International Health Statistics: What the Numbers Mean for the United States

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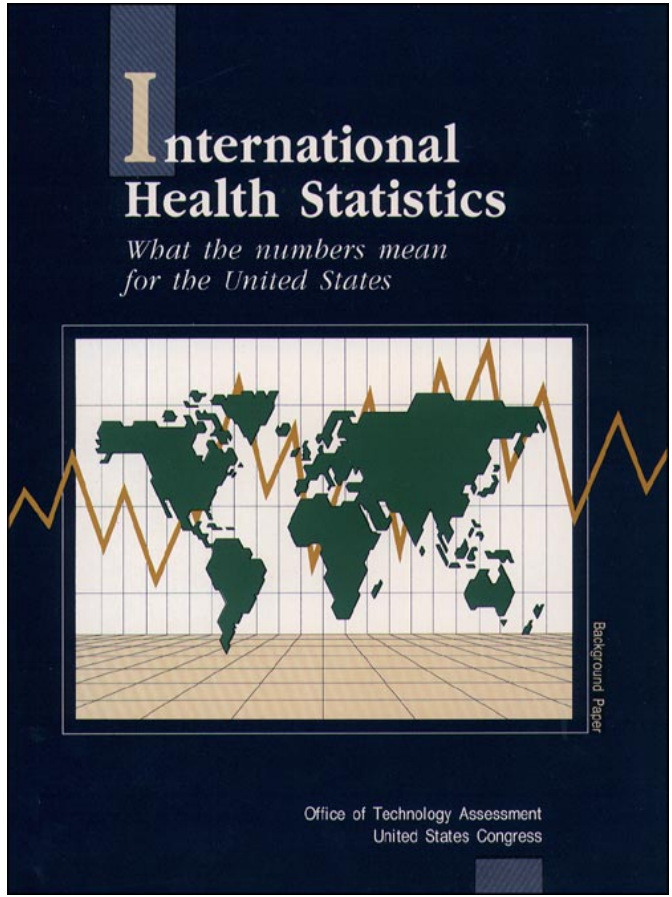

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Foreword

The United States spends more per capita on health care than any other developed country and yet ranks poorly in some key indicators of health. Policymakers have hoped that by looking to countries with better health status measures and lower spending, they might find solutions to some U.S. health and health care problems.

This Background Paper reviews how the United States compares with other developed countries on available health status measures, evaluates the validity of the data used to make such comparisons, and describes how international comparisons might be interpreted in the context of health care reform. Among the key findings of the Background Paper are that the United States generally fairs poorly relative to other developed countries on available health indicators, with higher death rates among infants, children, and young to middle-aged adults. The large differences, however, reflect much more than just differences in health care systems. Some of the most important determinants of a nation's health status fall outside the usual bounds of the health care system-including personal habits (e.g., smoking, exercise) and other factors related to socioeconomic status.

The Background Paper is part of a larger project, *International Differences in Health Care Technology and Costs. The* main report, to be published in 1994, looks at variations in expenditures and resources used in some specific areas of health care among developed countries. The House Committee on Ways and Means, Chairman Dan Rostenkowski, asked OTA to undertake this assessment.

The development of this Background Paper was greatly assisted by an advisory panel, chaired by Rosemary Stevens of the University of Pennsylvania. In addition, many other individuals provided information and reviewed drafts of the paper. OTA gratefully acknowledges the contribution of each of these individuals. As with all OTA documents, the final responsibility for the content of the assessment rests with OTA.



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Abbreviations

ADA	Americans With Disabilities Act
AIDS	acquired immunodeficiency syndrome
BMI	body mass index
BSE	breast self-examination
CDC	Centers for Disease Control and Prevention (U.S. Department of Health and Human Services)
FIMR	fete-infant mortality rate
HIV	human immunodeficiency virus
ICE	International Collaborative Effort (NCHS)
ICD	International Classification of Diseases (WHO)
ICIDH	International Classification of Impairments, Disabilities and Handicaps (WHO)
IMR	infant mortality rate
IOM	Institute of Medicine
IWG	The Inter-Country Working Group on Comparative Health Statistics (NCHS)
LSOA	Longitudinal Study of Aging (United States)
MONICA	Monitoring of Trends and Determinants in Cardiovascular Diseases project (WHO)
NCHS	National Center for Health Statistics (CDC)
OTA	Office of Technology Assessment (U.S. Congress)
REVES	Réseau Espérance de Vie en Santé
SIDS	sudden infant death syndrome
SIPP	Survey of Income and Program Participation (U.S. Department of Commerce)
WHO	World Health Organization
WONCA	World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians
YPLL	years of potential life lost

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Summary and Findings 1

The United States spends a higher proportion of national income on health care than any of its peers in the international community and yet continually ranks poorly in *some* key indicators of health. Death rates for infants, children, and young and middle-aged adults, for example, are substantially higher than in other industrialized countries. Policymakers have hoped that by looking to countries with better health status measures and lower spending, they might find solutions to U.S. health care problems. However, the determinants of a nation's health status are myriad, many falling outside the usual bounds of the health care system. This Office of Technology Assessment (OTA) analysis of international health statistics concludes that while comparisons are extremely useful for identifying health differences and beginning to elucidate the reasons for them, they are not particularly useful in formulating prescriptions for the U.S. health care system.

INTRODUCTION

The health of a nation's people can be gauged, however imperfectly, through aggregate statistics on factors such as births, deaths, personal behavior, and the use of health care. Seeing how countries stack up and how big the differences are among them is a first step in identifying the factors that enhance or detract from health. The range of values for these ''health indicators" among countries provides clues about the practical limits of what can be achieved. Eventually, some of the knowledge gained may be put into practice through health policy; however, the link between health indicators and the health care system is not necessarily direct. Because many factors outside the health care system itself-ranging from

unhealthy behavior on the part of individuals to the availability of guns to the wide ranging effects of unequal income distribution-affect the level of health of a population, changes in the health care system alone will not necessarily improve health indicators.

This background paper describes:

- how the health of U.S. residents compares with people in 12 other developed nations,
- why international comparisons are hard to interpret, and
- what new measurements and analytic approaches might improve international comparisons of health.

The comparison countries are Australia, Canada, France, Germany,[1] Italy, Japan, the Netherlands, New Zealand, Norway, Spain, Sweden, and the United Kingdom. Other countries are compared sometimes, as well, and separate comparisons between the United States and Canada have been made in several areas.

This paper is part of a larger project, *International Differences in Health Care Technology and Costs. The* main report, to be published in 1994, looks at variations in expenditures and resources used in some specific areas of health care among developed countries. The House Committee on Ways and Means, Chairman Dan Rostenkowski, asked OTA to do this assessment.

KEY FINDINGS

Do available international statistics allow us to determine whether real differences **in health status exist?**

- Despite some measurement problems, international statistics show real differences in health status between the United States and other developed countries. Measures that can be used with some confidence include age-specific mortality, life expectancy, and broadly defined cause-specific mortality. International comparisons of infant mortality can be made when vital registration reporting differences are taken into consideration. In contrast, comparisons based on detailed cause of death (e.g., deaths from tuberculosis, specific types of heart disease, and suicide) are not amenable to making international comparisons. There are virtually no population-based data available with which to make meaningful international comparisons on the prevalence of disease and disability.

How does the United States compare with other developed countries?

- Compared with 12 other developed countries, the United States generally has higher death rates among infants, children, and young to middle-aged adults. Many of these mortality differences are quite large. If, for example, the United States had Canada's more favorable age-specific mortality rates, it would have **9** percent fewer deaths (i.e., 192,200 U.S. deaths would have been avoided in 1989). Most of the ''excess' U.S. deaths relative to Canada are in the 45 to 64 age group.
- The gap between the U.S. and other countries' infant mortality rates may not be as wide as indicated by reported statistics. Some of the gap is explained by differences in how doctors record fetal and infant deaths in different countries. Nevertheless, while there is ample evidence that the U.S. international rank of 24 of 39 countries is overly pessimistic, the true rank of the United States is probably no better than 20, a rank that has deteriorated considerably over time.
- The United States compares quite favorably to other developed countries on some important health risk factors. For example, fewer U.S. than Canadian or European residents smoke, and more U.S. than Canadian or European residents undergo some tests for cancer.

[1] All data throughout this paper are from the former Federal Republic of Germany.

- Within the United States, infant mortality rates correlate inversely with socioeconomic status. Differentials related to socioeconomic status as large as those found in the United States exist in several other developed countries, even where there is universal access to high-quality medical care.

How should international health status differentials be interpreted?

- One cannot determine the exact reasons for international differences in health status with available international statistics. Among the factors that might contribute to differences are: socioeconomic, environmental, and cultural factors; personal risk behaviors; and access to health care.
- Because health status is the result of complex interactions between many social, biological, and health care factors, health status indicators may be considered as useful *social indicators. They are not* by themselves useful measures of the success or failure of a country's health care system.

DETAILED FINDINGS

Purposes and Limitations of International Comparisons of Health

The reasons for comparing the health status of different countries include exploring the causal mechanisms of disease, identifying important public-health problems, and investigating how health care policies affect health. Differences in national systems for reporting data hamper some international comparisons. Although deaths are uniformly reported in developed countries, consensus is lacking about which nonfatal health outcomes are important and about how to measure them and collect the data. The World Health Organization (WHO), the U.S. National Center for Health Statistics (NCHS),[2] and others have recently launched efforts to improve and standardize public-health surveillance, in part to help monitor progress toward achieving national goals for health by the year 2000.

A model for international comparisons of health is the NCHS International Collaborative Effort (ICE) on Perinatal and Infant Mortality. Great disparities between the fetal- and infant-mortality rates of the United States and those of other developed countries prompted NCHS to organize a consortium of international experts on perinatology, epidemiology, and statistics. Recognizing that available sets of national data were not comparable, the group has assembled an international database, which allows detailed comparisons of fetal and infant mortality. Using a similar model, a second ICE is currently addressing issues related to aging, and a third ICE will address issues related to injury.

Sociodemographic Characteristics of Comparison Countries

The chief sociodemographic difference between the United States and the comparison countries lies in the sizes of their populations. The United States has nearly 250 million residents, twice as many as Japan, nearly 10 times as many as Canada, and 75 times as many as New Zealand.

Another difference lies in what proportions of the residents fall into the various age groups within each country. The United States has a relatively young population and will remain younger than Western Europe and Japan through the year 2025, even though our baby boom cohort will have reached the age of 65 by then.

The United States is racially and ethnically diverse, with about one-fifth of its residents belonging to minority groups. Although comparable data on the ethnic and racial compositions of other countries are limited, available information suggests that foreign migration to Western Eu-

[2] The National Center for Health Statistics is an agency of the Centers for Disease Control and Prevention within the U.S. Department of Health and Human Services' Public Health Service.

rope has increased in recent years, contributing to the presence of sizable, disadvantaged, minority populations.

High proportions of residents participate in the labor forces of all the comparison countries, and the principal differences lie in the extent to which women and the elderly are economically active. Women's participation in the labor force is highest in Sweden, lowest in Australia, and intermediate in the United States. The United States, Norway, and Japan have relatively more elderly in the labor force than do the other countries.

Poor health is associated with poverty and with large disparities in income levels, both of which apply to the United States. Poverty rates are higher in the United States than in most comparison countries, and the distribution of income is relatively unequal in the United States, compared with other countries such as Sweden, Norway, and Japan.

Health insurance coverage improves health, and most residents of all 12 comparison countries are covered. By contrast, a large segment of the U.S. population has no health insurance.

Infant Mortality

Of **39** developed countries, the United States ranked 24th in infant mortality in 1990. The U.S. infant-mortality rate (9.2 per 1,000 live births) was 35 percent higher than Canada's rate (6.8 per 1,000 live births) and twice as high as Japan's rate (4.6 per 1,000 live births). The U.S. international standing was much better in 1950 and 1960, but infant mortality has declined much more rapidly in the other counties than in the United States.

Interpreting international differences in infant-mortality rates is difficult, because counties vary in how they report vital events. Available evidence suggests that infant-mortality rates are inflated in the United States, because many events that would be considered fetal deaths in other countries are counted as live births in the United States. U.S. rates would be comparable to those of Japan if infant deaths were combined with fetal deaths that occurred after at least 20 weeks of gestation. Such a comparison might be invalid, however, because evidence suggests that the United States undercounts early fetal deaths. Moreover, despite the fact that the current international rank of the United States is overly pessimistic, its true rank is probably no better than 20th.

Among the factors associated with whether an infant will live or die in its first year are the infant's race, sex, birth order, place of residence, birthweight, gestational age, and whether it is born alone or as part of a set of twins, triplets or other multiples; additional factors include the mother's age, prior experience with pregnancy, state of health, personal habits (e.g., smoking, drinking alcohol, obtaining prenatal care), and socioeconomic status. How these biological and social factors interact to influence infant mortality is unclear, but available data should aid in the assessment of how the factors vary in relation to infant-mortality rates in the United States and abroad.

By applying new analytic methods to an international perinatal- and infant-mortality database, researchers have assessed how infant mortality in the United States has been affected by the prevalence of low birthweights and by the proportion of deaths that occur at specific birthweights. The ICE research suggests that when definitions of low birthweight take population-specific birthweight distributions into account (rather than use an arbitrarily defined value for all populations), the relatively high infant-mortality rate in the United States may reflect birthweight-specific mortality more than birthweight distribution. This implies that efforts to decrease the U.S. infant-mortality rate must target interventions both to lower the prevalence of infants born in the high-risk, low-birthweight end of the distribution curve and to lessen the chances of deaths for infants of all birthweights.

The fetuses and infants of women who become pregnant while under the age of 20 or over the age

of *39 are* more likely to die or have health problems. There are more births by women of these age groups in the United States than in the other developed countries. This fact may explain up to 25 percent of the difference between the infant-mortality rate of the United States and the more favorable rates of countries like Canada and Japan. Nonetheless, the socioeconomic status, lifestyles, and health of women at the extremes of maternal age, rather than age itself, probably account for the differences.

Patterns of use of prenatal care in the United States differ from those in some Western European countries. Pregnant women in the United States tend to seek care later but to average a greater number of prenatal-care visits than do women in France, Denmark, and Belgium.

Significant socioeconomic differentials in infant mortality exist in the United States as well as several other developed countries, even where access to high-quality medical care is universal. Improving access to maternal- and child-health services in the United States would likely decrease the overall infant-mortality rate, but variation among the Nation's subpopulations might well persist.

Mortality Comparisons

In comparisons of death rates, the United States ranks relatively poorly among industrialized countries. Age at death is reliably reported in developed countries, and the age-specific death rate is a useful measurement for international comparisons. Compared with the age-specific death rates of other developed countries, U.S. rates are among the highest through the age of 64 and somewhat lower after the age of 65. These trends generally remain the same when the other countries' death rates are compared with the death rates of only the white residents of the United States. The high rates of death for young age groups mean that U.S. residents are born with relatively lower life expectancies and that many years of potential life are lost. An analysis of age-specific death rates since 1955 shows that they have been persistently high in the United States and that reductions in mortality have generally not been as great in the United States as in comparison countries. An important exception to this trend is that mortality rates have declined significantly for U.S. men aged 45 to 54. The United States has made the least progress, however, in reducing mortality rates for men aged 25 to 34.

For people below the age of 35, injuries are major causes of death, and the U.S. rates of death from injuries are among the highest for developed countries. The rate of death from homicide and other violence is at least twice as high for the under-35 age group in the United States as in any of the comparison countries. After the age of 35, cancer and heart disease are the major causes of death in all the developed countries. U.S. rates of death from heart disease for both men and women aged 35 to 65 are among the highest, but U.S. rates of death from cancer are not exceptionally high compared with those of other developed countries.

If U.S. age-specific death rates were the same as the Canadian rates, the United States would have 9 percent fewer deaths. In 1989, for example, 192,200 fewer people would have died. The excess death is primarily concentrated in the 45-to-64 group. Higher rates of heart disease in the United States than in Canada account for most of the disparity in the death rates for this age range.

Morbidity, Disability, and Quality-of-Life Indicators

There is no general consensus regarding disability measurements, but they are important for determining g whether gains in life expectancy have come at the expense of quality of life. The WHO International Classification of Impairments, Disabilities and Handicaps (ICIDH) has been accepted by many nations and is used for clinical and health services research, health services

planning, and population health monitoring. The ICIDH framework has been criticized, but many of the problems are likely to be resolved in the planned revision of the classification scheme. In view of differences in how health services are delivered, internationally comparable data on disability will probably come from population-based surveys rather than administrative records. Achieving consensus on a disability classification would be a first step toward the comparability of information about disability on such surveys. At present, both the content and methods of surveys differ so greatly that disability comparisons cannot be made.

Despite international disagreement over what disability means, there is general agreement that public-health efforts should focus on extending the years of life without disability. An indicator that shows great promise in monitoring health is a measurement of healthy-life expectancy, which is the number of years someone at a particular age can, on average, expect to live without experiencing any of various impairments, disabilities, or handicaps. Although the different countries have not yet agreed on how to measure healthy-life expectancy, many of them have included it as an indicator in their health goals, and efforts are underway to measure and monitor it. An international group of researchers (REVES) is working toward standardizing this measurement.

Health-Related Behaviors

Smoking cigarettes and drinking heavily are known to have both immediate and long-term health effects. As many as 20 percent of the deaths in developed countries can be attributed to smoking alone. Available evidence suggests that relatively fewer people smoke in the United States than in Canada and selected Western European countries. In the mid-to late-1980s, for example, the proportion of men smoking was 30 percent in the United States, 36 percent in Canada, and ranged from 40 to 62 percent in Europe. Current smoking-related deaths can be traced to smoking patterns that existed a decade or more ago. In the mid-1960s, males were less likely and females were more likely to smoke in the United States than in Western Europe.

Relatively more Canadian than U.S. residents drink alcohol, but the prevalence of heavy drinking is similar in Canada and the United States. People appear to abstain from alcohol or to drink infrequently at about the same rates in the United States and Europe.

Certain preventive health services (i.e., mammography, Pap tests) tend to be used more in the United States than in Europe, and U.S. women are more likely than Canadian women to participate in cervical-cancer screening and to examine their breasts for lumps every month. U.S. residents are less likely than Canadians, however, to have their blood pressures checked, use seatbelts regularly, and have smoke detectors in their homes. U.S. residents are more likely than Canadians to be overweight and less likely, especially if they are elderly, to engage in regular exercise.

CONCLUSIONS

No simple statistic or set of statistics can fully describe the success of a nation's health care system. A rough picture can be drawn, however, from the state of the population's health, the availability of health services, access to state-of-the-art medical technology, and public satisfaction with the health care system. The United States excels in providing high-technology care but appears to lag behind most other developed countries in the remaining indicators of a good health care system.

This background paper takes a broad look at some health outcomes, as depicted by nationally available public health data, most of which are death statistics. The United States ranks poorly in most categories. U.S. death rates from infancy through the age of 64, for example, are generally higher than those of the 12 other comparison countries.

Determining how much of each disparity is real and how much is artifactual is often difficult, because each country has a unique system for monitoring public health. The gap between infant mortality rates, for instance, may not be as wide as the reported statistics indicate. Some of the differences between U.S. rates and those of other countries can be explained by international variations in how doctors record the deaths of infants and fetuses. Nonetheless, other statistics, which show conclusively that premature deaths are more prevalent in the United States than elsewhere in the developed world, are extremely reliable.

A complex of factors affects health status, and how these relate to the poor relative position of the United States is uncertain. One major difference between the United States and the other developed countries is the extent to which residents are covered by health insurance, which affects the accessibility of services, the types and quality of care, the intensity of that care, and patient health. The broader coverage in the other countries may contribute to the fact that, for example, childhood immunization and other facets of well-child care are more widespread in Europe than in the United States. Whether this plays a significant role in shaping the health of a nation's people cannot be determined at this time. A number of U.S. and international agencies, however, are developing methods that will allow more exact comparisons in the future.

Purposes and Limitations of International Health Comparisons

2

The health of U.S. residents is compared with that of residents of other developed countries to answer both medical and health policy questions (128). Identifying international differences in health status can be the first step in uncovering the causal mechanism of disease. The observation of large differences in U.S. and Japanese rates of cardiovascular disease led to comparisons of dietary behaviors later identified as important heart disease risk factors.[1] International comparisons can also be used to corroborate a trend observed within one country. For example, the decline in cardiovascular disease noted in the United States has also been observed in several other developed countries (183).

International differences in health status can also indicate major public health problems. The observation that infant mortality rates are higher in the United States than in many other developed countries has alarmed policymakers and prompted studies of international differences in maternal and child health care delivery, perinatal risk factors, and vital statistics reporting (217,220,232).

In an effort to gauge how changes in U.S. health policies or practices might affect the health of the population, comparisons are sometimes made between the United States and countries whose sociodemographic characteristics are similar to those of the United States but whose health care financing or delivery mechanisms differ. Such predictions, however, are difficult to base on international comparisons because so many other

[1] A comparison of coronary heart disease, stroke, and suspected risk factors among Japanese and Japanese-Americans in Hawaii and the U.S. mainland led to the identification of dietary habits (fat consumption) as causal factors in the development of cardiovascular disease (12).

factors-including population, social, and environmental characteristic--influence health status. Interpreting international differences in health status is further complicated by evidence that some differences in health indicators reflect disparities in how countries define and measure health outcomes. Nonetheless, although difficult to interpret, measurements of health status are important social indicators, and great differences in the health status of the residents of two or more countries can stimulate further research into the underlying complex of contributing factors.

PROBLEMS IN MAKING INTERNATIONAL HEALTH COMPARISONS

The ability to make international comparisons rests on the availability of accurate national health statistics. The usual sources for data on the health status of the population include (256):

- vital statistics (e.g., certificates of births and deaths);
- population and housing censuses;
- routine health service records (e.g., hospital discharge data);
- epidemiologic surveillance data (e.g., reporting of infectious disease and other health occurrences);
- sample surveys (e.g., household surveys of health characteristics, knowledge, and practices);
- disease registers (e.g., cancer registers); and
- nonhealth sector sources (e.g., employment records of workplace injuries).

The most comparable health status data come from vital statistics systems, such as for births and deaths, because developed countries register virtually all events and generally adhere to certain international standards for recording the events. But despite the degree of uniformity, differences in data collection can undermine international comparisons. Countries appear to differ, for example, in distinguishing between infant and fetal deaths and recording causes of death (see chapters 3 and 4).

Most residents of developed countries live to at least the age of 70, and death rates at younger ages are relatively low. Measures that assess the consequences of living with chronic illnesses or disability are therefore also important. One country may have a lower death rate than another, but devote inadequate resources to maintaining a good quality of life for people who are chronically ill or disabled. Mortality data are uniformly available for developed countries, but virtually no morbidity or disability data are currently available for making international comparisons although some interesting measurements have been conceptualized (see chapter 5).

International comparisons of morbidity and disability are extremely difficult to make, in part because a consensus regarding measurements of outcomes is lacking, and also because countries have very different systems for monitoring morbidity and disability. The burden of disease and injury can be measured in several ways, each of which poses unique difficulties in an international context, The prevalence of chronic disease can be measured through medical examination surveys, through self-reports on interview, from hospital discharge information, or from disease registers or surveillance systems.

Each of these informational sources may be used to assess health status within countries. In the United States, for example, information on the prevalence and consequences of disease and injury comes from the National Health and Nutrition Examination Survey, in which a sample of U.S. residents is interviewed, examined by a clinician, and provided laboratory tests (229).[2]

[2] Few other developed countries have an ongoing periodic health examination survey similar to the U.S. National Health and Nutrition Examination Survey. Canada conducted examination surveys in 1978-79 (provincial surveys have subsequently been conducted), Finland conducted a survey in 1977-80, and the former German Democratic Republic conducted annual examinations of ita working population (175,272),

Self-reported health status, disability, utilization of health care, and risk factors for disease are determined through the National Health Interview Survey. Hospital records are examined in the National Hospital Discharge Survey to identify why hospitalizations occur and which surgical and diagnostic procedures are used. The extent to which a condition prompts visits for ambulatory care is evaluated through ambulatory care surveys.[3]

Most health-related information (other than mortality data) used in international comparisons comes from population-based surveys. Most countries include information on chronic illness, disability, and self-perceived health on these surveys, but the questions asked in the surveys differ to such an extent that comparisons of responses cannot easily be made (44,272). International efforts are underway to standardize morbidity and disability concepts and survey questions (see chapter 5).

Using hospital discharge data for international comparisons has the potential advantage of examining health outcomes closely linked to specific clinical interventions (e.g., hospital surgical outcomes) (154). Such comparisons, however, are not always feasible because some countries don't record surgical procedures as part of their hospital statistics (e.g., France, Italy, Japan, and Spain). Furthermore, hospital-based data may not be comparable because of differences in how data are collected[4] and how hospitals are defined.[5] Added difficulties arise because in some countries, including the United States, surgical procedures once performed in hospitals are increasingly being conducted on an outpatient basis and are thus not fully reflected in hospital statistics. International hospital-based comparisons are also difficult to make because of the lack of uniform information with which to adjust outcomes for differences in the health status of hospitalized patients. Such adjustments are important because of apparent differences in the rates at which procedures are used, which could mean that countries use different criteria in selecting patients for some procedures.[6]

HOW SHOULD INTERNATIONAL HEALTH STATUS COMPARISONS BE MADE?

The availability of computerized international health databases has facilitated international comparisons of health status, but such comparisons are limited because of differences in how the individual countries define and collect data that are reported to these databases (1 32,265). Several efforts are underway to thoroughly analyze the comparability of data sources that serve as the basis of international health comparisons.

The Inter-Country Working Group on Comparative Health Statistics (IWG) was established in 1991 through the U.S. National Center for Health Statistics (NCHS) to promote international comparability of health data. The group, which includes representatives from Canada, England and Wales, France, the Netherlands, and the United States, has developed a checklist to provide a standard format for evaluating the characteristics and comparability of health statistics among countries (41). After using the checklist to assess the comparability of national data *on* mortality and hospitalization associated with

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[3] In the United States, ambulatory care data are available through the National Ambulatory Medical Care Survey, and the National Hospital Ambulatory Care Survey which cover visits to physicians offices, hospital outpatient clinics, and other ambulatory care providers (233),

[4] U.S. hospital discharge data, for example, are obtained from a sample survey, whereas French discharge data are based on a complete count of discharges from public hospitals, only half of which respond in a given year (199).

[5] Discharges from long-term care facilities are included in some countries' hospital discharge surveys (e.g., Canada, England and Wales, France, Sweden) but are excluded in the U.S. National Center for Health Statistics (NCHS) hospital discharge survey (199), Information on nursing home stays in the United States is available through the National Nursing Home Survey (40)

[6] International comparisons of some of the characteristics of hospitalized patients and the conditions that lead to hospitalization can be made using selected countries' hospital discharge data (103).

diabetes, the IWG concluded that trends in different countries would be difficult to compare because of probable differences in data collection, coding, and clinical practices (41).

A model for conducting international comparisons of health status is NCHS's International Collaborative Effort (ICE) on Perinatal and Infant Mortality. Since 1984, representatives of the United States and 10 other industrialized countries have conducted comparative analyses using a database maintained by ICE members (128). ICE has been instrumental in identifying some sources of international differences in infant and fetal mortality (see chapter 3). A second ICE, the International Collaborative Effort on Aging was established in 1988. Existing data will be used to research the following prioritized areas (225,239):

- health promotion and disease prevention;
- measurement of vitality in older persons;
- comparative analysis of hip fracture;
- functional disabilities; and
- measurements of outcomes of nursing home care.

A third ICE is planned to address injury.

The U.S. NCHS also publishes an *International Health Data Reference Guide, which* provides information from 34 nations on the availability of selected national vital, hospital, health personnel resources, and population-based health survey statistics (222).

The World Health Organization (WHO),[7] the health unit of the United Nations, assumes an important role in standardizing, collecting, and disseminating statistical information about health. For example, WHO publishes and revises the *International Classification of Diseases, Injuries, and Causes of Death,* a classification system used throughout the world to ensure the uniformity of mortality statistics.[8] WHO has also published the *International Classification of Impairments, Disabilities, and Handicaps,* which has facilitated the collection of disability statistics (see chapter 5). The WHO Regional Office for Europe surveyed the statistical agencies of selected countries and detailed the difficulties of making international morbidity and disability comparisons because of differences in how health indicator data are collected in population-based surveys (see chapter 5) (44).

SUMMARY

The purposes of international comparisons of health status include exploring causal mechanisms of disease, identifying possible important public-health problems, and investigating the health consequences of health care policies. Differences in national systems for reporting health data make some international comparisons difficult. Although deaths are uniformly reported in developed countries, consensus is lacking as to which nonfatal health outcomes are important, and as to how these outcomes should be measured and collected. WHO, the U.S. NCHS, and others have recently launched efforts to improve and standardize public health surveillance, in part to help monitor progress toward achievement of national "year 2000" health goals (212,266,272).

A model for making international comparisons of health is the U.S. NCHS International Collaborative Effort on Perinatal and Infant Mortality. Large apparent differences between the United States and other developed countries with regard to birth outcomes prompted NCHS to organize a consortium of international experts on perinatology, epidemiology, and statistics. Recognizing that available sets of national data were not comparable, the group has assembled an intema-

[7] As of 1990, WHO had 166 member states in six regions: Africa, the Americas, Eastern Mediterranean, Europe, Southeast Asia, and the Western Pacific (262). Developed countries include Australia Canada, Europe, Israel, Japan, New Zealand, the former Union of Soviet Socialist Republics, and the United States (260).

[8] WHO also publishes the *World Health Statistics* Annual, which summarizes, for individual countries, demographic, and vital statistics and selected health system characteristics (e.g., health personnel data) (260).

tional database so that detailed comparisons of fetal and infant mortality can be made. Using a similar model, a second ICE is underway at NCHS to address issues related to aging, and a third ICE on injury is planned.

Sociodemographic Characteristics of Comparison Countries

3

International comparisons of health status are generally based on aggregated information that does not allow analysts to control for socioeconomic variables that could affect health status. This chapter describes how countries compare in selected demographic and socioeconomic characteristics.[1]

POPULATION SIZE, GEOGRAPHIC DISTRIBUTION, AND AGE COMPOSITION

The size, geographic distribution, and age composition of a nation's population play major roles in determining the allocation and use of health care resources. Urban and rural distribution can affect physical access to services and the availability of specialized tertiary care. The aging of developed countries' populations affects health status measures and increases demands on social and health services.

The population of the United States is much larger than that of any of the comparison countries and some of the larger States are more populous than some of the comparison countries. California, for example, has more residents than Canada does. The population of the United States is 75 times greater than that of the least populous country, New Zealand. Even Japan, whose population is the second largest of the comparison countries, has less than half as many residents as the United States does (table 3-1).

At least three-quarters of residents in almost all comparison countries are urban dwellers (table 3-l). The most urbanized

[1] Much of the information in this chapter comes from the U.S. C- Bureau's Center for International Research The Center maintains an international database containing demographic and socioeconomic information (%).

Table 3-I-Selected Demographic Characteristics, United States and Selected Countries, 1990

Country	Population (thousands)	Population under age 25 (percent)	Population aged 65 and over (percent)	crude birth rate (per 1,000)[a]	Population natural increase (per 1,000)[b]	urban population (percent)[c]
United States	249,415	36.5%	12.5%	15.1	6.3	75%
Australia	17,071	38.3	11.2	15.0	7.5	86
Canada	26,620	35.4	11.5	14.1	6.6	77
France	56,720	34.2	14.6	13.8	3.5	74
Germany[d]	79,357	29.7	15.0	11.2	-1.1	NA
Italy	57,661	32.4	14.6	9.9	-0.3	69
Japan	123,611	33.4	12.0	11.3	4.3	77
Netherlands	14,849	34.4	127	12.7	4.0	89
New Zealand	3,362	39.9	11.1	16.7	8.6	85
Norway	4,253	34.2	16.4	12.4	1.9	75
Spain	38,959	36.6	13.4	12.1	3.0	79
Sweden	8,529	31.2	18.0	12.9	0.8	84
United Kingdom	57,418	33.8	15.7	13.6	1.8	89

KEY: NA = not available.

aThe crude birth rate is the number of live births per 1,000 population and is shown for the period 1985-1990.

bThe rate of natural population growth is the difference between the crude birth and death rates and is shown for the period 1985-90.

cThere is no uniform definition of urban populations. Countries have different definitions, sometimes based on such factors as population density and economic characteristics. Urbanization data are for 1991.

dBased on data from the former Federal Republic of Germany.

SOURCES: Y. Kanegae, Chief, Intenational Statistical Affairs Section, Ministry of Health and Welfare, Tokyo, Japan, personal communication, July 1993; M.A Khawaja Chief Demographer, Population and Demography Division, Department of Statistics, Christ Church, New Zealand, personal communication, August 1993; K. Kinsella Chief, Aging Studies Branch, census Bureau, U.S. Department of Commerce, Suitland, MD, personal communication, June 1993; U.S. Department of Commerce, Bureau of the census, *An Aging World II,* International Population Report (P25, 92-3) (Washington DC: U.S. Government Printing Office, 1992); World Health organization, *World Health Statistics Annual, 1991 (Geneva, Switzerland:* World *Health* Organization, 1992); World Bank *Worldf Development Report 1993 (New York NY: Oxford* University Press, 1993).

countries are the United Kingdom and the Netherlands, with nearly 90 percent of their populations residing in urban areas. Somewhat less urbanized are Italy, France, Norway, and the United States, with roughly 70 to 75 percent of their populations residing in urban areas.

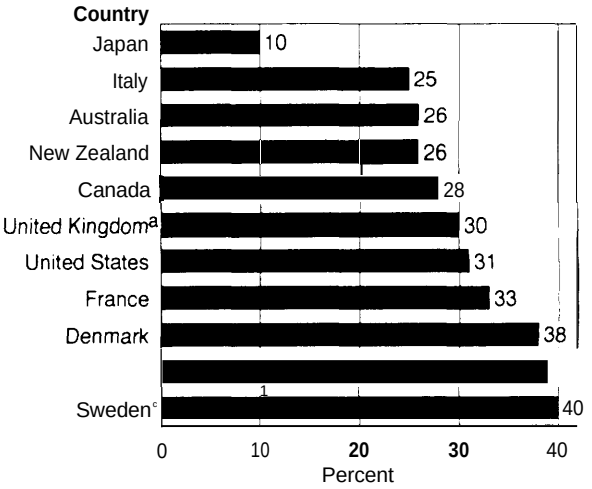
The population of the United States is younger than most comparison countries, in that a larger share of its population is under the age of 25 and a smaller share of its population is aged 65 and over (table 3-l). Birth rates higher than those in Europe contribute to a greater expansion of population in the United States. By contrast, Germany and Italy, where the number of deaths exceeds the number of births, are experiencing natural declines in population.[2]

The proportion of the population aged 65 and over in the United States will not increase significantly until after 2010, when the large birth cohorts of the baby boom (from 1946 to 1964) begin turning 65. By the year 2025, nearly one in five (19 percent) U.S. residents could be aged 65 and over (table 3-2). Even so, the United States as a whole will likely remain younger than Japan and most countries of Western Europe (196). Among the world regions, Europe has the highest proportion of residents aged 65 and over (14 percent in 1990), and by the year 2025, more than 1 in 10 Europeans are likely to be at least 75 years old (196). By the year 2025, an estimated 1 in 13 U.S. residents are projected to be at least 75 years old.

LIVING ARRANGEMENTS AND HOUSEHOLD COMPOSITION

Living arrangements and household composition may influence health status, especially for the elderly and children. International differences in the extent to which a country's elderly live alone or in institutions may indicate cultural preferences, the availability of families and informal networks to provide support, access to home or institutional care, or differences in the elderly's physical ability to live independently. According to data from the 1980s, the proportion of the elderly (age 65 and older) population living alone in private (non-institutional) households ranges from a low of 10 percent in Japan to a high of 40 percent in Sweden. Nearly one-third (31 percent) of the elderly in the United States live alone, a proportion comparable to those of France (33 percent) and the United Kingdom (30 percent) (figure 3-l).

Figure 3-l—Percentage of Elderly Population (Age 65 and Older) Living Alone in Private (Noninstitutional) Households: United States and Selected Countries, Selected Data from the 1980s



a **Refers to men aged *65* and over,** women aged **60 and over.**
b Based on data from the former Federal Republic of Germany.
c Refers to pensioners, with usual pension age **being** 65 years.

SOURCE: U.S. Department of **Commerce, Bureau of the Census, *WorldAging II,*** International Population Reports **(P25, 92-3) (Washington, DC: U.S. Government Printing Office, 1992).**

About 6 percent of the elderly in Australia, France, and the United States compared with 11 percent in the Netherlands live in institutions (either medical or non medical) (figure **3-2).**

Residents of Japan are much more likely than residents of Germany to live with children (the percentage of households including children being 42 and 25, respectively) (table 3-3). More than

[2] Estimates of natural changes in population take into account numbers of births and deaths, but ignore migration.

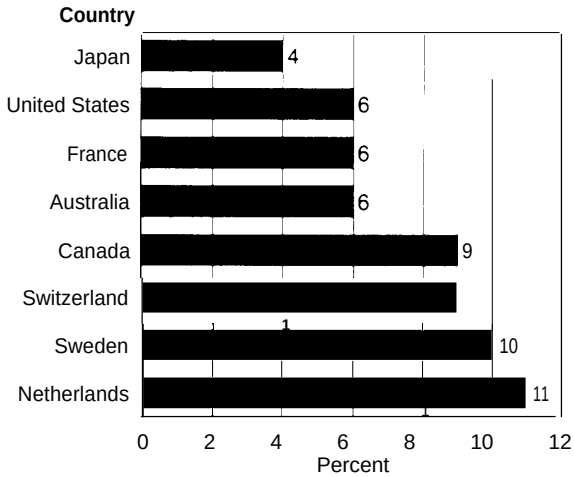
Table 3-2--Elderly Percent of Population by Age, United States and Selected Countries, Selected Years

Country	1990			2010			2025		
	65+	75+	80+	65+	75+	80+	65+	75+	80+
United States	**12.5**	**5.3**	**2.8**	**13.3**	**6.2**	**3.8**	**18.7**	**8.0**	**4.3**
Australia	11.2	4.4	2.2	13.4	6.1	3.6	18.8	8.4	4.6
Canada	11.5	4.6	2.4	14.3	6.8	4.1	20.7	9.2	5.2
France	14.6	7.1	4.1	17.2	9.1	5.6	22.6	11.1	6.3
Germany[a]	15.0	7.2	3.8	20.4	8.9	5.2	24.4	11.9	7.7
Italy	14.6	6.4	3.2	19.8	9.7	5.8	24.1	12.3	7.5
Japan	11.8	4.8	2.4	21.3	10.0	5.7	26.7	15.2	9.3
Netherlands	12.9	5.5	2.9	16.4	7.5	4.5	23.7	11.2	6.2
New Zealand	11.2	4.6	2.3	14.2	6.5	4.0	20.6	9.5	5.3
Norway	16.4	7.1	3.8	16.4	8.0	5.2	22.4	10.8	6.1
Spain	13.4	5.6	2.9	17.7	9.1	5.3	22.1	10.8	6.6
Sweden	18.0	8.2	4.4	19.6	9.2	5.9	23.7	12.6	7.5
United Kingdom	15.7	6.9	3.7	17.1	8.3	5.1	21.5	10.8	6.3

[a]Based on data from the former Federal Republic of Germany.

SOURCES: K. Kinsella, Chief, Aging Studies Branch, Census Bureau, U.S. Department of Commerce, Suitland, MD, personal communication, June 1993; U.S. Department of Co merce Bureau of the Census, *An Aging World II*, International Population Report, table 1, (P25, 92-3) (Washington DC: U.S. Government Printing Office, 1992).

Figure 3-2—Percentage of Elderly Population (Age 65 and Older) Living In Institutions (Medical and Nonmedical): United States and Selected Countries, Early to Mid-1980s



SOURCE: U.S. Department of Commerce, Bureau of the Census, ***World Aging II,*** International Population Reports **(P25, 92-3) (Washington, DC: U.S. Government Printing Office, 1992).**

one-third (35 percent) of U.S. households include children. Households composed of single parents and their children constitute a high proportion (8 percent) of households in the United States, although the rate is not much higher than those of some other countries (6 percent, for example, of Canadian households fall into this category).[3]

ETHNIC AND RACIAL COMPOSITION

Health status disparities between racial and ethnic groups occur in the United States (48). Some of these differences reflect social factors, such as income and education (2,64,91,92,153). The population of the United States is characterized by racial and ethnic diversity. In 1990, for example, Asians, Blacks, Hispanics, and Pacific Islanders constituted as many as one in five U.S. residents (197). Data on racial and ethnic composition are not always collected by comparison countries, but available data suggest that increased migration from less developed countries to Western Europe and other developed regions has increased population diversity there (131). For example, about 6 percent of the residents of France and 5 percent of the residents of the Netherlands were foreign, often from less developed countries (e.g., Algeria, Morocco, and Turkey), and from relatively disadvantaged groups (table 3-4) (241). An estimated 8 percent of U.S. residents, 15 percent of Canadian residents, and 23 percent of Australian residents are foreign-born (table 3-4) (105,131).4

SCHOOL ATTENDANCE

Educational attainment (as measured by school attendance) is generally positively related to health status (133a,171). In the United States, for example, 1986 death rates among those who had not graduated from high school were two to three times higher (depending on race and sex) than those of college graduates (133a).

