortality situation and one observed in a more developed country.

Procedures

Excess mortality will be defined empirically; to estimate it two indicators will be used: the standardized mortality ratio (SMR), and the ratio of observed over expected years of potential life lost (RYPLL). Premature mortality will be defined as that occurring under 65 years of age. Both indicators will be computed for each sex; the SMR will be computed for premature mortality and for all ages. To compute age-specific frequencies age groups are defined as follows: under 1 year of age, 1-4 years, 10-year groups from 5 to 64 years, and 65 years and above.

Data from Argentina and Mexico will be used to illustrate the proposed procedures. These two countries have been chosen as examples because their population size prevents excessive instability of observed frequencies, and mortality data by age and sex are available for more than two decades.

To analyze past experience each country's data for 1982 will be compared to its own data 20 years earlier. As reference for a more favorable situation the 1982 data for the largest developed country in the Region, i.e. the United States of America (USA) will be used.

As the analysis will be centered on the year 1982, both to assess progress against the past as well as to size up the challenges still ahead, the reference population will be the mid-year population estimate for 1982 for Argentina and Mexico. To stabilize the data the number of deaths for each of the years to be studied will be estimated to be the 3-year average centered in that year. Thus, deaths for 1982 and 1962 will be understood to be the average number of deaths occurring in the years 1981-1982-1983 and 1961-1962-1963 respectively, as shown in Table 1.

Table 1. Midyear population and number of deaths Argentina and Mexico, 1982.

Age groups	Argentina				Mexico			
	Population[a]		Deaths[b]		Population[a]		Deaths[b]	
	M	F	M	F	M	F	M	F
Under 1	353	339	11,702	9,127	1,198	1,152	45,548	35,494
1-4	1,346	1,308	1,954	1,665	4,849	4,676	11,897	10,898
5-14	2,743	2,666	1,439	972	10,595	10,237	8,148	5,434
15-24	2,410	2,347	2,784	1,602	7,479	7,295	17,371	6,854
25-34	2,170	2,116	3,658	2,376	4,823	4,836	18,309	7,325
35-44	1,729	1,712	6,469	3,825	3,070	3,187	18,640	9,054
45-54	1,534	1,566	14,227	6,891	2,109	2,239	20,729	12,146
55-64	1,166	1,268	23,787	11,872	1,346	1,492	23,774	16,706
Under 65	13,451	13,322	66,020	38,330	35,469	35,114	164,416	103,911
65+	1,050	1,333	67,868	64,100	1,178	1,424	68,274	69,885
All ages	14,501	14,655	133,888	102,430	36,647	36,538	232,690	173,796

(a) Midyear population estimate for 1982, in thousands.
(b) Average of the deaths registered for 1981, 1982 and 1983. Excludes a yearly average of 2,541 deaths of unknown sex and 7,647 of unknown age in Mexico, as well as 297 deaths of unknown sex and 5,479 of unknown age in Argentina.

Source: PAHO technical data base.

Computation of expected mortality will vary according to the purpose of the analysis. For evaluation of gains achieved, expected deaths will be those that would have occurred if the 1982 population had been subjected to the 1962 age- and sex-specific rates of the same country. To compare with a more favorable health situation, expected deaths will be computed applying the 3-year 1982-centered age and sex-specific death rates of the USA to the 1982 population of Argentina and Mexico. Specific rates are shown in Table 2; expected numbers of deaths are shown in Table 3 for each sex and both sexes combined, the latter obtained by addition of male and female deaths.

The overall SMR is computed by dividing total observed by total expected deaths; the SMR for mortality under 65 is restricted to the ratio of observed and expected deaths below that age limit; and the RYPLL is the ratio of the observed YPLL and those expected. The last column of Table 3 shows age-specific YPLL per death, i.e. the average YPLL for each death in every age group, obtained by subtracting the mid-point of the age interval from 65, the upper limit. Observed and expected YPLL are computed by multiplying (weighting) these age-specific YPLL per death by the observed and expected number of deaths respectively, and adding over all age groups up to but not including 65.

Results

In accordance with the purpose of this paper, presentation of results will focus on the indicators rather than on the health situation of the two countries chosen as examples.

The SMR for all ages, the SMR for deaths occurring before age 65, and the RYPLL, also for deaths prior to age 65 are compared in Table 4. The interpretation of these indicators is simple enough to use them for conveying messages to the general public or authorities not trained in public health: in Argentina the number of male deaths observed in 1982 represents 80.4% of those which would have been expected if the 1962 rates had prevailed; i.e. 19.6% of expected male—and 21.4% of expected female—deaths were avoided due to the reduction in mortality rates experienced since 1962. Similarly, there were savings of 38.5 and 51.2% of expected deaths for men and women in Mexico. Under age 65, the observed savings for each 100 deaths expected were 28.2% for men and 36.8% for women in Argentina and 45.4 and 59.7% respectively in Mexico.

With respect to the RYPLL, for each 100 YPLL expected in the 1982 population if 1962 rates had prevailed, observed data show a reduction of 41.2 and 47.2%, and 54.3 and 64.8% for men and women in Argentina and Mexico respectively. In this example it is clear that the SMR under 65 is more sensitive to rate changes than the SMR for all ages, and the RYPLL is the most sensitive of all.

Table 2. Mortality rates by age and sex Argentina and Mexico, 1962 and 1982; USA, 1982.

