[3]Uemura, K. Excess mortality ratio with reference to the lowest age-sex-specific death rates among countries. *Wld hlth statist. quart.* 42(1):26-41, 1989.
[4]Shapiro, S. A tool for health planners. *Am J Public Health*, 67(9): 816-817, 1977.
[5]Rothman, K.J. *Modern epidemiology*. Boston/Toronto, Little, Brown and Company, pp 45-49, 1986.
[6]Haenszel, W.A. Standardized rate for mortality defined in units of lost years of life. *Am J Public Health*, 40: 17-26, 1950.
[7]Centers for Disease Control. Premature mortality in the United States: public health issues in the use of years of potential life lost. *MWWR*, 35:2S, 1986.

(*Source*: Health Situation and Trend Assessment Program, PAHO. Based on Plaut, R. and Roberts, E. Preventable mortality: indicator or target? Applications in developing countries. *Wld hlth statist. quart.* 42(1):4-15, 1989.)

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.

References

[1]National Center for Health Statistics. *Advance report of final mortality statistics, 1986.* Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1988; DHHS Publication no. (PHS) 88—1120. (Monthly Vital Statistics Report vol 37, supplement 6.)

[2]Amler, RW. and Dull, HB. *Closing the gap: the burden of unnecessary illness.* New York, Oxford University Press, 210:1987.

[3]The Carter Center of Emory University. *Healthier people: health risk appraisal program.* Atlanta, Emory University, 1988.

[4]Gittlesohn, A. and Senning, J. Studies on the reliability of vital and health records: I. Comparison of cause of death and hospital record diagnoses. *Am J Public Health* 69:680-689, 1979.

[5]Kircher, T., Nelson J. and Burdo, H. The autopsy as a measure of accuracy of the death certificate. *N Engl J Med* 313:1263-1269, 1985.

[6]National Center for Health Statistics. *Technical appendix from vital statistics of the United States, 1986.* Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1988.

[7]Sorlie, PD. and Gold, EB. The effect of physician terminology preference on coronary heart disease mortality: an artifact uncovered by the ninth revision of ICD. *Am J Public Health* 77:148-152, 1987.

[8]Irwin, R. *1980-1986 intercensal population estimates by race, sex, and age (machine-readable data file).* Alexandria, Virginia, Demo-Detail, 1987.

[9]National Center for Health Statistics. *Vital statistics of the United States, 1985.* Hyattsville, Maryland: US Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1988.

(*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.