Available data on school attendance suggest that U.S. residents are well educated compared with residents of selected comparison countries.[5] Around 1980, for example, the proportion of young adults (age 25 to 44) who had completed post-secondary education was twice as great in

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[3] The proportion of households with children that arc headed by a single parent is 23 percent in the United States and 15 percent in Canada (table 3-3).

[4] European countries use nationality to define the ''foreign' population and non-European countries generally use place of birth to define the "foreign-born" population (131).

[5] Data on school attendance are not widely available, and statistics may vary by country for several reasons, including differences in educational systems, differences in categories used to describe educational level, varying durations of particular educational levels, different concepts of attendance, and differences in reporting attendance to international organizations. These factors hamper international comparisons, and available data must be interpreted with caution (196).

Table 3-3-Percent of Households with Children by Marital Status of Parent, United States and Selected Countries, Selected Years[a]

Country	Year	Total households (thousands)	Households with children (thousands)			Percent of all households			Percent of households with children	
			Total	Married parents	Single-parent	Households With children	Married parents with children	Single-parent with children	Married parents	Single-parent
United States	1988	91,066	31,920	24,601	7,319	35.1%	27.0%	8.0%	77.1%	22.9%
Australia	1982	5,214	1,770	1,569	201	33.9	30.1	3.9	88.6	11.4
Canada	1986	8,992	3,406	2,903	503	37.9	32.3	5.6	85.2	14.8
France	1988	20,853	7,070	6,301	769	33.9	30.2	3.7	89.1	10.9
Germany[b]	1988	27,403	6,918	5,984	934	25.2	21.8	3.4	86.5	13.5
Japan	1985	37,980	15,836	14,896	940	41.7	39.2	2.5	94.1	5.9
Sweden	1985	3,670	1,051	873	178	28.6	23.8	4.9	83.1	16.9
United Kingdom	1987	NA	NA	NA	NA	32.0	28.0	4.0	87.3	12.7

KEY: NA= not avalable.

aThe definitions of households, children and the treatment of unmarried cohabiting couples may differ across countries so comparisons should be made with caution. Households may include related or unrelated individual A small proportion of other household type may contain children. Households of unmarried cohabiting couples may be classified as single-parent households, married couple households, or 'other' households, depending on responses to surveys, in all countries except Canada, France, and Sweden where they are explicitly included under married couples. Singleparent subfamilies living in larger households are excluded from the data on single-parent households. Children are defined as under 18 years old with the following exceptions: Australia includes all children under 15 and full-time students aged 15 to 20 years. The United Kingdom includes all children under 16 and full-time students aged 16 and 17; data refer only to Great Britain (excludes Northern Ireland), and are based on a household survey that has not been inflated to national levels. Numbers in thousands. Figures may not add to totals due to rounding.

bBased on data from the former Federal Republic of Germany.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Children's *Well-Being, International* Population Reports (P-95, No. 80) (Washington, DC: U.S. Government printing office, 1990).

Table 3-4-Foreign or Foreign-born[a] Population, United States and Selected Countries, 1990

Country	Foreign or foreign-born[a] population (percent)	Significant cultural or language minority groups
United States	7.9%	Cuban, Mexican
Australia	22.6	Yugoslav
Canada[b]	14.7	Carribean, Vietnamese, Yugoslav
Denmark	3.1	NA
France	6.4	Algerian, Moroccan, Portuguese
Germany[c]	8.2	Turk, Yugoslav
Italy	1.4	NA
Netherlands	4.6	Moroccan, Turk
Norway	3.4	Pakistani, Vietnamese
Sweden	5.6	Iranian, Turk
United Kingdom	3.3	Caribbean, Guyanan, Indian

KEY: NA = not available.

[a]European countries use nationality to define the "foreign" population. Non-European countries use place of birth to define the foreign-born population.

bData for Canada are for 1986

cBased on data from the former Federal Republic of Germany.

SOURCES: S.J. Lapham, The Foreign Born Population in the United States: 1990," special tabulations of the Ethnic and Hispanic Branch, Population Division, Bureau of the Census, U.S. Department of Commerce, Washington, DC, Dec. 18, 1992; Organisation for Economic Co-operation and Development, *SOPEM; Trends in International Migration* (Park, France: Organisation for Economic Co-operation and Development, 1992).

the United States as in Canada (table 3-5).[6] Of the six countries where data are available, however, school attendance was highest in New Zealand where more than 90 percent of young adults (age 25 to 44) completed secondary schooling, and more than 30 percent completed some post-secondary education as of 1981 (table 3-5).

LABOR FORCE PARTICIPATION

The extent to which a nation's population participates in the labor force is a well-recognized economic indicator and can affect or reflect health status to varying degrees. In the United States, for example, an individual's employment can affect his or her access to health insurance, and absence from work or inability to work is a morbidity measure commonly used to reflect health status in health surveys (see chapter 6). Participation in the labor force may have indirect effects on health status, as well. Since 1970, for example, young women participation in the workforce has increased from nearly 50 to 75 percent in the United States, and some observers have speculated that this movement from the home to the workforce has affected the health of mothers and their young children.

More than 90 percent of the men aged 25 to 44 in all comparison countries participate in the labor force,[7] but participation by men over the age of 44 declines at different rates in different countries (table 3-6) (196). More than half of the women aged 25 to 44 participate in the labor

6 Estimates of 1990 school attendance in the United States and Canada show that U.S. residents were more likely to have completed secondary education. Among young adults (age 25 to 44), 87 percent of men and 87 percent of women in the United States, as compared to 77 percent of men and 79 percent of women in Canada, had completed high school (162),

[7] A country's labor force or economically active population is usually defined as all persons who are working, actively seeking work, or temporarily out of work because of illness, layoff, vacation, or strike. Because reporting of labor force participation varies as a result of, for example, the inclusion or exclusion of certain categories of workers, international comparisons need to be made cautiously (l%).

Table 3-5--Level of Education Completed by Age and Sex, United States and Selected Countries, Circa 1980[a]

Country by sex	Secondary level or more				Post-secondary			
	25-44	45-54	55-64	65+	25-44	45-54	55-64	65+
United States (1980)								
Male	**82.9%**	**66.9%**	**59.9%**	**39.2%**	**26.5%**	**20.5%**	**14.7%**	**10.3%**
Female	**81.8**	**69.6**	**61.5**	**41.8**	**19.1**	**11.°**	**8.6**	**7.4**
Canada (1981)								
Male	66.8	44.5	37.6	27.7	14.4	8.9	7.1	5.0
Female	64.3	42.6	36.4	28.7	8.4	3.6	2.5	2.0
Italy (1981)								
Male	51.4	26.1	21.6	13.8	7.0	4.5	5.0	3.4
Female	41.1	20.1	16.0	12.1	5.4	2.0	1.7	0.7
Japan (1980)								
Male	70.6	51.5	36.2	26.8	24.8	16.1	13.0	9.5
Female	69.6	48.0	31.8	19.6	15.5	5.2	3.4	2.3
New Zealand (1981)								
Male	93.1	71.8	48.7[b]	NA	38.6	24.9	15.5[b]	NA
Female	94.2	74.4	46.8[b]	NA	31.2	21.6	13.3[b]	NA
Norway (1980)								
Male	38.9	24.2	17.3	13.5	10.7	6.0	4.3	4.0
Female	24.6	12.3	7.9	6.3	4.9	1.5	0.7	0.5

KEY: NA = not available

[a]Data on completed educational attainment may vary by country for a variety of reasons including, differences in categories used to describe educational level, varying durations of particular educational levels, different concepts of attainment, and differences in reporting of attainment to international organizations.

[b]Refers to ages 55 years and over.

SOURCE: U.S. Department of Commerce, Bureau of the Census, *An Aging World II*, International Population Report, table 10 (P25, 92-3) (Washington DC: U.S. Government Printing Office, 1992).

Table 3-6--Labor Force Participation Rates, by Sex and Age, United States and Selected Countries, Selected Years

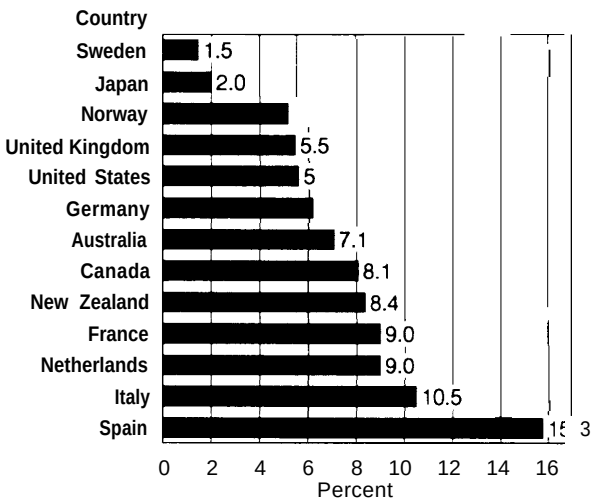
		Male						emal					
Country	Year	25-44	45-49	50-54	55-59	60-64	65+	25-44	45-49	50-54	55-59	60-64	65+
United States	**1991**	**93.9%**	**92.2%**	**88.4%**	**79.0%**	**54.8%**	**15.8%**	**74.9%**	**75.4%**	**67.8%**	**55.7%**	**35.1%**	**8.6%**
Australia	1986	92.1	89.8	85.7	76.4	44.8	9.0	59.0	58.2	46.4	30.9	13.6	3.0
Canada	1986	94.9	93.3	89.9	81.3	59.9	14.6	73.0	67.1	57.9	44.7	27.5	4.7
France	1990	96.1	95.9	91.6	68.6	18.1	2.8	77.2	71.8	63.2	46.8	16.7	1.5
Germany[a]	1988	94.1	96.4	93.2	79.8	34.5	4.9	64.6	60.9	53.7	41.1	11.1	1.8
Italy	1989	95.6	95.6	87.5	67.8	35.2	7.9	59.5	44.7	34.1	20.2	9.8	2.2
Japan	1989	97.0	97.6	96.0	91.6	71.4	35.8	61.1	70.7	64.2	52.2	39.2	15.7
New Zealand	1989	94.4	93.3	91.9	78.1	33.8	10.6	67.6	75.8	69.8	47.1	14.4	3.5
Norway	1989	93.7	93.8	90.5	83.2	64.9	23.6	78.9	82.0	75.8	63.2	44.1	11.8
Sweden	1985	90.6	92.1	90.3	85.3	63.2	11.3	85.6	87.5	83.1	72.5	45.6	3.1
United Kingdom	1986	93.9	91.6[b]	NA	80.3	53.4	7.5	66.9	69.9[b]	NA	51.5	18.8	2.7

KEY: NA = not available

[a]Based on data from the former Federal Republic of Germany.
[b]Refers to ages 45 to 54 years.

SOURCE: U.S. Department Co rce Bureau of the Census, *An Aging Wo II*, International Population Report, table 1 N[illegible] 92-3) (Washington DC: U.S. Government Printing Office, 1991).

Figure 3-3-Unemployment Rates, United States and Selected Countries, 1990 (percentage of labor force)



SOURCE: Organisation for Economic Co-operation and Development, *OECD Health Systems: The Socio-Economk Environment Statistical References, Volume II* (Paris, France: Organisation for Economic Co-operation and Development, 1993).

forces of all comparison countries, but participation ranges from a low of 59 percent in Australia to a high of 86 percent in Sweden. Three-quarters of young women are economically active in the United States. Labor force participation by men and women aged 65 and older is relatively high in the United States (16 and 9 percent, respectively) and is exceeded only in Norway (24 and 12 percent) and Japan (36 and 16 percent) (table 3-6).

Unemployment rates in 1990 were low in the United States (5.6 percent) relative to Spain (15.8 percent) and Italy (10.5 percent), but are somewhat higher than the very low rates of Sweden (1.5 percent) and Japan (2.0 percent) (figure 3.3) (133).

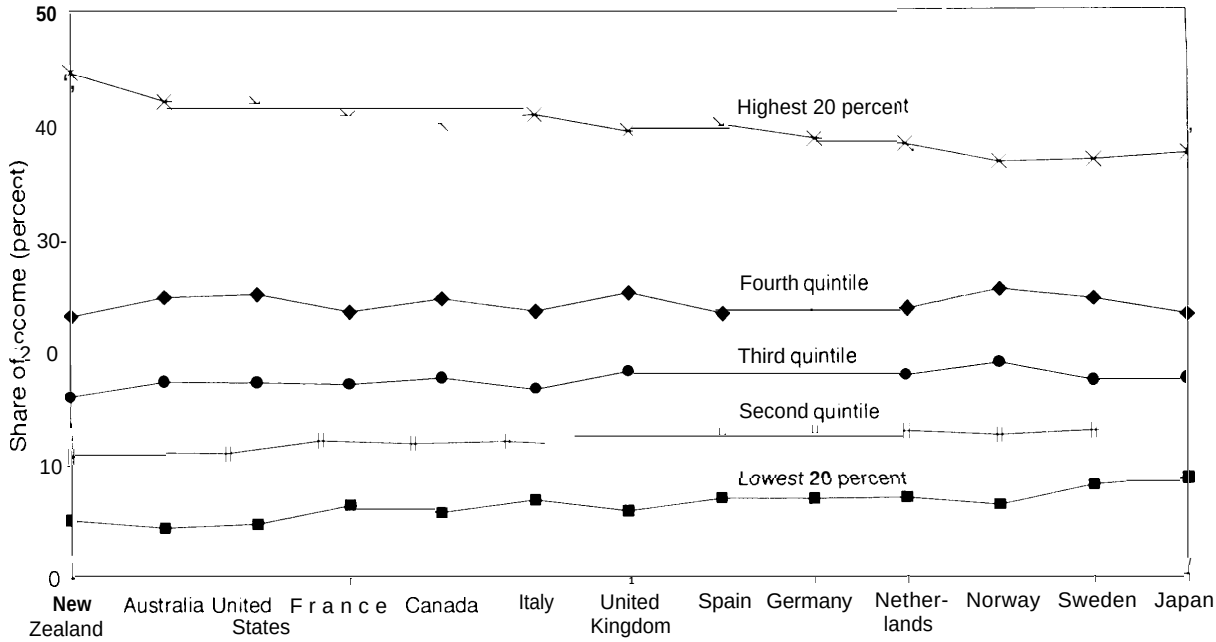
INCOME AND POVERTY

Significant disparities exist between the health status of poor people and that of people with higher incomes in the United States and other developed countries (46,133a,153,246). In the United States, for example, 1986 death rates among people with a yearly income of less than $9,000 were three to seven times higher (depending on race and sex) than people with a yearly income of $25,000 or more (2,133a).

Comparisons among industrialized countries have generally found little relationship at the aggregate level between mortality and per-capita personal income or other measures of the average standard of living (46,246). But some research suggests that a country's poverty rates and income distribution are associated with the health status of the population (83,244). A study of European countries, for example, found that improvements in life expectancy over a decade (generally from 1975 to 1985) were strongly related to reductions in poverty (245). According to the Luxemburg Income Study, which evaluated comparable income data from nine countries,[8] the nations with the most equality in distribution of income are Germany, Norway, and Sweden, and those with the greatest inequality are Switzerland and the United States. Australia, Canada, and the United Kingdom occupy the middle of the ranking (10). Household income distribution data from the early to late 1980s show that the poorest fifth of households in the United States held a smaller share of income, and the wealthiest fifth of households held a larger share of income relative to most other comparison countries (figure 3-4) (25 1). In the mid 1980s the United States had the highest poverty rates and the lowest

[8] The Luxemburg Income Study provides comparable data on income distribution in Australia, Canada, the Netherlands, Norway, Sweden, Switzerland, West Germany (*the* former Federal Republic of Germany), the United Kingdom, and the United States. The study defined family net cash income as gross original income plus public and private transfers minus direct (income and payroll) taxes. Income distribution is described in terms of the share of total income going to successive tenths of the population (245).

Figure 3-4-income Distribution: United States and Selected Countries, Selected Years[a]



a Data for France, Japan, Norway, and the United Kingdom are for 1979. Data for Spain are for 1980-81. Data for the Netherlands are for 1983. Data for Germany (the former Federal Republic of Germany) are for 1984. Data for Australia and the United States are for 1985. Data for Italy are for 1988. Data for Canada are for 1987.

NOTE: This figure shows the distribution of household Income accruing to percentile groups of households ranked by total household Income. Households in each country were ranked according to total household Income. Each country's listing of ranked households was then divided into 5 equal "quintiles." This figure shows each household quintile's share of total national household income for each country. The poorest households in the United States (i.e., the 20 percent of households with the lowest household incomes) hold a relatively small share of income (4.7 percent). Of the comparison countries, only Australia's poorest households hold a smaller share (4.4 percent) than do those In the United States. Japan and Sweden's poorest households appear to be better off Insofar as they hold a larger share of income (8.7and 8.0 percent, respectively) than the poorest households in any of the other comparison countries. The wealthiest households in New Zealand and the United States (i.e., the 20 percent of households with the highest household incomes) hold larger shares of income (44.7 and 41.9 percent, respectively) than comparable households in any of the comparison countries. These data support the contention that the United States has relatively unequal Income distribution.

SOURCE: World Bank, *World Development Report 1993: Investing in Health (New York, NY: Oxford* University Press, 1993).

poverty escape rates than some other developed **countries** (table 3-7) (39).

Poverty rates for children are generally higher in the United States than in selected comparison countries. In the mid-1980s, as many as 17 percent of children in the United States lived in poverty, compared with 5 percent in Sweden and 8 percent in the former Federal Republic of Germany (table 3-8).

HEALTH INSURANCE COVERAGE

Whether people are covered by health insurance affects their access to health services; the types, quality, and intensity of care delivered; and patient health (193). The proportion of the population with health insurance is smaller in the United States than in any of the comparison countries. In 1991, an estimated 13 percent of the U.S. population lacked health insurance coverage

Table 3-7--Poverty Indicators, United States and Selected Countries, Mid-1980s

Country	Single-year poverty rate[a]	Persistent poverty rate[b]	Poverty escape rate[c]
United States	20%	14%0	22%
Black	49	42	15
White	15	10	25
Canada	17	12	23
France (Lorraine)	4	2	32
Germany[d]	8	2	24
Ireland	11	NA	22
Luxemburg	4	<1	29
Netherlands	3	<1	23
Sweden	3	NA	45

KEY: NA= not applicable.

aPercent of families with income less than 50 percent of the median.

bPercent with less than 50 percent of median income for 3 years in a row.

cPercent of families with income 40 to 50 percent of the median whose income jumped to greater than 60 percent of the median 1 year later.

dBased on data from the former Federal Republic of Germany.

SOURCE: Adapted from G. J. Duncan, B. Gustafsson, R. Hauser, et al., 'Poverty Dynamics in Eight Countries," *Journal of* Population *Economics 6(3):215-234,* August 1993.

Table 3-8--Child Poverty,[a] United States and Selected Countries, Circa 1980

Country	Year	Poverty rate for children		Poverty rate for families with children	
		All families	Single parent	All families	Single parent
United States	1979	17.1%	51.%	13.8%	42.9%
Australia	1981	16.9	65.0	15.0	61.4
Canada	1981	9.6	38.7	8.6	35.3
Germany[b]	1981	8.2	35.1	6.9	31.9
Sweden	1981	5.1	8.6	4.4	7.5
United Kingdom	1979	10.7	38.6	8.5	36.8

aPoverty is defined as the percentage of peopole *who have adjusted* disposable income below the U.S. poverty line ($5,763 for a family of three in 1979) converted Into national currencies using the purchasing power parities developed by the Organisation for Economic Co-operation and Development. The definition of adjusted disposable income includes all forms of cash income (earnings, property income, and all cash transfers inducting the value of food stamps in the United States and housing allowances In Sweden and the United Kingdom) and it subtracts income and payroll taxes. This definition differs slightly from the definition of Income used in the official United States calculation of poverty rates. The source of the estimates of earnings, government transfers, and poverty rates Is the Luxemburg Income Study.

bBased on data from the former Federal Republic of Germany.

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Children's Well-Being,* International Population Reports (P-95, No. 80) (Washington, DC: U.S. Government Printing Office, 1990).

(144). All but one of the 12 comparison countries have public health insurance programs that cover at least 90 percent of their respective populations (133).9

SUMMARY

The most outstanding sociodemographic difference between the United States and the 12 comparison countries is population size. The United States has nearly 250 million residents, twice as many as Japan, nearly 10 times as many as Canada, and 75 times as many as New Zealand.

Another difference is age distribution. The United States has a relatively young population age distribution and will remain younger than Japan and Western European countries through 2025, even though the U.S. baby boom cohort will have reached age 65 by then.

The U.S. population is racially and ethnically diverse, with as many as one in five residents belonging to minority groups. Although comparable data on ethnic and racial composition from other countries are limited, available data suggest that foreign migration to Western Europe has increased in recent years, contributing to the presence of sizable, disadvantaged minority populations.

Labor force participation is relatively high in all comparison countries and varies chiefly in the extent to which women and the elderly are economically active. Women's participation in the labor force is highest in Sweden, lowest in Australia, and intermediate in the United States. The United States, along with Norway and Japan, have relatively more elderly in the labor force than do other comparison countries.

Poverty is associated with poor health, as are large disparities in the distribution of income throughout a nation. Income distributions are relatively unequal in the United States and more equal in Japan, Norway, and Sweden. Poverty rates are higher in the United States than in most comparison countries.

Health insurance coverage improves health (193). Among the comparison countries, only the United States has a large segment of population without any health care insurance.

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9 In the Netherlands, 69 percent of the population is covered through a publicly financed program and about 30 percent of the population are insured privately (16,133).

Infant Mortality 4

Infant mortality is sometimes used as a yardstick for comparing the outcomes of health systems in countries at similar levels of socioeconomic development although it does not represent the overall health status of a nation (226,256). In comparisons of developed and developing countries, infant mortality may be a social or economic indicator, but in developed countries infant mortality is not highly correlated with established socioeconomic measures (e.g., per-capita gross domestic product and the percentage spent on health) (45).

Infant mortality rates are useful for identifying problems with the health status of infants and mothers and the delivery of health care and related services to these groups (226). Thus, learning why infant mortality rates are up to twice as high in the United States as in other developed countries could lead to improvements in U.S. health programs for mothers and infants. The reasons for international differences in infant mortality are complicated, however, and to understand these differences requires consideration of differences in population characteristics, individual risk behaviors, and features of vital statistics systems. Ongoing examinations of the range of individual and societal factors that influence infant mortality has already provided valuable insight into why U.S. infant mortality is relatively high.

INTERNATIONAL COMPARISONS OF INFANT MORTALITY RATES AND TRENDS

Infant Mortality Rates

Infant mortality is measured as the annual number of deaths of infants below age 1 per annual number of live births and is expressed as deaths per 1,000 live births per year. Among 39

Table 4-1-infant Mortality Rates and Ranks, United States and Selected Countries, 1990

Country	Infant mortality Rate[a]	Rank	Country	Infant mortality Rate[a]	Rank
Japan	4.60	1	Ireland	8.20	21
Sweden	5.96	2	New Zealand	8.31	22
Finland[b]	6.03	3	Italy	8.53	23
Hong Kong	6.14	4	United States	9.22	24
Singapore	6.67	5	Greece	9.66	25
Canada	6.82	6	Israel	9.84	26
Switzerland	6.83	7	Cuba	10.74	27
Germany, Federal Republic of	6.98	8	Portugal	10.99	28
Norway	7.02	9	Czechoslovakia	11.25	29
Netherlands	7.06	10	Puerto Rico	14.77	30
France	7.33	11	Bulgaria	14.77	31
German Democratic Republic	7.33	12	Hungary	14.82	32
Denmark	7.39	13	Costa Rica	15.26	33
Northern Ireland	7.49	14	Poland	16.00	34
Scotland	7,73	15	Chile	16.82	35
Austria	7.84	16	Kuwait[d]	17.33	36
England and Wales	7.88	17	Yugoslavia	20.20	37
Belgium	7.94	18	Union of Soviet Socalist Republics	21.96	38
Spain[c]	8.07	19	Romania	30.09	39
Australia	8.17	20			

aNumber of deaths of infants under 1 year per 1,000 live births.
[b]Data are for 1989.
[c]Data are for 1988.
[d]Data are for 1987.

NOTES: Rankings are from lowest to highest infant mortality rates based on the latest data available for counties or geographic areas with at least 1 million population and with "complete" counts of live birth and Infant deaths as Indicated In the *United* Nations *1990* Demographic *Yearbook.*

SOURCE: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, International infant Mortality Data Set, Hyattaville, MD, 1993.

selected developed countries in the world, 1990 infant mortality rates range from a low of 4.6 in Japan to 30.1 in Romania (table 4-l). With a rate of 9.2, the United States ranks 24th, which puts it in the bottom half.

When comparisons of infant mortality are restricted to the United States and 12 other selected developed countries, the difference between the lowest and highest rates is two-fold (from 4.6 in Japan to 9.2 in the United States) (table 4-2).[1] In 1990, the United States ranked last in overall infant mortality, 1lth of 13 in neonatal deaths (those occurring during the first 27 days of life)[2] and 10th of 13 in postneonatal deaths (those occurring between 28 days and 1 year of age)[3] (table 4-2). The United States continues to rank poorly (8th of 13) when the infant mortality rate of only the country's white population is compared with the infant mortality rates of other nations. International variation in infant mortality

1 All subsequent comparisons with the United States are based on the following 12 countries: Australia, Canada, France, Germany (the former Federal Republic of Germany), *Italy,* Japan, *the* Netherlands, New *Zealand,* Norway, Spain, Sweden, and the United Kingdom.

2 Mortality within the first 27 days of life (neonatal death) is described by the neonatal mortality rate, which is the annual number of neonatal deaths per annual number of live births, and is expressed per 1,000 live births per year.

3 Mortality between 28 days and 1 year of age (postneonatal death) is described by the postneonatal mortality rate, which is the annual number of postneonatal deaths per annual number of live births, and is expressed per 1,000 live births per year.

Table 4-2-Rates and Ranks of Infant, Neonatal, Postneonatal, and Feto-infant Mortality in the United States and Selected Countries, 1990

country	Infant mortality		Neonatal mortality		Postneonatal mortality		Fete-infant mortality	
	Rate[a]	Rank	Rate[b]	Rank	Rate[c]	Rank	Rate[d]	Rank
United States	9.22	13	5.85	11	3.38	10	13.21	10
Australia	8.17	10	4.85	10	3.31	8	12.06	6
Canada	6.82	3	4.61	8	2.21	3	10.72	4
England and Wales	7.88	8	4.58	7	3.32	9	12.44	8
[e]	7.33	7	3.55	4	3.79	12	13.66	11
Germany[f]	6.98	4	3.54	3	3.44	11	10.37	3
Italy[g]	8.53	12	7.25	13	2.08	2	13.96	12
Japan	4.60	1	2.60	1	1.99	1	8.38	1
Netherlands	7.06	6	4.81	9	2.24	4	12.74	9
New Zealand	8.31	11	4.07	6	4.24	13	12.37	7
Norway	7.02	5	3.92	5	3.10	7	11.55	5
Spain[h]	8.07	9	6.05	12	2.95	6	14.69	13
Sweden	5.96	2	3.50	2	2.46	5	9.50	2

[a]Number of deaths of infants under 1 year per 1,000 live births.
[b]Number of neonatal deaths per 1,000 live births.
[c]Number of postneonatal deaths per 1,000 live births.
[d]Number of late fetal deaths plus infant deaths under 1 year per 1,000 live births plus late fetal deaths.
[e]Data are for 1990, except for feto-infant mortality rate which is for 1989.
[f]Based on data from the former Federal Republic of Germany.
[g]Data are for 1990, except for the neonatal and postneonatal mortality rates, which are for 1988.
[h]Data are for 1987, except infant mortality, which is for 1988.

NOTES: Rankings are from lowest to highest infant mortality rates based on the latest data available for countries or geographic areas with at least 1 million population and with 'complete" counts of live births and infant deaths as indicated in the *United Nations 7988 Demographic Yeabook Some of the* international variation in infant mortality rates is due to variation among counties in distinctions between fetal and infant deaths, The fete-infant mortality rate attempts to reduce internationaJ variation due to clinical distinctions between fetal and infant deaths.

SOURCE: U.S. Department of Health and Human Services, Public Health Service, C-enters for Disease Control and Prevention, National Center for Health statistics, International Infant Mortality Data Set, Hyattsville, MD, 1993.

Table 4-3--infant Mortality Rates, by Race, Geographic Division, and State: United States, Average Annual 1987-89

Geographic division and State	All 1987-89	White[a] 1987-89	Black[a] 1987-89
United States	9.9	8.3	18.6
New England	8.1	7.3	17.7
Connecticut	8.8	7.4	19.5
Maine	7.8	7.8	-b-
Massachusetts	7.6	6.8	16.7
New Hampshire	8.0	8.0	-b-
Rhode Island	8.9	8.4	15.9[c]
Vermont	7.4	7.4	-b-
Middle Atlantic	10.3	8.2	19.7
New Jersey	9.5	7.3	19.2
New York	10.7	8.7	18.7
Pennsylvania	10.1	8.0	22.8
East North Central	10.5	8.5	20.4
Illinois	11.6	8.9	21.5
Indiana	10.4	9.3	20.5
Michigan	11.0	8.3	22.4
Ohio	9.6	8.3	17.3
Wisconsin	8.7	7.8	17.0
West North Central	8.9	8.0	18.6
Iowa	8.7	8.2	22.6[c]
Kansas	8.7	7.8	18.9
Minnesota	7.8	7.1	22.8
Missouri	10.1	8.7	17.5
North Dakota	9.1	8.4	-b-
Nebraska	8.5	7.7	20.6[c]
South Dakota	9.9	8.1	-b-
South Atlantic	11.3	8.6	18.5
Delaware	11.8	9.2	20.5
District of Columbia	21.9	14.4	25.3
Florida	10.3	8.1	17.8
Georgia	12.5	9.4	18.5
Maryland	11.0	8.3	17.7
North Carolina	11.9	9.1	18.8
South Carolina	12.6	9.4	17.9
Virginia	10.2	7.8	18.2
West Virginia	9.4	9.1	18.7[c]
East South Central	11.3	8.9	17.7
Alabama	12.1	9.1	17.9
Kentucky	9.9	9.2	16.7
Mississippi	12.5	9.0	16,4
Tennessee	11.1	8.5	19.2
West South Central	9.6	8.2	15.9
Arkansas	10.4	8.6	16.6
Louisiana	11.4	8.4	16.1
Oklahoma	9.1	8.5	14.1
Texas	9.1	8.1	15.8

Table 4-3--infant Mortality Rates, by Race, Geographic Division, and State: United States, Average Annual 1987-89 (Continued)

Geographic division and State	All 1987-89	White[a] 1987-89	Black[a] 1987-89
Mountain	9.2	8.7	19.3
Arizona	9.5	8.9	21.4
Colorado	9.4	9.1	16.5
Idaho	9.6	9.3	-b-
Montana	10.0	9.1	-b-
Nevada	8.7	7.7	20.0
New Mexico	8.9	8.3	22.6[c]
Utah	8.3	8.0	-b-
Wyoming	9.2	9.1	-b-
Pacific	8.8	8.1	18.9
Alaska	10,4	8.0	15.7C
California	8.7	8.0	18,8
Hawaii	8.1	5.5	14.4[c]
Oregon	9.3	9.1	21.4[c]
Washington	9.3	8.7	20.6

aDeaths are tabulated by race of decedent; live births are tabulated by race of 'other"
bData for States with fewer then 1,000 live births for the 3-year period are considered highly unreliable and are not shown.
[c]Data for States with fewer than 5,000 live births for the 3-year period are considered unreliable.

SOURCE: US. Department of Health and Human Servicea, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, *Health United States and prevention Profile: 1991,* DHHS Pub. No. (PHS)92-1232 (Hyattsville, MD: U.S. Department of Heath and Human services, May 1992).

rates exceeds the rather large variation observed among U.S. regions and States (tables 4-2 and 4-3)$_0$

TIME OF DEATH

The timing of infant deaths varies greatly among the 13 comparison countries. The United States, which recorded the highest infant mortality rate in 1990, had the greatest proportion of its infant deaths (38 percent) during the first day of life (figure 4-l). In New Zealand, which had the second highest infant mortality rate, most deaths (51 percent) occurred in the postneonatal period (from 28 to 1 year of age).

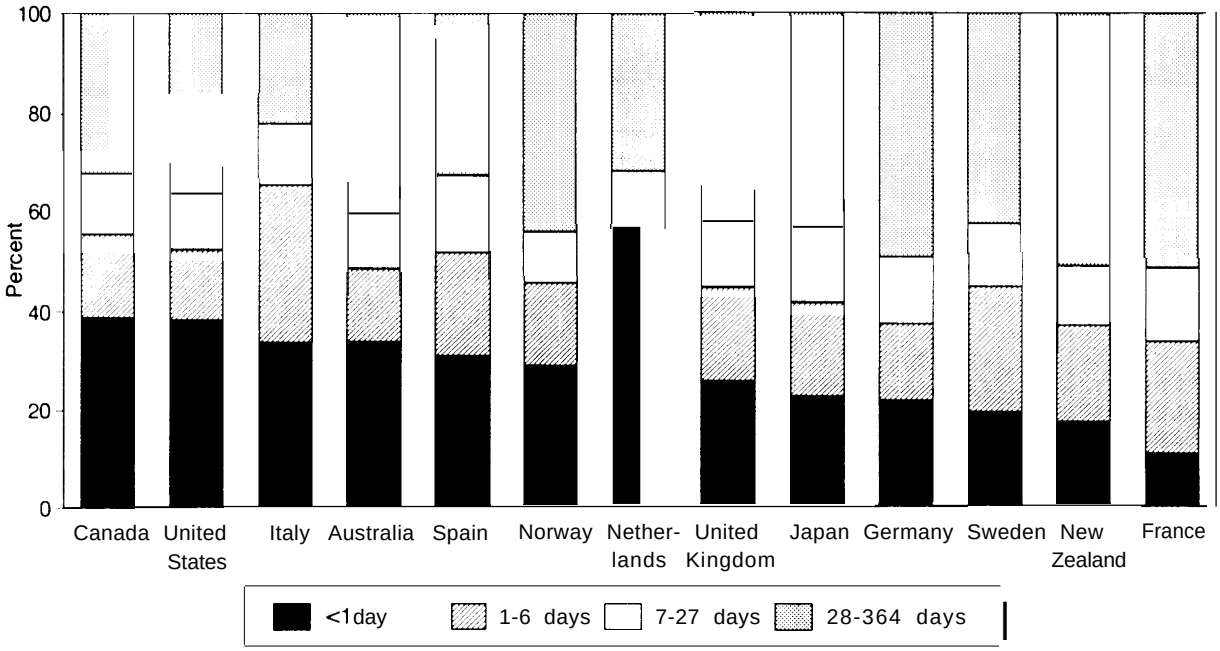
CAUSE OF DEATH

Perinatal conditions (e.g., birth trauma, respiratory distress syndrome), congenital anomalies, and sudden infant death syndrome (SIDS) are the leading causes of infants' deaths, and account for 60 to 85 percent of all deaths in each of the 13 comparison countries (figure 4-2). In 1988, a relatively high proportion of deaths in the United States were attributable to perinatal causes (46 percent), which is consistent with the large proportion of deaths occurring here during the first day of life. Japan, with the lowest recorded infant mortality rate, has the highest proportion of deaths attributable to congenital anomalies (35 percent). There appear to be differences in how countries diagnose and report deaths from SIDS. As many as 33 percent of infants' deaths in New Zealand are attributed to SIDS, whereas only 4 percent of such deaths in Japan are attributed to SIDS.

Infant Mortality Trends

The United States has not always ranked poorly in infant mortality when compared with other developed countries. In 1950, the infant mortality rates of Spain, Italy, Japan, Germany, France, Canada, and the United Kingdom were higher than the U.S. rate (figure 4-3). By 1970, however,

Figure 4-1-infant Mortality, Distribution of Time of Death, United States and Selected Countries, 1990°



a Data for Italy are for 1988 and data for Spain are for 1987.

SOURCE: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, International Infant Mortality Data Set, Hyattsville, MD, 1993.

most other countries[4] had experienced sharper declines in infant mortality than the United States. Rates of decline since 1950 were greatest for Japan and Spain. Since 1970, rates in Italy, Spain, and Germany have dropped the most.

TECHNICAL DIFFICULTIES IN MAKING INTERNATIONAL COMPARISONS OF INFANT MORTALITY

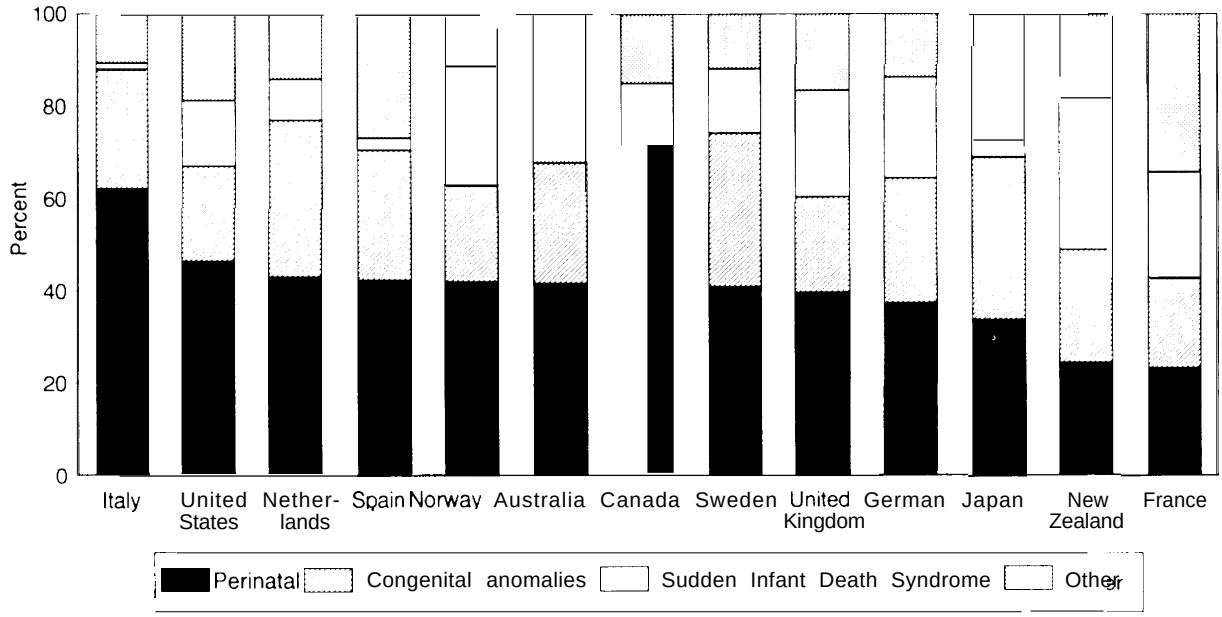
Recent evidence suggests that international differences in resuscitation practices and the classification of infant deaths may elevate the U.S. infant mortality rate somewhat (190). Physicians in the United States appear to be more likely to resuscitate extremely premature and low birthweight infants who later die.[5] These births are classified as live births and are included in the U.S. infant mortality statistics. Other countries appear to be more likely to class@ such births as fetal deaths. Because most countries do not require registration of fetal deaths of fewer than 28 weeks of gestation, these extremely premature infants are not counted within the registration system.[6] That the United States also has a much higher proportion of deaths occurring within 24 hours of birth and with extremely low birthweights (under 500 grams) suggests that different

[4] Of the countries with higher infant mortality rates than the United States in 1950, the rates in Germany, Spain, and Italy continued to exceed the U.S. rate in 1970 (figure 4-3).

[5] Extremely premature infants are those born at less than 28 weeks of gestation. Extremely low birthweight infants are those born weighing less than 500 grams (70).

[6] Distinguishing a live birth from a stillbirth can be difficult. The World Health Organization recommends that a birth be considered live if the newborn shows any sign of life, such as heartbeat, breathing, umbilical cord pulsation, or voluntary muscle movement (253).

Figure 4-2-infant Mortality, Distribution of Cause of Death, United States and Selected Countries, 1988"



a Data for Canada, Spain, and New Zealand are for 1987.

SOURCE: World Health Organization, *World Health Statistics* Annual (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

resuscitation (and possibly reporting) practices affect the reported statistics (71).