Age groups	Argentina				Mexico				USA	
	1962		1982		1962		1982		1982	
	M	F	M	F	M	F	M	F	M	F
Under 1	6,774.5	5,760.7	3,315.0	2,692.3	8,489.1	7,234.2	3,802.0	3,0781.1	1,271.0	1,018.4
1-4	348.7	346.3	145.2	127.3	1,178.1	1,260.7	245.3	233.0	64.8	51.1
5-14	83.1	62.2	52.5	36.5	201.2	188.8	76.9	53.1	34.0	22.0
15-24	172.0	115.9	115.5	68.3	278.8	227.1	232.3	94.0	149.7	52.3
25-34	243.5	164.4	168.6	112.3	477.7	359.9	379.6	151.5	181.1	71.1
35-44	431.1	269.9	374.1	223.4	740.2	537.0	607.1	284.1	275.7	145.4
45-54	1,014.5	530.0	927.4	440.0	1,165.7	825.2	982.9	542.5	720.2	393.8
55-64	2,452.2	1,245.1	2,040.1	936.3	2,206.5	1,807.4	1,766.3	1,119.7	1,741.4	921.3
65+	7,112.9	5,242.2	6,463.6	4,808.7	6,564.0	6,870.2	5,795.8	4,907.7	6,156.4	4,380.0
All ages	1,005.9	706.3	923.3	698.9	1,129.6	1,017.1	634.9	475.7	943.2	777.0

Note: Rates per 100,000 population were computed using as numerator one third of the deaths registered for 1961, 1962, 1963, and for 1981, 1982, 1983 respectively, and as denominator the midyear population for the middle year, i.e. 1962 and 1982 respectively.

Source: PAHO technical data base.

Table 3. Deaths expected in 1982 population of Argentina and Mexico according to country's 1962 rates and US rates for 1982.

Age groups	M		F		T		YPLL for each age group
	E(62)	E(USA)	E(62)	E(USA)	E(62)	E(USA)	
				Argentina			
Under 1	23,914	4,487	19,529	3,452	43,443	7,939	64.5
1-4	4,694	872	4,530	668	9,224	1,540	62.0
5-14	2,279	933	1,658	587	3,937	1,520	55.0
15-24	4,145	3,608	2,720	1,227	6,865	4,835	45.0
25-34	5,284	3,930	3,479	1,504	8,763	5,434	35.0
35-44	7,454	4,767	4,621	2,489	12,075	7,256	25.0
45-54	15,562	11,048	8,300	6,167	23,862	17,215	15.0
55-64	28,593	20,305	15,788	11,682	44,381	31,987	5.0
Under 65	91,925	49,950	60,625	27,776	152,550	77,726	**
65 +	74,685	61,884	69,879	51,831	144,564	113,715	**
All ages	166,610	111,834	130,504	79,607	297,114	191,441	**
				Mexico			
Under 1	101,699	15,227	83,338	11,732	185,037	26,959	64.5
1-4	57,126	3,142	58,950	2,389	116,076	5,531	62.0
5-14	21,317	3,602	19,327	2,252	40,644	5,854	55.0
15-24	20,851	11,196	16,567	3,815	37,418	15,011	45.0
25-34	23,039	8,734	17,405	3,438	40,444	12,172	35.0
35-44	22,724	8,464	17,114	4,634	39,838	13,098	25.0
45-54	24,585	15,189	18,476	8,817	43,061	24,006	15.0
55-64	29,699	23,439	26,966	13,746	56,665	37,185	5.0
Under 65	301,040	88,993	258,143	50,823	559,183	139,816	**
65+	77,324	71,017	97,832	56,081	175,156	127,098	**
All ages	378,364	160,010	355,975	106,904	734,339	266,914	**

Table 4. Comparison of standardized mortality ratios for all ages and under 65 years and ratio of years of potential life lost Argentina and Mexico, 1982.

Indicators		M	F	T
		Argentina		
Past experience (1962)	SMR all ages	80.4	78.6	79.6
	SMR under 65	71.8	63.2	68.4
	RYPLL	58.8	52.8	56.2
Future reference (USA)	SMR all ages	119.7	128.8	123.5
	SMR under 65	132.2	138.0	134.3
	RYPLL	157.4	187.7	168.4
		Mexico		
Past experience (1962)	SMR all ages	61.5	48.8	55.4
	SMR under 65	54.6	40.3	48.0
	RYPLL	45.7	35.2	40.8
Future reference (USA)	SMR all ages	145.4	162.6	152.3
	SMR under 65	184.8	204.5	191.9
	RYPLL	235.0	263.9	245.8

Note: All ratios multiplied by 100.

Source: Tables 1 and 3.

The greater sensitivity to change of the RYPLL can also be appreciated when a more favorable set of sex- and age-specific rates—such as those of the USA—is used for comparison. Under these reference rates the YPLL observed exceed those expected far more than the deaths did, as evidenced by the magnitude of the RYPLL in comparison to that of the SMRs.

It should be kept in mind that SMRs and RYPLLs of different countries should be compared only to the extent that one would compare crude rates, as the population of each country is used in both numerator and denominator [5]. By the same token this simplifies interpretation, since the only difference in numerator and denominator of each ratio derives from the mortality rates used.

Discussion

Indicators for excess and premature mortality can be computed for any age-specific subgroup of the population, and there has been much discussion about how they should be defined. But, as Haenszel [6] says, the problem

> ...is not on the mechanics of rate construction but in definition of terms and deciding what is to be measured. The choice of a rate under one criterion would not necessarily preclude the use of another rate under different circumstances...

This statement applies equally to age-limits and reference rates, the selection of which should be guided by the purpose of the analysis.

All three indicators presented here, namely the SMR for all ages and for deaths occurring prior to age 65 and the ratio of observed over expected YPLL were selected because they are simple to use for the purpose at hand. This is the main reason why YPLL were given preference over indicators derived from life tables; the fact that they use observed data was an added consideration.

In their excellent discussion of the main issues involved in the construction and use of the YPLL, the Centers for Disease Control point out that instead of using a common fixed limit the life expectancy remaining for each age group could be used as that group's upper limit [7]. It is felt, however, that this would detract from one of the main appeals of this indicator, namely its simplicity.

The 65-year age limit was chosen in this paper because, on a population-wide basis, mortality at 65 years and above appears to be more difficult to postpone; it should not be interpreted to imply a limit to economically active or potentially productive life. However, this cut-off point can be varied according to a country's circumstances and the purpose of the analysis.