Some countries have birth registration practices that might contribute to reporting differences. In France, for example, infants may be classified as stillbirths if they die before their births are registered, which may be as much as 2 days after birth (73,108). In some countries, a particular outcome might be preferred for cultural or other reasons, which may cause health care providers' or parents' reports of outcomes to be unreliable (68, 121). For example, some observers speculate that Japan's low infant mortality rate and very high fetal mortality rate may be explained in part by social and cultural customs that favor the recording of infant deaths as stillbirths because the latter are not recorded in Koseki, the Japanese family registration system (73).[7]

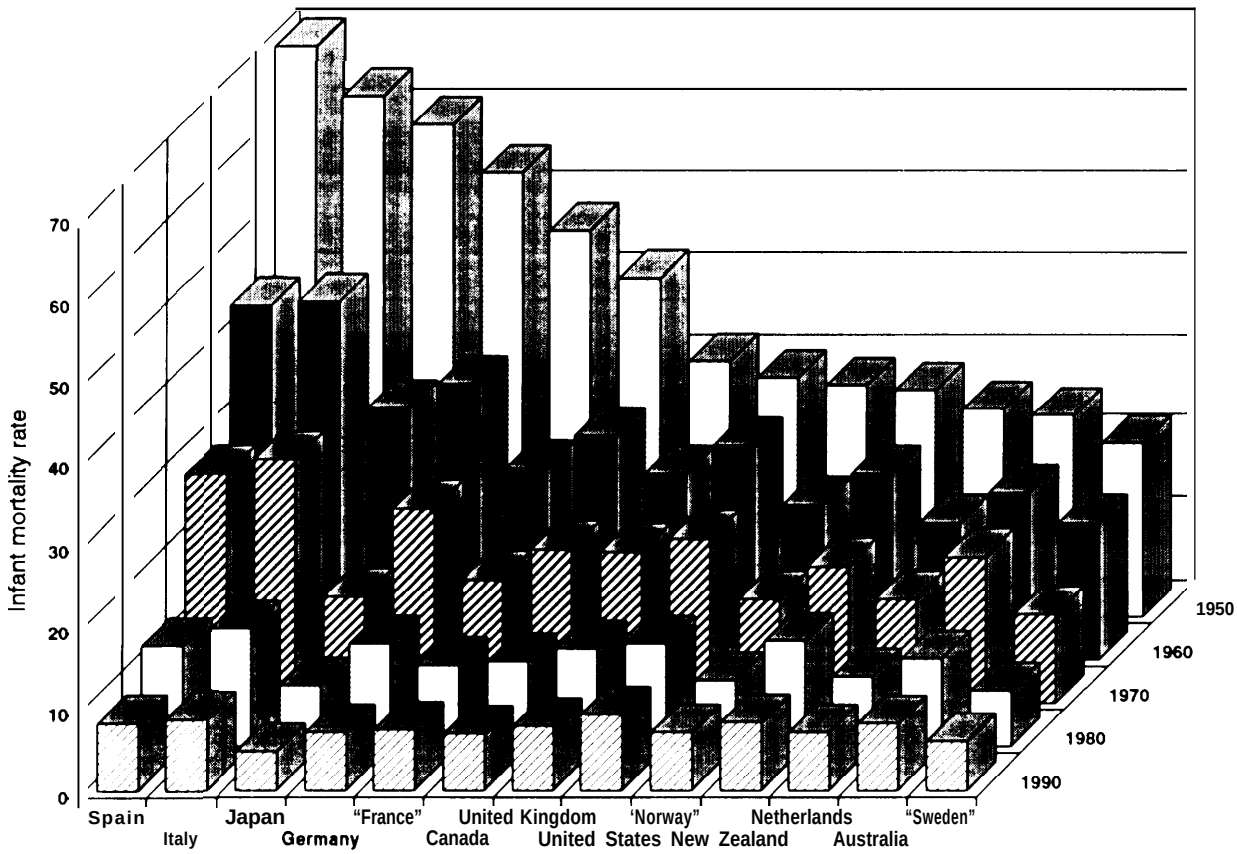
The fete-infant mortality rate (FIMR), a measure combining late fetal and infant deaths,[8] overcomes some of the problems in comparing countries with different ways of classifying live births and fetal deaths. Using the FIMR instead of the infant mortality rate (IMR) for international ranking of the 13 comparison countries, the United States moves from 13th to 10th, not a marked improvement (table 4-2).

The FIMR avoids some problems that arise because of international differences in clinical practice and classification, but the FIMR includes

[7] Some speculate that the preference for registering stillbirths stems from the fact that an infant death is considered a significant health problem in a family medical history, whereas a stillbirth is not. Such family histories have historically been reviewed while arranging marriages (70).

[8] The fete-infant mortality rate is the number of late fetal deaths (after at least 28 weeks of gestation) plus the number of infant deaths within the first year of life per 1,000 live births plus late fetal deaths (231).

Figure 4-3-infant Mortality Trends, United States and Selected Countries, 1950 to 1990[a]



a The latest data for Spain are for 1988.

SOURCE: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, International Infant Mortality Data Set, Hyattsville, MD, 1993.

only late fetal deaths, although some evidence suggests that the U.S. infant mortality rate includes births that other countries would likely categorize as early fetal deaths (those occurring at 20 to 27 weeks of gestation). Only a few countries, including Norway, Japan, and the United States, compile statistics on early fetal deaths. When early and late fetal deaths are combined with infant deaths, the United States FIMR is lower than that of Norway and only 16 percent higher than that of Japan (17.35 versus 14.90) (70). This comparison may be unreliable, however, because reporting early fetal death is more complete in areas that require reporting at earlier gestational ages.[9] Fetal death registration begins at 12 weeks of gestation in Japan, at 16

[9] Within the United States, for example, States that require reporting fetal death from conception report higher fetal mortality rates than States that require reporting fetal deaths starting at 20 weeks of gestation (226). When the U.S. FIMR calculation (including fetal deaths from 20 weeks of gestation) is limited to the eight States that report fetal deaths from conception, the rate is about one-third higher than the Japanese rate (19.9 versus 14.9). In this comparison however, U.S. reporting (starting from conception) might be more complete than Japanese reporting, which starts at 12 weeks of gestation.

weeks in Norway (l), and at 20 weeks in most of the United States.[10] Perhaps, therefore, Norway and Japan have more complete reporting of fetal deaths than does the United States.

The gap between the 1990 U.S. and Japanese infant mortality rates closes somewhat when infants of 20 to 27 weeks of gestation are excluded from the calculation. Under that condition, the U.S. infant mortality rate declines relative to the Japanese rate, but the U.S. rate remains approximately 25 to 30 percent higher than the Japanese rate (70). Alternatively, one can compare the rates of infant mortality occurring at least 24 hours after birth or at least 7 days after birth. Both measures avoid most of the problems that arise from disparities in how live births and fetal deaths are classified. Even these measures for ranking, however, leave the United States in the bottom half, at 20th, of the 39 countries shown in table 4-1 (70).

INTERNATIONAL DIFFERENCES IN RISK FACTORS ASSOCIATED WITH INFANT MORTALITY

Although reporting differences make international comparisons of infant mortality difficult, an attempt has been made to assemble perinatal and infant mortality data from developed countries into a standardized database to further international comparisons. The International Collaborative Effort (ICE) on Perinata1 and Infant Mortality, established in 1984 by the U.S. National Center for Health Statistics (NCHS), is a collaboration of researchers from the public and private sectors of the United States and 10 other industrialized nations: Denmark, England and Wales, Germany, Hungary, Israel, Japan, Norway, Scotland, and Sweden. A major accomplishment is the ICE database of standardized information from each country,[11] which can be analyzed to aid our understanding of how and why countries differ in particular outcomes of pregnancy.

Factors associated with whether an infant will live or die in its first year include its race, sex, birth order, place of residence, birthweight, gestational age, and whether it is born alone or as part of a set of twins, triplets, or other multiple. Additional factors include the mother's age, prior pregnancy outcomes, health status, personal habits (e.g., prenatal care, smoking, alcohol consumption), and socioeconomic status (101). How these biologic and social factors interact to influence infant mortality is unclear, but the availability of richer data sets[12] and improved research tools should help unravel the causal mechanisms. Internationally comparable data are available for some, but not all, of these correlates of infant mortality.

Low Birthweight

Low birthweight results from prematurity, poor growth, or a combination of the two, and is associated with a high risk of death. Using the ICE database, analysts have explored the contributions of the birthweight distribution-that is, the frequency with which various birthweights occur in a particular population-and birthweight-specific mortality rates to overall infant mortality (100). Analyses have shown that birthweight distributions always follow a bell-shaped curve with a residual group of high-risk, low birthweight infants at the left tail, but that different

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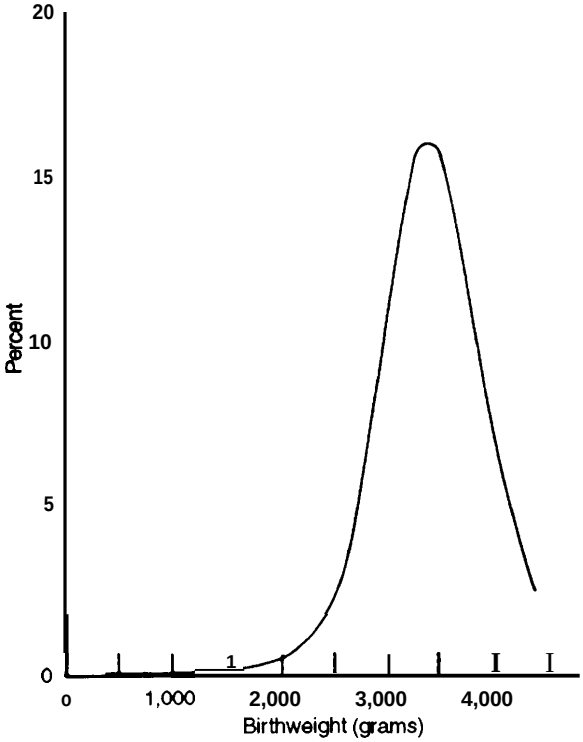
10 States vary in their fetal death registration requirements. Most States require reporting fetal deaths occurring at gestations of 20 weeks or more, and some States (e.g., Massachusetts) also require the registration of the deaths of fetuses weighing 350, 400, or 500 grams or more at birth. Other States (e.g., New York) require the registration of all pregnancy outcomes (226).

11 The most recent data set includes information on infant and fetal death by plurality, birthweight, length of gestation, and cause of death (71). The database includes information from linked files on births and infants' deaths.

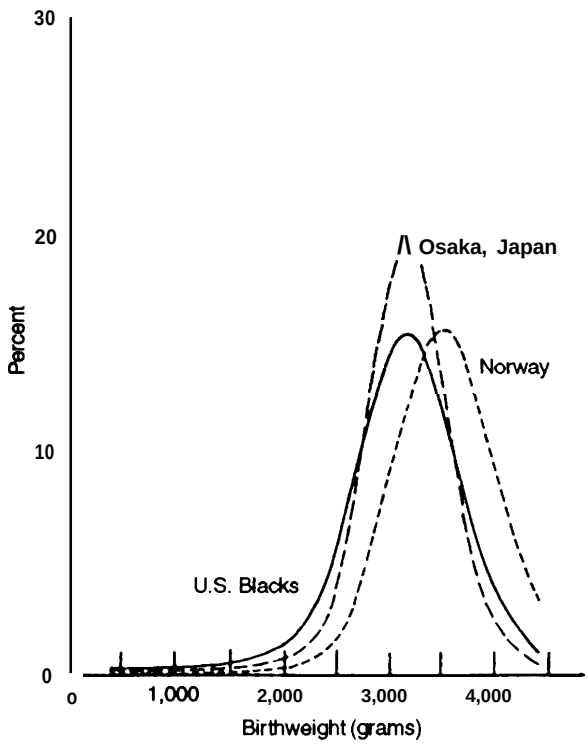
12 The standard U.S. birth certificate, fo, example, was modified in 1989 to include information on maternal medical and lifestyle risk factors (e.g., weight gain, educational attainment, smoking status) and health care (210). Data sets are created to include infant death certificates matched or linked to birth certificates enabling researchers to assess the relative contributions of risk factors to infant mortality.

Figure 4-4-Birthweight Distribution, Singleton Total Births for U.S. Whites



SOURCE: U.S. Department of Health and Human services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, Proceedings of the *International Collaborative Effort on Perinatal Infant Mortality, Volume III,* DHHS Pub. No. (PHS) 92-1252 (Hyattsville, MD: U.S. Department of Health and Human Services, October 1992).

Figure 4-5 Birthweight Distributions, Singleton Total Births for ICE Countries



KEY: ICE = International Collaborative Effort

SOURCE: U.S. Department of Health and Human services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, Proceedings *of the International Collaborative Effort on Perinatal and Infant Mortality, Volume III,* DHHS Pub. No. (PHS) 92-1252 (Hyattsville, MD: U.S. Department of Health and Human Services, October 1992).

countries vary greatly in the distribution of birthweights that occur (figure 4-4).[13]

Comparisons of population-specific birthweight distributions show that, on average, babies born in Norway, for example, are heavier than Black babies born in the United States or babies born in Osaka, Japan (i.e., the birthweights of Norwegian babies are to the right of those of Japanese and U.S. Black babies on the distribution curve) (figure 4-5).[14] Japanese and U.S. Black babies have on average similar birthweights but the distributions of births differ. The birthweights of most Japanese babies are near the median birthweight whereas a disproportionate number of U.S. Black babies have low birthweights, which occupy the left tail of the distribution curve.

A population's average birthweight is not a good predictor of overall infant mortality. Sweden and Japan, which have the lowest infant mortality rates, have the highest and lowest average birthweights, respectively (table 4-4). And Japan and U.S. Blacks, which have the

[13] U.S. data are for nine selected States.

[14] U.S. data are for nine selected States.

Table 4-4-Characteristics of Birthweight Distributions and Mortality Rates, United States and Selected Populations 1983-86

Population	Predominant distribution mean	Standard deviation	Percent in residual distribution	Percent <1,500 gm	Percent <2,500 gm	Mortality 1,000				
						Neonatal	Post-neonatal	Infant	Fetal	Feto-infant
United States										
Whltes[a]	3,469	504	2.0	0.86	4.7	4.4	2.9	7.3	4.3	11.5
Blacks[a]	3,217	508	4.3	2.56	11.6	8.0	5.9	13.8	6.5	20.3
Denmark	3,478	509	2.2	0.81	4.9	3.6	2.5	6.1	4.4	10.4
England and Wales	3,354	491	2.2	0.89	6.1	4.9	3.9	8.8	5.3	14.1
Israel										
Jews	3,294	472	2.7	1.13	7.0	6.6	2.9	9.6	4.4	13.9
Non-Jews	3,301	486	2.3	1.02	6.8	10.7	8.6	19.2	10.3	29.3
Japan (Osaka)	3,192	410	1.3	0.59	5.3	3.3	2.0	5.3	5.5	10.8
Sweden	3,537	508	1.8	0.65	3.8	3.8	2.4	6.2	3.7	9.9

*U.S. data are for nine selected States: California, Georgia, Michigan, Minnesota, Missouri, North Carolina, upstate New York Utah, end Wisconsin.

SOURCE: J.C. Kleinman, "Implications of Differences in Birthweight Distribution for Comparisons of Birthweight-Specific Mortality," *Proceedings of the International Collaborative Effort on Perinatal and Infant Mortality, Volume III,* U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, DHHS Pub. No. (PHS) 92-1252 (Hyattsville, MD: U.S. Department of Health and Human Services, October 1992).

lowest average birthweights, have the lowest and highest infant mortality rates in the ICE countries.

Because birthweight distributions are unique across populations, some observers have suggested that mortality risks be evaluated in terms of percentiles of the birthweight distribution. Instead of defining low birthweight by means of a uniform, arbitrary birthweight cutoff point (usually less than 2,500 grams), low birthweight could be defined for each country as a percent of the birthweight distribution (129). If, for example, the birthweight representing the 10th percentile were used to define low birthweight, 2,788 grams would be considered low for U.S. Whites, as would 2,440 grams for U.S. Blacks, and 2,677 grams for infants born in England and Wales (129). If each population's birthweight distribution were considered unique and normal for that population, differences in birthweight-specific mortality rates would become more important factors in determining infant mortality (231).[15]

Among the ICE populations studied, two subpopulations with exceptionally high mortality rates stand out: non-Jewish residents of Israel and Blacks in the United States (table 4-4). Both of these subpopulations have infant and fete-infant mortality rates twice as high as those of the respective majority populations. The explanations for the subpopulations' exceptionally high infant mortality rates differ. Non-Jewish residents of Israel have the highest reported IMR and FIMR of all comparison countries, and yet the mean birthweight is higher, and the proportion of low birthweight infants (defined here as those weighing less than 2,500 grams) is lower than that in the majority Jewish population. This subpopulation's excess infant mortality rate appears to reflect high mortality rates at every birthweight. The high infant mortality rate of U.S. Blacks reflects both a relatively large proportion of low birthweight infants and high mortality rates at higher birthweights.

Rates of infant and fete-infant mortality are higher for U.S. Whites than for residents of Sweden and Denmark, but lower than for those of England and Wales. Both birthweight distribution and birthweight-specific rates contribute to these differences, but their relative importance is uncertain (100). If the prevalence of low birthweights were the major contributor to infant mortality, targeted interventions designed to increase birthweight could lead to decreases in infant mortality. If, however, mortality rates were high at all birthweights (as is the case for Israel's non-Jewish population), a broader set of interventions would be needed.

Multiple Births

The risk of death is greater for infants born as twins, triplets, or other multiples than for infants born alone, chiefly because infants of multiple births weigh much less than those born singly. The occurrence of multiple births varies by country and population group, although most of them report rates of about 20 multiple births per 1,000 births and stillbirths. Multiple births occur most often among U.S. Blacks and least often among the Japanese, whose rates are 25 and 13, respectively (76). In view of the disparity between these extremes, international comparisons of infant mortality should be made separately for single and multiple births.

Teenage Pregnancy

Babies born to teenage mothers are more likely to die than are babies born to older mothers, probably because of differences in the mother's social and environmental characteristics. Mothers giving birth in their teens, for example, are more likely to have low incomes, poor educations, and inadequate prenatal care. Although birth rates for teenagers are much higher in the United States than in comparison countries (table 4-5), and there is a correlation between a country's infant

15 Birthweight distributions within countries tend to be stable over time (43).

Table 4-5-Live Birth Rates by Maternal Age, United States and Selected Countries, Circa 1990

Country	Year	Maternal age							
		All ages	<20[a]	20-24	25-29	30-34	35-39	40-44	45+[b]
United States	1989	61.8	59.4	115.4	116.6	76.2	29.7	5.2	0.2
Australia	1990	58.3	22.0	79.6	139.0	101.6	34.6	5.5	0.2
Canada	1989	54.5	24.8	82.5	126.1	81.9	26.4	3.8	0.1
France	1990	54.5	9.1	75.8	140.0	92.3	35.8	7.7	0.5
Germany[c]	1988	43.7	10.3	56.2	111.4	78.1	26.0	4.5	0.2
Italy	1988	39.4	9.6	58.6	97.2	68.6	26.5	5.4	0.3
Japan	1990	38.9	3.6	44.3	138.0	92.2	20.6	2.4	0.0
Netherlands	1990	49.9	8.3	48.2	126.4	106.5	31.0	3.7	0.5
New Zealand	1990	67.2	34.4	101.2	147.5	105.7	36.8	5.4	0.3
Norway	1990	58.0	16.9	93.3	145.0	95.2	32.4	4.7	0.3
Spain	1986	47.1	16.7	65.8	112.0	73.5	31.2	8.9	0.8
Sweden	1989	57.1	12.7	92.8	149.0	103.4	38.7	6.4	0.3
United Kingdom	1990	56.5	33.0	91.1	122.7	87.0	31.0	5.0	0.3

aRates computed on female population ages 15 to 19.
bRates computed on female population ages 45 to 49.
cBased on data from the former Federal Republic of Germany.

SOURCE: United Nations, 1991 Demographic Yearbook table 11 (New York, NY: United Nations, 1992).

mortality rate and the prevalence of teenagers giving birth, the elimination of such births from the computation would have little effect on infant mortality rates. Disregarding births to teenagers in the United States, for example, would lower the infant mortality rate by only 4 percent for Whites and 7 percent for Blacks, and would have essentially no effect on our international infant mortality ranking (102).

Relatively low use of contraceptives among sexually active teenagers in the United States, in part, explains higher teenage pregnancy rates in the United States than in Europe (185). Pregnant U.S. teenagers are, however, more likely to use elective abortion than their European counterparts (185).

The high proportion of births by women under the age of 20 or over 39 correlates with the high rate of infant mortality in the United States. If women in the United States gave birth at the same ages as women in Japan, where there are relatively few births to very young and older women (table 4-5), the U.S. infant mortality rate would be about 10 percent lower than it is (108). However, the socioeconomic, lifestyle, and health status characteristics of U.S. mothers at the extremes of the maternal age distribution, rather than age itself, probably account for the differences (70).

Births to unmarried women increased markedly between 1%0 and 1989 in the United States and many other developed countries, reflecting the rise in births to teens and older well-educated women[16] (table 4-6). An exception is Japan, where the proportion of births to unmarried women has remained constant at 1 percent. In the United States, the proportion of all births to unmarried women increased from 5 percent in 1960 to 27 percent in 1989. The proportions are even greater in other countries. In 1989, roughly one-half of the births in Denmark and Sweden were to unmarried women.

Use of Prenatal Care

Early, comprehensive, prenatal care improves birth outcomes (191a). The proportion of pregnant women lacking prenatal care or seeking prenatal care late (after 15 weeks of pregnancy) is greater in the United States than in selected Western European countries (21 percent in the United States compared with 4 percent in France, 8 percent in Denmark, and 14 percent in Belgium). These differences in prenatal care persist even when comparisons are restricted to college-educated women. Despite the fact that U.S. women seek care later than European women, the median number of prenatal care visits is higher in the United States (11 visits) than in Denmark (10 visits) or in France (7 visits) (22).[17] Differences in the number of prenatal visits might reflect differences in the recommendations of local professionals. In the United States, for example, the American College of Obstetricians and Gynecologists and the American Academy of Pediatrics recommend from 13 to 15 prenatal care visits. By contrast, the Royal College of Obstetricians and Gynecologists in Great Britain recommends only 7 to 9 visits (191a).

Elective Abortion

High rates of elective abortion seem to be correlated with low infant mortality rates in some countries (e.g., Japan, Sweden) (45). Infant mortality might be reduced if high-risk pregnancies were selectively terminated (30). This relationship does not exist in the United States, where the infant mortality rate is relatively high despite a very high elective abortion rate (45).

Sociodemographic Differences

Significant racial, ethnic, and socioeconomic differentials in infant mortality and other health outcomes exist not only in the United States, but

16 In the United States, for example, the proportion of all mothers that were never-married women 18 to 44 years old with 1 or more years of college doubled from 1982 to 1992 from 5.5 to 11.3 percent (5).

17 The number of prenatal care visits is unavailable for Belgium from this source.

Table 4-6-Births to Unmarried Women, Selected Countries, Selected Years[a]

Country	1960 Total live births (1,000)	1960 Percent born to unmarried women	1970 Total live births (1,000)	1970 Percent born to unmarried women	1980 Total live births (1,000)	1980 Percent born to unmarried women	1989 Total live births (1,000)	1989 Percent born to unmarried women
United States	4,258	5	3,731	11	3,612	18	4,041	27
Canada	479	4	372	10	360	13	384	23
Denmark	76	8	71	11	57	33	62	46
France	820	6	850	7	800	11	766	28
Germany[b]	969	6	811	6	621	8	662	11
Italy	910	2	902	2	640	4	567	6
Japan	1,624	1	1,932	1	1,616	1	1,269	1
Netherlands	239	1	239	2	181	4	189	11
Sweden	102	11	110	18	97	40	116	52
United Kingdom	918	5	904	8	754	12	777	27

[a]For U.S. figures, beginning 1980, marital status is inferred from a comparison of the childs' and parents' surnames on the birth certificate for those States that do not report on marital status. No estimates are included for misstatements on birth records or failures to register births.
bBased on data from the former Federal Republic of Germany.

SOURCE: U.S. Department of Commerce, Bureau of the Census, *Statistics Ah&mtoftie Unitid States, 7992*(1) 12th Ed.) (Washington, DC: U.S. Government Printing Office, 1992).

also in several other developed countries where access to high quality medical care is universal. In the former Federal Republic of Germany, for example, 1988 infant mortality rates were 25 percent higher for births by migrant workers than for those by nonmigrants.[18] In Sweden, neonatal mortality rates were 50 percent higher and late fetal mortality rates were 80 percent higher for manual workers than for nonmanual workers (box 4-A).

EFFECTS OF RACE IN THE UNITED STATES

Black infants are twice as likely as White infants to die (234).[19] Blacks have higher rates of low birthweight, the leading risk factor for infant mortality, and mortality rates are higher among Blacks than Whites for infants with normal birthweights. The racial disparity in reproductive outcomes in the United States cannot be explained fully by known sociodemographic differences. Even in low-risk populations, Black infants have higher death rates than White infants (102). For example, mortality rates for infants born to college-educated parents are nearly twice as high for Blacks as for Whites.[20] A higher incidence of low birthweight explains the higher infant mortality rates for this selected population (163).[21]

About 40 percent of the racial disparity in postneonatal mortality in the United States can be attributed to differences in how maternal risk characteristics (i.e., marital status, age, parity, educational attainment, prenatal care) are distributed. The remaining 60 percent possibly derives from income and behavioral factors (101).

The medical risk factors of mothers may account for some of the racial differences in infant mortality rates. According to studies of U.S. birth certificate data, anemia was reported more than twice as often in Black mothers as in White mothers (34.7 per 1,000 compared with 14.6 per 1,000), and the rate of chronic hypertension was nearly twice as high in Black mothers as in White mothers (10.8 compared with 5.7) in 1990.[22] Differences in how much weight mothers gain may also account for infant mortality disparities. According to available guidelines, gaining at least 22, but not more than 35 pounds, is optimal. Black women are more likely than white women to gain fewer than 21 pounds during pregnancy (234).[23]

Some studies suggest that maternal smoking is responsible for approximately 20 to 40 percent of all instances in which infants have low birthweights. Higher rates of low birthweight among Blacks, however, cannot be explained by smoking practices: Black mothers are less likely to smoke during pregnancy than White mothers; and among those who do smoke during pregnancy, Black mothers smoke less than White mothers (234). Alcohol use can cause fetal alcohol syndrome[24] and affect birthweight (234).[25] The proportions of women reporting alcohol consumption during pregnancy are similar for Blacks and Whites, but a greater proportion of Black than

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[18] In 1988, births by migrant workers represented 9 percent of German births (161).

[19] In 1990, the infant mortality rates for Whites and Blacks were 7.6 and 18.0 per 1,000 live births in the United States (234).

[20] Among this highly educated population, the infant mortality rates for Black and White infants were 10.2 and 5.4 per 1,000 live births, respectively (163).

[21] For infants born to highly educated parents, mortality rates are the same for Blacks and Whites when the birthweight is normal (i.e., at or above 2,500 grams) (163).

[22] Findings that death rates for U.S. women of reproductive age are at least 25 percent greater for Blacks than for Whites indicate that discrepancies in women's health status may play a role in the racial difference in infant mortality (58).

[23] Black mothers with pregnancies of 40 weeks gestation or more were more likely than comparable White mothers to gain fewer than 21 pounds (26 percent compared with 16 percent) (234).

[24] Fetal alcohol syndrome is characterized by retarded growth, facial malformations, and dysfunctions of the central nervous system, including mental retardation (234).

[25] The effect of alcohol on birthweight is independent of the effect of tobacco use and other maternal and infant characteristics (234).

Box 4-A—Socioeconomic Differences in Pregnancy Outcomes in Selected Countries

- **Australia**—In 1990, the infant mortality rate was three times greater for Aborigines than for the total Australian population.
- **Denmark**—Stillbirth and infant mortality rates for the lowest social group were 60 percent higher than for the highest social group during the period 1983-87. Social group was defined by the father's occupation recorded on the birth register. The lowest social group included the unemployed and unskilled manual workers, whereas the highest social group included university graduates, managers, teachers, and technicians. Comparisons were made controlling for social group differences in age, parity, and county of residence.
- **England and Wales**—Infant mortality rates for the lowest social class were nearly twice as high as those for the highest social class in 1987. Social class was defined in terms of the father's occupation.
- **Germany**[1]—Infant mortality rates of German migrant workers in 1988 were 25 percent higher than those of nonmigrant Germans. Births to migrant workers represent 9 percent of German births.
- **Israel**—Infant mortality was about twice as high for Moslems and Druze as for Jews in 1987. Births to Moslems and Druze represent 22 percent of births in Israel.
- **Norway**—Perinatal and postneonatal death rates among less educated parents (i.e., mothers and fathers with fewer than 9 years of formal education) were 50 to 80 percent higher than those of more educated parents during the period 1979-82.
- **Sweden**—Neonatal and late fetal death rates were 50 and 80 percent higher, respectively, among unskilled manual workers than among intermediate nonmanual workers during 1985-86 (after adjusting for differences in age, parity, and smoking). Postneonatal death rates did not vary significantly by socioeconomic status.

[1] Based on data from the former Federal Republic of Germany.

SOURCES: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, *Proceedings of the International Collaborative Effort on Perinatal and Infant Mortality, Volume III*, DHHS Pub. No. (PHS) 92-1252 (Hyattsville, MD: U.S. Department of Health and Human Services, October 1992); M. Whitehead, K. Judge, D.J. Hunter, et al., "Tackling Inequalities in Health: The Australian Experience," *British Medical Journal* 306:783-787, March 20, 1993.

White women who drink report high alcohol consumption .26

SUMMARY

Of 39 developed countries, the United States ranked 24th in infant mortality in 1990. The U.S. infant mortality rate (9.2) was 35 percent higher than Canada's rate (6.8) and twice as high as Japan's rate (4.6). The U.S. international standing was much better in 1950 and 1960, but other countries have since experienced more rapid declines in infant mortality.

Interpreting international differences in infant mortality rates is difficult, because countries vary in how they report vital events. Available evidence suggests that infant mortality rates are inflated in the United States because many events that would be considered fetal deaths in other countries are counted as live births in the United States. Although U.S. rates would be comparable to those of Japan if infant deaths were combined with fetal deaths that occurred after at least 20 weeks of gestation, such a comparison might be invalid because of evidence suggesting that the United States undercounts early fetal deaths.

26 Among the mothers who consumed alcohol during pregnancy, Black mothers were twice as likely as the White mothers to hsve consumed three or more drinks per week (37 percent compared with 18 percent) (234).

Moreover, despite the fact that the current international rank of the United States is overly pessimistic, its true rank is probably no better than 20th of 39, a rank that has deteriorated considerably over time.

Among the factors that influence whether an infant will live or die in its frost year are the infant's race, sex, birth order, place of residence, birthweight, gestational age, and whether it is born alone or a part of a set of twins, triplets, or other multiples; additional factors include the mother's age, prior pregnancy outcomes, health status, personal habits (e.g., prenatal care, smoking, alcohol consumption), and socioeconomic status. How these biologic and social factors interact to influence infant mortality is unclear, but available international data should aid in the assessment of how these factors vary in relation to infant mortality rates in the United States and abroad.

By applying new analytic methods to an international perinatal and infant mortality database, researchers have assessed the relative roles of birthweight distribution and birthweight-specific mortality on infant mortality in the United States. The ICE research suggests that when definitions of low birthwe ight take population-specific birthweight distributions into account (rather than use an arbitrarily defined value for all populations), the relatively high infant mortality rate in the United States may reflect birthweight-specific mortality more than birthweight distribution. This implies that efforts to improve the U.S. infant mortality rate must target interventions both to lower the prevalence o f infants born in the high-risk, low birthweight end of the distribution curve and to lessen the chances of death for infants of all birthweights.

The age of the mother, her use of prenatal care, her race and ethnicity, and her socioeconomic status are all factors associated with infant mortality. There are relatively more births in the United States by women under the age of 20 or over the age of 39, groups who tend to be at greater risk of poor pregnancy outcomes. The difference in age distribution may explain up to 25 percent of the difference between the infant mortality rate of the United States and countries with more favorable rates, such as Canada and Japan. Nonetheless, the socioeconomic, lifestyle, and health status characteristics of U.S. mothers at the extremes of the maternal age distribution, rather than age itself, probably account for the differences.

Patterns of use of prenatal care in the United States differ from those in some **Western** European countries. Pregnant women in the United States tend to seek care later, but average a greater number of prenatal care visits than do women in Denmark and France.

Significant socioeconomic differentials in infant mortality exist in the United States as well as in several other developed countries, even where access to high quality medical care is universal. Improving access to maternal and child health services in the United States would likely decrease the U.S. infant mortality rate, but variation among the Nation's subpopulations might well persist.

Mortality Comparisons

5

Most residents of developed countries can expect to live beyond the age of 70, and deaths at younger ages have become relatively infrequent. Consequently, measures of premature deaths occurring during early adulthood are increasingly being used to gauge the health status of populations. This chapter describes some commonly used mortality measures and provides data showing trends and the 1987-88[1] status of the United States and selected comparison countries.[2]

Mortality data are generally considered the most reliable sources of health indicators, because deaths in developed countries are generally reported in accordance with international reporting standards (67). The countries differ, however, in their use of diagnostic technology, their use of autopsy to confirm cause of death, and their training of medical personnel, which contributes to differences in how their physicians certify causes of death. Consequently, international comparisons of causes of death must be made cautiously (see appendix B) (67,160).

LIFE EXPECTANCY

Of all the comparison countries, residents of Japan have the highest life expectancy at birth (76.2 years for males and 82.1 years for females in 1990) and can expect to live 3 to 4 years longer than U.S. residents, whose life expectancy at birth (71.8

[1] The most recent year for which mortality data regarding Spain and New Zealand are published in the *World Health Statistics Annual is* **1987 (260,261,263,264).** Data for 1988 are presented for the other countries.

[2] Comparison countries include **Australia, Canada,** France, Germany, Italy, **Japan,** the Netherlands, New Zealand, Norway, **Spain, Sweden,** and the United Kingdom. Data for Germany are from the former Federal Republic of **Germany** and refer to West Germany.

years for males and 78.8 years for females in 1990) is among the lowest (table 5-1).[3] Since 1955-59, Japan has experienced a greater improvement in life expectancy at birth than any other developed country.[4] The United States, by contrast, has maintained its historically lower life expectancy (figure 5-l). Expected years of remaining life can be measured at various ages and is lower in the United States than in most other countries up to the age of 80, at which point the U.S. position improves somewhat compared with other countries (table 5-l).

SURVIVAL TO ADULTHOOD

U.S. residents are less likely than residents of the other countries to survive to the age of 45 or 65 (e.g., the proportion of males who reach 65 is 74 percent in the United States and 83 percent in Japan) (table 5-2). Even though infant and child mortality are higher in the United States than in most of the comparison countries, such deaths are relatively few and differences in adult mortality account for most of the disparities in the survival rates (table 5-2). In fact, individuals who survive childhood and reach the age of 25 are less likely to reach 65 in the United States than in any of the comparison countries (e.g., the proportion of 25-year-old males who survive to age 65 is 76 percent in the United States and 84 percent in Japan) (figure 5-2).[5]

YEARS OF POTENTIAL LIFE LOST

An indicator of premature or untimely death is "years of potential life lost" (YPLL) (107). If deaths prior to the age of 65 were considered premature, an individual dying at the age of 20 would have lost 45 years of potential life.[6] Not all premature deaths are avoidable, and YPLL is really a measure of mortality prior to the attainment of old age. A country's YPLL increases when conditions that affect children and youth (e.g., birth defects, injuries, AIDS) result in death, but chronic diseases that cause death at older ages have little effect on YPLL. Of the comparison countries, Japan and Sweden have the lowest YPLL and the United States has the highest YPLL, reflecting the relatively high U.S. infant and child mortality rates (figure 5-3) (209).

AGE-SPECIFIC MORTALITY

Compared with the rates of the other countries, U.S. age-specific death rates[7] are among the highest up to the age of 65, and then are relatively lower (figures C-1 and C-2).[8] U.S. rates are especially high during adolescence and early adulthood (i.e., the ages of 15 to 24 and 25 to 34). For males in these age groups, for example, the U.S. death rates are more than twice those of Japan and the Netherlands.

U.S. death rates for ages up to 65 have been consistently high from the 1950s to the 1980s (tables C-1 and C-2). Of the 13 comparison

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[3] Life expectancy is the average number of years an individual is expected to live and can be measured from birth or subsequent ages Life expectancy is calculated from life tables, which are constructed using current age-specific death rates, as if these rates would remain unchanged throughout the lifetime of the cohort. Life expectancy for infants born in the 1980s, for example, is calculated from 1980 age-specific death rates even though the 1980 birth cohort will, as it ages, be subjected to the age-specific rates prevailing in 1990, 2000, and subsequent years.

[4] Declining death rates among those aged 55 and older have contributed largely to increases in Japan's life expectancy (277).

[5] The probability that a person surviving to a certain age (e.g., 25) will survive to another age (e.g., 65 years) is called temporary life expectancy (3). This measure is useful whensummarizing the mortality experience for different broad age groups (99).

[6] No agreement has been reached regarding the age or age limits considered for the determination of YPLL. Some calculate it for the age group 1 to 64, whereas others calculate it either from birth or through the age of 69 (57). The Centers for Disease Control and Prevention (CDC) used the ages 1 through 65 in its calculation of YPLL until 1986, when it began including mortality during the first year of life (206). More recently, CDC has estimated YPLL before the age of 85 (205).

[7] The age-specific death rate is the annual number of deaths among persons of a given age group divided by the estimated mid-year population of that age group (114).

[8] Figures and tables designated by a C are in appendix C.

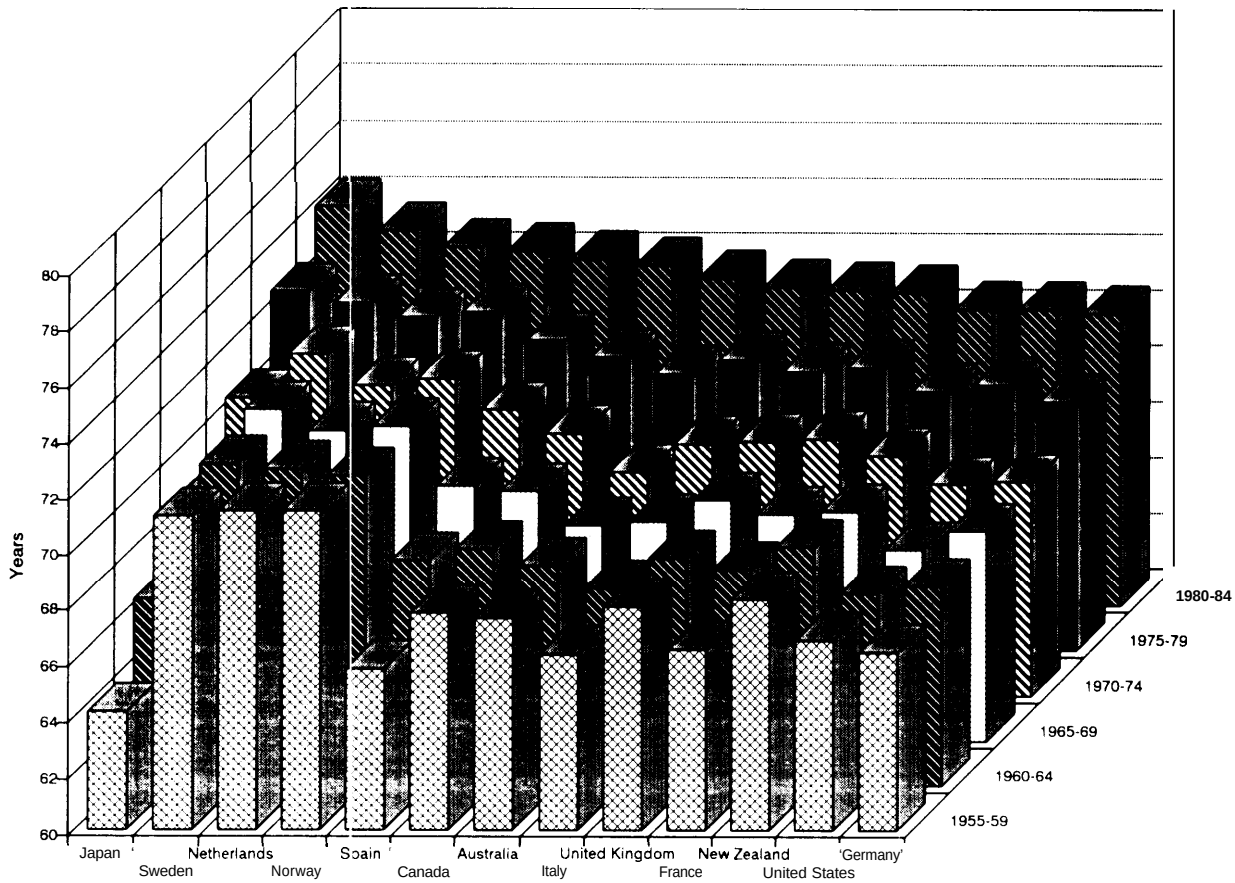
Table 5-l-Life Expectancy at Birth and at Ages 15, 45,65 and 80, United States and Selected Countries, 1990

	At birth		Age 15		Age 45		~			~
country	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
United States	**71.80**	78.80	57.90	**64.70**	**30.70**	**35.90**	**15.10**	**18.90**	**7.10**	***9.00***
Australia	**73.61**	80.05	59.57	**65.81**	**31.35**	36.67	**15.05**	**19.05**	**6.92**	***8.80***
Canada	**73.81**	81.11	59.75	**66.86**	**31.70**	37.83	**15.80**	**20.69**	**8.20**	**10.99**
France	**73.37**	81.76	59.25	***67.50***	**31.56**	38.53	**15.98**	**20.69**	**7.40**	9.52
Germany[a]	**72.63**	79.16	58.47	***64.86***	**30.16**	35.79	**14.24**	**18.18**	**6.27**	7.98
Italy	**73.58**	80.31	59.51	66.11	**31.07**	36.88	**14.96**	**19.03**	**6.94**	8.65
Japan	**76.17**	82.05	61.79	67.57	**33.10**	38.29	**16.35**	**20.11**	**7.07**	8.91
Netherlands	**74.17**	81.08	60.07	66.84	**31.33**	37.66	**14.94**	**20.02**	**7.07**	9.81
New Zealand	**71.57**	79.27	57.73	65.28	**29.99**	36.37	**14.09**	**19.26**	**6.60**	9.70
Norway	**73.29**	80.77	59.22	66.50	**30.84**	37.26	**14.85**	**19.51**	**7.02**	9.29
Spain	**73.58**	80.54	59.54	66.32	**31.42**	37.14	**15.35**	**19.10**	**7.00**	8.42
Sweden	**74.70**	80.73	60.39	66.34	**31.97**	37.21	**15.51**	**19.54**	**7.21**	9.28
United Kingdom	**73.03**	78.68	58.95	64.44	**30.35**	35.26	**14.12**	**18.00**	**6.62**	8.46

aBased on data from the former Federal Republic Of Germany.

SOURCES: M. MacDorman, National Center for Health Statistics, *Centers* for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services, Hyattsville, MD, personal communication, Sept. 1993; U.S. Department of Commerce, Bureau of the Census, Center for International Research, unpublished tabulations, Suitland, MD, 1992.

Figure 5-l—Trends in Life Expectancy at Birth, United States and Selected Countries, Males, 1955-84

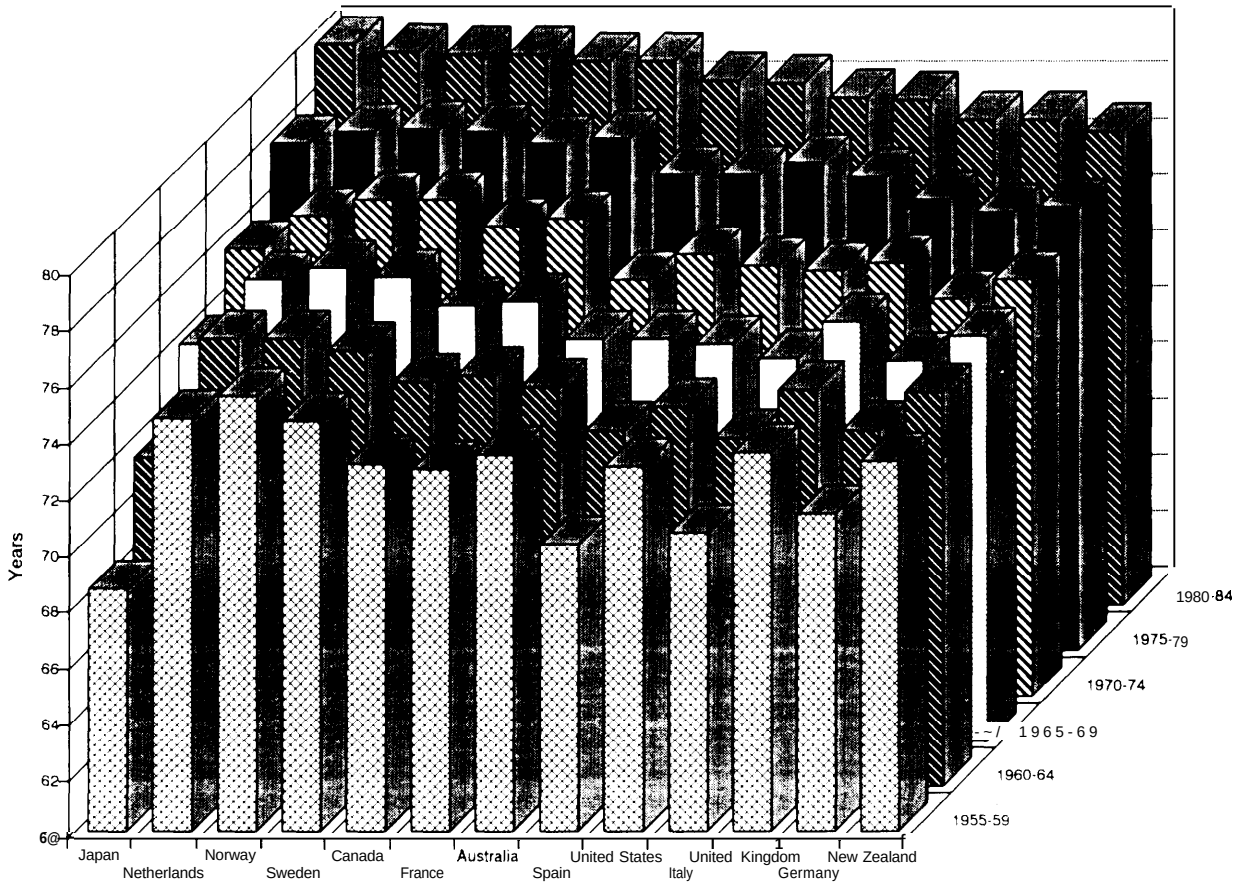


countries, Japan showed the most pronounced decline in rates for every sex and age group during that period. In general, agc-specific mortality declines within the United States did not keep pace with those of the comparison countries, and the United States showed relatively poor improvement for some age groups. The United States, for example, showed the lowest decline in mortality among men aged 25 to 34. Nonetheless, the U.S. decline in mortality among men aged 45 to 54 was second only to the Japanese decline. But, even this improvement was insufficient to boost the relative international standing of the United States. By the late 1980s, the U.S. death rate for men aged 45 to 54 was the second highest of the 13 comparison countries (only France's rate was higher) (figure C-l).

CAUSE-SPECIFIC MORTALITY COMPARISONS

This section presents cause-specific death rates and trends for five categories that account for most deaths in developed countries: accidents; homicide and other violence; cancer; circulatory system disease; and infectious and parasitic diseases. Examining such broad categories of disease minimizes the effects of international cause-of-death reporting differences (see appendix B).

Figure 5-l—Trends in Life Expectancy at Birth, United States and Selected Countries, Females, 1955-84



SOURCE: World Health Organization, World*Health Statistics Annual:* 1986 (Geneva, Switzerland: World Health Organization, 1986).

Accidents, Homicide, and Other Violence

Adolescent and young adult mortality is especially high in the United States, compared with other developed countries. Leading causes of death among U.S. residents aged 15 to 44 include accidents (e.g., motor vehicle accidents, falls, poisonings),[9] homicide, and other violence. For individuals aged 15 to 24, these causes account for more than one-half of U.S. deaths (table C-3). The U.S. rates of accident-related death for persons aged 15 to 44 are exceeded only by those of New Zealand.[10] The rates of accident-related deaths in many of the other comparison countries are half that of the United States for this age group (e.g., the Netherlands, United Kingdom, Japan) (figures C-3 and C-4).[11]

[9] Accidents and adverse effects include International Classification of Diseases (ICD-9) codes E800 through E949 (254).

[10] In the United States, motor vehicle accidents account for between one-half and three-quarters of accident-related deaths among those aged 15 to 44. Rates of death by motor vehicle accidents in the United States are exceeded only in New Zealand.

[11] Accidental death rates for the elderly (65 and older) are highest in France, among the lowest in the United Kingdom, and intermediate in the United States.

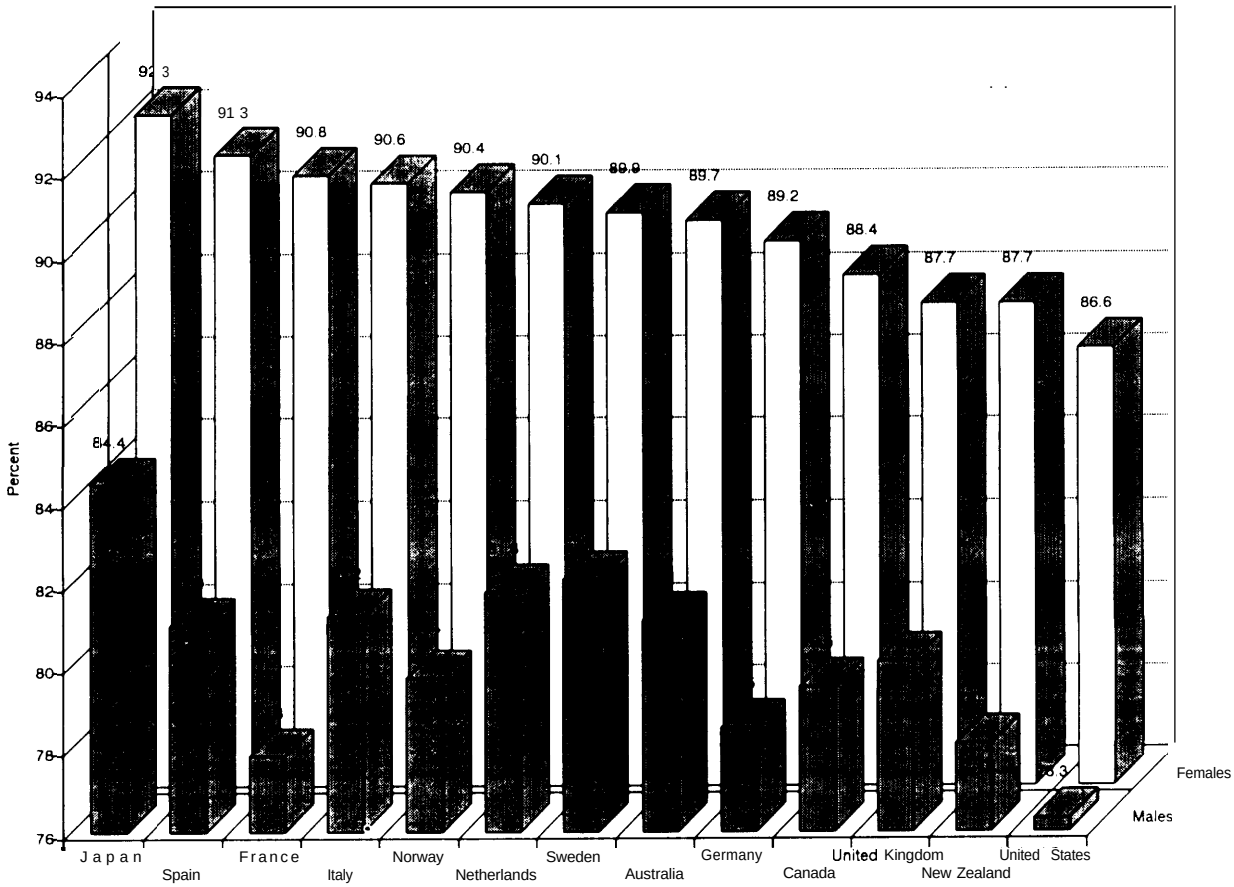
Table 5-2-Percent of Population Surviving to the Age of 1, 25,45, and 65, United States and Selected Countries, 1990

	Male				Female			
Survival to age... Country	1	25	45	65	1	25	45	65
United States	99.0%	97.1%	92.1	74.1%	99.2%	98.4%	96.3%	85.1%
Australia	99.1	97.5	94.7	79.0	99.3	98.6	97.3	88.5
Canada	99.2	97.6	94.4	77.6	99.4	98.7	97.1	87.2
France	99.2	97.7	93.5	76.1	99.4	98.7	97.0	89.7
Germany[a]	99.2	98.0	94.8	77.0	99.4	98.8	97.1	88.1
Italy	99.1	97.8	95.2	78.4	99.3	98.7	97.4	89.4
Japan	99.5	98.5	96.3	83.1	99.6	99.1	97.9	91.5
Netherlands	99.2	98.1	95.9	80.2	99.4	98.8	97.4	89.0
New Zealand	98.9	96.6	93.3	75.5	99.1	98.2	96.5	86.1
Norway	99.2	97.7	95.0	77.9	99.4	98.8	97.5	89.4
Spain	99.2	97.7	94.4	78.2	99.3	98.7	97.3	90.1
Sweden	99.3	98.3	95.5	80.7	99.5	99.0	97.4	89.0
United Kingdom	99.1	97.9	95.5	78.4	99.3	98.7	97.2	86.6

aBased on data from the former Federal Republic of Germany.

SOURCES: M. MacDorman, National Center for Health Statistics, Centers for Disease Control and Prevention, Public Health service, U.S. Department of Health and Human Services, Hyattsville, MD, personal communication, Sept. 1993; U.S. Department of Commerce, Bureau of the Census, Center for International Research, unpublished tabulations, Suitland, MD, 1992.

Figure 5-2—Probability of Survival to Age 65 for Those Surviving to Age 25, United States and Selected Countries,[a] 1990



a Data for Germany from the former Federal Republic of Germany.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Center for International Research, unpublished tabulations, Suitland, MD, 1992.

The U.S. rates of age-specific homicide and other violence[12] for residents aged 15 to 34 are at least twice as high as the rates of any of the comparison countries (figures C-5 and C-6). The Swedish homicide rate surpasses the U.S. rate at the age of 35 for women and 45 for men. In most countries, including the United States, mortality from accidents, homicide, and other violence have declined since the 1950s (figure C-7).[13]

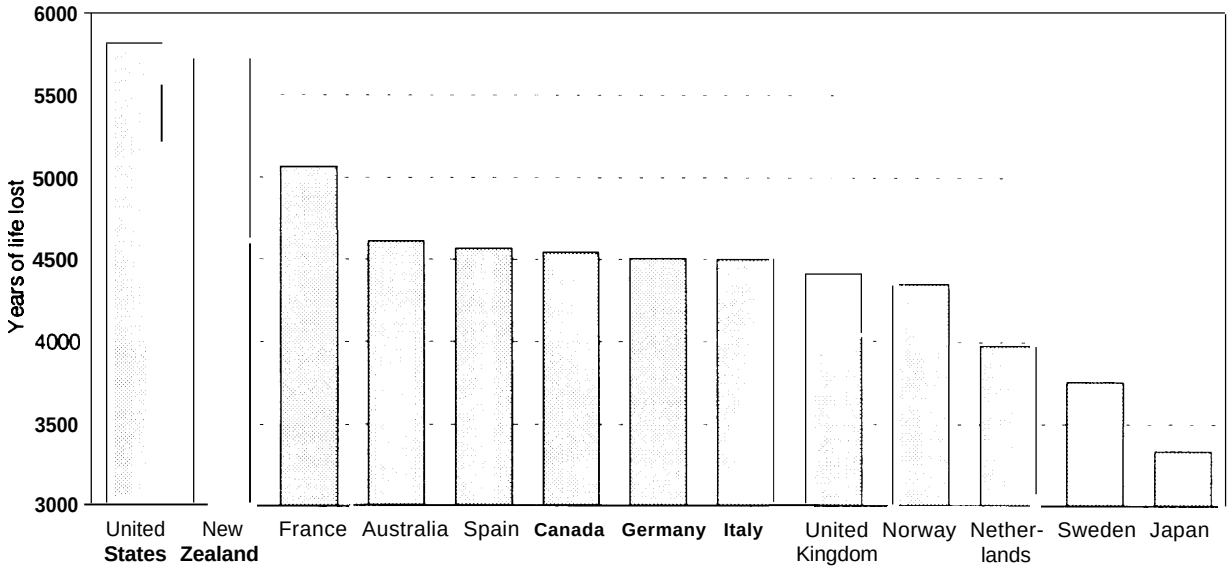
U.S. rates of fatalities from motor vehicle accidents are among the highest when measured in terms of total population, but are relatively low when measured in terms of vehicle miles traveled (table 5-3).

Cancer and circulatory system disease overtake accidents as the leading causes of deaths for U.S. residents aged 45 and above (table C-3).

12 Homicide, injury purposely inflicted by other persons, and other violence include ICD-9 codes E960 through E999 (254).

13 The trend data are based on age-standardized death rates (European standard) and include motor vehicle accidents, poisoning, suicide, homicide, and other violence (ICD-9 codes E800-E999). In the United States, homicide rates have increased somewhat, while accident-related death rates have declined.

Figure 5-&Years of Potential Life Lost Before Age 65, United States and Selected Countries, 1964-67°



a Year of data for Spain is 1984; for Italy, 1985; for Australia, Canada, France, Netherlands, New Zealand, Norway, Sweden, and United States, 1986; for Germany, Japan, and United Kingdom, 1967. Data for Germany from the former Federal Republic of Germany.

SOURCE: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, "Mortality in Developed Countries," Morbidity and *Mopртality* Weekly *Report 39(13) 205-209,* April 6, 1990.

Cancer

For persons aged 45 to 64, death rates from cancer[14] were intermediate in the United States compared with those of other industrialized countries in 1988 (figures C-8 and C-9). Comparison countries show different trends in age-specific rates of death from cancer between 1955-59 and 1980-84 (table C-4). For example, the rates of death from cancer for men 45 to 54 years old increased during this period in all countries but the United Kingdom, Netherlands, and Japan, whereas the corresponding rates for women declined in all but the United Kingdom, New Zealand, and Australia,

Combining mortality data for all cancers masks trends that diverge by cancer site. Data on age-standardized death rate[15] trends show that cancers of the trachea, bronchus, and lung have increased greatly while stomach cancer has declined between 1955-59 and 1980-84 for both men and women in all comparison countries. During this period, death from breast cancer mortality has increased for women in all countries but Sweden (table C-5).

Among the factors that might lead to international differences in cancer death rates are disparities in genetic predisposition to cancer, the prevalence of risky behaviors (such as smoking), environmental conditions, survival of cancer patients, the extent to which physicians diagnose cancer and report it on death certificates, and how death certificates are coded. Sorting out the relative role each of these factors plays in causing international differences in cancer mortality lev-

14 Cancer (i.e., malignant neoplasms) includes ICD-9 codes 140 through 208 (254).

15 Age-adjusted death rates are calculated by applying comparison countries' age-specific death rates to an arbitrarily chosen standard population with a known age distribution. Comparisons are made with the number of expected deaths observed in the standard population (1 14).

Table 5-3--Rates of Motor-Vehicle-Related Deaths, Selected Countries, Circa 1990

Country	Year	Death rate (per 100,000 population)	Death rate (per 100 million vehicle miles traveled)[a]
United States	1988	19.54	2.1
France	1989	18.15	3.9
Germany[b]	1989	12.26	2.8
Japan	1990	11.73	3.1
Netherlands	1989	9.44	2.3
Norway	1989	9.13	2.0
Spain	1987	17.27	10.9
Sweden	1988	9.59	1.9
United Kingdom	1990	9.80	2.1

aDeath rates per 100 million vehicle miles traveled are for 1990 for all countries.

bBased on data from the former Federal Republic of Germany.

SOURCES: L. Hall, National Highway Traffic Safety Administration, U.S. Department of Transportation, Washington, DC, personal communication, March 1993; World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland, World Health Organization, 1991 and 1992).

els and trends is the subject of study and debate (34,37,66,79,87,275).[16] Recent studies suggest that some of the increase in reported cancer deaths might be secondary to increased use of diagnostic tests, especially among the elderly (47,78,109, 117,118).

Circulatory System Disease

U.S. rates of death from circulatory system disease[17] were at their highest between 1955 and 1959,[18] have declined precipitously since then (figure C-10), but remain among the highest relative to comparison countries (figures C-11 and C-12).19 For men and women 45 to 64 years old, 1987-88 rates of death from circulatory system diseases were highest in the United States, New Zealand, and the United Kingdom and lowest in Japan and France.

Circulatory system disease includes disorders with different underlying causes. Atherosclerosis, for example, is a major risk factor for ischemic heart disease and hypertension is a major underlying risk factor for cerebrovascular disease. Some suggest that vital statistics cannot be used to accurately determine secular trends in types of heart disease (174), in part because physicians in some countries tend to use certain diagnostic categories, such as ischemic heart disease, more often than do their counterparts in other countries (179,184).[20]

Trend data, though imperfect, indicate that cerebrovascular disease[21] rates have declined in all countries (table C-6). For men, ischemic heart

16 The congressional General Accounting Office will publish a comparison of survival from cancers of the lung, colon, and breast and Hodgkin's lymphoma in the United States and Canada (139).

17 Circulatory system diseases include ICD-9 codes 390 through 459 (254).

18 Age-standardized (European standard) rates were higher in the United States than in any Of the 12 comparison countries (261).

19 Fo, U.S. males aged 35 t. 64, death rates from heart disease dropped by more than one-third between 1955-59 and 1980-84. By contrast, heart disease rates in Germany and Sweden have historically been low and have remained relatively stable during this period (260)

20 The way heart diseases are reported is also affected by changes in the ICD over time (especially the change from ICD-7 to ICD-8). When circulatory system diseases are analyzed as a group, the effects of these ICI) changes are minimized (184).

21 Cerebrovascular disease includes ICD-9 codes 430-438 (254).

disease[22] mortality rates vary: They have declined markedly in the United States, Italy, and Canada; have remained relatively stable in Germany and Spain; and have increased in Sweden, France, and Norway (table C-6). For women, rates of death from ischemic heart disease mortality have declined in all countries but France.[23]

Factors that may have contributed to the decline in heart disease in the United States and elsewhere include reductions in coronary risk factors such as cigarette smoking, hypertension, and high-fat diets, and improvements in medical therapy for patients with heart disease (59).[24] The World Health organization's MONICA project,[25] an international study of risk factors for cardiovascular diseases, is assessing the extent to which trends in coronary heart disease and cerebrovascular disease are related to such factors as smoking, blood pressure, cholesterol, and body-mass index (249).[26]

Infectious and Parasitic Diseases

Deaths from infectious and parasitic diseases[27] are most common among the elderly, but increasingly, deaths related to human immunodeficiency virus (HIV) infection are important causes of death among young people.[28] The United States had the highest infectious disease-related 1987-88 death rates among men and women aged 24 to 64. Among elderly men and women (age 65 and older), infectious and parasitic disease death rates (primarily septicemia) are highest in Japan and the United States (table C-3).

United States and Canada Mortality Comparisons

Mortality rates are lower for Canadian residents than for U.S. residents at almost every age. If the United States had had the same age-specific death rates as Canada in 1989, about 200,000 fewer U.S. residents would have died-a difference of 9 percent (table 54).[29,30] The deaths of more than one-quarter of the children (under the age of 15) and more than one-third of the men aged 25 to 44 who died in the United States that year could be viewed as "excess" deaths relative to Canada's mortality experience. An examination of the leading causes of death by age in the United States shows that higher U.S. rates of homicide and HIV and acquired immunodeficiency syndrome (AIDS) account for much of the differential among young people (ages 15 to 24), but that higher U.S. rates of death from heart disease account for most of the excess deaths, which are concentrated in the over-44 age group.[31]

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22 Ischemic heart disease includes ICD-9 codes 410-414 (254).

23 In most countries, ischemic heart disease is a more common cause of death than cerebrovascular disease. The reverse appears to be true in Japan, where cerebrovascular disease is the predominant cause of circulatory disease death. Some evidence suggests that this trend might result from reporting, because Japanese physicians appear to over-diagnose cerebral stroke (72).

24 Improvements in hospital care (e. g., the use of coronary care units) for patients suffering acute myocardial infarction was not found to contribute to declines in U.S. rates of death from acute myocardial infarction between 1973-74 and 1978-79 (60).

25 The acronym MONICA stands for *MONI*toring of trends and determinants in Cardiovascular diseases (248).

26 Data on risk factors are being gathered through population-based surveys of areas served by collaborating centers in 27 countries. Stanford, California is the only U.S. center represented in WHO's MONICA project (248).

27 Infectious and parasitic diseases include ICD-9 codes 001-139, but exclude codes 480-486 (pneumonia),

28 Data on the incidence of AIDS is provided in chapter 6.

29 If the United States had the same age-specific death rates as Canada, an estimated 96,234 fewer males and 95,979 fewer females would have died.

30 If the comparison were confined to the U.S. white population, there would have been 5 percent fewer deaths in the United States.

31 Even though the proportion of U.S. deaths considered excess is highest for younger age groups, most excess U.S. deaths are concentrated among men aged 25 to 64 and women aged 65 and older, because that is when most deaths occur (table C-5).

Table 5-4-Expected U.S. Deaths If United States Had Canadian Age-Specific Mortality Rates, 1989

	U.S. deaths number	Expected U.S. deaths if Canadian rates	Excess U.S. deaths		Percentage of U.S. deaths that are excess deaths
			Number	Percent	
Male					
Under 15	31,895	23,375	8,520	8.9%	26.7%
15 to 24	27,165	22,406	4,759	4.9	17.5
25 to 44	99,482	63,825	35,657	37.1	35.8
45 to 64	234,432	193,840	40,592	42.2	17.3
65 and older	720,811	714,105	6,706	7.0	0.9
All ages	1,113,785	1,017,551	96,234	100,0	8.6
Female					
Under 15	23,966	17,404	6,562	6.8%	27.4%
15 to 24	9,323	7,529	1,794	1.9	19.2
25 to 44	41,961	31,109	10,852	11.3	25.9
45 to 64	143,892	115,086	28,806	30.0	20.0
65 and older	816,977	769,012	47,965	50.0	5.9
All ages	1,036,119	940,140	95,979	100.0	9.3

SOURCES: Statistics Canada, The Leading Causes of Death at Different Ages, (Ottawa, Ontario: Statistics Canada, 1989); U.S. Department of Commerce, Bureau of the Census, U.S. *Population Estimates, by Age, Sex, Race, and Hispanic* Origin: 1980-1991 (P25-1095) (Washington, DC: U.S. Department of Commerce, February 1993); U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *Advance Report of* Final *Mortality Statistics, 1989,* Monthly Vital Statistics Report 40(8), suppl. 2, Jan. 7, 1992;.

AGES 15 TO 24

Homicide is the second leading cause of death for U.S. residents aged 15 to 24 and accounts for as many as 19 percent of males' deaths and 12 percent of females' deaths in this age group (tables C-7 and C-8). In Canada, homicide accounts for 3 percent of males' deaths and 5 percent of females' deaths in this age group. If U.S. homicide rates were as low as Canada's, the U.S. overall death rate for young adult males would be comparable to Canada's (119.6 vs. 117.5 per 100,000).

AGES 25 TO 44

Death rates for this age group are 55 percent higher for males and 35 percent higher for females in the United States than in Canada (tables C-9 and C-10). Much higher rates of HIV and AIDS, homicide, and chronic liver disease in the United States account for the fact that its death rates are higher than Canada's. Homicide rates, for example, are five times as high for males in the United States as in Canada.

AGES 45 TO 64

Death **rates** for this age group are 22 percent higher for males and 26 percent higher for females in the United States than in Canada. Much of the difference can be accounted for by the higher rates of heart disease in the United States than in Canada. For men and women aged 45 to 64, the rates of death from heart disease are 31 and 64 percent higher in the United States than in Canada (tables C-1 1 and C-12).

AGES 65 AND OLDER

U.S. and Canadian death rates are comparable for males in this age group, but U.S. rates are about 12 percent higher than Canadian rates for females (tables C-13 and C-14). Much of this difference is explained by the higher rates of death from heart disease in the United States.

SUMMARY

The United States ranks relatively poorly among industrialized countries when general

mortality measures are used as indicators. Age at death is reliably reported in developed countries, and the age-specific death rate is a useful mortality measure for international comparisons. Compared to the age-specific death rates of other developed countries, U.S. rates are among the highest through the age of 64, and then are somewhat lower after the age of 65. These trends generally remain the same when the other countries' death rates are compared with the death rates of only the white residents of the United States. The high rates of death for members of younger age groups mean relatively low life expectancies at birth, and many years of potential life lost. An analysis of age-specific death rates since 1955 shows that the U.S. rates have been persistently high and that reductions in mortality have generally not been as great in the United States as those observed in comparison countries. An important exception to this trend is that mortality rates have declined significantly for U.S. men aged 45 to 54. The United States has made the least progress, however, in reducing mortality rates for men aged 25 to 34.

For people below the age of 35, accidents and injuries are major causes of death, and the U.S. rates of death from accidents and injuries are among the highest for a developed country. The rate of death from homicide and other violence is at least twice as high for the under-35 age group in the United States as in any of the comparison countries. After the age of 35, cancer and heart disease are the major causes of death in all the developed countries. U.S. rates of death from heart disease for both men and women aged 35 to 65 are among the highest, but U.S. rates of death from cancer are not exceptionally high compared with those of other developed countries.

If U.S. age-specific death rates were the same as the Canadian rates, the United States would have 9 percent fewer deaths (i.e., 192,200 U.S. deaths would have been avoided in 1989). Most of such excess deaths are concentrated in the 45 to 64 age group. Lower rates of heart disease in Canada than in the United States account for most of the disparities in the death rates for these age groups.

Morbidity, Disability, and Quality-of-Life Indicators

6

International comparisons of health status are usually limited to mortality because of the lack of widely accepted and uniformly measured morbidity or disability indicators. Morbidity comparisons could include the rates of reportable diseases (e.g., acquired immune deficiency syndrome (AIDS)), the incidence of diseases for which there are registries (e.g., birth defects, cancer), and the prevalence of disabilities reported in national surveys. This chapter reviews available morbidity comparisons and current efforts to develop internationally useful measures of disability, quality-of-life, and healthy life expectancy.

MORBIDITY, DISABILITY AND QUALITY-OF-LIFE INDICATORS

As life expectancy in developed countries has increased, interest in health indicators has shifted from mortality measures to indicators of the consequences of living with chronic illnesses and, to the extent that it can be measured, the maintenance of good health. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well being and not merely the absence of disease and illness" (252).[1] Although health is defined in a positive sense, most available indicators measure the negative complement of health (198). Three types of indicators can be used to describe health or its absence:

[1] The World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians (WONCA) has recommended that the word "optimal" be substituted for "complete" in the WHO definition, because few people can achieve complete health as it has been defined (9).

Box 6-A—WHO International Classification of Impairments, Disabilities, and Handicaps

Impairment, disability, and handicap indicators measure the consequences of disease and injuries and their implications for the life of individuals. The World Health Organization (WHO) has published the *International Classification of Impairments, Disabilities, and Handicaps* (ICIDH), which has been used for clinical and health services research, health services planning, and population health monitoring. The ICIDH model components are as follows:

- **Impairment** is any disturbance to the body's mental or physical structure or functioning. The impairment is characterized by a permanent or temporary loss or abnormality of psychological, physiological, or anatomical structure or function. Impairments include blindness, deafness, loss of limb, and loss of mental function.
- **Disability** is a reduction or loss of an individual's functional capacity or activity resulting from an impairment. Examples of disabilities include difficulty seeing, climbing stairs, dressing, and feeding oneself.
- **Handicap** is the social disadvantage resulting from an impairment and/or a disability, entailing a divergence between the individual's performance or status and that expected of him by his social group. Examples of handicaps include unemployment, social isolation, and inability to use public transportation.

SOURCES: P. Minaire, "Disease, Illness, and Health: Theoretical Models of the Disablement Process," *Bulletin of the World Health Organization* 70(3):373-379, 1992; M.C. Thurlaux, "The International Classification of Impairments, Disabilities, and Handicaps (ICIDH): Current Status and Development," *Calculation of Health Expectancies: Harmonization, Consensus Achieved and Future Perspectives*, J.M. Robine, C.D. Mathers, M.R. Bone, et al. (eds.) (Paris, France: INSERM, 1993); P.H.N. Wood, "Measuring the Consequences of Illness," *World Health Statistics Quarterly* 42:115-121, 1989; World Health Organization, *International Classification of Impairments, Disabilities, and Handicaps* (Geneva, Switzerland: World Health Organization, 1980).

- **Morbidity indicators are** reports of diseases or conditions that can potentially impair, disable, or handicap (e.g., the prevalence of arthritis, or heart disease).
- **Impairment, disability, and handicap indicators, as** defined by WHO, measure the *consequences* of diseases and injuries and their implications for the lives of individuals (box 6-A) (24,1 16,181,255).
- **Health-related quality-of-life indicators measure** subjective judgments about states of health or disease (19,115,116,134).2 An example of a quality-of-life indicator is self-perceived health.[3]

Morbidity Indicators

REPORTABLE DISEASES

Only three diseases-plague, cholera, and yellow fever—require official notification under WHO's International Health Regulations, but most developed countries have their own disease surveillance systems. In the United States, for example, physicians report to State or local health officials, who in turn make weekly reports to the U.S. Centers for Disease Control and Prevention, when patients have any of 49 notifiable conditions (e.g., AIDS, hepatitis, rabies, and measles) (211). In the United States, notification is not mandatory, and the thoroughness of the reporting

2 Sometimes health-related quality of life is defined more broadly to include all those things important to patients beyond traditional outcomes of death and physiologic measures of disease activity (65).

3 A question on self-perceived health appears on the U.S. National Health Interview Survey: "Would you say your health in general is excellent, very good, good, fair, or poor?" (232).

varies with the seriousness of the condition. Salmonellosis and mumps are, for example, less likely to be reported than are plague and rabies. Reporting is also influenced by the availability of diagnostic facilities, infectious disease control policies, and the vigilance of State and local authorities involved in surveillance activities.

AIDS data are available from all developed countries' disease surveillance programs. As of mid-1993, cumulative rates of the incidence of AIDS[4] were substantially higher in the United States than in comparison countries (table 6-l). Spain had the second highest rate (465 cases per million), but it was less than half the U.S. rate (1,268 cases per million). Japan's rate is remarkably low, at only four cases per million.

Risk factors responsible for AIDS transmission in the comparison countries vary substantially. Homosexual or bisexual activity has been responsible for most of the cases in the United States, intravenous drug use has caused most of the cases in Italy and Spain, and contaminated blood products have been responsible for most of the cases in Japan (98,237,274).

Table 6-l--Cumulative AIDS Incidence Through Mid-1 993, United States and Selected Countries

Country	AIDS cases through mid-1 993	Cumulative AIDS incidence (per million)
United States	315,390	1,267.8
Australia	3,697	219.9
Canada	8,232	309.5
France	24,226	427.7
Germany[a]	9,697	123.3
Italy	16,860	293.1
Japan	543	4.4
Netherlands	2,575	171.0
New Zealand	360	106.2
Norway	319	75.4
Spain	18,347	464.7
Sweden	817	96.1
United Kingdom	7,341	128.3

aBased on data from the former Federal Republic of Germany.

SOURCES: Health end Welfare Canada "AIDS in Canada Surveillance Update," (Ottawa Ontario: Health and Welfare Canada, July 1993); U.S. Department of Health and Humeri Services, Pubic Health Service, Centers for Disease Control end Prevention, National Center for Infectious Diseases, Division of HIV/AIDS *Surveillance Report, Second Quarter* Edition, Volume 5, No. 2 (Atlanta, GA: U.S. Department of Health and Human Services, July 1993); World Health Organizaton, Regional Office for Europe, *AIDS Surveillance in Europe, Quarterly Report, No. 37* (Copenhagen, Denmark: World Health Organization, March 1993).

CHRONIC DISEASE

Incidence, prevalence, and mortality rates cannot adequately measure the extent and effect of chronic conditions. Chronic diseases are often variable in their onset, progress gradually, and persist for months or years. International differences in chronic disease statistics may be misleading, if the disease entails any long asymptomatic period and is detected at different rates during various stages. A country with an aggressive cancer screening program, for example, might report a higher incidence of breast cancer than a country without such a program would report. To make international comparisons, cancer survival must be evaluated according to what stage the cancer had reached at the time of diagnosis. To evaluate the consequences of disease or disability, measures are needed that could distinguish between, for example, a diabetic individual with no complications and a diabetic patient with heart, eye, and kidney diseases.

Disability Indicators

The World Health Organization has developed a conceptual model describing the disability process and has published the *International Classification of Impairments, Disabilities, and Handicaps* (ICIDH) to facilitate measuring the consequences of diseases and injuries (box 6-A)

[4]Cumulative AIDS incidence is the total number of AIDS cases reported to date (as of mid-1993), divided by the current estimate of the mid-year population.

(24,1 16,181,255). The United Nations Statistical 0ffice has compiled national statistics on disability from over 55 countries (187a). Although disability-related statistics are often available from national censuses or population surveys, they are generally not comparable. Three factors hamper efforts to make international comparisons of disability: disagreement on what disability means and on which states of health should be measured; differences in how disability surveys are conducted; and the need to interpret disability statistics in a cultural and social context.

General disagreement on what disability means has hampered attempts to standardize morbidity and disability measures. The WHO classification system has been adopted in Europe but, until recently has not been widely accepted in the United States.[5] Critics of the WHO framework state that the concepts of impairment, disability, and handicap are ambiguous and result in problems of classification (24,25 .85).6 Some of the problems identified in the ICIDH will likely be resolved when the WHO clarification system is revised in 1993 (181). A U.S. task force on disability criteria recommended that the United States adopt the ICIDH framework and participate in the ongoing revision of the ICIDH (201).[7] The North **American WHO** Collaborating Center for Health Related Classifications will participate in revising the ICIDH and will coordinate its use in the United States and Canada (74).[8]

National statistics on disability are generally available from several sources, such as censuses, surveys, and registration systems (e.g., administrative records from health or disability programs). According to a 1990 survey of data collection policies in 14 countries, almost all countries gather, as part of their population-based surveys, information on the prevalence or incidence of chronic conditions,[9] temporary and/or long-term disability, and long-term incapacity to work (44). But because countries differ in how they conceptualize disability, the content of disability-related questions on surveys varies so widely that international comparisons cannot be made (box 6-B). Furthermore, available surveys sometimes include different populations; some include institutionalized populations whereas others do not (14a).

There are numerous sources of data on disability in the United States,[10] but even here the content of disability surveys varies widely (124). U.S. estimates of the prevalence of work-disability range from 9 to 17 percent based on

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5 An important U.S. civil rights law, the Americans with Disabilities Act (ADA) (Public Law 101-336), defines disability broadly as "a physical or mental impairment that substantially limits one or more major life activities, " a record of such an impairment, or being regarded as having such an impairment (61). This definition outlines generally who is covered by the ADA, but the final determination is made on a case-by-case basis (242).

6 According to an alternative conceptual model proposed by S. Nagi, the term *handicap* is dropped and a distinction is made between functional limitations, which entail problems in performing simple actions and disabilities that entail problems in performing complex activities. The WHO framework was critiqued, and the Nagi framework was adopted (but modified) in *Disability in America, an* influential U.S. report published by the Institute of Medicine (IOM). The IOM and others have questioned the use of the term *handicap because people with* disabling conditions in some countries perceive it as negative (85,1 13).

7 The U.S. Department of Health and Human Services' Public Health Service Task Force on Improving Medical Criteria for Disability Determination recommended a strategy to improve the scientific basis for determining disabilities and developed a research agenda regarding medical criteria for such determintions (201).

8 The U.S. National Center for Health Statistics recently sponsored an international workshop on the collection of disability statistics in population- based surveys (74).

9 The extent of self-reporting of medical conditions can vary with the format of the survey question. For example, the proportion of British General Household Survey respondents reporting health problems rose from about one-quarter to almost three-quarters when the survey format changed from being open-ended to including a checklist of medical conditions (13). Such variations support other evidence suggesting that the prevalence of chronic diseases by diagnosis may not be reliably assessed through self-reports on national health interview surveys (89).

10 The U.S. National Center for Health Statistics is planning a supplement on disability as part of its National Health Interview Survey in 1994-95 (169).

Box 6-B—Examples of Differences in Disability-Related Questions Included in Population-Based Surveys

Prevalence (or incidence) of chronic conditions

United States (National Health Interview Survey)—Respondents are asked whether during the past 12 months anyone in the family has had any of a list of medical conditions.

Great Britain (General Household Survey)—Respondents are asked whether they have any long-standing illness, disability, or infirmity. If so, they are asked whether it limits their activities in any way and to name what is the matter with them.

Temporary disability

United States (National Health Interview Survey)—Temporary disability is measured in terms of bed-days, work-loss days, school-loss days and other restricted activity days.

Denmark (Danish Health and Morbidity Survey)—Respondents report the number of days in the past 2 weeks that an illness, injury, or complaint has made it difficult or impossible to carry out ordinary daily activities (e.g., domestic work or work outside the home, spare time activities, etc.).

Long-term disability

United States (National Health Interview Survey)—Persons under 70 years of age are asked questions about their ability to perform the usual role functions for their age (i.e., working, keeping house, going to school, or normal play, as well as any limitations in other activities). Person 60 years of age or older and anyone reporting any other role limitation are asked if they need the help of another person with personal care needs, or handling routine needs?

The Netherlands (National Health Interview Survey)—Respondents are asked a series of questions regarding functional abilities (e.g., ''Can you carry an object of 5 kilos for 10 meters, for example a full shopping bag?'' and ''Can you walk 400 meters without resting?'').

Long-term incapacity to work

United States (National Health Interview Survey)—Respondents ages 18 to 69 are asked, ''Does any impairment or health problem keep you from working at a job or business?'' and ''Are you limited in the kind or amount of work you could do because of any impairments or health problems?''

Japan (The Comprehensive Survey of Living Conditions of the People on Health and Welfare)—respondents are asked, ''Do you have any kind of restriction on doing the following activities. . .working of any kind?''

SOURCES: S. M. Evers, ''Health For All Indicators in Health Interview Surveys,'' *Health Policy* 23:205-218, 1993; R. Wilson, Director, Office of Epidemiology and Health Promotion, National Center for Health Statistics, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services, Hyattsville, MD, personal communication, July 1993.

population-based surveys because of differences in the purposes, context, and content of the surveys (124).

A WHO working group has recommended standardizing questions about disability to promote comparability of disability statistics (44,272). Although having countries change the content and wording of their population-based surveys to promote international comparability might be desirable, such changes would diminish each country's ability to monitor its internal trends because its new data would not be comparable with its old data. Consequently, the changes might be resisted.