Another choice involves the reference rates to be used, especially when assessing the gap between what is and what could be. Again, this choice is entirely dependent on the purpose and intentionality of any given analysis, and the decisions to be based on it.

An important application of these indicators would be their use to highlight differentials and inequalities within a country. Thus, on a subnational level, the reference rates could be those of that region or area in the country exhibiting the least unfavorable sanitary conditions, as Farr proposed over 150 years ago. This idea is especially attractive since in almost all countries of the Americas there exist mortality statistics of sufficient completeness to do this comparative analysis for mortality from all causes. The SMR under age 65 or the RYPLL should be excellent evaluation tools, since they use a country's or area's own population and thus assess the health status from within that area and in regard to itself.

The ratios discussed are not meant to be used instead of the more traditional indicators, but as their complement. The level of mortality is still best measured by mortality rates. When comparisons over time or among countries or different areas within any one country are desired, rates adjusted for age (by the so-called direct method) will still be the indicator of choice. However, the RYPLL will be an excellent complement for the assessment of differentials and inequalities, of gains achieved and challenges ahead. But, since ratios only express the relation between two numbers, saying nothing about the size of either one, they should not be used without an indicator providing a yardstick for the size of at least one of the ratio's components.

The procedures presented are geared towards analyses to be used by a country or subnational area for its own benefit. It is hoped that countries in the Americas and elsewhere will replicate this exercise and enrich it with their own perspectives and experience.

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Chronic Disease Reports in the Morbidity and Mortality Weekly Report (*MMWR*)

Introduction

In 1986, 1.58 million people in the United States of America (USA) died from six major chronic diseases: cardiovascular and cerebrovascular diseases, chronic obstructive pulmonary disease, chronic liver disease and cirrhosis, malignant neoplasms, and diabetes. These deaths accounted for 75% of all USA deaths [1]. In comparison, unintentional injuries, suicides, and homicides accounted for 7% of mortality, acquired immunodeficiency syndrome for 0.5%, and other infectious diseases for an additional 8%. For many chronic diseases, means of primary, secondary, or tertiary prevention are well known [2, 3]. It has been estimated that many deaths caused by these six chronic diseases could have been prevented by various means, for example, by effective control of smoking, blood pressure, diet, and alcohol consumption [2, 3].

From January 1989, the *MMWR* publishes monthly Chronic Disease Reports (CDR) to provide basic information on chronic disease mortality, associated risk factors, and preventive measures.

Table 1. Topics included in the MMWR CDR with ICD codes where appropriate.

Topic	ICD code-Mortality	ICD code-Hospital discharge
Years of potential life lost		
Chronic disease mortality trends		
Stroke*	430-434, 436-438	430-434, 436-437
Coronary heart disease*	410-414, 429.2	410, 411, 413, 429.2
Diabetes	250	250
Smoking-related obstructive pulmonary disease*	491, 492, 496	491-493, 496
Lung cancer	162	162
Female breast cancer*	174	174
Cervical cancer	180	180
Colorectal cancer	153-154	153-154
Cirrhosis	571	571
Preventable chronic disease mortality		

*CDR groupings of ICD codes differ from groupings used by NCHS and WHO.

Chronic diseases are defined as diseases that have a prolonged course, that do not resolve spontaneously, and for which a complete cure is rarely achieved, even with treatment. Nine diseases were chosen for the CDR because of their high rates of mortality or their association with known, practical means of prevention. Injuries, occupational diseases, and chronic infectious diseases are not included. The grouping of International Classification of Diseases (ICD) codes in CDR nomenclature reflects shared primary, secondary, or tertiary preventive interventions.

Each CDR provides a table of mortality rates in each state for the featured disease, standardized to the age distribution of the USA population in the same year; a map of age-standardized mortality by state accompanies each table. Each report also includes: 1) rates of hospitalization for the featured disease in the USA population, 2) lists of major modifiable risk factors and preventive measures for that disease, 3) estimates of the prevalence of these risk factors and preventive measures in the USA population, and 4) estimates of the crude proportion of each chronic disease in the population attributable to each risk factor and failure to follow each preventive measure.

Sources of Information in Chronic Disease Reports

1. *Mortality*

CDR presents information from the National Center for Health Statistics (NCHS) on mortality in the United States for the most recent year for which final mortality data are available [1]. Autopsy and hospital discharge studies of causes of death noted on certificates have shown a wide range of inaccuracies in death-certificate reporting [4-6].

Where variation of diagnosis nomenclature among states is known to occur—for example, in the classification of ischemic heart disease [7] CDR use broad, inclusive groupings of ICD codes.

CDR provides underlying causes of death, defined as "the disease or injury that initiated the train of events leading directly to death or as the circumstances of the accident or violence which produced the fatal injury" [6].

2. *Hospital discharges*

Information is not always directly available on the incidence and prevalence of these diseases. However, a rough measure of "disease burden" is provided by information on the discharge diagnoses of hospitalized patients.

Thus, reported numbers of hospital discharges should be considered only as approximate indicators of disease occurrence or medical-care use.

The number of hospital discharges for a given disease does not indicate the number of patients hospitalized, but only the number of hospitalizations for that condition during a set period, usually a year. The number of discharges does not distinguish multiple hospitalization for one patient from single hospitalizations for multiple patients. This data give no indication of the number of patients with chronic diseases who are not hospitalized because 1) their conditions are not serious enough or are so severe that they die before hospitalization, 2) they have no access to a hospital, or 3) they receive care elsewhere.

3. *Population*

Estimates of the population for the same year as that for which mortality data are derived are projected from the 1980 census with use of models that incorporate several population characteristics (e.g., births, deaths, migration, military, college, and other institutional associations involving residence away from home) [8]. Differences on estimated undercounts and overcounts by the census are not considered in CDR.

4. *Risk factors, preventive measures, and associated relative risks*

For each chronic disease, information on risk factors, preventive measures, and the relative risks associated with them is provided by a panel of experts convened by the Carter Center [2, 3]. Risk factors chosen for presentation in CDR are those that might be reasonably eliminated or controlled, e.g., hypercholesterolemia, obesity, smoking, and alcohol consumption, and whose eradication or control is not likely to have major adverse effects on health.