But even if disability-related questions on national surveys were standardized, difficulties would remain in making international comparisons. Disability is commonly measured in terms of "bed days, ' "restricted activity days," or ''work-loss days. Restricted activity days might be measured, for example, in terms of responses to the question ''Did you have to cut down on any

of your usual activities about the house, at work, or in your free time because of illness or injury?' but the concept of usual activities is likely to vary in different countries and to affect the responses accordingly (13). Levels of work-related disability may measure unemployment and social security programs rather than the actual health of the groups concerned. The increase in sickness-related absences from work in Europe since the 1950s has coincided with the growth of sickness insurance plans and may not reflect true increases in levels of disability (13).

Measuring handicap is inherently difficult because it is defined in terms of societal accommodation of disability. A handicap exists when an impairment or a disability is not environmentally accommodated. Handicaps refly be absent in spite of disabilities. **A** wheelchair-bound individual, for example, might be considered disabled but would not be considered to have a work-related handicap if he or she were employed at a site with adequate accommodations.[11] Levels of handicap among those with disabilities can be used to measure progress toward accommodation of impaired and disabled people in the workplace and elsewhere.

Trying to compare survey data on functional limitations from the United States, Canada, and Britain illustrates the difficulties in interpreting international data on disability. A higher proportion of U.S. residents (21 percent)[12] reported having functional limitations than did Canadians (15 percent)[13] or Britons (14 percent),[14] despite a survey format that favored the reporting of functional limitations in Canada and Britain.[15] Differences in health status, variations in the environment, distinctions in how disability was defined or measured, or survey error could account for these international disparities (106).

Quality-of-Life Indicators

With attention increasingly focused on prevention and treatment for chronic illness, outcome measures that describe the effects of treatment in terms of both mortality and morbidity, and also incorporate public values associated with various outcomes, are potentially useful. Such interventions as heart transplants might increase life expectancy but seriously compromise physical independence, mobility, social activity, and other factors that contribute to the quality of life. Certain indexes try to capture, sometimes in a single measure, dimensions of health that affect its quality. Quality-of-life indicators are based on health-state preferences, which are measures of satisfaction or desirability that people associate with the presence of symptoms and functional limitations that can affect quality of life (50,51, 52,53). Health-related quality-of-life measures are increasingly being considered for program evaluation, population monitoring, clinical research, and policy analysis (134). Box 6-C shows a selection of instruments for assessing functional status. Some of these measurements are weighted for quality-of-life factors.[16] WHO's Quality-of-Life project is developing a survey instrument to assess how patients in developing and developed countries perceive the quality of their lives (33).

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11 Only half of the individuals reportin ; that they were wheelchair-bound said that they were limited in their ability to work, according to a 1978 survey by the U.S. Social Security Administration (124).

12 An estimated 21 percent of the U.S. population aged 15 and older reported living with functional limitations in 1984, according to the Survey of Income and Program Participation (106),

13 The Canadian Health and Activity Limitation Survey estimated that in 1987 approximately 15 percent of the adult population (age 15 and older and including those residing in institutions) had a functional or activity limitation (106).

14 According t. a British survey, about 14 percent of adults aged 16 or older were estimated to have a functional limitation in 1986 (106).

15 Both the Canadian and British surve ys used a more extensive list of functional limitations than the U.S. survey (106).

16 Some persons with disabilities find c ertain quality-of-life approaches offensive, because they imply that a year of life with a disability is less valuable than a year without a disability (74).

Box 6-C—Selected Health Status and Quality-of-Life Measures

EuroQol

Research workers from five European countries (Finland, Great Britain, the Netherlands, Norway, and Sweden) have developed a questionnaire to measure health-related quality of life (called "EuroQol"). Patients score their levels of mobility, self-care, conduct of major activity, ability to pursue family and leisure activities, pain, and anxiety or depression.

Medical Outcome Study (SF-36)

In the United States, this 36-item, short-form health survey (SF-36) has gained acceptance as a generic measure of health states. The SF-36 has been used principally in physicians' offices to monitor health status over time and has not been used to measure population health. Incorporated into the SF-36 are measures of physical functioning, role limitations because of physical or emotional problems, bodily pain, social functioning, general mental health, vitality, and self-perceived health status.

Nottingham Health Profile

The Nottingham Health Profile (NHP) questionnaire includes assessments of emotional reactions, energy level, pain, physical mobility, sleep, social isolation, usual social role, and the relationship of health status to work, home management, social life, sex life, hobbies, and vacations. The NHP questionnaire has been used within physicians' offices, as part of clinical trials, and for population health monitoring.

Quality of Well-Being Scale

The Quality of Well-Being Scale (QWB) questionnaire measures mobility, physical activity, social activity, symptoms, and health problems. It has been used in clinical trials, population monitoring, and allocating health resources.

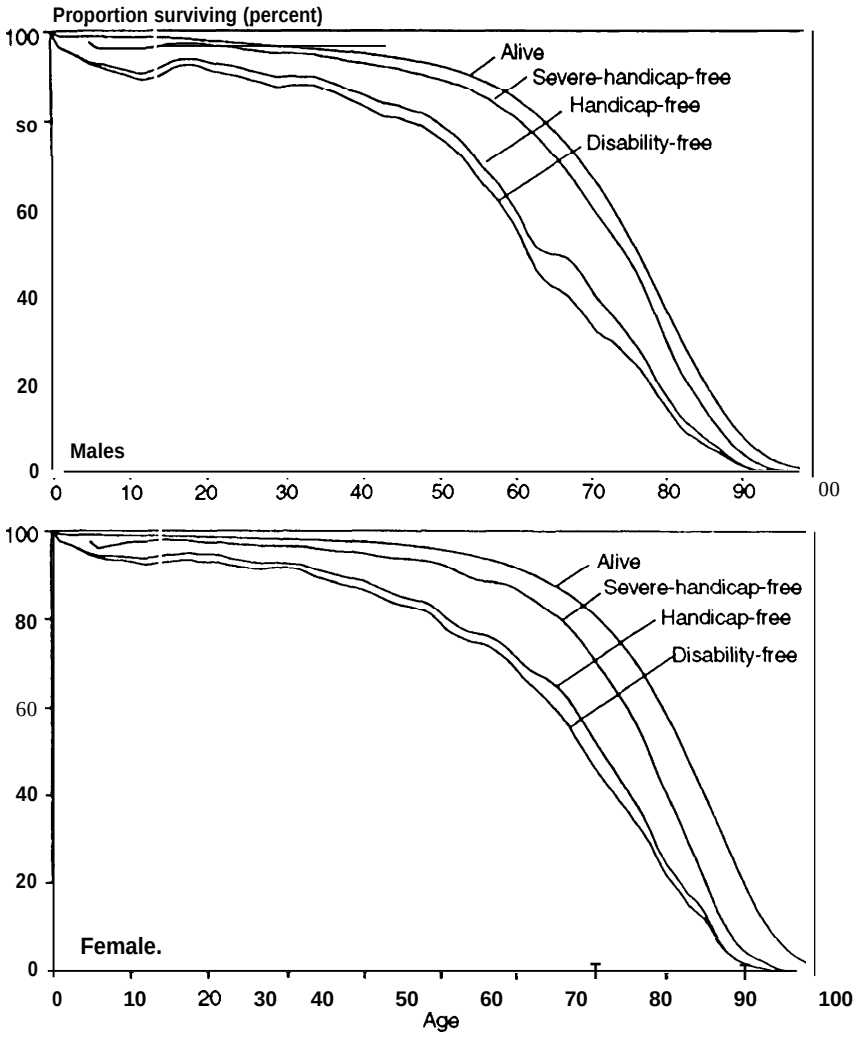
SOURCES: S. Bjork, "Discussion Paper No. 1: EuroQol Conference Proceedings," The Swedish Institute for Health Economics, Lund, Sweden, April 1992; R.G. Brooks, S. Jendteg, G. Lindgren, et al., "EuroQol: Health-Related Quality of Life Measurement. Results of the Swedish Questionnaire Exercise," *Health Policy* 18:37-48, 1991; U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research, *Public Health Service Task Force on Improving Medical Criteria for Disability Determination*, (Rockville, MD: U.S. Department of Health and Human Services, April 1992).

HEALTHY LIFE EXPECTANCY

Information on mortality and morbidity in a population can be integrated to yield measures of life expectancy adjusted for the prevalence of impairment, disability, or handicap. WHO has recommended that these healthy life expectancy indicators be used to monitor the health of populations (256). Healthy life expectancy differs from life expectancy by referring to the number of years someone of a particular age can, on average, expect to live in a healthy state, in view of prevailing age-specific rates of mortality and morbidity (15). Evidence of widespread acceptance of the indicator is its incorporation into the health objectives of various nations. One goal of the United States, for example, is to increase the years of healthy life from an estimated 62 years in 1980 to 65 years by the year 2000 (200). WHO's fourth European regional target toward "Health for All' calls for a 10 percent increase in healthy life expectancy by the year 2000 (267).

A country's life tables can be adjusted by using information from population-based surveys to estimate what portion of the residents' life expectancy is free from various types of impairments, disabilities, or handicaps (figure 6-l). An

Figure 6-1--Survival Curves for Australian Males and Females, 1988



SOURCE: C. Mathers, Health Expectancies in *Australia 1981* and 1988(Canbarra, **Australia: Australian Government Publishing Service, 1991).**

international network of researchers called REVES[17] is developing techniques and proposing standards to be used to calculate healthy life expectancy (113,150,151). These standards would be helpful because although national estimates of disability-free life expectancy exist for more than 30 countries (150),[18] the estimates rely on different methods and disability data and cannot be compared (17). Some measures, for example, include a quality-of-life adjustment. The World Bank has

[17] The full name of the network on health expectancy and the disability process is Réseau Espérance de Vie en Santé. From 1989 to 1992, the network has convened six international meetings and has published papers, bibliographies, and a world yearbook on statistical calculations of healthy life expectancy (1 13).

[18] Developed countries for which estimates are available include: Canada, Denmark, England and Wales, France, Germany (the former Federal Republic of Germany), Italy, the Netherlands, Spain, Sweden, Switzerland, and the United States (1 13,180).

calculated 'disability-adjusted life years, ' which include a weighting scheme reflecting relative severity and burden of disabling conditions. These weights were determined by a group of experts (25 1). The U.S. measurement of years of healthy life also includes a quality-of-life adjustment (200). However, some have suggested that disability weights should not yet be used because there is no consensus on how to measure quality of life, and such adjustments obscure the ability to monitor changes in a population's health status over time (15 1).

Most researchers agree on the need for longitudinal surveys to identify the incidence, duration, and possible recovery from impairments and disabilities. The United States has one of the few national longitudinal data sets, the Longitudinal Study of Aging (LSOA).[19] Other countries are beginning to mount such surveys, which will allow international comparisons (153a).

SELF-PERCEIVED HEALTH

Population-based health surveys often include questions on self-perceived health, but the responses to such questions may reflect social perceptions that are culturally bound, making them difficult to interpret and compare (68). Furthermore, international comparisons are often difficult to make, because the wording of survey questions and responses varies by country .20

A standard question[21] on self-perceived health was included in a 1987 12-country study, "Europeans and Their Health. " A full 79 percent of Irelands' residents rated their general state of health as "good" or "very good" compared with 60 percent of residents of Italy (table 6-2) (28).[22]

The U.S. National Health Interview Survey records responses to a question on self-perceived health similar to the question used in the European survey, but the response categories differ somewhat.[23] In the United States, most residents (90 percent) reported themselves to be in "good," "very good, ' or ''excellent' health in 1987 (214). This is higher than reports of "very good" or "good" health in Europe in 1987, but the difference in the response categories makes comparisons difficult.

SELF-PERCEIVED STRESS

Perceptions of personal levels of stress are sometimes intended to be a measure of mental well-being. According to population-based surveys in the United States and Canada,[24] a greater proportion of adults (aged 18 and older) reported ''very stressful" lives in 1985 in the United States (18 percent of males and 23 percent of females) than in Canada (10 percent of males and 8 percent of females). In 1990 the report's findings were similar (20 percent versus 13 percent of males and 27 percent versus 12 percent of females) (162).

SUMMARY

There is no general consensus regarding disability measures, but they are important for determining whether gains in life expectancy have come at the expense of quality of life. The WHO

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19 The LSOA includes data on disability, institutionalization, and mortality for a sample of U.S. respondents, aged 70 or older, who were originally interviewed in 1984 and then reinterviewed in 1986 and 1988 (152a).

20 WHO has recommended a standard self-perceived health question for survey use (269).

21 The question on self-perceived health on the survey was ''How would you describe your state of health in general now? Would you say it is very good, good, reasonable, rather poor, very poor or you don't know?" (28).

22 A standardized questionnaire related to cancer and its prevention was used as part of the survey. Face-to-face interviews were conducted within the homes of a representative sample of residents aged 15 and older within 12 countries. A total of 11,651 subjects were included in the study (28).

23 In the U.S. Survey, th[illegible]sti[illegible] is ''Would you say your health in general is "excellent,' "verygood," "good," or 'fair or poor" (214).

24 The 1985 and 1990 Health Promotion Surveys in Canada and the National Health Interview Survey Health Promotion and Disease Prevention Supplements included comparable questions on self-perceived stress. In the United States, respondents were asked how much stress they had experienced in the 2 weeks preceding the interview. In Canada, respondents were asked to assess the level of stress in their lives (162).

Table 6-2--Self-Perceived Health, United States[a] and Selected European Countries,[b] 1987

	Excellent	Very good	Good	Fair or poor
United States	40.3%	27.8%	22.40/Q	9.5%

	Very good	Good	Reasonable	Rather poor	Very poor	Don't know
European community[c]	21%	44%	28%	5%	1%	1%
Belgium	27	45	22	4	0	2
France	24	43	25	7	1	0
Germany	16	50	27	4	1	2
Ireland	39	40	19	2	0	0
Italy	16	44	36	4	0	0
Netherlands	22	51	22	3	1	1
Spain	21	46	25	6	2	0
United Kingdom	28	37	30	4	1	0

[a]As part of the U.S. National Health interview Survey, respondents were asked, "Would you say your health In general Is excellent, very good, good, or fair to poor?"
[b]The Commission of the European Communities survey respondents were asked, 'How would you describe yourstate of health in general now? Would you say it is very good, good, reasonable, rather poor, very poor or you don't know?"
[c]Weighted average of 12 countries. Data from Denmark, Greece, Luxemburg, and Portugal are not shown.

SOURCE: Commission of the European Communities, *Europeans and Cancer Prevention: A Study of Attitudes and Behaviour of the Public (Brussels,* Belgium: Commission of the European Communities, June 1988); U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, *Health United States:* 1988, DHHS Pub. No. (PHS) 88-1232 (Hyattsville, MD: US. Department of Health and Human Services, March 1988).

International Classification of Impairments, Disabilities and Handicaps has been accepted by many nations and used for clinical and health services research, health services planning, and population health monitoring (181,250,255). The ICIDH framework has been criticized, but many of the problems are likely to be resolved in the planned revision of the classification scheme. In view of differences in how health services are delivered, internationally comparable data on disability probably will come from population-based surveys and not from administrative records. **Achieving** consensus on a disability classification would be a first step toward comparability of information about disability on such surveys. At present, both the content and methods of surveys differ so widely that disability comparisons cannot be made.

Despite international disagreement over what disability means, there is general agreement that years of life without disability should be the focus of public health efforts. An indicator that shows great promise in monitoring health is a measure of healthy life expectancy, which is the number of years someone of a particular age can, on average, expect to live without various impairments, disabilities, or handicaps. Although the different countries have not yet agreed on how to measure healthy life expectancy, many of them have included it as an indicator in their health goals, and efforts are underway to measure and monitor it. An international group of researchers (called REVES) is working toward standardizing this measure.

Health-Related Behaviors 7

Some voluntary behaviors, such as smoking, drinking alcohol, and driving recklessly contribute substantially to the deaths and disabilities that result from chronic diseases and injuries (200). Other behaviors—such as using medical screening tests, getting immunizations, using automobile seatbelts, and eating a healthy diet-can prevent premature death and disability. Encouraging healthy lifestyles has become a focus for public health in developed countries, where targets are being used to monitor the success of health education and promotion programs.[1] This chapter presents information on health-related behaviors and selected preventive health practices in the United States and other countries.

SMOKING AND ALCOHOL CONSUMPTION

It is difficult to accurately measure behaviors that may be considered socially undesirable. National estimates of smoking rates and alcohol consumption are available from surveys,[2] but these can be unreliable if heavy smokers or drinkers either don't participate in the surveys or underreport their smoking or drinking. Large discrepancies between the amount of smoking

[1] The WHO European Year 2000 target states that "there should be significant increases in positive health behavior, such as balanced nutrition, non-smoking, appropriate physical activity, and good stress management" and that ".. there should be significant decreases in health-damaging behavior, such as overuse of alcohol and pharmaceutical products; use of illicit drugs and dangerous chemical substances; and dangerous driving and violent social behavior" (256).

[2] Other methods of measuring the consequences of alcohol consumption or smoking include analyses of alcohol-or smoking-related mortality (e.g., liver cirrhosis, respiratory cancer); admissions to general and/or psychiatric hospitals and to alcohol treatment clinics; convictions for drunkenness or driving under the influence of alcohol; and the number of traffic accidents associated with alcohol use (270,271).

and drinking self-reported on surveys and the amount of alcohol and cigarettes accounted for on sales records provide indirect evidence of underreporting (270,271).

Smoking

Cigarette smokers die at twice the rates of nonsmokers throughout middle age, and nearly one in five deaths in developed countries can be attributed to the effects of smoking (140). In the United States, more than one-fourth of deaths from cancer, nearly one-fifth of deaths from cardiovascular disease, and one-half of deaths from respiratory disease were attributable to smoking in 1990 (for a total of approximately 419,000 deaths) (194,212a).

Comparable information on smoking in 12 European countries is available from a 1987-88 study, "Europeans and Cancer Prevention. "[3] In Europe, smoking prevalence varied for males from 40 percent (Ireland, Portugal, and the United Kingdom) to 62 percent (Greece), and for females from 11 percent (Portugal) to 44 percent (Denmark) (table 7-l).

A much smaller proportion of U.S. males (30 percent) than European males (45 percent) smoked in the late 1980s, but the gap was less significant between female smokers in the United States (26 percent) and Europe (29 percent) (table 7-1) (28,228). The European and U.S. numbers are not strictly comparable, because the European definition included pipe and cigar smokers and the U.S. definition referred only to cigarettes (28,221). Almost all (94 percent) European smokers smoke cigarettes, however, so the comparison is roughly accurate.[4] In light of these differences, the World Health Organization (WHO) has recommended that countries use a uniform set of smoking questions on their surveys (44).

In Europe and the United States, in general, more males than females smoke. But among those aged 24 or younger, the rate for females is higher in the United States, United Kingdom, the Netherlands, and Denmark (table 7-l).

According to comparable surveys from the United States and Canada in 1985 and 1990,[5] smoking prevalence was higher in Canada than in the United States (30 versus 26 percent in 1990) (table 7-2) (162). Higher rates for Canada were most pronounced among women, especially those aged 18 to 24 (162). In 1990, a greater proportion of deaths in Canada (22 percent) than in the United States (19 percent) were attributable to smoking.[6]

Since the mid-1960s, smoking by males has declined in the United States and selected European countries (table 7-3). The proportion of females smokers has increased in some countries where the rates used to be low (e.g., Belgium, France) and declined in places where the rates used to be high (e.g., United States, United Kingdom). As a result, by the late 1980s, nearly one-third of the women in the comparison countries smoked.

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[3] A standardized questionnaireeon cancer and its prevention was used as part of two surveys conducted in 1987 and 1988. For each survey, face-to-face interviews wereconducted within the homes of a representative sample of residents aged 15 and older within 12 countries. Smoking data were aggregated from the two studios, which included more than 20,000 subjects in total. Survey respondents were asked to select which of the following applied to them: "smoke cigarettes (including roll-your-own)," "smoke cigars or a pipe," "used to smoke but you have stopped, " or "you have never smoked, ' Smokers were identified as those reporting currently smoking cigarettes, cigars, or a pipe (28).

[4] If pipe and cigar smokers were removed from the European prevalence numbers, the gap between U.S. and European males would close slightly, but the difference between U.S. and European females would likely remain the same, because most cigar and pipe smokers are males,

[5] In 1985 and 1990, the United States conducted the National Health Interview Survey Health Promotion and Disease Prevention Supplements, and Canada conducted Health Promotion Surveys (162).

[6] Estimates of mortality attributable to smoking in the United States and Canada were made by OTA using the Smoking-Attributable Mortality, Morbidity, and Economic Costs computer program (SAMMEC 2.1) developed by the U.S. Centers for Disease Control and Prevention's Office on Smoking and Health (194).

Table-7-1-Smoking Prevalence by Age, Selected European Countries(1987-88)a and the United States (1988)

	Males					Females				
	All Ages	15-24	25-39	40-45	55+	All Ages	15-24	25-59	40-54	55+
European Community	45%	390/.	53%	51%	36%	29%	31%	41%	28%	18%
Belgium	49	49	55	56	41	30	39	49	29	19
Denmark	46	37	53	51	44	44	44	47	48	37
France	46	55	58	46	32	31	48	40	25	11
Germany[b]	45	34	61	51	39	31	30	45	33	18
Greece	62	62	72	69	45	27	38	46	20	9
Ireland	40	35	41	39	40	31	28	33	32	27
Italy	42	32	49	4a	34	27	25	43	26	17
Netherlands	47	38	51	57	49	40	46	51	39	25
Portugal	40	52	60	42	30	11	24	23	8	2
Spain	48	52	62	56	34	24	44	47	11	6
United Kingdom	40	30	48	45	37	30	33	33	41	21
	All ages	18-24KE343&44		45-64	65+	All ages	18-245443544		45-64	65+
United States	30	26	36	37	31	18	26	26	31	28	28	13

aFor European countries, smoking prevalence came from two surveys conducted in 1987 and 1988 by the Commission of the European Communities (surveys 'erg induddn '2 countries of the European Economic Community). Data from Luxemburg we not shown but are included in the total for Europe. These data refer to current smoking of cigarettes, cigars or pipes. U.S. smoking data came from the 1988 U.S. Health Interview Survey. The data refer to current cigarette smokers (i.e., individuals who have smoked at least 100 cigarettes and who now smoke; includes occasional smoking).

bBased on data from the former Federal Republic of Germany.

SOURCES: Commission of the European Communities, Europeans and Cancer Prevention: *A Study of Attitudes and Behaviour of the Public* (Brussels, Belgium: @remission of the European Communities, June 1988); U.S. Depatment of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics, Health, *United States* 1991 (Hyattsville, MD: U.S. Department of Health and Human Services, May 1992).

Table 7-2--Cigarette Smoking by Adults (Age 18 and Older),[a] by Age, Sex, and Education, United States and Canada, 1985 and 1990

	Current smokers (as a percent of population)			
	United States		Canada	
	1985	1990	1985	1990
Total[b]	30	26	35	30
Men	33	28	36	32
Women	28	23	33	29
Age group				
18-24				
Men	28	27	38	31
Women	30	23	41	31
25-44				
Men	38	33	40	36
Women	32	27	37	34
45-64				
Men	33	29	36	30
Women	30	25	30	26
65+				
Men	20	15	20	18
Women	14	11	18	14
Educational level				
High school not completed	35	32	39	36
High school completed	34	30	39	34
College or university	23	18	28	23

aThe definition of a current smoker varied only slightly between the 1990 Canadian Health Promotion survey and the 1990 U.S. National Health Interview Survey of Health Promotion and Disease Prevention. In the Canadian survey, a current smoker is anyone who currently smokes, whereas in the U.S. survey, a current smoker is one who has smoked at least 100 cigarettes in his or her lifetime and smokes now. The effect of this definitional difference should be minimal and would be most likely to reduce the rate for young people who have begun smoking but who have not yet smoked 100 cigarettes.

bData for Canada includes persons 17 years of age. These persons are included in all totals as well as the age category 18 to 24 years for men and women.

SOURCE: C.A. Schoenborn, "Health Status and Practices in Canada and the United States, 1985 and 1990," Canada's Health Promotion Survey 1990: *Technical Report,* T. Stephens and D.F. Graham (eds.) (Ottawa, Ontario: Health and Welfare Canada, 1993).

Alcohol Consumption

At least 3 percent of all deaths in the United States can be attributed to alcohol-related causes (202). Excess and chronic consumption of alcohol can lead to liver disease (e.g., cirrhosis), gastrointestinal cancers, and cardiovascular disorders. Alcohol also contributes heavily to deaths and disabilities related to injuries. As many as one-half of all automobile crash fatalities are alcohol-related. Furthermore, fetal exposure to alcohol is a leading cause of mental retardation (202).

International comparisons of alcohol use are difficult to make, because no standard criteria have been used to assess alcohol use in population-based surveys (270,271). The information about alcohol consumption contained in population-based surveys may include average occurrences of drinking, amount of consumption, and frequency of intoxication. Drinking patterns, which vary among the residents of different countries, are important to distinguish, because the health consequences of different patterns are likely to vary. In wine-producing countries, for example,

Table 7-3--Smoking Prevalence, United States and Selected European Countries, Mid-1960s and Late 1980s[a]

	Males		Females	
	mid-1960s	late 1980s	mid-1960s	late 1980s
United States	**52%o**	**31%**	**34%**	**27%**
Belgium	80	49	15	**30**
France	66	46	15	31
Germany[b]	**70**	**45**	**16**	**31**
Italy	**50**	**41**	**27**	**27**
Netherlands	**82**	**47**	**32**	**40**
United Kingdom	**67**	**40**	**38**	**30**

aEuropean statistics are for those 21 and older in 1963 and 1987-88. United States statistics are for those 18 snd older in 1965 and 1987.
bBased on data from the former Federal Republic of Germany.

SOURCES: Commission of the European Communities, *Europeans and* Cancer Prevention: A Study of Attitudes and *Behavior of the Public* (Brussels, Belgium: Commission of the European Communities, March/April and June 1988); US. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, Health United States: *1988,* DHHS Pub. No. (PHS) 88-1232 (Hyattsville, MD: U.S. Department of Health and Human Services, March 1988).

consumption tends to be regular whereas in other countries consumption is more episodic. With long-term moderate drinking, the risks of some chronic diseases actually decline, but heavy binge drinking is often associated with injury and violence.

Uniform data on alcohol consumption are available from 12 European countries.[7] In these 12 countries, the prevalence of frequent[8] drinking ranges from a low of 11 percent of males and 2 percent of females in Ireland, to a high of 56 percent of males and 30 percent of females in Italy (table 7-4). For the European Community as a whole frequent drinking is reported more than twice as often for males (38 percent) as for females (16 percent) and infrequent alcohol consumption is reported twice as often for females (55 percent) as for males (27 percent).

Information on alcohol consumption in the United States is not directly comparable to the European data because different consumption categories are used.[9] Within the United States, "heavier" drinking is reported more frequently by males (13 percent) than by females (3 percent). Levels of alcohol abstention in the United States are similar to levels of infrequent consumption in Europe. In 1988, almost one-third (32 percent) of

7 The Commission on the European Communities included alcohol consumption in a survey on cancer-related topics conducted in 12 countries in 1988. An identical questionnaire was used to conduct 11,729 face-to-face interviews among representative sample of respondents aged 15 years or older (27a).

8 In the survey by the Commission on the European Communities, frequent consumption of alcohol was defined as drinking wine or beer daily and or spirits at least 3 or 4 days a week (28).

9 The National Health Interview Survey alcohol consumption categories are ''abstaiq" which is consumption of less than .01 ounces of alcohol per day; ''light,'' which is consumption of between .01 and .21 ounces of alcohol per day; "moderate," which is consumption of between .22 and .99 ounces of alcohol per day; and "heavier," which is consumption of 1.00 or more ounces of alcohol per day. One ounce of alcohol is equal to approximately 2 average size drinks of beer, wine, or liquor (162,232).

Table 7-4--Alcohol Consumption, Selected European Countries[a] and the United States,[b] 1988

	Males			Females		
	Infrequent	Average	Frequent	Infrequent	Average	Frequent
European Community	27%	35%	36%	55%	29%	16%
Belgium	33	33	34	52	33	15
Denmark	24	56	20	50	42	8
France	24	29	47	51	29	20
Germany[c]	24	50	26	54	40	6
Greece	27	36	37	64	25	11
Ireland	41	48	11	72	16	2
Italy	25	19	56	51	19	30
Luxemburg	29	40	31	60	28	12
Netherlands	31	41	28	59	26	15
Portugal	22	21	57	53	25	22
Spain	30	23	47	56	23	21
United Kingdom	33	47	20	60	30	10
	Abstain	Light	Heavier	Abstain	Light	Heavier
United States	32	30	25	13	53	30	14	3

aThe European Community data derived from a 1988 survey conducted by the Commission of the European Communities in 12 countries. Infrequent alcohol consumption was d> fined as consumption of wine, beer, or spirits less often than once per week. Frequent alcohol consumption was defined as consumption of wine or beer daily and/or spirits at least 3 or 4 days per week. Average consumption was defined as consumption falling between infrequent and frequent as defined above.

bThe U.S. data derived from the National Health interview Survey. Alcohol consumption status is defined in ounces (oz.) of absolute alcohol (ethanol) consumed per day as follows: abstain-less than .01 oz.; light-.01 to .21 oz.; moderate-.22 to .99 oz.; and heavier-1.tl(l or more oz.

CBased on data from the former Federal Republic of Germany.

SOURCES: Commission of the European Communities, *Europeans and Cancer Prevention: A Study of Attitudes and* Behaviour of the Public (Brussels, Belgium: Commission of the European Communities, June 1988); U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Health Statistics, *Health United States:* 1988, DHHS Pub. No. (PHS) 88-1232 (Hyattsville, MD: U.S. Department of Health and Human Services, March 1988).

U.S. males and more than one -half (53 percent) of females were abstainers (table 7-4).

Comparable data on alcohol consumption are available from 1985 and 1990 population-based surveys in the United States and Canada (162).[10] Both countries define a current drinker as someone who has had at least one drink of alcohol in the year preceding the survey, and define heavy alcohol consumption as two or more drinks per day on average (162).[11] In both years, a greater proportion of Canadian than U.S. residents reporteddrinking (in 1990, 81 versus 61 percent) (table 7-5). The overall prevalence of heavy drinkig is similar in Canada (7 percent) and the United States (6 percent) .12

10 In 1985 and 1990, the United States conducted the National Health Interview Survey Health Promotion and Disease Prevention Supplements, and Canada conducted Health Promotion Surveys (162),

11 The calculation of heavy drinking v ties slightly on the two surveys, with average consum ption based on a 7-day recall period m Canada and 14-day recall period in the United States (162).

12 The prevalence of heavy drinking among drinkers in the United States and Canada WSS the same (9 percent) in 1990, but the overall prevalence of heavy drinking in 1990 was slightly higher in Canada than in the United States, because the prevalence of drinking was higher in Canada (table 7-5).

Table 7-5--Current Alcohol Consumption by Adults (Age 18 and Older), by Age, Sex, and Education, United States and Canada, 1985 and 1990

	Current drinkers[a]				Current drinkers who drank heavily[b]			
	United States		Canada		United States		Canada	
	1985	1990	1985	1990	1985	1990	1985	1990
Total[c]	65%	61%	82%	81%	12%	9%	14%	9%
Men	76	72	87	86	17	14	23	16
Women	56	51	78	77	5	4	6	3
Age group								
18-24								
Men	79	71	93	92	18	14	24	21
Women	91	86	64	56	5	3	9	d -
25-44								
Men	83	79	92	90	16	13	23	15
Women	63	59	86	83	4	3	4	2[e]
45-64								
Men	72	68	80	84	18	15	23	14
Women	53	48	73	73	7	4	7	4[e]
65+								
Men	58	55	73	66	18	16	16	12[e]
Women	34	31	52	58	8	6	d -	d -
Education level								
High school not completed	47	42	71	72	15	13	13	11
High school completed	66	60	86	85	12	10	16	10
College or university	77	71	90	88	11	8	14	8

aA current drinker is defined as a person who had at least one drink of any alcoholic beverage in the 12 months preceding the survey.
bHeavy drinking is defined as two or more drinks per day, on average, over the overall period (7-day recall in Canada; 14-day recall in the United States)"
cData for Canada includes persons 17 years of age. These persons are included in all totals as well as in the age category 18 to 24 years for both men and women.
dData suppressed because of high sampling variability.
eModerate sampling variability; read with caution.

SOURCE: C.A. Schoenborn, "Health Status end Practices in Canada and the United States, *1985 and* 1990," Canada's Health Promotion Survey 1990: *Technical Report,* T. Stephens and D.F, Graham (eds.) (Ottawa Ontario: Health and Welfare Canada, 1993).

PREVENTIVE HEALTH PRACTICES

Death and disability associated with breast and cervical cancer and hypertension can be reduced by early detection and treatment. In the United States women have about a 10 percent risk of developing breast cancer and a 1 percent risk of developing cervical cancer at some point during their lives (164a). The use of the Pap test may reduce the rates of mortality from uterine cervical cancer by as much as 75 percent, however, and the use of breast examination and mammography can reduce mortality from breast cancer by 30 percent for women aged 50 and (alder (200). Other personal practices, such as use of seatbelts and household smoke alarms can reduce the rates of death and disability associated with automobile crashes and household frees. For example, up to one-half of the fatalities related to automobile crashes in the United States could be prevented if everyone used lap-shoulder belts (148).

Comparisons of the United States and Canada

Information on preventive health practices in Canada and the United States is available from comparable population surveys conducted in 1985 and 1990 (162).[13]

BLOOD-PRESSURE CHECKS

In 1990, a similar proportion of the residents of the United States (75 percent) and Canada (78 percent) had had their blood pressure checked within the past year (table 7-6). For those aged 45 or older, who are at greater risk of heart disease, the rates differed. Men aged 45 to 64, for example, were more likely to have had their blood pressure checked recently in Canada (80 percent) than in the United States (74 percent) [162).

PAP TESTS

In 1985, Pap tests were used at similar rates in the United States (78 percent) and Canada (76 percent). Between 1985 and 1990, the use of Pap tests declined in Canada and increased in the United States, so that by 1990 there was a clear difference in usage in the United States (81 percent) and Canada (72 percent) (table 7-7). Among women aged 65 and older, many fewer women in Canada (44 percent) than in the United States (63 percent) had had a Pap test within the past 3 years (162).

BREAST SELF-EXAMINATION

In 1985, a greater proportion of women in Canada (41 percent) than in the United States (32 percent) reported performing a monthly breast self-examination (BSE) (table 7-7). By 1990, however, monthly BSE rates had increased in the United States (38 percent) and fallen in Canada (27 percent) so that more U.S. than Canadian women were engaged in this preventive health practice (162).

SEATBELT USE

In 1985, regular use of seatbelts by residents of the United States (36 percent) was less than half that reported in Canada (79 percent) (table 7-8). Between 1985 and 1990, regular use of seatbelts increased in the United States from 36 to 67 percent, but such use remained substantially higher in Canada (91 percent in 1990) (162).

OWNERSHIP OF SMOKE DETECTORS

Residents of the United States were less likely than Canadian residents to have a home smoke detector in 1985 (63 versus 77 percent) and 1990 (79 versus 85 percent) (table 7-8) (162).

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[13] In 1985 and 1990, the United States conducted the National Health Interview Surveys of Health Promotion and Disease Prevention, and Canada conducted the Health Promotion Surveys (162),

Table 7-6--Trends In Adults Having Recent Blood-Pressure Checks, by Age, Sex, and Education, United States and Canada, 1985 and 1990

	Had blood pressure checked in year preceding survey			
	United States		Canada	
	1885	1990	1985	1990
Total[a]	74%	75%	76"/'	78%
Men	68	69	69	71
Women	79	80	83	85
Age group				
18-24				
Men	62	62	51	57
Women	79	82	78	79
25-44				
Men	63	64	68	67
Women	76	78	81	84
45-64				
Men	73	74	77	80
Women	78	80	85	87
65+				
Men	82	84	86	89
Women	86	85	92	92
Education level				
High school not completed	74	75	78	79
High school completed	73	74	77	76
College or university	75	76	74	79

[a]Data for Canada Include persons 17 years of age. These persons are included in all totals as well as the 18 to 24 age category for both men and women.

SOURCE: C.A. Schoenborn, 'Health Status and Practices in Canada and the United States, 1985 and 1990," Canada's *Health promotion Survey 1980: Technical Report,* T. Stephens and D.F. Graham (eds.) (Ottawa, Ontario: Health and Welfare Canada, 1993).

EXCESS BODY WEIGHT[14]

The proportion of men and women considered overweight increased in both Canada and the United States between 1985 and 1990 (figure 7-1) (162). In 1990, similar proportions of men in the United States (26 percent) and Canada (27 percent) were overweight, but substantially more women were overweight in the United States (26 percent) than in Canada (18 percent) .15

REGULAR PHYSICAL ACTIVITY

Between 1985 and 1990, the proportion of residents who engaged in regular physical activity declined somewhat in Canada (from 53 to 47 percent) but increased slightly in the United States (from 40 to 41 percent). Even so, relatively fewer U.S. than Canadian residents reported participation in regular physical activity in 1990 (table 7-9) (162). The elderly in Canada are much

14 Being overweight can seriously affect health and longevity. Evidence suggests that the causes of overweight are multifactorial and reflect inherited, environmental, cultural, socioeconomic, and psychological conditions (123).

15 Body-mass index (BMI) (weight in kilograms divided by the square of height in meters) is used to define overweight. The definition Of overweight used in the United States is somewhat more restrictive (BMI of 27.8 for men and 27.3 for women) than in Canada (BMI of 27 for both sexes) (162).

Table 7-7-Trends in Women Having Had Pap Tests Within 3 Years of the Survey and Monthly Breast Self-Examination,[b] by Age and Education, United States and Canada, 1985 and 1990

	Had Pap smear within 3 years of survey				Perform BSE monthly			
	United States		Canada		United States		Canada	
	1985	1990	1985	1990	1985	1990	1985	1990
Total[c]	78%	81%	76%	72%	32%	38%	41%	27%
Age group								
18-24	78	80	75	66	24	28	38	16
25-44	90	90	88	83	34	39	40	26
45-64	76	78	73	72	37	42	46	36
65+	57	63	51	44	29	36	37	28
Education level								
High school not completed	68	70	68	62	29	33	38	28
High school completed	79	81	78	75	32	39	40	28
College or university	85	87	83	79	34	39	44	26

aThe Canadian Pap test question changed between 1985 and 1990, with the addition of a screcreening question about ever having had a Pap smear and asking recently only of those who reported ever having had one. The 1985 question simply asked respondents when they had their last Pap test, with "never being a response option. The U.S. questions did not change between 1985 and 1990 and were more similar to the 1985 Canadian question, in that they asked when the respondent had her last Pap bet, to which she could respond with an interval or "never."

bThe context of the Canadin questions on BSE changed between the 1985 and 1990 surveys, The 1985 survey explained an introductory question regarding whether the woman had ever been shown how to examine her own breasts. All women, regardless of the answer to the question, were then asked about their current BSE practices. The 1990 survey just asked a direct question on frequency of performing BSE, without any introductory statement The question's wording also changed from a more descriptive "know how to examine your own breasts" in 1885 to "perform breast calf-exarnination" in 1990. The U.S. questions remained identicalin context and content between the two survey years, asking women if they knew how to examine their own breast for lumps and, for those who know how, asking how many times a year they did so.

cData for Canada include women 17 years of age. These women are included in the total and in the age category 18 to 24 years.

SOURCE: C.A. Schoenborn, "Health Status and Pradices in Canada and the United States, 1985 and 1990," Canada's *Health Promotion Survey 1990: Technical R.T.* Stephens and D.F. Graham (eds.) (Ottawa, Ontario: Health and Welfare Canada, 1993).

Table 7-8-Trends in Adults' Regular Use of Seatbelts[a] and Ownership of Smoke Detectors,[b] by Age, Sex, and Education, United States and Canada, 1985 and 1990

	Percent of population who usually wear seatbelts				Percent of Population who own smoke detectors			
	United States		Canada		United States		Canada	
	1985	1990	1985	1990	1985	1990	1985	1990
Total[c]	36%	67%	79%	91%	63%0	79%	77%	85%
Men	34	62	75	87	63	79	78	84
Women	38	71	83	95	63	78	77	85
Age group								
18-24								
Men	27	54	67	82	59	75	78	86
women	32	65	76	91	58	75	73	83
25-44								
Men	36	63	76	87	66	81	81	87
Women	41	73	83	95	68	82	81	87
45-64								
Men	35	64	75	88	63	77	76	84
Women	37	72	84	96	62	78	75	87
65+								
Men	33	67	85	90	59	78	70	75
Women	35	72	88	95	60	73	74	80
Education level								
High school not completed	25	56	75	88	51	67	72	84
High school completed	31	62	78	91	64	78	81	87
College or university	48	77	83	93	71	85	80	88

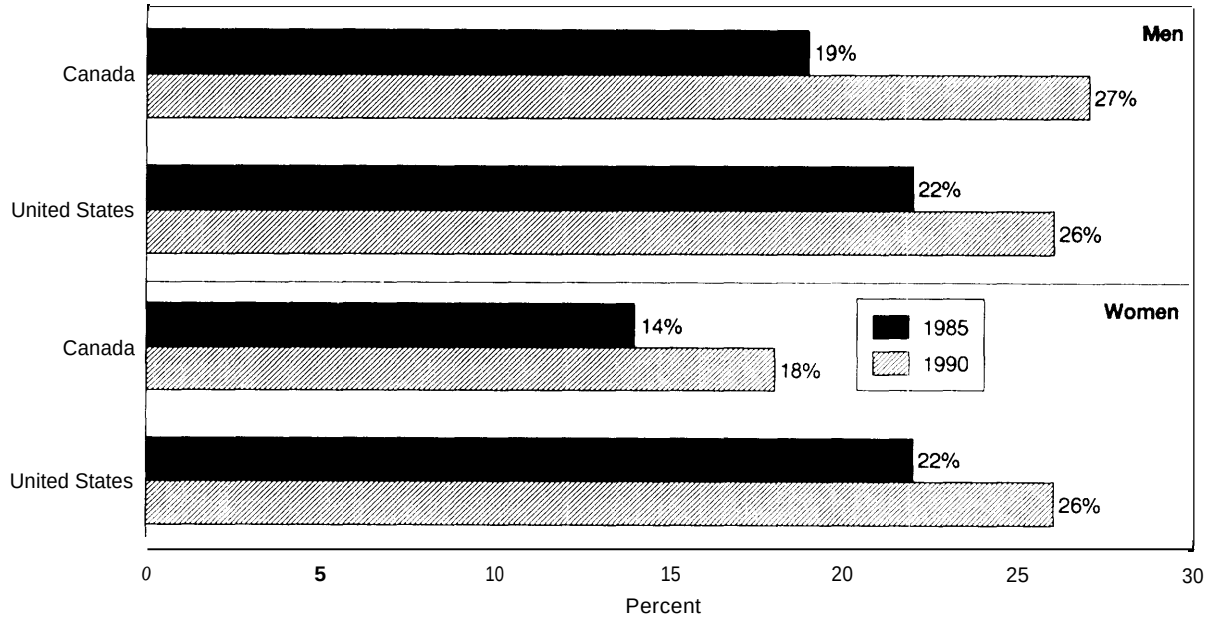
aThe Candian and U.S. questions regarding use of seatbelts remained unchanged between 1985 and 1990. There were some minor differences between the two surveys in terms of response categories, but they should not affect results presented here.

bIn contrast to the 1985 Canadian question on smoke detection, which asked about having any smoke detectors in the home, the 1990 question asked about working smoke detectors. The 1985 and 1990 U.S. questions asked first about ownership of any smoke detectors and subsequently about their working status. In order to be comparable with 1985 Canadian results, previously published 1985 U.S. data presented ownership of any smoke detector, regardless of working status. The data presented in this table include 1985 and 1990 U.S. and Canadian data on working smoke detectors only.

cData for Canada includes persons 17 years of age. These persons are included in all totals as well as the age cateegory 18 to 24 for both men and women"

SOURCE: C.A. Schoenborn, "Health Status and Practices in Canada and the United States, 1985 and 1990," Canada's Health *Promotion Survey 1990: Technical Report,* T. Stephens and D.F. Graham (ads.) (Ottawa, Ontario: Health and Welfare Canada 1993).

Figure 7-l—Trends in Overweight Proportion of Adult Population (Age 18 and Older), Canada and United States, 1985 and 1990



SOURCE: C.A. Schoenborn, "Health Status and Practices in Canada and the United States, 1985 and 1990," Canada's *Health Promotion Survey 1990: Technical Report* T. Stephens and D.F. Graham (eds.) (Ottawa, Ontario: Health and Welfare Canada, 1993).

more likely to be engaged in physical activity than their contemporaries in the United States (162).

Comparisons Between Europe and the United States

PAP TESTS

Women's use of Pap tests appears to be much higher in the United States than in Europe. In 1987, 88 percent of U.S. women reported ever having had a Pap test and 75 percent reported having had one within the preceding 3 years (200).[16] By contrast, only 48 percent of women surveyed in 12 European countries had ever had a Pap test (table 7- 10).[17] The lowest European use was in Portugal (6 percent) and Greece (30 percent), and the highest was in France (70 percent) and the United Kingdom (67 percent). Pap tests appear to be done less frequently in Europe than is recommended. In France and the United Kingdom, for example, where the proportion of women using the testis relatively high, a significant proportion of them have the test

16 The U.S. Task Force on preventive Services recommends regular Pap testing fOr all women starting at the onset of sexual activity, with repeat tests every 1 to 3 years, at the physician's discretion. Pap tests may be discontinued at age 65, if previous test results have been consistently normal (238). Recommendations vary somewhat in Europe, In Great Britain, for example, Pap tests are recommended every 3 years for all women beginning at age 20 and for younger women if sexually active. In Denmark, women up to the age of 70 are invited to be screened, but those between the ages of 23 and 59 are targeted, and Pap tests every 3 years are recommended (192).

17 Women's use of Pap tests and mammography was assessed in 1988, A standardized questionnaire related to cancer and its prevention was used as part of the survey. A total of 11,729 face-to-face interviews were conducted in the homes of a representative sample of residents aged 15 and older in 11 countries (27a).

18 In France, 55 percent of women reported having Pap tests performed every year or every 2 to 3 years. In the United Kingdom, only 32 percent of women reported having the test repeated within years (table 7-10).

Table 7-9--Trends in Adult Participation in Regular Physical Activity, by Age, Sex, and Education, United States and Canada, 1985 and 1990

	Regularly active[a]			
	United States		Canada	
	1985	1990	1985	1990
Total[b]	40%	**41%**	53%	**47%**
Men	43	**44**	**55**	**49**
Women	38	**38**	**52**	**46**
Age group				
18-24				
Men	**62**	**61**	**64**	**70**
Women	**47**	**45**	**60**	**54**
25-44				
Men	**46**	**46**	**55**	**44**
Women	**42**	41	**51**	**42**
45-64				
Men	**30**	**36**	**46**	**41**
Women	**32**	**35**	**51**	**48**
65+				
Men	32	37	**59**	**55**
Women	28	29	**47**	**43**
Education level				
High school not completed	**24**	**26**	**45**	**44**
High school completed	**38**	**37**	**55**	**49**
College or university	**53**	**52**	**59**	**49**

aCanada: reported vigorous physical activity of at least 15 minutes' duration three or more times weekly; United States: answered "yes" to "Do you exercise or play sports regularly?"
bData for Canada includes persons 17 years of age. These persons are Included in all totals as well as the age categories 18 to 24 years for both men and women.

SOURCE: C.A. Schoenborn, "Health Status and Practices In Canada and the United States, 1985 and 1990," Canada's Health Promotion *Survey* 1990: *Technical Report,* T. Stephens and D.G. Graham (eds.) (Ottowa, Ontario: Health and Welfare Canada, 1993).

performed less often than once every 3 years (table 7-10).[18]

MAMMOGRAPHY

Women aged 50 and older are somewhat more likely to get mammograms in the United States than in Europe. One-quarter of U.S. women in that age group reported in 1987 that they had had mammograms within the preceding 2 years (200),[19] whereas 17 percent of their European contemporaries surveyed in 1988 had ever had a mammogram (table 7-11). Higher rates of ever having had a mammogram were reported in Germany (35 percent), and lower rates were reported in the United Kingdom (9 percent) and Ireland (6 percent).

CHILDHOOD VACCINATION

Vaccinating children for diphtheria, pertussis, and tetanus (DPT), as well as measles and polio,

19 The recommended age of onset and frequency of mammography is in dispute within the United States and internationally (165), but within the United States there is somewhat of a consensus concerning women aged 50 and older: For those women, the American Cancer Institute and the U.S. National Cancer Institute recommend annual mammograms; the U.S. Preventive Task Force recommends mammography every 1 to 2 years concluding at approximately the age of 75, unless pathology has been detected (200,238). Mammography is recommended every 3 years for women aged 50 to 64 in the United Kingdom (165).

Table 7-10-Awareness, Use, and Frequency of Women's Cervical Smear Test in Selected European Countries, 1988

	Know about it	Have shady had one	Frequency of use				
			Every year	Every 2 or 3 years	Every 4 or 5 years	Less often	Never
European Community	80%	48%	17%	12%	5%	14%	52%
country							
Belgium	75	43	22	10	2	9	57
Denmark	92	62	21	15	4	22	38
Germany[a]	89	47	29	10	4	4	53
Greece	82	30	10	7	3	10	70
Frame	89	70	40	15	4	11	30
Ireland	90	45	2	16	10	17	55
Italy	81	40	16	8	3	13	60
Luxemburg	87	63	47	8	2	6	37
Netherlands	89	55	8	20	8	19	45
Portugal	40	6	2	1	0	2	94
Spain	37	12	6	1	1	4	88
United Kingdom	93	67	5	27	15	20	33
Age							
15-24	72	25	13	6	1	5	75
25-39	87	63	30	18	6	9	37
40-54	83	59	20	18	9	12	41
55 and over	77	41	10	6	5	17	59

aBased on data from the former Federal Republic of Germany.

SOURCE: Commission of European Communities, Europeans and cancer prevention: A Study of the Attitudes and Behaviours of the Public (Brussels, Belgium: Commission of European Communities, June 1988).

Table 7-1 l--Mammography Use by Women Aged 50 and Older in Selected European Countries, 1988[a]

	Number of women used as basis for percentages	Every year	Every 2 or 3 years	Less often	Never had one
European Community	2,215	3%	3%	11?40	83%
Belgium	179	6	4	11	79
Denmark	167	3	2	17	78
Germany[b]	175	7	10	18	65
Greece	201	NA	1	8	91
France	156	5	1	22	72
Ireland	165	NA	2	5	94
Italy	186	4	3		
Luxemburg	43	(9)	(7)	(23)	(61)
Netherlands	136	1	1	15	83
Portugal	216	NA	1	8	91
Spain	226	2	2	6	90
United Kingdom	266	NA	2	7	91

KEY: NA = not available

aThe results for each country must be interpreted cautiously, because the number of women aged 50 and older in the sample Is relatively small.
bBased on data from the former Federal Republic of Germany.

SOURCE: Commission of European Communities, *Europeans and Cancer Prevention: A Study* of *Attitudes and Bahaviours of the Public* (Brussels, Belgium: Commission of European Communities, June 1988).

is widely recognized as a simple, effective, and inexpensive way to safeguard their health (247). Immunization rates for these conditions among preschool-age children are substantially higher in most European countries than in the United States (table 7-12).[20] European immunization rates for DPT, for example, are much higher than U.S. rates (97 percent in France and the Netherlands versus 65 percent in the United States).

Making international comparisons of the prevalence of infectious diseases is difficult, because of marked differences in reporting practices (248). Available evidence indicates that the United States does not have greater rates of infectious disease or the deaths attributed to them than do selected European countries (table 7-13), which is not surprising because U.S. immunization levels are sufficient to prevent many large outbreaks of disease. But even a relatively small number of outbreaks can result in many cases. For example, a U.S. resurgence of measles during 1989-90 resulted from seven large outbreaks among unvaccinated, preschool children in urban areas (4). Insofar as a country's level of childhood immunization is an indicator of overall participation in well-child care, the United States appears to lag behind most of Europe. Many other developed countries provide universal insurance coverage and actively promote preventive health care for children (191).

SUMMARY

Smoking cigarettes and drinking heavily are known to have both immediate and long-term adverse effects on health. As many as 20 percent of the deaths in developed countries can be attributed to smoking alone. Available evidence suggests that relatively fewer U.S. residents are smoking than are residents of either Canada or

[20] U.S. immunization rates are available for 1 to 4 year olds. In Europe, rates are presented for children underage 3 (table 7-12). By school age, U.S. rates improve, because State laws mandate immunization of school children (247).

Table 7-12--Completed Immunization Rates for Preschool Children, the United States and Selected European Countries, Most Recent Available Year

Country	Year	DTP[a,b]	Measles[c]	Polio[a,d]
United States	1985	64.9%	60.8%	553%
White		68.7	63.6	58.9
Ail other		48.7	48.8	40.1
Belglum[e]	1987	95.0	90.0	99.0
Denmark	1987	94.0[f]	82.0	100.0
England and Wales	1987	87.0[g]	76.0	87.0
France[e]	1986	97.0	55.0	97,0
Germany[h]	1987	95.0	50.0	95.0
Netherlands	1987	96.9	92.8	96.9
Norway	1987	80.0	87.0	80.0
Spain	1986	88.0	83.0	80.0
Switzerland (Different cantons)	1986	90-98	60-70	95-98

KEY: DTP= Diphtheria, tetanus, pertussis.

aThree doses or more.
bU.S. rates for children 1 to 4 years of age; European figures are for children under 3.
CU.S. rates are for children 1 to 4 years of age; European figures are for children under 2.
dU.S. rates are for children 1 to 4 years of age; European figures are for children 1 to 3 years of age.
'Estimated.
fRate is for combined diphtheria, tetanus, and polio immunizations. Pertussis (coverage--89.0%) and oral polio vaccines are given at separate visits; sequential immunization against polio by both injectable and oral vaccines is recommended.
gRate is for diphtheria and tetanus; rate for pertussis immunization is 73 percent.
hBased on data from the former Federal Republic of Germany.

SOURCE: B.C. Williams and CA. Miller, Preventive *Health Care for Young Children: Findings From a 10-Country* Study *and Directions for United States* Policy (Arlington, VA: National Center for Clinical Infant Programs, 1991).

selected Western European countries. In the mid- to late-1980s, the proportion of men smoking was 30 percent in the United States and 36 percent in Canada, and ranged from 40 to 62 percent in Europe. Current smoking-related deaths can be traced to smoking patterns that existed a decade or more ago. In the mid-1960s, males were less likely and females were more likely to smoke in the United States than in Western European.

Relatively more Canadian than U.S. residents drink alcohol, but the prevalence of heavy drinking is similar in Canada and the United States. People appear to abstain from alcohol or to drink infrequently at about the same rates in the United States and Europe.

Certain preventive health services (i.e., mammography, Pap test) tend to be used more in the United States than in Europe, and U.S. women are more likely than Canadian women to participate in cervical cancer screening and engage in monthly breast self-examination. U.S. residents are less likely than Canadians, however, to have their blood pressure checked, to use seatbelts regularly, and to have smoke detectors for their homes. U.S. residents are more likely than Canadians to be overweight and less likely to engage in regular exercise, especially if they are elderly.

Childhood immunization is substantially more widespread in Europe than in the United States, which may reflect higher use of well-child care associated with universal health insurance coverage and the promotion of preventive health services for children.

Table 7-13--Reported Pertussis and Measles Morbidity, United States and Selected European Countries, 1980-86

Country	1980	1981	1982	1983	1984	1985	1988	Total deaths per million population 1980-86a
Pertussis cases reported per 100,000 population								
United States	0.76	0.54	0.82	1.05	0.96	1.50	1.74	0.18
Denmark	9.70	8.52	2.60	3.68	6.59	3.58	2.22	0.59
England and Wales	4.66	4.33	14.30	4,35	1.29	4.88	7.98	0.76
France	0.02	0.01	0.03	0.02	0.01	NA	NA	0.49
Ireland	1.61	2.90	3.08	4.93	8.67	10.42	NA	2.86
Netherlands	0.02	0.04	0.06	0.13	0.37	1.05	1.48	0.07
Norway	4.90	4.92	5.13	6.53	3.32	2.95	1.89	0.00
Spain	NA	NA	14.08	9.26	9.37	15.73	14.50	0 . 3[b]
Switzerland	0.02	0.01	0.00	0.02	0.08	0.10	0.15	0.16
Measles cases reported per 100,000 population								
United States	5.96	1.36	0.74	0.64	1.10	1.18	2.61	0.11
Denmark	55.14	69.61	30.59	65.00	41.45	25.79	45.87	1.76
England and Wales	30.05	12.46	21.30	23.15	13.59	20.99	18.02	2,03
France	0.23	0.21	0.15	0.16	0.18	NA	NA	2.82
Ireland	3.25	3.12	5.45	17.62	16.22	27.97	NA	6.86
Netherlands	0.13	0.05	0.07	0.31	0.08	0.02	0.06	0.14
Norway	3.24	11.19	26.67	14.97	42.21	3.16	2.93	0.98
Spain	38.71	38.86	4203	7.90	10.15	20.95	57.16[c]	2.34[b]

KEY: NA = not available.

[a]The total number of reported deaths from 1980-88 divided by the mean annual population during this interval.

[b]1980-85 totals.

[c]1985 population used as denominator.

SOURCE: B.C. Williams and C.A. Miller, *Preventive Health Care for Young Children: Findings From a 10-country Study and Diredctions for United States Policy* (Arlington, VA: National Center for Clinical Infant Programs, 1991).

Appendix A: Acknowledgments

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Appendix B: International Comparability of Cause-of-Death Data

International differences in medical training and practices and in death certification procedures are among the factors that affect the comparability of cause-specific mortality data. Within-country studies indicate that from 12 to 29 percent of death certificates do not correctly report the autopsy-confirmed underlying cause of death (97). International differences in the accuracy of death certificates are likely because of differences in the use of diagnostic tests,[1] the proportion of physicians who are specialists, autopsy rates,[2] and hospital use for terminally ill patients (table B-l). More diagnostic information, for example, is probably available for certifying deaths that occur in medical facilities than for those occurring at home or elsewhere. The proportion of deaths occurring in hospitals or other medical facilities varies substantially by country from a low of 30 percent in Spain to a high of 79 percent in Sweden. in the United States, 60 percent of deaths occur in medical facilities (264).[3]

Aspects of the health care delivery system could also affect mortality reporting. Countries with national health insurance systems, for example, are more likely to have uniform medical records, which may enhance physicians access to cause-of-death information. Greater use of general practitioners and better continuity of care within such systems may also increase the likelihood of physicians' being familiar with decedents' medical histories.

There are documented international differences in how physicians complete death certificates and how countries code cause-of-death information (93,94,136).[4] Predictably, the greatest differences are observed at the level of specific diseases (e.g., site-specific cancers), but international differences in reporting and coding appear to exist even for broad categories of illness (e.g., malignant neoplasms, cardiovascular system diseases) (136). The Office of Technology Assessment (OTA) adjusted U.S. and French male age-adjusted

[1] Technology use trends have recently been linked to mortality trends. Secular increases in rates of death from breast and brain cancer probably stem from the increased use of noninvasive screening and diagnostic tests, especially among the elderly (47,1 18).

[2] The proportion of deaths for which an autopsy is performed varies significantly from a low of 4 percent in Japan to a high of 37 percent in Sweden (table B-1) (264). In the United States, 12 percent of deaths are autopsied. In U.S. teaching hospitals, between 20 and 30 percent of deaths are autopsied (168).

[3] Medical facilities do not include nursing homes.

[4] One type of coding problem is the extent to which imprecise codes are used to identify the underlying cause of death on the death certificate. In 1988-89, the proportion of deaths with the underlying cause of death "signs, symptoms, and other ill-defined conditions" (ICD-9 codes 780-799) such as "senility without mention of psychosis' (ICD-9 code 797) ranged from less than 1 percent of deaths in the United Kingdom, to more than 6 percent of deaths in France (table B-1). In France and the Netherlands, as many as 8 percent of deaths in the age group 15 to 44 are assigned underlying cause-of-death codes representing ''signs, symptoms, and other ill-defined conditions. " Before malting international comparisons, some analysts adjust mortality data by apportioning deaths attributed to nonspecific causes to other causes according to age- and cause-specific mortality patterns (1 12),

cancer mortality rates for international coding differences, to illustrate the extent to which they could affect published cause-specific mortality rates.[5] The published French male 1988 age-adjusted cancer rate is 22 percent higher than the U.S. rate (262.5 vs. 215.5 per 100,000), but when further adjusted for various coding differences, the French rate could be from 11 to 26 percent higher than the U.S. rate.

It should not be surprising that there are international differences in how causes of death are recorded on death certificates. The underlying cause of death recorded on each death certificate is used for comparison, but identifying a single underlying cause of death has become more difficult as an increasing proportion of deaths occurs among the elderly, who are likely to have more than one chronic illness contributing to death.[6] Even for younger decedents, deaths increasingly result from chronic diseases that often cannot be well characterized by single causes (86).[7]

International comparability of data on cause-specific mortality will likely improve as countries adopt automated cause-of-death coding systems. Furthermore, physicians' training regarding appropriate methods for completing death certificates will improve the quality of the data (170,229).

---

[5] OTA adjusted the rates for differences in how physicians assign the underlying causes of death on death certificates and for the use of nonspecific cause-of-death codes (136).

[6] In most developed countries at least one-third of deaths occur among those aged 80 and older, and approximately 60 to 70 percent of deaths are attributed to three chronic diseases: heart disease, cancer, and stroke.

[7] Some advocate analyzing all of the causes listed as contributing to death to better understand the contribution to death of conditions like diabetes, which is rarely reported as the underlying cause of death on death certificates (122). Such multiple-cause-of-death analyses provide information on the prevalence of disease at death but are limited because of differences in the extent to which physicians list causes other than the underlying cause of death on the certificate. There are probably international differences in the extent to which physicians list more than one cause on the certificate, in part, because of differences in the format of death certificates.

Table B-I-Background Information on Mortality Statistics, Circa 1989[a]

country	% deaths medically certified	% deaths occurring in a hospital or other medical establishment	% deaths for which an autopsy was performed: Age	%	Followup inquiries in case of doubt about the cause of death	Death recorded by dateo f:	Coding procedure	Remarks on coverage of mortality	% deaths attributed to 'signs, symptoms and other ill-defined conditions": Age	%	% deaths among elderly (age 85 and over) attributed to "senility without mention of psychosis"
WHO *Region* of the Americas											
United states	100	60	0 1-14 15-44 45-64 65+ All ages	46 45 15 16 5 12	Yes, for about 10% of deaths.	Occurrence	Coded by National center for Health Statistics or under its guidance.	Since, 1970, residents only except fordeaths)a tabulated by place or occurrence.	1-4 5-14 15-44 45 - 64 65 +	4 2 3	<1%
Canada	100	73[b]	o 1-4 5-14 15-44 45-64 65+ All Ages	62 55 49 56 29 13 20	Yes	Occurrence	Separately coded in large provinces, centrally for the small ones.	All deaths occurring in counry; residents dying abroad included.	1-4 5-14 15-44 45 - 64 65 +	5 3 3	<1
WHO European Region											
France	100	50	*No information*		Yes	Occurrence	Centrally coded.	Oversees departments and territories included.	1-4 5-14 15-44 45-64 65+	9 4 8 4 4	2
Germany[c]	100	53	8		Yes	Occurrence	Descendmas under guidance Of Federal Statistical Office.	dying abroad included; Berlin (west) included.	1-4 5-14 1544 45-64 65+	7 3 5 3 1	

Table B-I-Background Information on Mortality Statistics, Circa 1989a (Continued)

country	% deaths medically certified	% deaths occurring in a hospital or other medical establishment	% deaths for which an autopsy was performed: Age	%	Followup inquiries in case of doubt about the cause of death	Death recorded by date of:	Coding procedure	Remarks on coverage of mortality	% deaths attributed to "signs, symptoms and other ill-defined conditions": Age	%	% deaths among elderly (age 65 and over) attributed to "senility without mention of psychosis"
Italy	100	37	No information		Yes	Occurrence	Centrally coded.	All deaths occurring in country; nationals resident abroad excluded.	1-4 5-14 15-44 45-64 65+	4 2 3 1 1	2
Netherlands	100	44	0 1-14 15-44 45-64 65+ All ages	48 18 14 11 7 8	Yes	Occurrence	Centrally coded.	Residents and nationals dying abroad included; resident foreigners included.	1-4 5-14 15-44 45-64 65+	12 9 8 4 2	
Spain	100	30	No Information		Yes, in some regions	Occurrence	Decentralized, reviewed by National Institute of Statistics.	All deaths occurring in country; nationals dying abroad excluded.	1-4 5-14 15-44 45-64 65+	3 1 2 1 1	2
Sweden	100	79	0 1-14 15-44 45-64 65+ All ages	74 66 76 56 36 37	Yes, about 3% of deaths	Occurrence	Centrally coded.	Residents dying abroad included; nationals resident abroad excluded.	1-4 5-14 15-44 45-64 65+	6 1 2 1 0	
United Kingdom England and Wales	100	57	0-14 15-44 45-64 65+ All ages	56 62 36 22 26	Yes, 2-3% of death	Registration	Centrally coded	All deaths occurring in England and Wales	1-4 5-14 15-44 45-64 65+	3 <1 <1 <1 <1	

Table B1-Background Information on Mortality Statistics, Circa 1989[a] (Continued)

country	% deaths medically certified	% deaths occurring in a hospital or other medical establishment	% deaths for which an autopsy was performed Age	%	Followup inquiries in case of doubt about the cause of death	Death recorded by date of	Coding prooedure	Remarks on coverage of mortality	% deaths attributed to "signs, symptoms and other ill-defined conditions" Age	%	% deaths among elderly (age 65 and over) attributed to "senility without mention of psychosis"
WHO Western Pacific Region											
Australia	100	75[d]	0	43	Yes, 9% of death certifiedd queried in 1985.	Occurrance	Decentralized with quality control through a system of sample checking at state and national levels.	All deaths occurring in country except foreign diplomatic personnel; nationals dying abroad excluded.	1-4	3	<1
			1-14	68					5-14	1	
			15-44	70					15-44	1	
			45-64	29					45-64	<1	
			65+	12					65+	<1	
			All ages[e]	21							
Japan	100	67	0	19	No	Occurrence	Centrally coded.	Resident nationals only.	1-4	3	5
			1-14	12					5-14	1	
			15-44	8					15-44	1	
			45-64	7					45-64	<1	
			65+	3					65+	1	
			Allages	4							
New Zealand	100	63	0	74	Yes	Registration	Centrally coded.	An occurring in country; nationals dying abroad excluded.	1-4	3	<1
			1-14	71					5-14	0	
			15-44	71					15-44	<1	
			45-64	35					45-64	<1	
			65+	18					65+	<1	
			All ages	26							

aSatistics reflect situation around 1989.
[b]Excluding Quebec.
cBased on data from the former Federal Republic of Germany.
'Based on data for New South Wales.
ebased on for western Australia.

SOURCES: World Health Organization, World Health Statistics Annual (Geneva, Switzerland: World Health Organization, 1969,1990,1991, and 1992); M. Chief, Demographer, New Zealand Department of Statistics, Christchurch, New Zealand, personal communication, August 6, 1993.

Appendix C: International Mortality Comparisons by Age: Tables and Figures

Table C-I-Trends In Age-Specific Death Rates (per 100,000), Males, United States and Selected Countries, 1955-59 to 1980-84

country	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age 15-24						
United States	161.1	150.2	174.7	186.6	169.7	151.7
Australia	159.4	140.2	151.6	167.0	159.6	135.6
Canada	144.1	139.6	151.3	172.8	165.3	135.5
France	123.3	115.8	131.2	148.1	147.0	140.3
Germany[a]	161.9	154.6	144.8	157.9	146.1	119,6
Italy	127.2	127.2	110.6	108.4	98.2	99.3
Japan	186.9	145.1	116.0	113.7	88.7	77.4
Netherlands	85.7	87.0	97.0	104.7	89.8	74.0
New Zealand	152.1	128.3	146.6	159.9	168.4	152.1
Norway	113.7	106.6	101.6	111.1	104.3	107.1
Spain	129.9	105.2	106.0	102.0	99.0	92.4
Sweden	107.1	100.8	100.0	103.2	97.8	78.7
United Kingdom	98.9	100.0	97.8	96.4	93.9	83.4
Age 25-34						
United States	180.9	189.5	207.4	211.4	190.6	183.0
Australia	171,6	159.2	154.2	143.3	135.2	128.8
Canada	170.0	156.8	158.1	155.6	150.8	134.3
France	204.6	186.8	177.3	163.9	153.7	161.4
Germany[a]	187.4	171.8	162.5	166.2	149.8	129.3
Italy	169.4	159.2	132.6	119.3	105.7	103.5
Japan	262.6	211.3	170.7	140.7	106.8	84.8
Netherlands	106.7	106.5	104.2	96.9	86.8	85.1
New Zealand	165.1	145.4	152.4	141.1	137.8	139.2
Norway	136.9	131.1	126.1	119,1	106.4	104.7
Spain	201.7	167.7	157.6	143.0	128.0	118.5
Sweden	132.5	120.6	128.6	123.5	126.8	116.3
United Kingdom	122.6	113.0	104.8	102.0	99.1	93.2

Table C-l-Trends in Age-Specific Death Rates (per 100,000), Males, United States and Selected Countries, 1955-59 to 1980-84 (Continued)

Country	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age 35-44						
United States	373.9	374.4	397.6	384.5	321.2	280.9
Australia	291.4	296.7	310.0	286.2	247.3	196.2
Canada	288.4	282.9	284.4	289.6	263.0	213.5
France	364.9	347.3	354.4	346.5	317.9	278.6
Germany[a]	297.9	284.4	293.4	304.2	290.4	269.3
Italy	292.8	285.7	282.6	257.4	231,9	205.7
Japan	386.0	325.7	298.0	283.6	230.5	191.6
Netherlands	194.3	197.4	208.9	202.9	180.1	163.6
New Zealand	256.4	261.6	277.6	275.9	250.4	211.6
Norway	217.3	233.2	239.3	236.6	208.9	185.8
Spain	325.7	287.0	285.7	266.2	246.7	217.0
Sweden	216.4	210.2	229.6	234.3	235.4	202.0
United Kingdom	254,9	250.0	244.3	233.4	213.5	184.5
Age 45-54						
United States	975.1	973.2	971.9	926.1	819.6	721.7
Australia	782.9	801.1	820.7	796.3	713.5	593.0
Canada	763.1	749.6	751.0	736.9	705.8	592.0
France	922.1	865.0	832.3	797.6	821.7	768.7
Germany[a]	764.1	768.7	748.8	720.9	724.6	676.4
Italy	740.9	740.3	719.2	687.5	698.9	624.8
Japan	876.6	772.7	678.3	578.2	529.1	517.2
Netherlands	545.3	573.8	599.4	598.1	568.2	510.7
New Zealand	684.4	731.9	759.7	734.3	728.1	609.2
Norway	534.7	547.4	587.0	605.1	599.6	565.1
Spain	755.0	676.0	634.5	632.4	610.4	558.5
Sweden	527.4	514.2	533.1	560.1	574.5	521.4
United Kingdom	762.9	752.6	732,1	737.1	708.7	609.6

Table C-l-Trends in Age-Specific Death Rates (per 100,000), Males, United States and Selected Countries, 1955-59 to 1080-84 (Continued)

Country	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age 55-64						
United States	2283.2	2285.7	2324.5	2216.4	1921.6	1750.1
Australia	2127.4	2135.8	2176.9	2133.5	1827.8	1569.1
Canada	1955.3	1927.1	1899.3	1853.9	1760.7	1550.5
France	2141.2	2114.0	2078.3	1861.5	1743.3	1623.4
Germany[a]	2011.8	2105.1	2128.9	2066.2	1854.8	1655.9
Italy	1865.8	1926.3	1915.8	1824.6	1770.5	1643.7
Japan	2165.7	2017.0	1811.1	1560.2	1287.3	1110.9
Netherlands	1481.0	1598.8	1694.6	1721.7	1610.5	1489.1
New Zealand	1891.1	1928.6	2048.6	2033.8	1804.6	1714.1
Norway	1408.8	1514.6	1547.9	1556.2	1520.0	1488.0
Spain	1809.0	1705.6	1685.2	1634.2	1522.7	1362.2
Sweden	14332	1441.6	1407.9	1416.4	1427.4	1367.6
United Kingdom	2231.3	2220.4	2158.0	2087.7	1954.6	1788.0
Age 65-74						
United States	4811.6	4954.5	5080.9	4765.5	4234.9	3953.1
Australia	50822	5168.7	5314.3	5158.4	4435.7	3972.7
Canada	4425.8	4380.7	4358.9	4257.9	4027.2	3735.9
France	4827.9	4675.9	4724.7	4405.9	4068.2	3788.6
Germany[a]	4898.2	5013.8	5267.2	5237.8	4936.0	4572.6
Italy	4342.8	4464.1	4751.6	4522.0	4155.1	4000.7
Japan	5465.9	5122.2	4731.3	4247.3	3542.1	3093.7
Netherlands	3635.7	3802.8	4117.2	4262.7	4245.9	4023.7
New Zealand	4792.6	4787.6	4897.5	4601.3	4633.7	4297.4
Norway	3436.2	3716.3	3863.5	4002.7	3821.9	3764.3
Spain	4570.8	4355.2	4169.8	4202.8	3931.0	3384.3
Sweden	3764.7	3830.2	3832.7	3772.7	3757.9	3564.4
United Kingdom	5$472	5454.4	5386.9	5263.5	5013.4	4636.2

aBased on data from the former Federal Republic of Germany.

SOURCE: World Health Organization, *World* Health *Statistics Annual (Geneva* Switzerland: World Health Organization, 1988).

Table C-2--Trends in Age-Specific Death Rates (per 100,000), Females, United States and Selected Countries, 1955-59 to 1980-84

Country	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age 15-24						
United States	65.1	61.0	65.3	66.1	58.9	52.9
Australia	56.5	55.3	57.0	57.8	52.1	45.1
Canada	56.8	54.4	53.0	58.1	53.1	43.2
France	59.3	54.6	57.1	58.6	54.7	51.1
Germany[a]	61.9	56.6	55.5	58.4	55.9	44.5
Italy	67.0	56.3	48.0	44.6	37.2	33.2
Japan	132.5	83.9	58.2	52.8	38.6	30.5
Netherlands	41.3	34.9	39.8	42.0	35.8	31.9
New Zealand	61.2	54.4	50.9	59.8	59.9	62.7
Norway	38.4	35.1	36.9	33.3	35.3	31.7
Spain	85.0	56.9	48.1	44.3	37.6	35.0
Sweden	46.0	42.1	43.7	42.3	41.4	31.1
United Kingdom	46.8	41.6	41.6	40.9	38.4	33.0
Age 25-34						
United States	108.6	106.4	104.3	96.5	78.8	71.6
Australia	89.5	83.9	80.2	73.3	61.1	53.5
Canada	92.1	79.4	75.4	73.8	64.1	56.3
France	108.6	91.9	83.6	75.8	68.5	67.8
Germany[a]	112.5	92.6	81.7	78.8	72.7	62.3
Italy	111.5	93.8	76.6	65.5	53.3	47.8
Japan	211.6	143.5	104.6	83.2	63.1	53.3
Netherlands	71.2	61.2	58.6	55.7	53.1	47.7
New Zealand	91.8	83.9	83.2	75.7	74.4	67.9
Norway	68.7	56.1	47.7	49.4	44.4	41.0
Spain	148.4	111.4	86.5	73.9	60.2	50.2
Sweden	73.4	68.9	64.2	58.7	58.7	53.5
United Kingdom	88.0	74,8	66.2	59.4	57.9	52.2
Age 35-44						
United States	232.0	228.0	235.1	220.1	175.4	148.2
Australia	199.1	189.9	190.2	178.8	146.6	112.2
Canada	186.5	168.8	167.8	165.6	145.3	123.1
France	217.1	188.7	178.4	166.8	148.5	131.6
Germany[a]	211.4	193.3	187,4	172.0	152.2	140.6
Italy	204.1	178.7	164.4	142.7	122.4	109.8
Japan	308.1	230.7	185.2	156.1	124.3	105.1
Netherlands	155.5	136.8	140.3	132.6	119.4	105.7
New Zealand	200.7	188.2	190.9	194.1	175.1	142.6
Norway	142.1	132.1	126.1	118.8	102.9	98.8
Spain	242.5	189.5	166.9	150.1	126.6	102.1
Sweden	161.7	140.3	144.3	135.6	128.5	109.7
United Kingdom	192.2	181.3	175.1	162.7	148.3	123.8

Table C-2-Trends In Age-Specific Death Rates (per 100,000), Females, United States and Selected Countries, 1955-59 to 1980-84 (Continued)

Country	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age 45-54						
United States	536.1	522.0	517.5	496.1	437.3	393.5
Australia	475.3	459.2	474.3	452.0	387.2	321.4
Canada	450.4	418.4	408,6	391.2	368.5	319.9
Frame	480.1	429.8	403.8	369.3	342.2	306.8
Germany[a]	458.2	449.8	438.8	422.3	392.3	331.3
Italy	435.3	416.0	394.6	353.4	321.4	284.6
Japan	604.3	506.0	421,1	350	289.6	249.9
Netherlands	361.3	339.4	338.8	341.6	316.4	287.6
New Zealand	484.7	454.0	480.3	462.7	446.3	402.4
Norway	333.8	307.0	303.8	298.4	291.1	266.2
Spain	471.8	411.6	369.4	348.6	300.4	253.9
Sweden	382.4	360.3	331.8	324.8	309.7	280.7
United Kingdom	463.0	452.1	443.6	448.1	430.2	375.2
Age 55-64						
United States	1216.6	1164.2	1120.3	1078.2	960.0	921.4
Australia	1123.6	1081.2	1081.5	1058.1	909.8	780.5
Canada	1121.1	1025.0	962.4	913.5	843.4	772.5
France	1058.1	949.1	892.3	831.4	711.5	629.8
Germany[a]	1121.0	1059.5	1043.3	1006.6	897.0	793.1
Italy	1084.2	1001.3	955.6	890.8	801.8	710.3
Japan	1361.9	1177.3	1015.7	866.3	690.6	572.4
Netherlands	920.3	837.2	821.7	779.4	714.6	671.4
New Zealand	1148.2	1090.8	1098.8	1060.3	1020.1	941.7
Norway	833.6	828.9	789.9	716.7	698.5	671.8
Spain	1093.7	1000.5	916.7	848.0	744.3	613.1
Sweden	972.9	873.9	807.8	752.7	708.5	676.2
United Kingdom	1139.1	1094.0	1054.1	1053.0	1027.1	981.5
Age 65-74						
United States	2944.8	2828.6	2759.2	2495.8	2151.0	2105.4
Australia	3008.3	2877,2	2876.8	2735.4	2249.7	2000.8
Canada	2899.4	2698.8	2443.4	2241.3	2059.9	1918.6
France	2850.2	2561.5	2396.9	2131.7	1872.0	1709.1
Germany[a]	3432.2	3120.1	3053.6	2859.6	2538.4	2313.9
Italy	3212.3	2945.4	2837,0	2517.1	2189.0	2044.5
Japan	3741.9	3312.4	2903.0	2522.6	2028.6	1695.2
Netherlands	2856.7	2570.4	2430.5	2272.8	2001.9	1799.2
New Zealand	3004.3	2871.1	2805.3	2666.7	2517.5	2402.0
Norway	2548.7	2547.4	2383.9	2224.7	1975.5	1818.2
Sweden	2950.2	2691.9	2432.1	2169.6	1980.7	1837.7
Spain	3213.3	2897.7	2657.0	2506.6	2172.4	1790.3
United Kingdom	3198.6	3048.9	2869.1	2738.7	2600.3	2472.6

aBased on data from the former Federal Republic of Germany.

SOURCE: World Health Organization, world Health Statistics (Geneva, Switzerland: World Health Organization , 1988).