To simplify analysis, CDR categorizes individuals as being either "exposed" or "unexposed" to a given risk factor and as either "users" or "nonusers" of a preventive behavior at levels that correspond to known risk (or risk reduction) and for which relative-risk estimates are available. It should be said however, that both risk factors and preventive measures present themselves in the population in widely varying degrees.

The relative risks used for analysis in CDR are chosen to represent the effect of a given exposure on each chronic disease, taking into account other known exposures. Because of different design and control variables, these overall measures of the

effect of risk factors and preventive measures are best regarded as approximate.

The effects of risk factors and preventive behaviors on a given disease are not always independent; that is, the effect of one risk factor may be modified (i.e., increased or decreased) in the presence of another risk factor. For example, the effect of asbestos exposure on smokers is greater than the sum of the separate, singular effects of asbestos and of smoking. For such interdependent risk factors, the effects of prevalence of exposure on a given population will differ to the extent that these risk factors occur simultaneously in individuals. The consequences of multiple interactive risk factors in individuals are not considered in CDR because limited information is available on their population distribution.

5. *Prevalence of risk factors and preventive behaviors in the population*

Information on the prevalence of risk factors and preventive behaviors in the USA population is available from the following sources:

a. Health Interview Survey (HIS)

NCHS conducts an ongoing survey to ascertain health characteristics and to monitor trends in the USA civilian, noninstitutionalized population. In 1985, the survey assessed knowledge of exposure risks for a variety of diseases, as well as knowledge and use of preventive measures, such as smoking reduction, weight control, Pap smear, and breast examination.

b. Behavioral Risk Factor Survey (BRFS)

Since 1981, the Center for Health Promotion and Education (now a part of the Center for Chronic Disease Prevention and Health Promotion) at the Centers for Disease Control (CDC), has coordinated a random-digit-dial telephone survey of health-related behavior. The BRFS allows participating states to estimate the prevalence of behaviors, such as alcohol consumption, hypertension control, smoking, dieting and exercise, and breast cancer screening.

c. National Health and Nutrition Examination Survey II 1976-80 (NHANES II)

While not current, NHANES II is the best source for estimates of blood-cholesterol and blood-pressure levels, obesity, and undiagnosed diabetes in the USA population.

d. Alcohol Epidemiologic Data System

The National Institute on Alcohol Abuse and Alcoholism assesses the prevalence of alcohol consumption by state in the USA population.

e. Smoking and Smoking Cessation

The Office of Smoking and Health provides information on rates of smoking and smoking cessation by state on the basis of a survey conducted by the Bureau of Census in 1985.

6. *Analysis*

a. Age-standardized rates

Rates for many diseases vary with age. In particular for chronic diseases, rates are higher among older persons than younger persons. Age standardization allows comparison of disease rates for different states *as if* the states had similar age distributions. Even though differences among state rates may be accounted for, in part, by race and sex differences, as well as by differences in other characteristics such as smoking, diet, alcohol consumption, medical care, and socio-economic status, in CDR age standardization was chosen.

b. Population-attributable risk (PAR)

For each chronic disease, it is important to ascertain risk factors that can be eliminated or controlled to reduce the burden of this disease. Similarly, it is important to find measures that can be taken to prevent disease occurrence or to minimize the severity of disease or its consequences, such as death. In a population, the proportion of disease events associated with given risk factors or preventive measures is the PAR. The PAR varies both with the magnitude of the effect of the given risk factor or preventive measure and with the prevalence of the risk factor or preventive behavior in the population. More specifically,

$$PAR = \frac{Pe\,(RR\text{-}1)}{1 + Pe\,(RR\text{-}1)}$$

where Pe is the population prevalence of exposure to the risk factor (or preventive behavior) and RR is the relative risk associated with this risk factor (or preventive behavior). The PAR allows estimation of the number of disease events or deaths that would not have occurred had this risk factor been eliminated in the population, or, in the case of preventive measures, had these measures been appropriately taken in the population at risk (i.e., Number of prevented events = Total number of events in the population x PAR).

7. *Applications*

CDR provides recent basic information on rates of major preventable chronic diseases in the United States. This information should 1) facilitate priority setting and design of public health programs in chronic disease, 2) provide baseline information for monitoring disease trends and evaluating public health programs, 3) serve as a model for chronic disease surveillance within states (e.g., surveillance of chronic diseases by county), and 4) indicate gaps in existing knowledge.

8. *Discussion*

Public health attention to chronic diseases in the United States has increased as these diseases have increased in incidence, mortality, and the use of health-care resources. In 1900, tuberculosis, diphtheria, influenza and pneumonia, and various gastrointestinal conditions (most likely infectious) accounted for 38.3% of mortality [9]; in 1986, a similar group of conditions caused 3.6% of mortality [1]. In 1900, cardiovascular and renal diseases, malignant neoplasms, diabetes, and cirrhosis accounted for 25% of mortality; in 1986, they accounted for 72% of mortality. At CDC, the proportion of *MMWR* articles devoted to noninfectious diseases has grown from 23% in 1980 to 46% in 1987.

CDR alerts the public health community to recent rates of major preventable chronic diseases in each state and to the principal known means of preventing these diseases and their consequences. Rates and attributed causality presented in CDR will necessarily be approximations. Nevertheless, CDR will serve to inform the public and the public health community about the magnitude and scope of chronic disease in the United States.

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(*Source*: Abstracted from Chronic Disease Reports in the Morbidity and Mortality Weekly Report, *MMWR*, 38:S-1, 1989.)

Editorial Note

This new line of periodic reports on chronic diseases, with data on their occurrence, principal risk factors, and preventive measures, is being presented because it is felt that the information may be useful for setting up epidemiological surveillance systems on the subject.

Despite limitations regarding the sources of data for the study of these complex problems, and the difficulty of measuring the effects resulting from the interaction of multiple risk factors, attention is called to the possibility of using existing data of different kinds.

Also, the findings are of interest for setting priorities and adjusting health policies, as well as providing a basis for raising new issues on the subject.

AIDS Surveillance in the Americas

Cases reported by year and cumulative number of cases and deaths by country and subregion, 1986 to 1989[a].

Country	CASES 1986	1987	1988	1989	Cum. cases	Cum. deaths	Last report
REGIONAL TOTAL	43,978	30,654	34,800	13,531	122,963	68,049	30 Jun 89
LATIN AMERICA[b]	3,585	4,159	5,605	2,290	15,639	5,967	30 Jun 89
ANDEAN AREA	192	289	333	342	1,156	634	30 Jun 89
Bolivia	3	2	3	3	11	7	30 Jun 89
Colombia	81	107	120	163	471	206	30 Jun 89
Ecuador	11	19	15	0	45	26	30 Jun 89
Peru	9	60	68	73	210	103	30 Jun 89
Venezuela	88	101	127	103	419	292	30 Jun 89
SOUTHERN CONE	101	133	258	112	604		30 Jun 89
Argentina	69	72	714	62	377	185	30 Jun 89
Chile	23	45	55	26	149	57	30 Jun 89
Paraguay	1	7	1	3	12	8	31 Mar 89
Uruguay	8	9	28	21	66	36	30 Jun 89
BRAZIL	1,510	1,934	2,781	958	7,183	3,574	30 Jun 89
CENTRAL AMERICAN ISTHMUS	79	139	301	190	709	320	
Belize	1	6	4	0	11	8	30 Sep 88
Costa Rica	20	23	50	20	113	59	30 Jun 89
El Salvador	7	16	48	27	98	29	30 Jun 89
Guatemala	18	16	13	9	56	36	30 Jun 89
Honduras	15	66	130	133	344	142	30 Jun 89
Nicaragua	0	0	2	1	3	3	31 Dec 88
Panama	18	12	54	0	84	43	30 Jun 89
MEXICO	793	866	885	139	2,683	762	30 Jun 89
LATIN CARIBBEAN[c]	910	798	1,047	549	3,304	391	
Cuba	0	27	24	10	61	15	30 Jun 89
Dominican Republic	115	294	292	327	1,028	79	30 Jun 89
Haiti	795	477	731	212	2,215	297	30 Jun 89
CARIBBEAN	454	382	522	294	1,652	906	
Anguilla	0	0	3	0	3	0	31 Mar 89
Antigua	2	1	0	0	3	2	31 Mar 89
Bahamas	86	90	93	81	350	177	30 Jun 89
Barbados	31	24	15	23	93	69	30 Jun 89
Cayman Islands	2	1	1	0	4	2	31 Dec 88
Dominica	0	6	1	1	8	6	31 Mar 89
French Guiana	78	25	33	1	137	78	31 Mar 89
Grenada	3	5	3	3	14	8	30 Jun 89
Guadeloupe	46	37	45	5	133	46	31 Mar 89
Guyana	0	14	36	20	70	26	30 Jun 89
Jamaica	11	33	30	47	121	68	30 Jun 89
Martinique	25	21	25	8	79	25	31 Mar 89
Montserrat	0	0	0	1	1	0	30 Jun 89
Netherlands Antilles	0	23	16	2	41	16	30 Jun 89
Saint Lucia	3	7	2	4	16	10	31 Mar 89
St. Christopher-Nevis	1	0	17	0	18	9	31 Dec 88
St. Vincent/Grenadines	3	5	8	3	19	10	30 Jun 89
Suriname	4	5	2	0	11	11	30 Sep 88
Trinidad and Tobago	149	82	158	67	456	306	31 Mar 89
Turks and Caicos Islands	3	3	1	0	7	6	31 Dec 88
Virgin Islands (UK)	0	0	1	0	1	0	31 Mar 89
Virgin Islands (US)	7	0	32	28	67	31	30 Sep 89
NORTH AMERICA	39,939	26,113	28,673	10,947	105,672	61,176	
Bermuda	51	21	28	22	122	91	30 Jun 89
Canada	1,094	760	775	367	2,996	1,725	30 Sep 89
USA[c]	38,794	25,332	27,870	10,558	102,554	59,360	30 Sep 89

[a] As of 15 September 1989.
[b] French Guiana, Guyana, and Suriname included in Caribbean.
[c] Puerto Rico included in USA.
Differences in case definition and late reporting may lead to discrepancies with other published data.

Epidemiological Activities in the Countries

Meeting of the XVth Scientific Advisory Committee and Directing Council of the Caribbean Epidemiology Centre (CAREC)

CAREC is a subregional center of the Pan American Health Organization (PAHO), located in Port of Spain, Trinidad and Tobago, which serves 18 English-speaking Caribbean countries and Suriname. It has its origin in the Trinidad Regional Virus Laboratory whose land and facilities were granted to PAHO in 1975 through a bilateral agreement with Trinidad and Tobago. CAREC functions in its subregional role through a multilateral agreement with the governments of the Member Countries.

The main functions of the Center stated in those agreements are:

-To serve as a specialized technical resource to assist and advise the Governments, and to include in its aims and functions assistance, advise and cooperation for the surveillance of non-communicable and communicable diseases, and for program development by Member Governments to such ends;
-To act as a Center for epidemiological analysis, including situational analysis and trend assessment for all countries in the Caribbean which are or will be participating, or cooperating with the Center.

The CAREC service and research program is reviewed in depth annually by a Scientific Advisory Committee (SAC) and the CAREC Council. SAC is composed by five scientists nominated by the Director of PAHO, three medical faculty members and one agricultural faculty member from the University of West Indies, and three representatives nominated by the Conference of Ministers responsible for Health in the Caribbean. The Committee advises the CAREC Council which in turn advises PAHO's Director and through him the Caribbean Health Ministers about the Center's program and budget needs.