Table C-3a-Age- and Cause-Specific Death Rates (per 100,000), United States, 198@

cause of death	Age O death rate	Age 1-4 death rate	Age 5-14 death rate	Age 15-24 death rate	Age 25-34 death rate	Age 35-44 death rate	Age 45-54 death rate	Age 55-64 death rate	Age 65-74 death rate	Age 75+ death rate
Male										
Total	1099.0	56.5	30.9	151.0	196.7	301.4	629.0	1606.9	3573.8	10122.0
Cancer	2.3	3.8	3.6	5.9	11.7	39.7	166.3	526.7	1072.7	1985.8
Heart	29.7	2.8	1.4	4.8	14.7	62.5	229.2	676.1	1632.4	5234.9
Accidents	26.5	23.1	15.7	75.1	60.0	51.0	47.0	51.2	68.6	186.9
Violence	8.9	3.2	1.8	26.5	27.8	20.1	13.2	9.6	7.4	8.7
Infection	18.1	2.0	0.6	1.0	3.3	6.2	9.2	18.9	43.8	136.2
other	1013.5	21.6	7.8	37.7	79.2	121.9	164.1	324.4	748.9	2569.5
Females										
Total	886.3	45.0	20.4	52.1	74.0	140.0	350.9	904.7	2056.1	7632.6
Cancer	2.3	3.7	2.7	4.2	12.2	48.5	154.9	376.6	659.2	1064.4
Heart	25.0	2.9	1.1	3.0	7.8	24.5	89.1	296.2	871.4	4481.9
Accidents	21.3	15.9	8.4	23.3	16.6	15.0	16.0	20.7	35.4	121.4
Violence	9.3	2.7	1.2	6.6	8.3	5.5	3.7	3.1	3.7	4.4
Infection	15.5	1.8	0.6	0.9	1.7	3.1	5.5	13.0	29.3	119.9
Other	812.9	18.0	6.4	14.1	27.4	43.4	81.7	195.1	457.1	1840.6

SOURCES: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Healt

[a] Cancer includes ICD-Basic Tabulation list codes 08-14; heart, 25-30; accidents, E47-E53; violence, E55-E

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from Us. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from Us. rate
				Australia						
Males										
Total	972.1	-1 1.5%	45.7	-19.1%O	26.6	-1 3.9%	134.5	-10.9%	144.2	-26.7%.
cancer	4.0	73.9%	3.2	-15.8%	5.0	38.9%	6.8	15.3%	13.2	12.8%
Heart	2.4	-91.9%	0.8	-71 .4%	0.8	-42.9%	4.0	-16.7%	10.0	-32.0%
Accidents	18.2	-31.370	22.5	-2.6%0	13.3	-1 5.3%	74.1	-1.3%	55.9	-6.8%
Violence	1.6	-82.O%	1.2	-62.5%	0.8	-55.6%	5.1	-80.8%	6.1	-78.1 %
Infection	10.3	-43.1%	2.0	0.0%	0.9	50.O%	0.8	-20.0%	2.0	-39.4%
Other	935.6	-7.7%	16.0	-25.9%	5.8	-25.6%	43.7	15.9%	57.0	-28.O%
Females										
Total	754.4	-14.9%	41.6	-7.6%	16.5	-19.1 %	47.5	-8.8%	53.3	-28.O%
Cancer	0.8	-65.2%	4.2	13.5%	2.3	-14.8%	3.7	-11.9%	10.8	-1 1.5%
Heart	5.0	-80.0%0	1.0	-65.5%	0.7	-36.4%	2.2	-26.7%.	5.8	-25.6%
Accidents	20.8	-2.3%	15.5	-2.5%	6.7	-20.2%	21.3	-8.6%	12.6	-24.1 %
Violence	5.0	-46.2%0	1.7	-37.O%	0.7	-41.7%	3.3	-50.0%	3.1	-62.7%
Infection	9.2	-40.60/0	1.7	-5.6%	0.7	16.7%	0.7	-22.2%	0.1	-94.1%
other	713.6	-12.2%	17.5	-2.8%	5.4	-15.6%	16.3	15.6%	20.9	-23.7%

Cause of death	Age 35-44 Death rate	Age 35-44 Y. different from U.S. rate	Age 45-54 Death rate	Age 45-54 Y. different from U.S. rate	Age 55-64 Death rate	Age 55-64 Y. different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ Y. different from U.S. rate
					Australia					
Males										
Total	185.4	-38.5%	456.7	-27.4%	1359.7	-15.4%	3465.3	-3.0%	10023.4	-1.0%
Cancer	35.8	-9.8%	145.7	-12.4%	495.6	-5.9%	1096.6	2.2$/0	2179.4	9.7%
Heart	45.3	-27.5%	167.3	-27.0%	556.6	-17.7%	1639.2	0.4%	5146.6	-1.7%
Accidents	33.1	-35.1 %	36.0	-19.1%	43.9	-14.370	58.0	-15.5%	178.2	4.7%
Violence	5.3	-73.6%	4.3	-67.4%	4.5	-53.1 %	3.0	-59.5%	3.5	-59.8%
Infection	2.7	-56.5%	4.6	-50.O%	5.0	-73.5%	15.6	-64.4%	56.5	-57.0%
Other	63.2	-48.2%	96.8	-41.0%	254.1	-21.7%	652.9	-12.8%	2457.2	-4.4%
Females										
Total	101.6	-27.4%	270.0	-23.1 %	713.9	-21.1%	1814.4	-11.8%	7446.0	-2.4%
Cancer	48.0	-1 .0%	144.2	-6.9%	336.5	-10.6%	586.1	-11.1%	1088.6	2.3%
Heart	13.3	-45.7%	51.9	-41.8%	215.2	-27.3%	826.0	-5.2%	4582.3	2.2%
Accidents	9.7	-35.3%	15.5	-3.1%	17.3	-16.4%	31.4	-11.3%	145.9	20.2%
Violence	3.3	-40.0%	2.9	-21.6%	0.8	-74.25/0	1.0	-73.0%	2.7	-38.6%
Infection	0.7	-77.4%	2.0	-63.6%	4.4	-66.2%	9.9	-66.2%	36.8	-67.6%
Other	26.6	-38.7%	53.5	-34.5%	139.7	-28.4%	360.0	-21 .2%	1587.7	-13.7%

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from Us. rate
					Canada					
Males										
Total	803.9	-26.9%	45.5	-19.5%	28.9	-6.5%	121.9	-19.370	132.0	-32.9%
Cancer	1.6	-30.4%	4.6	21.1%	4.9	36.1%	6.3	6.8%	10.7	-8.5%
Heart	10.4	-65.0%	1.2	-57.1%	0.5	# . 3 %	2.4	-50.O%	7.7	-47.67.
Accidents	12.5	-52.8%	17.3	-25.1 %	14.2	-9.6%	66.1	-12.0%	49.9	-16.8%
Violence	3.6	-59.6%	0.6	-81 .3%	0.8	-55.6%	4.7	-82.3%	7.6	-72.7%
Infection	6.2	-65.7%	0.9	-55.0%	0.4	-33.3%	0.3	-70.O%	0.9	-72.7%
Other	769.6	-24.1%	20.9	-3.2%	8.1	3.8%	42.1	11,770	55.2	-30.3%
Females										
Total	631.7	-28.7%	36.6	-18.7$70	17.1	-16.2%	38.8	-25.5%	50.2	-32.2%
Cancer	2.7	17.4%	4.3	16.2%	3.0	11.1%	3.8	-9.5%	12.4	1.6%
Heart	4.9	-80.4%	2.0	-31.0%	0.7	-36.4%	1.5	-50.0%	4.5	-42.3%
Accidents	16.9	-20.7%	10.2	-35.8%	6.5	-22.6%	16.5	-29.2%	11.5	-30.7%
Violence	2.7	-71.070	1.6	-40.7%	0.4	436.7%	2.2	-66.7%	3.3	40.2%
Infection	4.4	-71 .6%	1.1	-38.9%	0.3	-50.O%	0.6	-33.3%	0.6	64.7%
Other	600.1	-26.2%	17.4	-3.3%	6.2	-3.1%	14.2	0.7%	17.9	-34.7%

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from Us. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Canada					
Males										
Total	189.1	-37.3%	474.9	-24.5%	1390.1	-1 3.5%	3474.7	-2.8%	10148.3	0.3%
Cancer	33.7	-15.1%	151.1	-9.1%	527.6	0.2%	1183.2	10.3%	2275.1	14.6%
Heart	40.1	-35.8%	161.9	-29.4%	538.6	-20.3%	1483.8	-9.1%	4743.5	-9.4%
Accidents	37.5	-26.5%	39.2	-16.6%	47.7	-6.8%	63.8	-7.O%	216.5	15.6%
Violence	6.6	-67.2%	5.9	-55.3%	5.7	-40.6%	5.5	-25.7%	8.2	-5.7'%
Infection	0.9	-85.570	1.9	-79.3%	7.4	-60.8%	19.9	-54.6%	52.0	-61.8%
Other	70.3	-42.3%	114.9	-30.0%	263.1	-18.90/o	718.5	-4.1%	2853.0	1 1.0%
Females										
Total	105.3	-24.8%	280,4	-20.1 %	729.3	-19.4%	1771.1	-13.9%	7133.6	-6.5%
Cancer	46.8	-3.5%	149.9	-3.2%	369.9	-1.870	669.5	1.6%	1179.3	10.8%
Heart	15.2	-38.0%	53.2	-40.3%	191.3	-35.4%	681.6	-21.8%	3844.4	-14.2%
Accidents	9.5	-36.7%	13.8	-13.7%	20.3	-1.9%	33.6	-5.1%	177.5	46.2%
Violence	3.0	-45.5%	3.7	O.O%	2.5	-19.4%	1.7	-54.1%	3.0	-31.8%
Infection	0.9	-71.070	1,8	-67.3%	5.2	-60.0%	12.0	-59.0%	42.4	-64.6%
Other	29.9	-31.1%	58,0	-29.0%	140.1	-28.2%	372.7	-18.5%	1687.0	2.5%

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					France					
Males										
Total	892.9	-18.8%	47.6	-15.8%	24.7	-20.170	115.8	-23.3%	163.2	-17.09/0
Cancer	4.3	87.O%	4.2	10.5%	3.7	2.8%	6.7	13.6%	11.9	1.7%
Heart	13.4	-54.9%	1.4	-50.0%	1.0	-28.6%	3.2	-33.3%	10.2	-30.6%
Accidents	38.7	46.0%	16.6	-28.1 %	10.4	-33.8%	66.4	-11.6%	55.2	-8.O%
Violence	3.8	-57.3%	2.7	-15.6%	1.2	-33.3%	5.2	-80.4%	8.0	-71.2%
Infection	18.5	2.2%	1.1	-45.0%	0.7	16.7%	0.7	-30.O%	0.9	-72.7%
Other	814.2	-1 9.7%	21.6	0.O%	7.7	-1.3%	33.6	-10.9%	77.0	-2.8%
Females										
Total	668.4	-24.6%	37.3	-17.1 %	17.4	-14.7%	40.2	-22.8%	60.9	-17.7%
Cancer	4.5	95.7%	4.1	10.8%	2.4	-11.1%	4.1	-2.4%	11.8	-3,3%
Head	10.4	-58.4%	1.9	-34.5%	1.0	-9.1%	2.4	-20.0%	5.0	-35.9%0
Accidents	32.2	51.2%	11.1	-30.2%	6.5	-22.6%	17.5	-24.9%	12.6	-24.1%
Violence	4.8	48.4%	2.2	-18.5%	0.7	-41.7%	1.4	-78.8%	2.5	-69.9%
Infection	10.6	-31 .6%	2.1	16.7%	0.4	-38.3%	0.6	-33.3%	0.8	-52.9%
Other	605.9	-25.5%	15.9	-11 .7%	6.4	O.O%	14.2	0.7%	28.2	2.9%

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 O/. different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					France					
Males										
Total	272.3	-9.7%	640.8	1 .9%	1498.3	43.8%	3004.1	-15.9%	9623.2	-4.9%
cancer	58.0	46.1 %	254.0	52.7%	677.0	28.5%	1197.9	11 .7%	2371.1	19.4%
Heart	40.1	-35.8%	116.6	-49.1%	350.7	-48.1%	926.8	-43.2%	3793.6	-27.5%
Accidents	47.0	-7.8%	56.6	20.4%	70.0	36.7%	106.3	55.0%	369.3	97.6%
violence	7.7	-61.7%	7.7	-41 .7%	6,0	-37.5%	6.8	-8.1%	12.9	48.3%
Infection	2.4	-61.3%	5.6	-39.1%	14.1	-25.4%	34.7	-20.8%	132.0	-3.1%
#her	117.1	-3.9%	200.3	22.1%	380.5	17.3Y0	731.6	-2.3%	2944.3	14.6Y0
Females										
Total	119.7	-14.5%	272.9	-22.2$/0	558.8	-38.2%	1311.6	-36.2%	7157.4	-6.2%
Cancer	42.3	-12.8%	125.3	-19.1 %	267.3	-29.0%	488.1	-26.0%	1095.5	2.9%
Heart	12.0	-51.0%	33.5	-62.4%	107.4	-63.7%	409.8	-53.0%	3256.7	-27.3%
Accidents	14.0	6.7%	18.2	13.7Y0	24.9	20.3%	48,1	35.9%	384.1	216.4%
Violence	3.3	40.0%	4.0	8.I%	2.7	-12.9%	3.5	-5.4%	6.6	50.0%
Infection	1.1	-64.5%	2.2	-60.0%	6.3	-51.5%	18.2	-37.9%	97.3	-18.8%
Other	47.0	8.3%	89.7	9.8%	150.2	-23.0%	343.9	-24.8%	2317.2	25.9%

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					Germany[a]					
Males										
Total	866.9	-21 .1%	46.6	-1 7.5%	24.0	-22.3%	90.2	-40.3%	109.8	-44.2%0
Cancer	2.9	26.1 %	5.0	31 .60/0	4.2	16.7%	6.5	1 0.2%	12.4	6.0%
Heart	5.5	-81.570	2.1	-25.0%	0.9	-35.770	3.3	-31 .30/.	10,0	-32.0%
Accidents	17.8	-32.8%	14.6	-36.8%	9.9	-36.970	47.6	-36.6%	28.8	-52.0%
Violence	4.8	-46.1%	1.3	-59.4%	0.8	-55.6%	3.3	-87.570	4.2	-84.9%
Infection	10.9	-39.870	2.1	5.0%	0.7	16.70/'	0.5	-50.0%	0.9	-72.7%
Other	825.0	-1 8.6%	21.5	-0.5%	7.5	-3.80/.	29.0	-23.1%	53.5	-32.4%
Females										
Total	626.5	-29,3%	37.5	-16.7%	16.1	-21.1%	34.4	-34.0%	50.7	-31,570
Cancer	1.8	-21 .7%	3.6	-2.7%	3.0	11 .1%	4.3	2.40/o	13.9	13.9%
Heart	4.6	-81.6%	0.8	-72.4%	0.6	-45.570	2.2	-26.70/0	5.8	-25.6%
Accidents	17,6	-17.4%	9.9	-37.7%	5.0	-40.5%	12.7	-45.5%	6.4	-61.4%
Violence	2.4	-74.2%	1.0	-63.0%	0.9	-25.0%	1.7	-74.2%	2.1	-74.7%
Infection	11.2	-27.7%	2.4	33.3%	0.6	0.0%	0.4	-55.670	0.6	-64.7%
Other	588.9	-27.6%	19.8	10.0%	6.0	-6.2%	13.1	-7.1%	21.9	-20.1%

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Germany[a]					
Males										
Total	215.9	-28.4%	588.7	-6.4%	1530.2	-4.8%	3758.4	5.2%	11374.5	12.4%
Cancer	47.0	18.4%	189.5	14.0%	536.5	1 .9%	1167.3	8.8%	2516.6	26.70/o
Heart	46.1	-26.2%	176.9	-22.8%	600.6	-11.2%	1773.0	8.6%	6218.8	18.8%
Accidents	24.4	-52.2%	30.7	-34.7%	33.5	-346%	46.0	-32.9%	176.7	-5.5%
Violence	4.5	-77.6%	4.8	-63.6%	3.7	-61.5%	4.9	-33.80/0	7.4	-14.970
Infection	2.7	-56.570	4.4	-52.2%	11.8	-37.6%	26.2	-40,2%	65.4	-52.0%
Other	91.2	-25.2%	182.4	1 1.2%	344.1	6.1%	741.0	-1 .1%	2389.6	-7.0%
Females										
Total	120.1	-14.2%	287.1	-18.2%	707.1	-21 .8%	1903.4	-7.4%	8220.7	7.7%
Cancer	52.4	8.0%.	146.2	-5.6%	329.5	-12,5%	647.6	-1 .8%	1379.9	29.6%
Heart	17.2	-29.8%	49.8	-44.1%	204.3	-31.0%	840.4	-3.6%	5066.5	13.0%
Accidents	6.2	-58.770	9.1	-43.1%	11.9	-42.5%	28.0	-20.9%	180.7	48.8%
Violence	3.0	-45.5%	2.4	-35.1%	2.1	-32.3%	1,9	-48.6%	4.7	6.8%
Infection	1.2	-61.3%	2.3	-58.2%	5.0	-61.5%	14.3	-51 .20/0	49.0	-59.1%
Other	40.1	-7.6%	77.3	-5.4%	154.3	-20.9%	371.2	-1 8.80/0	1539.9	-16.3%

Table C-3b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					Italy					
Males										
Total	1015.4	-7.6%	35.4	-37.3%	22.2	-28.2%	89.1	-41.0%	109.9	-44.1%
Cancer	4.0	73.9%	5.0	31.6%	5.0	38.9%	7.4	25.4%	12.2	4.3%
Heart	5.4	-81 .8%	2.3	-17.9%	1.1	-21.4%	4.9	2.1%	10.7	-27.2%.
Accidents	14.1	-46.8%	9.4	-59.3%	8.4	-46.5%	48.6	-35.3%	36.4	-39.3%
Violence	1.0	-88.8%	0.1	-96.9%	0.4	-77.8%	4.2	-84.294	6.8	-75.5%
Infection	6.7	-63.0%	1.3	-35.0%	0.4	-33.3%	0.5	-50.0%	1.0	-69.7%
Other	984.2	-2.9%	17.3	-19.9%	6.9	-11.5%	23.5	-37.7%	42.8	-46.0%
Females										
Total	818.0	-7.7%	29.3	-34.9%	15.1	-26.0%	29.4	-43.6%	42.3	-42.8%
Cancer	2.9	26.1%	4.9	32.4%	3.7	37.0%	5.9	40.5%	12.5	2.5%
Heart	4.7	-81.2%	2.3	-20.7%	1.4	27.3%	2.3	-23.3%	5.0	-35.9%
Accidents	12.9	-39.4%	5.1	-67.9%	4.0	-52.4%	10.6	-54.5%	7.2	-56.6%
Violence	0.0	-100.0%	0.4	-85.2%	0.3	-75.0%	0.9	-86.4%	1.0	-88.0%
Infection	6.8	-56.1%	0.7	-61.1%	0.5	-16.7%	0.3	-66.7%	0.5	-70.67.
other	790.7	-2.7%	15.9	-11.7%	5.2	-18.7%	9.4	-33.3%	16.1	-41 .2%

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 4554 Death rate	Age 4554 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from US. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Italy					
Males										
Total	173.2	-42.5%	490.4	-22.%	1455.1	-9.4%	3479.3	-2.6%	10393.2	2.7%
Cancer	44.6	12.3%	200.4	20.5%	648.2	23.1%	1301.3	21 .3%	2248.5	13.2%
Heart	39.3	-37.1%	130.0	-43.3%	449.6	-33.570	1293.2	-20.8%	5133.2	-1.9%
Accidents	31.7	-37.8%	40.5	-13.8%	51.3	0.2%	79.4	15.7%	258.2	38.1%
Violence	5.7	-71.6%	4.8	-63.6%	4.4	-54.2%	5.5	-25.7%	8.8	1.1%
Infection	1.3	-79.0%	3.1	-66.3%	7.1	-62.4%	18.6	-57.5%	34.0	-75.0%
Other	50.6	-58.5%	111.6	-32.0%	294.5	-9.2%	781.3	4.3%	2710.5	5.5%
Females										
Total	96.3	-31 .2%	245.3	-30.1%	622.2	-31.2%	1705.2	-17.1%	7856.2	2.9%
Cancer	49.5	2.1%	136.8	-11.7%	297.1	-21 .1%	568.8	-13.7%	1153.1	8.3%
Heart	15.3	-37.6%	45.0	-49.5%	162.6	-45.1%	681.1	-21.8%	4541.6	1.3%
Accidents	6.4	-57.3%	10.4	-35.0%	16.2	-21.7%	37.8	6.8%	275.1	126.6%
Violence	0.9	-83.6%	1.0	-73.0%	1.2	-61.3%	1.7	-54.1%	5.0	13.6%
Infection	0.6	-80.6%	1.1	-80.0%	3.3	-74.6%	7.7	-73.7%	22.9	-80.9%
Other	23.6	45.6%	51.0	-37.60/0	141.8	-27.3%	408.1	-10.7%	1858.5	1.0%

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1 - 4 Death rate	Age 1 - 4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from US. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					Japan					
Males										
Total	**508.8**	**-53.7%**	**50.9**	**-9.9%**	**20.1**	**-35.0%**	**72.0**	*-52.3%*	**80.8**	-58.9%0
Cancer	**2.4**	**4.3%**	**3.9**	**2.6%**	**3.7**	**2.8%**	**5.6**	*-5.1%*	**11.5**	**-1.7%**
Heart	**19.0**	**-36.0%**	**3.5**	**25.0%**	**1.4**	**0.0%**	**5.5**	*14.6%*	**13.8**	**-6.1%**
Accidents	**36.6**	**38.1%**	**18.1**	**-21 .6%**	**7.3**	**-53.5%**	**39.4**	*47.5%*	**19.4**	**47.7%**
Violence	**9.3**	**4.5%**	**2.1**	**-34,4%**	**0.8**	**-55.6%**	**2.3**	*-91.3%*	**2.6**	**-90.6%**
Infection	**16.2**	**-10.5%**	**2.5**	**25.0%**	**0.5**	**-16.7%**	**0.7**	*-30.O%*	**1.0**	**-69.7%**
Other	**425.3**	**-58.0%**	**20.8**	**-3.7%**	**6.4**	**-17.9%**	**18.5**	*-50.9%*	**32.5**	**-59.0%**
Females										
Total	**443.0**	**-50.0%**	**39.7**	**-11.8%**	**13.3**	**-34.8%**	**27.2**	**-47.8%**	**43.2**	**-41 .6%**
Cancer	**2.3**	**0.0%**	**3.8**	**2.7%**	**3.0**	**11.1%**	**4.2**	**O.O%**	**12.8**	**4.9%**
Heart	**15.3**	**-38.8%**	**2.5**	-13.80%	**1.1**	**0.0%**	**2.6**	**-13.3%**	**6.4**	**-17.9%**
Accidents	**29.6**	**39.0%**	**10.4**	**-34.6%**	**2.9**	**-65.5%**	**7.1**	**-69.5%**	**3.3**	**-80.1%**
Violence	**8.5**	**-8.6%**	**2.1**	**-22.2%**	**0.6**	**-50.0%**	**1.1**	**-83.3%**	**1.2**	**-85.5%**
Infection	**11.6**	**-25.2%**	**1.9**	**5.6%**	**0.4**	**-33.3%**	**0.6**	**-33.3%**	**0.8**	**-52.9%**
Other	**375.7**	**-53.8%**	**19.0**	**5.6%**	**5.3**	**-1 7.29/0**	**11.6**	**-17.770**	**18.7**	**-31.8%**

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 O/. different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Japan					
Males										
Total	**161.1**	**-46.5%**	**430.6**	**-31.5%**	**1073.7**	**-33.2%**	**2661.6**	**-25.5%**	**9361.4**	**-7.5%**
Cancer	**38.3**	**-3.5%**	**139.7**	**-16.0%**	**461.1**	**-12.5%**	**1007.6**	**-6.1%**	**1911.0**	**-3.8%**
Heart	**41.0**	**-34.4%**	**115.5**	**-49.6%**	**293.4**	**-56.6%**	**879.1**	**-46.1%**	**3979.8**	**-24.0%**
Accidents	**20.9**	**-59.0%**	**35.9**	**-23.6%**	**49.3**	**-3.7%**	**77.3**	**12.7%**	**177.8**	**-4.9%**
Violence	**4.4**	**-78.1%**	**6.1**	**-53.8%**	**5.1**	**-46.9%**	**5.5**	**-25.7%**	**9.3**	**6.9%**
Infection	**2.6**	**-58.1%**	**6.5**	**-29.3%**	**18.2**	**-3.7%**	**49.8**	**13.7%**	**134.8**	**-1.0%**
Other	**53.9**	**-55.8%**	**126.9**	**-22.7%**	**246.6**	**-24.0%**	**642.3**	**-14.2%**	**3148.7**	**22.5%**
Females										
Total	**91.8**	-34.4%	**214.7**	-38.8%	**485.9**	**-46.3%**	**1350.4**	**-34.3%**	**6675.8**	**-12.5%**
Cancer	**42.6**	-12.2%	**100.9**	-34.9%	**217.4**	**-42.3%**	**445.8**	**-32.4%**	**938.1**	**-1 1.9%**
Heart	**16,7**	-31.870	**50.7**	-43.1%	**134.6**	**-54.6%**	**521.9**	**-40.1%**	**3389.3**	**-24.4%**
Accidents	**4.7**	-68.7%	**8.3**	-48.1%	**13.8**	**-33.3%**	**31.0**	**-12.4%**	**105.8**	**-12.9%**
Violence	**1.9**	-65.5%	**2.2**	-40.5%	**2.0**	**-35.5%**	**3.3**	**-10.8%**	**7.1**	**61 .4%**
Infection	**1.3**	-58.1%	**3.0**	-45.5%	**7.8**	**-40.0%**	**20,9**	**-28.7%**	**65.5**	**-45.4%**
Other	**24.6**	-43.3%	**49.6**	-39.3%	**110.3**	**-43.5%**	**327.5**	**-28.4%**	**2170.0**	**17.9%**

Table C-3 b-Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
				Netherlands						
Males										
Total	798.1	-27.4%.	48.2	-14.7%	22.0	-28.8%	63.9	-57.7%	83.8	-57.4%
Cancer	4.2	82.6%	4.1	7.9%	4.1	13.9%	8.0	35.6%	12.4	6.O%
Heart	11.5	-61.3%	0.5	-82.1%	0.6	-57.1%	2.7	-43.7%	8.1	-44.9%
Accidents	10.5	-60.4%	14.2	-38.5%	7.7	-51.0%	27.6	-63.2%	18.3	-69.5%
violence	1.0	-88.8%	0.8	-75.0%	0.2	-88.9%	1.9	-92.8%	3.8	-86.3%
Infection	11.5	-36.5%	3.3	65.0%	0.6	0.0%	1.1	10.0%	0.2	-93.9%
Other	759.4	-25.1%	25.3	17.1%	8.8	12.8%	22.6	-40.1%	41.0	-48.2%
Females										
Total	562.7	-36.5%	32.1	-28.7%	14.6	-28.4%	26.2	-49.7%	45.4	-38.6%
Cancer	7.7	234.8%	4.3	16.2%	2.7	0.0%	4.2	0.0%	13.0	6.6%
Heart	5.5	-78.0%	1.4	-51.7%	0.8	-27.3%	1.7	-43.3%	6.0	-23.1%
Accidents	8.8	-58.7%	6.0	-62.3%	4.5	-46.4%	7.9	-66.1%	3.7	-77.7%
Violence	4.4	-52.7%	1.4	-48.1%	0.2	-83.3%	0.9	-86.4%	1.4	-83.1%
infection	11.0	-29.0%	1.7	-5.6%	0.3	-50.0%	0.3	-66.7%	0.6	-64.7%
Other	525.3	-35.4%	17.3	-3.9%	6.1	-4.7%	11.2	-20.6%	20.7	-24.5%

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 6574 Death rate	Age 6574 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
				Netherlands						
Males										
Total	153.3	-49.1%	435.9	-30.7%	1353.6	-15.8%	3736.5	4.6%	11182.0	10.5%
Cancer	38.6	-2.8%	154.0	-7.4%	544.3	3.3%	1402.2	30.7%	2961.2	49.1%
Heart	42.4	-32.2%	161.0	-29.8%	531.6	-21.4%	1561.3	-4.4%	4881.9	4.7%
Accidents	14.8	-71 .0%	19.6	-58.3%	21.1	-58.8%	38.2	-44.3%	207.5	11 .0%
Vl ce	2.4	-88.1%	2.2	-83.3%	2.2	-77.1%	1.5	-79.7%	2.9	-66.7%
Infection	0.5	-91.9%	1.8	-80.4%	5.9	-68.8%	14.8	-66.2%	48.4	-64.5%
Other	54.6	-55.2%	97.3	-40.7%	248.5	-23.4%	718.5	-4.1%	3080.1	19.9%
Females										
Total	103,3	-26.2%	258.8	-26.2%	648.0	-28.4%	1674.1	-18.6%	7632.8	0.0%
Cancer	51.4	6.0%	148.1	-4.4%	338.5	-10.1%	622.2	-5.6%	1343.9	26.3%
Heart	13,7	-44.1%	46.0	-48.4%	166.4	-43.8%	643.1	-26.2%	3838.7	-14.4%
Accidents	4.9	-67.3%	7.1	-55.6%	9.1	-56.0%	26.4	-25.4%	194.2	60.0%
Violence	0.9	-83.6%	1.4	-62.2%	1.1	-64.5%	0.7	-81.1%	1.0	-77.370
Infection	0.8	-74.2%	1.1	-80.0%	3.3	-74.6%	10.4	-64.5%	41.5	-65.4%
Other	31.6	-27.2%	55.1	-32.6%	129.6	-33.6%	371.3	-18.8%	2213.5	20.3%

Table C-3 b-Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age O Death rate	Age O % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from US. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Aae2534 Death rate	Aae2534 % different from US. rate
New Zealand										
Males										
Total	1073.7	**-2.3%**	**58.9**	**4.2%**	**38.8**	**25.6%**	**174.6**	**15.6%**	153.1	**-22.2%**
Cancer	7.0	**204.3%**	**9.7**	**155.3%**	**8.9**	**147.2%**	**9.4**	**59.3%**	**15.1**	**29.1%**
Heart	3.5	**-88.2%**	**0.0**	**-100.0%**	**1.8**	**28.6%**	**4.7**	**-2.1%**	**13.2**	**-10.2%**
Accidents	28.0	**5.7%**	**28.0**	**21 .2%**	**17.4**	**10.8%**	**106.9**	**42.3%**	**70.3**	**17.2%**
Violence	3.5	**-60.7%**	**2.9**	**-9.4%**	**0.4**	**-77.8%**	**7.7**	**-70.9%**	**6.8**	**-75.5%**
infection	14.0	**-22.7%**	**1.9**	**-5.O%**	**1.1**	**83.3%**	**1.3**	**30.0%**	**1.9**	**-42.4%**
Other	1017.7	**0.4%**	**16.4**	**-24.1%**	**9.2**	**17.9%**	**44.6**	**18.3%**	**45.8**	**-42.2%**
Females										
Total	**949**	7.1%	51.8	**15.1%**	**22.7**	**11 .3%**	**62.1**	**19.2%**	**71.5**	**-3.4%**
Cancer	**3.8**	65.2%.	8.1	**118.9%**	**3.9**	**44.4%**	**5.9**	**40.5%**	**16.3**	**33.6%**
Heart	**11.3**	-54.8%	0.0	**-100.0%**	**1.5**	**36.4%**	**2.4**	**-20.0%**	**8.2**	**5.1%**
Accidents	**37.5**	76.1%	23.4	**47.2%**	**9.2**	**9.5%**	**29.8**	**27.9%**	**20.4**	**22.9%**
Violence	**3.8**	-59.1%	1.0	**-63.0%**	**0.4**	**-66.7%**	**2.8**	**-57.6%**	**2.6**	**-68.7%**
Infection	**26.3**	69.7%	0.0	**-100.0%**	**0.4**	**-33.3%**	**0.7**	**-22.2%**	**0.7**	**-58.8%**
Other	**866.3**	6.6%	19.3	**7.2%**	**7.3**	**14.1%**	**20.5**	**45.4%**	**23.3**	**-1 5.0%**

Cause of death	Age 35-44 Death rate	Age 35-44 % different from US. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age6574 Death rate	Age6574 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
New Zealand										
Males										
Total	190.0	**-37.0%**	**562.3**	**-10.6%**	**1547.6**	**-3.7%**	**4100.1**	**14.7%**	**11066.8**	**9.3%**
Cancer	**39.8**	**0.3%**	**148.8**	**-10.5%**	**482.5**	**-8.4%**	**1197**	**11 .6%**	**2190.6**	**10.3%**
Heart	**57.2**	**-8.5%**	**260.5**	**13.7%**	**752.4**	**11 .3%**	**2080.1**	**27.4%**	**5556.0**	**6.1%**
Accidents	**36.2**	**-29.0%**	**41.4**	**-11.9%**	**40.6**	**-20.7%**	**63.2**	**-7.9%**	**196.5**	**5.I%**
Violence	**1,8**	**-91.0%**	**5.6**	**-57.6%**	**2.8**	**-70.8%**	**8.4**	**13.5%**	**2.0**	**-77.0%**
infection	**2.7**	**-56.5%**	**1.2**	**-87.0%**	**5.6**	**-70.4%**	**13.7**	**48.7%**	**47.2**	**-65.3%**
Other	**52.3**	**-57.1%**	**104.8**	**-36.1%**	**263.7**	**-18.7%**	**737.7**	**-1.5%**	**3074.5**	**19.7%**
Females										
Total	**128.5**	**-8.2%**	**385.9**	**10.0%**	**928.5**	**2.6%**	**2338.2**	**13.7%**	**8376.0**	**9.7%**
Cancer	**62.9**	**29.7%**	**185.4**	**1 9.7%**	**425.4**	**1 3.0%**	**753.2**	**14.3%**	**1190.3**	**11 .8%**
Heart	**22.0**	**-10.2%**	**90.8**	**1 .9%**	**316.7**	**6.9%**	**1078.6**	**23.8%**	**4808.5**	**7.3%**
Accidents	**15.7**	**4.7%**	**15.1**	**-5.6%**	**18.2**	**-12.1%**	**35.0**	**-1.1%**	**218.0**	**79.6%**
violence	**0.8**	**-85.5%**	**3.2**	**-13.5%**	**2.1**	**-32.3%**	**2.6**	**-29.%**	**1.2**	**-72.7%**
Infection	**2.7**	**-1 2.9%**	**1.9**	**-65.5%**	**4.9**	**-62.3%**	**12.0**	**-59.0%**	**49.6**	**-58.6%**
Other	**24.4**	**-43.8%**	**89.5**	**9.5%**	**161.2**	**-17.4%**	**456.8**	**-0.1%**	**2108.4**	**14.5%**

Table C-3b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25 34 Death rate	Age 25 34 % different from U.S. rate
					Norway					
Males										
Total	919.5	-1 6.3%	51.7	-8.5%	26.1	-15.5%	97.8	-35.2%	113.4	-42.3%
cancer	0.0	-100.0%	7.5	97.4%	5.4	50.0%	3.2	-45.8%	11.7	0.0%
Heart	3.4	-88.6%	1.9	-32.1%	0.4	-71.4%	3.5	-27.1%	9.9	-32.7%
Accidents	3.4	-87.2%	13.2	-42.9%	10.5	-33.1%	48.0	-36.1%	35.1	-41 .5%
Violence	0.0	-100.0%	0.0	-100.0%	0.4	-77.8%	3.2	-87.9%	3.1	-88.8%
infection	17.0	-6.1%	4.7	135.0%	0.0	-100.0%	0.0	-100.0%	0.9	-72.7%
Other	095.7	-11 .6%	24.4	13.0%	9.4	20.5%	39.9	5.8%	52.7	-33.5%
Females										
Total	734.3	-17.1%	38.5	-14.4%	10.6	-48.0%	30.2	-42.0%	40.3	-45.5%
Cancer	7.1	208.7%	3.0	-18.9%	3.4	25.9%	2.5	4 . 5 %	7.1	-41.8%
Heart	0.0	-100.0%	0.0	-100.0%	0.8	-27.3%	2.2	-26.7%	3.6	-53.8%
Accidents	10.7	-49.8%	9.9	-37.7%	2.3	-72.6%	10.8	-53.6%	7.5	-54.8%
Violence	0.0	-100.0%	0.0	-1 00.0%	0.0	-100.0%	0.6	-90.9%	0.6	-92.8%
Infection	10.7	-31.0%	6.9	283.3%	0.8	33.3%	0.9	0.0%	1.0	-41.2%
Other	705.8	-13.2%	18.7	3.9%	3.3	-48.4%	13.2	-6.4%	20.5	-25.2%

Cause Of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Norway					
Males										
Total	188.4	-37.5%	518.6	-1 7.6%	1440.8	-10.3%	3549.6	-0.7%	11058.0	9.2%
Cancer	36.6	-7.8%	126.4	-24.0%	452.5	-14.1%	1035.5	-3.5%	2135.6	7.5%
Heart	42.0	-32.8%	201.5	-12.1%	669.4	-1.0%	1794.8	9.9%	5608.0	7.1%
Accidents	30.9	-39.4%	54.7	16.4%	51.6	0.8%	66.5	-3.1%	341.4	82.7%
Violence	6.0	-70.1%	4.3	-67.4%	2.0	-79.2%	2.8	-62.2%	1.9	-78.2%
Infection	1.6	-74.2%	1.9	-79.3%	4.6	-75.7%	15.8	-63.9%	69.2	-49.2%
Other	71.3	-41.5%	129.8	-20.9%	260.7	-19.6%	634.2	-15.3%	2901.9	12.99/0
Females										
Total	109.5	-21.8%	277.1	-21.0%	681.5	-24.7%	1790.2	-12.9%	8241.4	8.0%
Cancer	49.8	2.7%	163.2	5.4%	347.6	-7.7%	560.8	-14.9%	1130.6	6.2%
Heart	12.8	-47.8%	37.0	-58.5%	194.4	-34.4%	814.8	-6.5%	4339.6	-3.2%
Accidents	8.4	-44.0%	10.4	-35.0%	10.2	-50.7%	38.5	8.8%	333.5	174.7%
Violence	1.3	-76.4%	3.0	-18.9%	0.5	-83.9%	1.4	-62.2%	0.5	-88.6%
Infection	1.0	-67.7%	0.5	-90.9%	3.4	-73.8%	15.8	-46.1%	62.0	-48.3%
Other	36.2	-16.6%	63.0	-22.9%	125.4	-35.7%	358.9	-21.5%	2375.2	29.0%

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age O Death rate	Age O % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					Spain					
Males										
Total	1009.1	**-8.2%**	**45.4**	**-19.6%**	**27.8**	**-10.0%**	**114.3**	**-24.3%**	**140.7**	**-28.5%**
Cancer	5.0	**117.4%**	**4.8**	**26.3%**	**5.4**	**50.0%**	**8.6**	**45.8%**	**14.4**	**23.1%**
Heart	56.9	**91.6%**	**3.4**	**21.4%**	**2.0**	**42.9%**	**9.5**	**97.9%**	**18.4**	**25.2%**
Accidents	43.4	**63.8%**	**14.6**	**-36.8%**	**11.2**	**-28.7%**	**70.0**	**-6.8%**	**59.8**	**-0.3%**
Violence	0.9	**-89.9%**	**0.5**	**-84.4%**	**0.4**	**-77.8%**	**2.7**	**-89.8%**	**4.0**	**-85.6%**
Infection	28.9	**59.7%**	**3.8**	**90.0%**	**1.0**	**66.7%.**	**1.5**	**50.0%**	**2.6**	**-21.2%**
Other	874	**-13.8%**	**18.3**	**-15.3%**	**7.8**	**0.0%**	**22.0**	**-41.6%**	**41.5**	**-47.6%**
Females										
Total	**757.2**	**-1 4.6%**	**39.2**	**-12.9%**	**17.8**	**-1 2.7%**	**41.5**	**-20.3%**	**50.6**	**-31 .6%**
Cancer	**1.9**	**-1 7.4%**	**4.7**	**27.0%**	**3.9**	**44.4%**	**5.5**	**31 .0%**	**12.3**	**0.8%**
Heart	**39.9**	**59.6%**	**2.0**	**-31 .0%**	**1.5**	**36.4%**	**4.7**	**56.7%**	**7.9**	**1.3%**
Accidents	**30.2**	**41.8%**	**11.1**	**-30.2%**	**5.1**	**-39.3%**	**17.6**	**-24.5%**	**11.1**	**-33.1%**
Violence	**2.4**	**-74.2%**	**0.5**	**-81.5%**	**0.3**	**-75.0%**	**1.1**	**-83.3%**	**0.8**	**-80.4%**
Infection	**20.9**	**34.8%**	**3.7**	**105.6%**	**0.6**	**0.0%**	**1.1**	**22.2%**	**1.4**	**-17.6%**
Other	**661.9**	**-18.6%**	**17.2**	**-4.4%**	**6.4**	**0.0%**	**11.5**	**-18.4%**	**17.1**	**-37.6%**

Cause of death	Age 35-44 Death rate	Age 35-44 % different from U.S. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Spain					
Males										
Total	**223.5**	**-25.8%**	**538.2**	**-14.4%**	**1294.8**	**-19.4%**	**3151.4**	**-11.8%**	**8644.2**	**-4.7%**
Cancer	**54.0**	**36.0%**	**188.9**	**13.6%**	**491.7**	**-6.6%**	**1053.3**	**-1 .8%**	**1916.7**	**-3.5%**
Heart	**50.3**	**-19.5%**	**147.9**	**-35.5%.**	**393.2**	**-41.8%**	**1138.2**	**-30.3%**	**4484.5**	**-14.1%**
Accidents	**50.7**	**-0.6%**	**56.4**	**20.0%**	**61.9**	**20.9%**	**74.8**	**9.0%**	**141.5**	**-24.3%**
Violence	**3.0**	**-85.1%**	**3.3**	**-75.0%**	**2.5**	**-74.0%**	**2.6**	**-64.9%**	**4.7**	**-48.0%**
Infection	**4.3**	**-30.6%**	**8.0**	**-13.0%**	**15.4**	**-18.5%**	**31.8**	**-27.4%**	**86.0**	**-36.9%**
Other	**61.2**	**-49.8%**	**133.7**	**-18.5%**	**330.1**	**1.8%**	**850.7**	**13.6%**	**3000.8**	**16.870**
Females										
Total	**101.2**	**-27.7%**	**237.8**	**-32.2%**	**553.5**	**-38.8%**	**1582.9**	**-23.0%**	**7587.9**	**0.6%**
Cancer	**45.5**	**-6.2%**	**119.5**	**-22.9%**	**231.6**	**-38.5%**	**444.3**	**-32.6%**	**912.2**	**-14.3%**
Heart	**17.5**	**-28.6%**	**47.8**	**-46.4%**	**152.1**	**-48.6%**	**657**	**-24.6%**	**4412.2**	**-1.6%**
Accidents	**9.4**	**-37.3%**	**13.4**	**-16.3%**	**21.0**	**1.4%**	**35.9**	**1.4%**	**74.1**	**-39.0%**
Violence	**1.2**	**-78.2%**	**1.0**	**-73.0%**	**1.0**	**-67.7%**	**1.3**	**-64.9%**	**2.6**	**-40.9%**
Infection	**1.9**	**-38.7%**	**2.3**	**-58.2%**	**7.3**	**-43.8%**	**16.8**	**-42.7%**	**59.6**	**-50.3%**
Other	**25.7**	**-40.8%**	**53.8**	**-34.1%**	**140.5**	**-28.0%**	**427.6**	**-6.5%**	**2127.2**	**15.6%**