The SAC and the Directing Council of CAREC convened for their XVth Meeting on March 23-24, 1989, with the Directing Council accepting and endorsing recommendations of the SAC, in the areas of epidemiology, laboratory and AIDS. Some of the highlights of the recommendations for the strengthening of epidemiology were:

-To identify and evaluate the different epidemiological activities and practices in the various countries in the subregion, in order to provide a sound base to technical cooperation in areas such as research, training and dissemination of information.
-To facilitate the transfer of this health information among Member Countries, and to organize scientific meetings to foster such an exchange. To establish a liaison with national and international agencies, as well as academic institutions to maintain and strengthen these efforts.
-To develop a new long term training proposal for strengthening the practice of epidemiology in the Caribbean jointly with the University of the West Indies, and other interested institutions such as the Sparkman Center at the University of Alabama. Such a proposal should include not only training in epidemiology and public health, but also the improvement of access to and exchange of information, the encouragement of epidemiological research, and the improvement of working conditions of epidemiologists.
-To coordinate PAHO's response to Member Countries' requests for epidemiologic assistance in unusually critical health situations requiring mobilization of national, as well as international resources.
-To continue to assist through its Epidemiology Unit and network of epidemiologists and deputy epidemiologists in the various Member Countries, in the detection of diseases of the Expanded Program on Immunization, provide laboratory support for diagnosis, and analyze the trends and control measures.
-To further develop CAREC's scientific capacity through continued updating of computer technology, training of staff in the field, expanded statistical expertise and expansion of library services.
-To continue the program of occupational health which was conducted in collaboration with the National Institute for Occupational Safety and Health (NIOSH).

Other considerations included chronic disease epidemiology, health status and trend assessment, and evaluation studies, all recognized functions within the mandate of CAREC. Although they are reflected in the activities of the organization, none of these are actually represented in CAREC's current organizational structure. Under the leadership

of the newly appointed Director, Dr. Franklin White, and in the context of the current review and revision of CAREC's overall organizational structure, appropiate recognition should be given to these activities.

Areas of laboratory priority for CAREC were considered to be technical staffing, maintenance and replacement of equipment, biosafety, cooperation with Member Countries towards laboratory standardization, strengthening of a capability for the diagnosis of serious bacterial diseases, long-term atttachments of competent technicians to national laboratories, expansion of leptospirosis and hepatitis-B activities, and development of a pesticide resistance testing facility.

As for AIDS, the following were some of the recommendations:

-To continue to promote, coordinate and support epidemiologic surveillance in the subregion, including the distribution of quarterly reports to Member Countries.
-To explore the feasibility of decentralized confirmatory testing.
-To expand HIV proficiency testing and quality control.
-To include epidemiological and socio-behavioral studies, as well as prevention and control strategies as research topics.
-To initiate specific research programs on perinatal transmission.
-To coordinate public education programs and media approaches, and serve as a clearinghouse for sharing materials among Member Countries.
-To monitor and evaluate the implementation of individual country and subregional AIDS prevention and control plans.

These recommendations are also in accordance with the Cooperation in Health Plan, agreed upon by the whole of the Caribbean, whose seven priorities are: environmental protection and vector control; human resource development; chronic noncommunicable diseases and accidents surveillance; strengthening health systems; food and nutrition, maternal and child health and population activities, and recently added, AIDS prevention and control. Major gains have been achieved in these areas, largely through actions to reduce the impact of communicable diseases and nutritional disparities through good practical epidemiology, appropriate development of laboratory and other support services, and effective prevention and control programs.

In the process of addressing the rapid emergency of AIDS, for which so much program planning has had to be accomplished, an inevitable displacement of organizational priorities has been endured by the countries as well as by CAREC. Although it is rec ognized that this experience is not unique, and despite the new funding which has become available for this public health emergency, the entire effort to date appears to have been extensively subsidized by time and energy taken from other epidemiologic and public health priorities.

For example, the leading cause of potential years of life lost in the Caribbean for ages from 1 to 65 years, is traffic injury mortality, and cardiovascular diseases are now showing rates that are still going up, while in most of the developed countries they have started to decrease. In particular, this subregion experience among the highest prevalence rates of hypertension and adult-onset diabetes in the world. Furthermore, in keeping with international demographic trends, Caribbean populations are rapidly aging, with associated implications related to functional disabilities and social adjustments of and to the elderly. These are issues in which the Caribbean countries and CAREC have barely made a start on.

The combined effects of increasing rates of widely prevalent chronic diseases and an aging society will have major implications for the choice of appropriate policies and strategies. For example, no society can really afford to adopt so called high technology but also high cost, approaches to the end stages ot chronic diseases, without first addressing their prevention through potentially efficacious yet relatively low cost alternatives, such as healthy public policies and health promotion strategies. However, such policies and strategies are very difficult to formulate in the absence of a properly developed data analysis. This subregion has evidence of a unique epidemiology and its own cultural context, and the necessary fact finding must take place in this environment and not simply be transposed uncritically from other parts of the world.

A start of course, has been made, such as the Caribbean Traffic Injury Study, and the St. James Cardiovascular Disease Study with the Trinidad and Tobago Ministry of Health, but much more needs to be done particularly in the development of appropriate interventions models.

Finally, CAREC is to become a more active participant with the national authorities in the assessment of the health status of Caribbean populations, at least insofar as the development of a common methodology is concerned.

(*Source*: Caribbean Epidemiology Centre, CAREC.)

Strengthening of Epidemiology in Peru

The health authorities of the country found during 1988 that the absence of a locus to coordinate the various areas in which epidemiology is used both at the level of the central administration of the Ministry of Health and within the structures corresponding to the departmental, hospital, and peripheral service levels, limited their capacity to respond to and investigate abnormal situations, as well to analyze and utilize the existing information. The strategy utilized to give new impetus to epidemiology at the national level was to create, in December 1988, the Technical Bureau of Epidemiology (DTE) at the central level, with general directorates for epidemiological surveillance and health programs (including an evaluation component), and the functions of conducting situation analyses, research, and training.

The following functions were formulated for the new bureau:

-To organize and coordinate epidemiological surveillance activities: collection, consolidation, analysis, and dissemination of information;

-To identify and obtain information in order to periodically determine what the national health profile is, in support of planning for the resources of the sector;

-To promote and support timely and efficient investigation of disease outbreaks;

-To determine, coordinate, and monitor the implementation of prevention and control measures based on the findings of an investigation;

-To prepare, based on the epidemiological surveillance data, recommendations for the programs of control and prevention, (both new ones and those already under way);

-To develop, in coordination with the programs for specific health problems, techniques for their systematic evaluation;

-To support and promote health research in the services and other institutions in the sector which is oriented toward priority health problems;

-To organize and promote a comprehensive program for human resources in epidemiology;

-To organize a system for the collection and dissemination of scientific and technical information in epidemiology.

The identification of a limited national capacity to respond to outbreaks and other abnormal situations led to the devising of an additional strategy for in-service training in epidemiology, whose initial implementation was in February 1989. The Field Epidemiology Training Program has the support of the Centers for Disease Control, the United States Agency for International Development (USAID), and PAHO. The program lasts for two years and involves around ten professionals who carry out the duties of epidemiologists at the various levels of the Ministry of Health and the Peruvian Institute of Social Security. The first stage of the residency consists of a course on epidemiological principles and methods, statistics, and information science which lasts for two months, after which time the entire teaching and learning process is carried out in the field, through epidemiological research activities that include making recommendations for the control of health problems and conducting follow-up on the recommended measures.

Annual Meeting on Epidemiology and Veterinary Public Health

The Field Office of the Pan American Health Organization (PAHO) in El Paso, Texas promoted the Annual Meeting of Epidemiology on the Mexico-United States Border in Ciudad Juárez, Mexico, from 6 to 7 March 1989. The meeting was attended by representatives from the National Bureau of Epidemiology of the Ministry of Health of Mexico and the United States Centers for Disease Control, and by epidemiologists and veterinarians from the Mexican border states of Chihuahua, Coahuila, Nuevo León, Sonora and Tamaulipas, and the North American states of Texas and New Mexico, as well as by PAHO advisers from the El Paso Office, Mexico City, and the Program on Health Situation and Trend Assessment in Washington, D.C.

The session on veterinary public health covered the current situation of rabies and brucellosis and activities for their prevention and control, along with public and private slaughterhouses and pasteurizers.

During the sessions on epidemiology there were special meetings as well as reports by the states. The meetings addressed the following topics: uses of epidemiology in public health; profiles of principal causes of death in the border area; the situation of rabies in the region; the environmental health situation; environmental epidemiology; and prevention of diabetes.

In their presentations the epidemiologists from the states reported on principal causes of death, outbreaks during the past year, and the current situation of specific diseases such as AIDS, measles, rabies, brucellosis, poliomelitis, and diabetes.

The presentations on principal causes of death and environmental health stressed the need to utilize epidemiological principles and methods that lead to

knowledge of the health-disease reality of an area and its determinants, as well as to mechanisms for putting that knowledge to use.

Thus the presentations took into consideration the relationships between biological and social processes, covering everything from demographics (43% and 23% of the population is under 15 years of age on the Mexican and American sides respectively) through the economic development process in the area which in 1988 led to a 20% increase in the 1,600 assembly plants on the Mexican side with repercussions on workers' health and the environment. The presentations benefited from the inclusion of rates that were adjusted for age and an analysis of potential years of life lost.

The reports on specific diseases brought out the interest that the states have in describing their health problems, especially those related to AIDS and diseases preventable by vaccination, with a view toward reorienting their control programs.

For the first time at an event of this kind there was a discussion about the prevention of chronic diseases, with special emphasis on diabetes.

It is worthwhile to mention the *Border Epidemiological Bulletin*, a twice-monthly publication of the El Paso Field Office whose latest issues emphasize analysis of the health situation along the border, as well as the subject of updating on epidemiological methods.

In order to promote the strengthening of epidemiological practice in the area, the following recommendations were made:

-To form an epidemiology committee which will prepare an evaluation of epidemiological practice along the border, indicate training needs, and suggest an agenda for the next meeting.

-To promote training activities on the investigation of outbreaks and the preparation of reports and articles for publication.

-To include contributions from the epidemiologists in the states in each issue of the *Border Epidemiological Bulletin.*

Second National Scientific Meeting on Epidemiology in Venezuela

The Second National Scientific Meeting on Epidemiology, which had been scheduled to be held in Caracas from 26 February to 1 March 1989, had to be postponed after 28 February because of the social disturbances that occurred in the city. The meeting was completed from 7 to 8 July of that same year.

The event was organized by the National Commission for the Development of Epidemiology Teaching and Practice, with the collaboration of the Ministry of Health and Social Welfare of Venezuela and the Pan American Health Organization. In attendance were approximately 100 professionals in the field.

The objectives of the meeting were to permit an exchange of experiences among the personnel working in epidemiology in Venezuela; to review some specific topics of current scientific relevance and national interest; and to conduct activities for bringing health service workers up to date.

The presentations included 31 scientific papers, of which 16 referred to health situation analysis; 4 to epidemiological surveillance; 7 to evaluation of services, programs, and technologies; 2 to studies of risk factors; and 2 to the area of research on teaching.

During the meeting four lectures were given on the following topics:

Vaccines for leprosy and leishmaniasis;
Epidemiology and primary care;
Epidemiology and public health; and
Epidemiology and workers' health.

There were round table discussions on the Expanded Program on Immunization, manpowe training, the laboratory as an aid to epidemiology, and pesticides.

Workshops were planned on the areas of epidemiological research and different types of research design. A special session was held for epidemiologists in the service of the Ministry of Health and Social Welfare as a post-meeting activity for the purpose of providing updated information on the topics of information and data management for epidemiological diagnosis and surveillance, as well as management and evaluation of the Expanded Program on Immunization.

A special purpose behind the meeting was the formal establishment of the Venezuelan Association of Epidemiology, a scientific association which brings together persons in the discipline. Its board of directors was set up with the following professionals: Hernán Málaga (President), Marisela Perdomo (Secretary of Proceedings and Correspondence), Alexis Veja (Treasurer), Francisco Inareta (Committee Member), and Johnny Arandia (Committee Member.)

In addition, mention was made of the publication of the report of the First Annual Scientific Meeting on Epidemiology, held in Caracas from 26 to 2º November 1988. The work includes a biographica sketch on Dr. Darío Curiel, founder of the epidemi-

ology services in Venezuela, which was presented by Aníbal Osuna; summaries of the papers presented; a ;t of the persons who attended the event; and three special lectures: *Epidemiology and the Organization of Health Services*, by Pedro Luis Castellanos; *Surveillance of the Uses of Epidemiology*, by Alvaro Llopis, and *The Epidemiology of Aging*, by Elías Anzola Pérez.

National Meeting on the Development of Epidemiology in Argentina

The Ministry of Health and Social Action, jointly with the Pan American Health Organization (PAHO), the Ministry of Social Welfare of the Province of Mendoza, and the School of Medical Sciences of the National University of Cuyo, organized a national meeting on the development of epidemiology in Argentina, which was held in Mendoza, Argentina, from 20 to 23 March 1989. The general objective of the meeting was to propose strategies for the training of human resources in epidemiology, specifically, to analyze the national experience in relation to the uses of epidemiology, research, and manpower training; to propose crite- 'a for the reorientation and strengthening of epidemiological training; and to define lines of action for the preparation of a project on human resources training in Argentina.

The meeting included an opening talk on epidemiology and health policy, as well as presentations on the uses of epidemiology in health planning and administration, health research policy, and the analysis of manpower training in epidemiology.

The presentations were followed by group discussions whose work was reported in plenary sessions. A final report was prepared which was discussed and approved in a general meeting.

Attending the meeting were 60 professionals, representatives from institutions in the areas of teaching, services, social welfare, professional associations and research institutes dealing with epidemiology throughout the country.

In discussing the uses of epidemiology in health planning and health administration, factors limiting progress were identified at the macropolitical level. There was discussion of the relationships among health policies, planning, and epidemiology; epidemiological theory and practice; the training of human resources in epidemiology; and information systems. At the same time, strategies were indicated or promoting the following uses of epidemiology, among others: the creation of a space for epidemiological debate, stimulating the production of knowledge; seeking out and disseminating that knowledge and promoting its application to a variety of political decisions; differentiating the training of epidemiologists from the formation of epidemiological awareness; promoting the development of epidemiology in relation to the services; prioritizing the establishment of open systems of information and lines of research that identify the needs perceived by the community; and promoting regional meetings with interinstitutional participation that would cover health problems, living and working conditions, and risks at the level of the population as well as the individual level.

In relation to health research policies, some obstacles that were pointed out can be overcome through the achievement of such conditions as the inclusion of epidemiological practice into the decentralization process, the placement of human resources in research practice, the provision of adequate technical and financial support, and the utilization of the results obtained by the political levels. Once a research policy has been made explicit, it should be oriented toward the analysis by levels of health problems and living conditions, the identification of priorities at the local level, the measurement of effectiveness and impact; the improvement of epidemiological surveillance, and the promotion of improvements in the information systems.

In connection with the topic of manpower training, elements that have impeded the teaching of epidemiology were identified at the various levels, and the following changes were considered to be necessary in order to promote the incorporation of epidemiological knowledge into the universities: the reinstatement of the universities to their leadership role as social institutions, which means giving them responsibility for the conduct of research and for developing teaching and health care actions in relation to community needs; the consolidation of curriculum changes in the health professions; and the development of continuing education programs in epidemiology.

In the health services, changes in attitudes oriented toward integrated work should be promoted in the health team, as well as toward social responsibility and population coverage and the development of strategies for epidemiological research in the social security.

The strategies suggested for achieving those changes included the structuring of training in epidemiology through the organization of residencies or Master's Degree programs, as a possible the first step in pursuing a career as an epidemiologist.

At the undergraduate level, it was proposed that epidemiological subject matter be incorporated into the different professional health science curricula, and that an educational policy be formulated based on the analysis of epidemiological profiles.

Finally, the promotion of regional scientific meetings was recommended, as well as an annual congress on epidemiology which would constitute th basis for a specific national publication on the specialty.

Diseases Subject to the International Health Regulations

Total cholera, yellow fever, and plague cases and deaths reported in the Region of the Americas as of 15 September 1989.

Country and administrative subdivision	Cholera cases	Yellow fever		Plague cases
		Cases	Deaths	
BOLIVIA	—	*98*	*78*	—
Beni	—	1	1	—
Cochabamba	—	92	72	—
La Paz	—	2	2	—
Santa Cruz	—	3	3	—
BRAZIL	—	*7*	*2*	—
Minas Gerais	—	6	7	—
Rondônia	—	7	7	—
UNITED STATES OF AMERICA	—	—	—	*3*
Colorado	—	—	—	1
New Mexico	—	—	—	2

Note: Since the publication of the last issue of the *Epidemiological Bulletin* in 1988 (Vol. 9, No. 4), *Brazil* reported an additional 15 cases of plague in the State of Bahia, for a partial total of 25 cases in 1988. *Colombia* adjusted number of reported cases of yellow fever, no cases in the Chocó Department, and one case in Santander Department, for a partial total of 7 cases and 7 deaths in 1988. *Peru* adjusted number of reported cases of yellow fever, 34 cases and 26 deaths in the Junín Department, for a partial total of 195 cases and 166 deaths in 1988.

Triennial Meeting of the International Epidemiological Association

The triennial International Scientific Meeting of the International Epidemiological Association (IEA) will be held in Los Angeles, USA, from 9 to 11 August 1990. Further information on the program will be published in next issues.

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