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age 0 Death rate	Age 0 % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 514 Death rate	Age 514 % different from U.S. rate	Age 15-74 Death rate	Age 15-74 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from U.S. rate
					Sweden					
Males										
Total	657.2	-40.2%	30.9	-45.3%	20.3	-34.3%	81.0	-46.4%	114.8	-41 .6%
Cancer	1.7	-26.1%	2.4	-36.8%	3.5	-2.8%	5.4	-8.5%	12.3	5.1%
Heart	5.2	-82.5%	0.0	-100.0%	1.0	-28.6%	3.3	-31.3%	9.4	-36.1%
Accidents	8.6	-67.5%	7.3	-68.4%	9.4	40.1%	35.5	-52.7%	31.6	-47.3%O
Violence	3.5	-60.7%	2.5	-21.9%	0.4	-77.8%	6.9	-74.0%	12.0	-56.8%
Infection	5.2	-71.3%	1.0	-50.0%	0.2	-66.7%	0.3	-70.0%	0.0	-100.0%
Other	633.0	-37.5%	17.7	-18.1%	5.8	-25.6%	29.6	-21.5%	49.5	-37.5%
Females										
Total	501.3	-43.4%	26.4	-41.3%	12.3	-39.7%	34.0	-34.7%	51.3	-30.7%
Cancer	3.7	60.9%	2.1	-43.2%	2.3	-14.8%	4.0	-4.8%	12.1	-0.8%
Heart	11.1	-55.6%	1.0	-65.5%	0.8	-27.3%	1.7	-43.3%	4.3	-44.9%
Accidents	1.8	-91.5%	5.2	-67.3%	4.3	-48.8%	10.7	-54.1%	6.7	-59.6%
Violence	0.0	-100.0%	0.0	-100.0%	0.2	-83.3%	2.5	-62.1%	4.1	-50.6%
Infection	5.5	-64.5%	1.6	-11.1%	0.4	-33.3%	1.0	11.1%	0.7	-58.8%
Other	479.2	-41.1%	16.5	-8.3%	4.3	-32.8%	14.1	0.0%	23.4	-1 4.6%

Cause of death	~ Death rate	~ % different from U.S. rate	Death rate	% different from U.S. rate	~ Death rate	~ % different from U.S. rate	Age 65- 4 Death rate	Age 65- 4 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					Sweden					
Males										
Total	195.5	-35.1%	438.9	-30.2%	1256.1	-21.8%	3265.4	-8.6%	10832.3	7.0%
Cancer	26.3	-33.8%	106.8	-34.6%	362.5	-31.2%	896.6	-16.2%	1906.0	-4.O%
Heart	39.0	-37.6%	150.7	-34.2%0	610.4	-9.7%	1747.5	7.1%	6191.9	18.3%
Accidents	29.4	-42.4%	34.1	-27.4%	39.2	-23.4%	57.0	-16.9%	234.7	25.6%
Violence	16.8	-16.4%	18.3	38.6%	13.3	38.5%	11.1	50.0%	9.5	9.2%
Infection	1.4	-77.4%	1.0	-89.1%	8.0	-57.7%	17.3	-60.5%	80.1	-41.2%
Other	82.6	-32.2%	126.0	-23.2%	222.7	-31.4%	533.9	-28.7%	2410.1	-6.2%
Females										
Total	115.1	-17.8%	264.8	-24.5%	635.5	-29.8%	1726.5	-16.0%	8071.8	*5.8%*
Cancer	49.3	1.6%	132.8	-14.3%	311.3	-1 7.3%	594.8	-9.8%	1096.6	*3.0%*
Heart	13.7	-44.1%	44.8	-49.7%	181.0	-38.9%	762.1	-12.5%	4648.4	*8.2%*
Accidents	6.2	-58.7%	10.6	-33.8%	14.3	-30.9%	29.2	-17.5%	196.4	*61.870*
Violence	6.5	18.2%	6.9	86.5%	6.2	100.0%	5.8	56.8%	4.1	*-6.8%*
Infection	1.8	-41.9%	1.9	-65.5%	4.5	-65.4%	17.0	-42.0%	59.7	*-50.2%*
Other	37.6	-13.4%	67.8	-17.0%	118.2	-39.4%	317.6	-30.5%	1866.6	*1.4%*

Table C-3 b--Age- and Cause-Specific Mortality Rates of Selected Countries Compared with U.S. Rates, 1988 (Continued)

Cause of death	Age O Death rate	Age O % different from U.S. rate	Age 1-4 Death rate	Age 1-4 % different from U.S. rate	Age 5-14 Death rate	Age 5-14 % different from U.S. rate	Age 15-24 Death rate	Age 15-24 % different from U.S. rate	Age 25-34 Death rate	Age 25-34 % different from US. rate
					United Kingdom					
Males										
Total	1019.2	**-7.3%**	**44.7**	**-20.9%**	**24.8**	**-19.7%**	80.3	-46.8%	**94.2**	**-52.1%**
Cancer	2.5	**8.7%**	**4.6**	**21.1%**	**4.4**	**22.2%**	6.9	16.9%	**12.4**	**6.0%**
Heart	9.7	**-67.3%**	**1.2**	**-57.1%**	**0.9**	**-35.7%**	3.1	-35.4%	**10.0**	**-32.0%**
Accidents	15.4	**-41.9%**	**9.7**	**-58.0%**	**10.3**	**-34.4%**	36.4	-51.50/o	**26.1**	**-56.5%**
Violence	5.7	**-36.0%**	**1.8**	**-43.7%**	**0.6**	**-66.7%**	7.2	-72.8%	**9.2**	**-66.9%**
Infection	12.9	**-28.7%**	**3.7**	**85.0%**	**0.7**	**16.7%**	0.8	-20.0%	**1.1**	**-66.7%**
Other	973.0	**-4.0%**	**23.7**	**9.7%**	**7.9**	**1.3%**	25.9	-31.3%	**35.4**	**-55.3%**
Females										
Total	767.9	**-13.4%**	**38.1**	**-15,3'-%**	**15.1**	**-26.0%**	30.9	-40.7%	**46.0**	**-37.870**
Cancer	3.9	**69.6%**	**4.8**	**29.7%**	**3.5**	**29.6%**	5.2	23.8%	**15.0**	**23.0%**
Heart	8.3	**-66.8%**	**1.5**	**-48.3%**	**0.7**	**-36.4%**	2.4	-20.0%	**5.0**	**-35.9%**
Accidents	13.3	**-37.6%**	**7.6**	**-52.2%**	**3.7**	**-56.0%**	7.7	-67.0%	**6.1**	**-63.3%**
Violence	3.1	**-66.7%**	**1.5**	**-44.4%**	**0.6**	**-50.0%**	2.7	-59.1%	**2.8**	**-66.3%**
Infection	11.4	**-26.50/,**	**2.9**	**61.1%**	**0.5**	**-16.7%**	0.8	-11.l%	**0.9**	**-47.1 "/0**
Other	727.9	**-10.5%**	**19.8**	**10.0%**	**6.1**	**-4.7%**	12.1	-14.2%	**16.2**	**-40.9%**

Cause of death	Age 35-44 Death rate	Age 35-44 % different from US. rate	Age 45-54 Death rate	Age 45-54 % different from U.S. rate	Age 55-64 Death rate	Age 55-64 % different from U.S. rate	Age 65-74 Death rate	Age 65-74 % different from U.S. rate	Age 75+ Death rate	Age 75+ % different from U.S. rate
					United Kingdom					
Males										
Total	**174.4**	**-42.1%**	**511.9**	**-18.6%**	**1595.2**	**-0.7%**	**4123.9**	**15.4%**	11121.2	**9.9%**
Cancer	**38.6**	**-2.8%**	**154.0**	**-7.4%**	**538.5**	**2.2%**	**1282.7**	**20.5%**	2455.5	**23.7%**
Heart	**50.3**	**-19.5%**	**235.4**	**2.7%**	**781.7**	**15.6%**	**2046.1**	**25.3%**	5363.9	**2.5%**
Accidents	**23.1**	**-54.7%**	**24.0**	**-48.9%**	**26.3**	**-48.6%**	**37.5**	**-45.3%**	118.0	**-36.9%**
Violence	**8.6**	**-57.2%**	**8.4**	**-36.4%**	**7.5**	**-21.9%**	**7.2**	**-2.7%**	10.7	**23.0%**
Infection	**2.2**	**-64.5%**	**2.7**	**-70.7%**	**7.0**	**-63.0%**	**16.2**	**-63.0%**	39.1	**-71.3%**
Other	**51.6**	**-57.7%**	**87.4**	**-46.7%**	**234.2**	**-27.8%**	**724.2**	**-3.3%**	3134.0	**22.0%**
Females										
Total	**117.7**	**-15.9%**	**315.4**	**-10.1%**	921.1	1.8%	2320.0	**12.8%**	**8440.6**	**10,6%**
Cancer	**61.4**	**26.6%**	**174.1**	**12.4%**	426.6	**13.3%**	761.5	**15.5%**	**1315.5**	**23.6%**
Heart	**17.3**	**-29.4%**	**69.5**	**-22.0%**	305.3	**3.1%**	1064.2	**22.1%**	**4541.7**	**1.3%**
Accidents	**6.4**	**-57.3%**	**7.6**	**-52.5%**	13.0	**-37.2%**	26.0	**-26.6%**	**127.7**	**5.2%**
Violence	**3.8**	**-30.9%**	**4.4**	**18.9%**	4.3	**38.7%**	4.9	**32.4%**	**5.6**	**27.3%**
Infection	**0.8**	**-74.2%**	**1.7**	**-69.1%**	4.8	**-63.1%**	8.7	**-70.3%**	**26.3**	**-78.1%**
Other	**28.0**	**-35.5%**	**58.1**	**-28.9%**	**167.1**	**-14.4%**	454.7	**-0.5%**	**2423,8**	**31.7%**

[a]Based on data from the former Federal Republic of Germany.

SOURCES: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991 and 1992).

Table C-4--Trends in Age-Specific Death Rates (per 100,000) for Cancer, by Sex, Age 45 to 74, United States and Selected Countries, 1950-54 to 1980-84

	Males							Females						
	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
Age-Specific Death Rates per 100,000 (age 45-54)														
United States	**159.7**	**165.5**	**172.6**	**179.4**	**183.6**	**190.0**	**183.4**	**192.1**	**183.2**	**181.0**	**180.0**	**178.9**	**175.5**	**167.5**
Australia	123.4	131.6	138.9	148.0	160.3	163.1	166.1	152.0	147.9	147.2	155.7	157.6	153.2	148.2
Canada	141.9	139.4	140.2	151.1	159.1	166.2	162.2	185.6	174.7	175.8	174.8	171.3	163.3	155.9
France	180.7	175.9	192.3	195.7	217.7	261.1	271.5	152.5	150.8	151.5	145.9	141.1	136.6	130.4
Germany[a]	164.4	166.2	166.4	163.0	156.1	168.7	176.6	178.5	179.2	187.3	184.3	177.0	167.7	149.0
Italy	161.5	169.7	177.5	186.6	199.2	223.1	223.3	145.1	148.5	155.4	155.6	151.2	145.9	140.2
Japan	165.0	171.3	171.7	163.1	147.4	151.7	161.2	176.5	165.6	158.9	146.2	130.7	121.1	110.9
Netherlands	158.0	167.0	179.0	172.5	172.0	171.2	166.9	177.0	168.0	173.0	174.6	177.3	162.8	154.9
New Zealand	134.3	142.3	146.5	156.7	167.1	178.6	165.9	187.4	172.9	169.9	186.2	189.0	200.3	194.4
Norway	128.2	122.1	113.3	122.2	130.2	130.6	126.7	161.9	159.0	146.0	147.5	150.8	154.3	139.9
Spain	120.1	132.1	147.9	140.3	150.6	161.2	173.4	114.2	124.3	133.8	126.8	126.1	123.3	115.3
Sweden	114.2	106.9	113.4	112.2	119.4	122.6	116.4	162.2	161.3	164.2	154.8	157.4	148.3	143.0
United Kingdom	210.1	206.1	203.6	194.4	189.0	185.7	166.3	186.0	185.2	192.0	196.3	203.1	202.9	188.3
Age-Specific Death Rates per 100,000 (age 55-64)														
United States	**425.7**	**448.5**	**464.9**	**494.7**	**514.5**	**513.9**	**523.0**	**359.0**	**345.3**	**334.3**	**338.5**	**350.9**	**356.2**	**366.9**
Australia	358.5	383.1	412.1	429.9	470.3	470.1	484.1	297.8	290.5	285.0	294.0	317.9	314.6	318.9
Canada	384.3	412.1	427.5	443.2	468.8	482.5	506.8	356.9	350.6	341.0	338.2	349.7	343.9	350.5
France	474.2	512.7	571.3	583.9	611.9	608.9	632.9	313.4	305.7	299.6	296.3	298.4	281.6	272.0
Germany[a]	475.0	499.4	532.9	536.3	532.7	515.5	498.6	372.3	366.4	362.5	362.9	364.1	354.5	335.5
Italy	396.0	449.0	505.4	536.5	558.8	587.5	623.0	294.1	299.9	303.4	304.1	308.0	305.6	298.7
Japan	440.1	466.8	481.0	476.7	455.3	440.1	429.4	321.2	316.7	312.1	300.0	279.1	255.1	235.6
Netherlands	422.2	466.1	519.7	565.1	586.3	564.5	558.8	370.8	344.4	332.6	337.0	327.6	330.4	325.3
New Zealand	390.6	413.3	421.1	445.6	491.8	500.0	514.4	348.3	334.1	347.3	335.7	355.2	379.6	383.8
Norway	344.2	369.6	371.6	351.3	374.2	388.3	405.5	331.0	320.7	306.7	303.2	291.6	314.5	321.0
Spain	298.3	345.2	401.7	413.7	425.1	455.3	468.3	215.4	235.8	266.1	254.3	259.2	249.3	233.5
Sweden	336.3	341.4	345.7	338.8	357.8	367.1	363.4	342.1	331.2	324.1	310.0	321.5	326.8	321.6
United Kingdom	552.1	591.6	607.2	611.1	604.6	575.7	557.6	364.9	356.3	358.1	371.6	392.5	404.6	419.2

Table C-4--Trends in Age-Specific Death Rates (per 100,000) for Cancer, by Sex, Age 45 to 74, United States and Selected Countries, 1950-54 to 1980-84 (Continued)

	Males							Females						
	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
	Age-Specific Death Rates per 100,000 (age 65-74)													
United States	809.4	863.2	925.3	1,002.8	1,031.5	1,066.6	1,092.7	596.3	573.4	562.8	573.5	566.8	576.9	620.8
Australia	804.9	843.8	901.9	977.9	1,068.7	1,064.7	1,090.8	560.2	541.3	519.1	515.7	548.7	532.8	563.0
Canada	808.6	860.3	924.3	979.5	1,040.4	1,065.6	1,109.6	628.0	611.6	603.1	587.0	586.8	598.4	624.0
France	939.9	1,006.8	1,109.9	1,200.5	1,217.1	1,245.3	1,280.2	608.4	595.5	579.9	564.0	535.2	522.3	520.7
Germany[a]	1,015.1	1,072.5	1,166.6	1,250.1	1,272.7	1,275.6	1,247.0	773.6	740.0	725.7	724.6	689.9	670.5	664.2
Italy	730.1	815.9	933.5	1,078.0	1,157.0	1,140.8	1,238.2	537.1	555.0	563.6	581.3	566.3	545.8	567.7
Japan	787.3	897.7	960.2	1,002.8	1,016.7	1,002.6	1,017.5	501.6	545.7	556.4	559.0	540.0	510.2	488.7
Netherlands	912.2	928.4	1,064.6	1,211.3	1,291.3	1,412.7	1,430.0	735.6	681.8	655.9	655.3	622.9	602.8	587.9
New Zealand	874.0	922.4	922.3	963.7	1,084.6	1,131.9	1,128.5	594.2	591.0	583.0	573.8	618.1	659.3	684.2
Norway	810.6	787.2	802.1	854.1	871.7	930.7	930.7	622.4	576.2	548.8	575.3	538.4	550.8	554.7
Spain	604.1	709.9	839.8	842.3	922.4	984.3	988.9	405.4	449.4	491.9	477.4	485.0	467.2	442.2
Sweden	783.7	804.8	881.2	860.6	935.2	962.4	880.4	638.7	620.7	614.7	590.5	617.4	609.5	586.2
United Kingdom	1,057.4	1,130.2	1,205.8	1,291.1	1,328.2	1,326.6	1,314.8	652.1	629.9	617.7	632.4	647.7	674.2	711.9

[a]Based on data from the Federal Republic of Germany.

SOURCE: World Health Organization, *World Health Statistics Annual: 1988* (Geneva, Switzerland: World Health Organization, 1988).

Table C-5–Trends in Age-Standardized Death Rates[a] (per 100,000) for Selected Cancer Sites, United States and Selected Countries, 1950-54 to 1980-84

	Male							Female						
	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
	Age-Standardized Death Rates (per 100,000)													
Trachea, bronchus, and lung cancers[b]														
United States	**29.3**	**39.1**	**48.9**	**60.4**	**71.1**	**78.3**	**83.3**	**5.7**	**6.2**	**7.4**	**10.5**	**15.1**	**20.4**	**26.9**
Australia	23.7	33.3	45.1	57.1	66.5	70.1	72.5	4.5	4.7	5.6	7.0	9.7	12.2	15.1
Canada	23.8	32.3	41.1	51.9	64.1	73.3	81.6	4.8	5.3	6.0	8.0	11.0	15.6	21.5
France	18.2	26.5	34.5	42.0	47.7	57.1	62.9	4.5	4.9	5.2	5.4	5.1	5.3	5.9
Germany[c]	33.4	43.1	54.9	62.5	67.0	72.2	73.5	5.6	6.0	7.0	7.2	7.1	7.9	9.2
Japan	5.0	10.8	16.2	21.1	26.1	32.7	39.9	1.9	3.9	5.8	7.2	8.0	9.5	11.2
Italy	16.0	24.2	34.0	46.5	57.7	68.7	80.7	3.9	4.8	5.8	6.6	7.1	8.2	9.3
Netherlands	37.8	50.3	67.6	84.6	99.8	111.9	116.9	4.7	4.5	5.1	5.2	5.9	7.3	10.1
New Zealand	29.2	40.6	48.3	59.6	67.2	74.2	75.2	4.2	5.4	7.1	8.1	13.9	16.7	19.9
Norway	10.9	13.7	18.5	23.3	28.2	34.9	40.8	3.7	3.7	3.9	4.4	5.6	6.9	9.5
Spain	13.0	19.1	25.5	29.6	35.5	45.6	53.6	3.4	4.5	5.2	5.6	5.9	5.8	5.5
Sweden	13.4	17.5	22.4	26.3	32.8	38.0	36.5	5.4	5.6	5.6	6.5	7.9	9.3	11.3
United Kingdom	61.5	80.2	94.0	104.4	109.4	109.4	103.6	8.9	10.2	12.5	15.9	19.4	23.2	27.0
Stomach cancer[d]														
United States	**26.1**	**21.4**	**17.7**	**14.2**	**11.9**	**10.1**	**9.0**	**14.0**	**11.0**	**8.9**	**7.2**	**5.7**	**4.8**	**4.2**
Australia	37.9	32.9	27.3	24.1	22.0	18.0	15.7	21.6	17.5	14.5	12.7	11.0	8.9	7.0
Canada	38.7	34.5	29.6	25.1	21.8	18.2	15.0	20.7	17.4	14.3	11.7	10.2	7.9	6.7
France	43.3	41.0	37.4	31.7	25.9	22.0	18.2	24.0	22.2	19.1	15.7	12.3	10.0	8.0
Germany[c]	69.1	65.4	60.3	54.3	45.7	38.2	30.6	45.0	40.8	35.6	30.5	24.8	20.3	16.2
Italy	53.8	52.4	52.0	49.4	44.4	36.8	33.9	32.5	30.0	28.2	25.9	22.3	18.4	16.4
Japan	95.5	101.4	100.9	98.6	89.7	78.4	68.5	51.2	53.3	52.5	50.5	46.0	39.0	32.3
Netherlands	61.8	53.0	47.6	41.9	35.8	31.1	26.0	40.4	32.6	26.2	22.8	17.8	14.0	11.0
New Zealand	37.7	32.0	28.3	25.3	22.9	20.7	18.0	21.2	18.4	14.2	12.2	10.4	9.3	8.5
Norway	65.7	52.1	43.0	39.3	30.7	25.6	21.8	39.4	31.6	25.3	21.3	16.2	13.0	11.4
Spain	39.0	42.7	46.9	44.7	40.1	34.7	26.7	24.3	25.8	28.0	25.3	22.3	18.2	13.3
Sweden	49.2	45.3	39.2	31.5	27.3	23.6	18.4	33.0	27.9	21.3	17.0	14.6	12.1	9.4
United Kingdom	43.3	41.1	38.0	34.8	31.6	28.5	24.7	25.9	23.1	20.2	17.5	15.3	13.3	10.9

Table C-5-Trends in Age-Standardized Death Rates[a] (per 100,000) for Selected Cancer Sites, United States and Selected Countries, 1950-54 to 1980-94 (Continued)

	mal						
	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
	Age-Standardized Death Rates (per 100,000)						
Breast cancer[e]							
United States	30.4	30.5	30.5	31.4	31.6	31.0	31.4
Australia	29.3	28.2	27.8	27.8	29.0	28.0	28.5
Canada	32.3	32.3	33.6	33.9	33.9	33.1	33.0
France	19.5	22.1	23.0	24.8	25.3	26.2	27.2
Germany[c]	22.1	22.9	24.4	26.6	28.3	29.5	30.8
Italy	18.6	19.9	21.4	23.6	25.7	26.2	28.2
Japan	5.4	5.3	5.2	5.5	6.3	7.0	7.6
Netherlands	33.4	33.7	35.4	38.5	39.0	37.4	37.6
New Zealand	32.6	31.2	32.0	33.5	35.4	35.0	36.5
Norway	24.9	24.7	24.3	26.0	25.2	26.6	25.3
Spain	8.0	9.0	12.7	13.5	15.6	18.3	19.9
Sweden	25.6	26.7	28.3	26.4	28.6	27.4	26.6
United Kingdom	33.2	33.3	34.3	35.4	37.8	39.2	40.3

[a]The European standard population was used to age-standardize rates.
[b]Trachea, bronchus, and lung cancers include International Classification of Diseases (ICD-9) basic tabulation code 101.
[c]Based on data from the former Federal Republic of Germany.
[d]Stomach cancer includes ICD-9 basic tabulation code 091.
[e]Breast cancer includes ICD-9 basic tabulation code 113.

SOURCE: World Health Organization, *World Health Statistics Annual: 1988* (Geneva, Switzerland: World Health Organization, 1988).

Table C-6--Trends in Age-Standardized Death Rates[a] (per 100,000) for Cerebrovascular and Ischemic Heart Disease, United States and Selected Countries, 1950-54 to 1980-84

	Male							Female						
	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84
	Age-Standardized Death Rates (per 100,000)													
Cerebrovascular disease[b]														
United States	151.6	150.4	143.9	134.6	123.7	93.0	70.8	141.9	137.1	128.8	118.9	104.9	78.6	61.6
Australia	156.8	164.9	159.8	169.2	172.5	136.9	108.8	177.6	171.0	160.3	160.6	163.1	128.0	99.3
Canada	139.2	141.3	125.6	116.9	109.9	93.8	72.9	148.5	142.2	124.0	105.9	91.4	76.6	61.4
France	171.1	167.5	159.8	158.6	154.5	129.9	105.4	131.8	125.3	115.9	110.1	107.1	91.3	75.7
Germany[c]	197.6	211.8	205.4	199.9	181.6	158.2	137.8	193.4	199.1	180.6	168.2	149.2	127.6	109.8
Italy	196.7	195.3	180.9	175.6	161.1	149.3	135.7	160.9	156.7	141.1	135.6	124.1	116.2	105.4
Japan	300.1	341.3	371.6	366.4	325.1	253.4	185.1	237.1	247.8	256.8	247.3	220.9	178.6	132.3
Netherlands	128.9	137.5	124.2	121.8	111.9	100.2	87.5	146.1	146.4	126.1	114.2	101.6	84.4	71.5
New Zealand	132.8	134.6	139.5	146.7	156.1	132.1	112.3	161.0	156.9	150.4	150.8	156.3	129.9	103.6
Norway	139.1	149.6	154.7	155.8	147.2	120.9	105.3	145.5	154.9	154.7	139.8	127.3	105.6	86.9
Spain	150.2	159.9	165.8	163.4	166.0	168.5	136.3	123.6	139.0	145.6	145.1	145.5	144.8	117.2
Sweden	147.2	143.6	128.3	108.3	97.2	92.2	82.3	158.6	151.6	124.6	102.9	87.9	81.0	70.3
United Kingdom	177.3	180.8	176.8	171.6	159.5	137.3	116.3	166.1	165.5	157.7	149.4	140.2	122.4	103.8
Ischemic heart disease[d]														
United States	483.7	502.7	520.7	522.5	496.1	411.5	324.7	277.8	281.7	282.8	283.2	263.1	209.6	165.8
Australia	458.4	459.3	496.3	514.6	482.6	406.5	340.4	261.3	247.4	257.8	256.2	236.9	197.5	165.1
Canada	428.6	453.6	464.6	457.4	423.8	381.3	316.1	256.5	256.9	255.9	240.7	210.7	183.5	153.9
France	66.5	91.6	113.9	111.3	112.7	117.1	111.2	33.3	46.8	56.0	50.3	49.0	49.7	47.7
Germany[c]	222.7	258.4	278.7	272.5	259.0	276.9	257.8	170.7	171.9	162.5	137.6	118.3	127.2	110.3
Italy	240.3	264.7	279.9	247.8	197.7	206.9	171.7	218.4	215.6	205.6	162.6	114.3	112.7	84.2
Japan	86.8	100.4	115.5	105.9	78.4	72.2	65.4	72.3	75.5	81.2	69.4	46.2	43.4	38.5
Netherlands	245.6	268.7	291.7	297.3	290.8	282.9	251.6	195.5	188.4	176.5	153.9	132.6	121.9	105.3
New Zealand	432.4	411.4	451.5	470.0	446.6	419.7	374.9	264.9	226.8	232.9	227.7	209.2	194.7	179.3
Norway	185.6	244.2	312.2	334.7	336.8	316.2	305.4	122.7	148.2	175.8	169.6	150.8	132.4	124.3
Spain	117.1	119.2	110.7	96.5	103.0	126.0	114.5	93.2	92.6	78.5	58.1	48.8	60.5	50.9
Sweden	283.4	317.0	359.3	369.9	402.6	404.4	377.9	214.4	218.0	230.5	217.9	218.1	201.1	174.6
United Kingdom	441.1	426.0	433.6	415.2	401.2	401.2	371.5	283.5	252.6	236.3	202.1	180.4	178.8	164.5

[a]The European standard population was used to age-adjust rate.
[b]Cerebrovascular disease includes International Classification of Diseases (ICD-9) basic tabulation list code 29 (ICD-9 codes 430-438).
[c]Based on data from the former Federal Republic of Germany.
[d]Ischemic heart disease includes ICD-9 basic tabulation list code 27 (ICD-9 codes 410-414).

SOURCE: World Health Organization, *World Health Statistics Annual: 1988* (Geneva, Switzerland: World Health Organization, 1988).

Table C-7--Comparison of U.S. and Canadian Death Rates (per 100,000) for the Five Leading U.S. Causes of Death, Males, Age 15 to 24,1989

U.S. cause of death rank	Cause (ICD-9 Codes)		United States			Canada	
			Number	Percent	Rate (per 100,000)	Number	Percent
	All causes	27,165	100.0%	142.4	2348	100.0%	117.5	21.1%
1	Accidents and adverse effects (E800-E949)	12,647	46.6	66-3	1,240	52.8	621	6.8
	Motor vehicle accidents (E810-E825)	9,429	34.7	49.4	904	38.5	45.3	9.1
	All other accidents and adverse effects (E800-E807,E826-E949)	3,218	11.8	16.8	336	14.3	I&8	0.6
2	Homicide and legal intervention (E960-E978)	5,112	18.8	26.8	82	3.5	4.1	552.8
3	Suicide (E950-E959)	4,106	15.1	2-15	528	22.5	26.4	-18.6
4	Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues (140-208)	1,074	4.0	5.6	131	5.6	6.6	-142
5	Diseases of heart (390-398, 402, 404-429)	590	2 2	3.1	44	1.9	2 2	40.4
	All other causes	3,636	13.4	19.1	323	13.8	162	17.9

KEY: ICD = International Classification of Diseases-9 code.

[a]The rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate.

SOURCES: Statistics Canada, *Health Reports* 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991*, Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, February 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Table C-8--Comparison of U.S. and Canadian Death Rates (per 100,000) for the Five Leading U.S. Causes of Death, Females, Age 15 to 24,1987

U.S. cause of death rank	Cause (ICD-9 Codes)	United States			Canada	
		Number	Percent	Rate (per 100,000)	Number	Percen
	A	9,323	100.0%	50.9	791	100.0%
1	A					
	(	4,081	43.9	22.3	379	47.9
	N	3,512	37.7	19.2	317	40.1
	A					
	e	579	6.2	3.2	62	7.8
2	H					
	(	1,073	11.5	5.9	42	5.3
3	N					
	r					
	h	777	8.3	4.2	77	9.7
4	S	764	8.2	4.2	91	11.5
5	D					
	4	348	3.7	1.9	20	2.5
	A	2270	24.3	124	182	23.0

KEY: ICD = International Classification of Diseases-9 code.

[a]The rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus th rate.

SOURCES: Statistics Canada, *Health Reports* 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bu Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991*, Pub. No. P25-1095 (Washington, DC: U 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Stati 1993.

Table C9--Comparison of U.S. and Canadian Death Rates (per 100,000) for 10 Leading U.S. Causes of Death, Males, Age 25 to 44,1989

Us. cause of death rank	Cause (ICD-9 Codes)	United States			Canada			Us. and Canada rate difference[a] (percent)
		Number	Percent	Rate (per 100,000)	Number	Percent	Rate (per 100,000)	
	All causes	99,482	100.0%0	251.2	7040	100.0%	161.7	55.4%
1	Accidents and adverse effects (E800-E949)	21,889	22.0	55.3	2024	28.8	46.5	18.9
	Motor vehicle accidents (E810-E825)	12,169	12.2	30.7	1108	15.7	25.4	20.9
	All other accidents and adverse effects (E800-E807,E826-E949)	9,720	9.8	24.5	916	13.0	21.0	16.7
2	Human immunodeficiency virus infection (042444)	14,646	14.7	37.0	584	8.3	13.4	175.7
3	Diseases of heart (390-398, 402, 404-429)	11,204	11.3	28.3	773	11.0	17.8	59.4
4	Malignant neoplasms, Including neoplasm of lymphatic and hematopoletic tissues_ (140-208)	9,522	9.6	24.0	959	13.6	22.0	9.2
5	Suicide (E950-E959)	9,442	9.5	23.8	1181	16.8	27.1	-12.1
6	Homicide and legal intervention (E960-E978)	8,797	8.8	22.2	160	2.3	3.7	504.5
7	Chronic liver disease and cirrhosis (571)	3,388	3.4	8.6	*138*	2.0	3.2	169.9
8	*Cerebrovascular* diseases (430-438)	1,730	1.7	4.4	130	1.8	3.0	46.3
9	Pneumonia and influenza (480-487)	1,454	1.5	3.7	*54*	0.8	1.2	196.0
10	Diabetes mellitus (250)	1,302	1.3	3.3	*48*	0.7	1.1	198.2
	All other causes	16,108	16.2	40.7	989	14.0	22.7	79.1

KEY: ICD = International Classification of Diseases-9 code.

aThe rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate.

SOURCES: Statistics Canada health Reports 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, U.S. Population estimates *by Age, Sex, Race, and* Hispanic *Origin: 1980* to 1991, Pub. No. F'XP1095 (Washington, DC: U.S. Government Printing Office, Februaly 1993; U.S. Department of Health and Human services, Centers for Disease Control end Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Table C-10--Comparison of U.S. and Canadian Death Rates (per 100,000) for the 10 Leading U.S. Causes of Death, Females, Age 25 to 44,1989

U.S. Cause of death	Cause (ICD-9 codes)	United States			Canada			U.S. and Canada rate Canada[a] (percent)
		Number	Percent	Rate (per 100,000)	Number	Percent	(per 100,000)	
	All Causes	**41,9611**	**100.0%**	**104.8**	**3,411**	**100.0%**	**77.7**	**34.9%**
1	**Malignant neoplasms, including neoplasms of lumphatic and hematopoietic tissues (140-208)**	**11,534**	**27.5**	**28.8**	**1,250**	**36.6**	**28.5**	*1.1*
2	*Accidents and adverse effeects (E800-949)*	*6540*	*15.6*	*16.3*	**603**	*17.7*	*13.7*	*18.9*
	Motor vehicle accidents (E810+E825)	*4,402*	*10.5*	*10.9*	**392**	*11.5*	*8.9*	**22.5**
	All otheraccidents and adverse effects (E800-E807,E826-E949)	*2,138*	*5.1*	*5.3*	*211*	*62*	*4a*	*10.4*
3	*Diseases ofheart (390-398, 402, 404-429)*	*4,040*	*9.6*	*10.1*	*214*	*6.3*	*4.9*	*106.9*
4	*Suicide (E950-E959)*	*2,454*	*5-8*	*6.1*	**354**	*10.4*	*8.1*	*-24.0*
5	*Homicide and legal intervention (E960-E978)*	**2,357**	*5.6*	*5.9*	*80*	*23*	*1.8*	*223.0*
6	*Human immodeficiency virus infection (042444)*	*1,676*	*4.0*	*42*	*28*	*0.8*	*0.6*	**556.2**
7	*Cerebrovascular diseases (430-438)*	*1,537*	*3.7*	*3.8*	*139*	*4.1*	*32*	*212*
8	*Chronic liver disease and cirrhosis (571)*	*1,196*	*29*	*3.0*	*48*	*1.4*	*1.1*	*173.1*
9	*Pneumonia and influenza (480-487)*	**842**	*20*	*21*	*44*	*1.3*	*1.0*	*109.8*
10	*Diabetes mellitus (250)*	*817*	*1.9*	*20*	*43*	*1.3*	*1.0*	*108.3*
	All other causes	*8,968*	*21.4*	*22.4*	**608**	*17.8*	*13.8*	*61.7*

Key: ICD = International Clasification of Diseases-9 code.

[a]The rate difference represents how much greater or smaller the U.S rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate..

SOURCES: **Statistics Canada, *Health Reports* 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991*, Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, February 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.**

Table C-11—Comparison of U.S. and Canadian Death Rates (per 100,000) for the 10 Leading U.S. Causes of Death, Males, Age 45 to 64, 1989

U.S. cause of death rank	Cause "CD-" Codes'	United States			Canada			U.S. and Canada rate difference[a] (percent)
		Number	Percent	Rate (per 100,000)	Number	Percent	Rate (per 100,000)	
	All causes	234,432	100.0%	1,064.4	22,064	100.0%	876.1	21.5%
1	Diseases of heart (390-398, 402, 404-429)	79,286	33.8	360.0	6,917	31.3	274.6	31.1
2	Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues (140-208)	73,298	31.3	332.8	8,099	36.7	321.6	3.5
3	Accidents and adverse effects (E800-E949)	10,806	4.6	49.1	1,119	5.1	44.4	10.4
	Motor vehicle accidents (E810-E825)	4,938	2.1	22.1	443	2.0	17.6	25.6
	All other accidents and adverse effects (E800-E807,E826-E949)	5,868	2.5	26.3	676	3.1	26.9	-2.2
4	Cerebrovascular diseases (430-438)	8,130	3.5	36.9	749	3.4	29.7	24.1
5	Chronic liver disease and cirrhosis (571)	7,896	3.4	35.9	696	3.2	27.6	29.7
6	Chronic obstructive pulmonary disease and allied conditions (490-496)	7,138	3.0	32.4	478	2.2	19.0	70.8
7	Suicide (E950-E959)	5,221	2.2	23.7	634	2.9	25.2	-5.8
8	Diabetes Mellitus (250)	4,938	2.1	22.4	414	1.9	16.4	36.4
9	Human immunodeficiency virus infection (042-044)	4,137	1.8	18.8	179	0.8	7.1	164.3
10	Pneumonia and influenza (480-487)	3,551	1.5	16.1	259	1.2	10.3	56.8
	All other causes	30,031	12.8	136.3	2520	11.4	100.1	36.3

KEY: ICD = International Classification of Diseases-9 code.

[a]The rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate.

SOURCES: Statistics Canada, *Health Reports* 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991*, Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, February 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Table C-12-Comparison of U.S. and Canadian Death Rates for the 10 Leading U.S. Causes of Death, Females, Age 45 to 64,1989

Us. muse of death rank	Cause (ICD-9 Codes)	United States Number	United States Percenlt	United States Rate (per 100,000)	Canada Number	Canada Percent	Canada Rate (per 100,000)	Us. and Canada rate difference[a] (percent)
	All causes	143,892	100.0%	603.3	12,332	100.0%	478.8	26.0%
1	Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues (140-208)	61,951	43.1	259.8	6,325	51.3	245.6	5.8
2	Diseases of heart (390-398, 402, 404-429)	32,987	22.9	138.3	2,172	17.6	84.3	64.0
3	Cerebrovascular diseases (430-438)	6,994	4.9	29.3	600	4.9	23.3	25.9
4	Chronic obstructivepulmonary disease and allied Conditions (490-496)	5,893	4.1	24.7	341	2.8	13.2	86.6
5	Diabetes mellitus (250)	4,788	3.3	20.1	239	1.9	9.3	116.3
6	Accidents and adverse effects (E800-E949)	4,240	2.9	17.8	429	3.5	16.7	6.7
	Motor vehicle accidents (E810-E825)	2,349	1.6	9.7	231	1.9	9.0	7.8
	All other accidents and adverse effects (E800-E807,E826-E949)	1,891	1.3	7.8	198	1.6	7.7	1.3
7	Chronic liver disease and cirrhosis (571)	3,581	2.5	15.0	264	2.1	10.3	46.5
8	Pneumonia and influenza (480-487)	2,036	1.4	8.5	145	1.2	5.6	51.6
9	Suicide (E950-E959)	1,763	1.2	7.4	237	1.9	9.2	-19.7
10	Nephritis, nephrotic syndrome and nephrosis (580-589)	1,108	0.8	4.6	74	0.6	2.9	61.7
	All other causes	18,551	12.9	77.8	1,506	12.2	58.5	33.0

KEY: ICD. International Classification of Diseases code.

aThe rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate.

SOURCES: Statistics Canada, Health *Repott* 3(1) (suppl.) (Ottowa, Ontario: Statistics Canada 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S.* Population Estimates age,sSex, race, and Hispanic origin: 1980 to b 1991, Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, Febrary 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Table C13-Comparison of U.S. and Canadian Death Rates (per 100,000) for the 10 Leading U.S. Causes of Death, Males, Age 65 and Over, 1989

U.S. cause of death rank	Cause (ICD-9 Codes)	United States Number	United States Percent	United States Rate (per 100,000)	Canada Number	Canada Percent	Canada Rate (per 100,000)	U.S. and Canada Rate difference (percent)
	All causes	720,811	100.0%	5,844.6	70,261	100.0%	5,671.2	3.1%
1	Diseases of heart (390-398, 402, 404429)	276,328	38.3	2,240.6	23,609	33.6	1,905.6	17.6
2	Malignant neoplasms, including neoplasm of Lymphatic and hematopoietic tissues (140-208)	178,430	24.8	1,446.8	19,055	27.1	1,538.1	-5.9
3	Cerebrovascular diseases (430-438)	47,202	6.5	382.7	5,224	7.4	421.7	-9.2
4	Chronic obstructive pulmonary disease and allied conditions (490-496)	40,304	5.6	326.8	4,496	6.4	362.9	-9.9
5	Pneumonia and influenza (480-487)	29,972	4.2	243.0	2,836	4.0	228.9	6.2
6	Accidents and adverse effects (E800-E949)	13,525	1.9	109.7	1,479	2.1	119.4	-8.1
	Motor vehicle accidents (E81O-E825)	4,051		32.1	391	0.6	31.6	1.6
	All other accidents and adverse effects (E800-E807,E826-E949)	9,474		75.0	1,088	1.5	87.8	-14.6
7	Diabetes mellitus (250)	13,399	1.9	108.6	1,359	1.9	109.7	-1.0
8	Nephritis, nephrotic syndrome and nephrosis (580-589)	8,187	1.1	66.4	896	1.3	72.3	-8.2
9	Artherosclerosis (440)	6,652	0.9	53.9	831	1.2	67.1	-19.6
10	Septicemia	6,281	0.9	50.9	209	0.3	16.9	201.9
	Ail other causes	100,531	13.9	815.1	10,267	14.6	828.7	-1.6

KEY: ICD. International Classification of Diseases-9 code.

aThe rate difference represents how much greater or smaller the U.S. rate is relative to Canadas' rates. It is calculated as the U.S. rate minus the Canadian rate, rate.

SOURCES: Statistics Canada Health Reports 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991,* Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, February 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Table C-14-Comparison of U.S. and Canadian Death Rates (per 100,000) for the 10 Leading U.S. Causes of Death, Females, Age 65 and Over, 1989

U.S. cause of death rank	Cause (ICD-9 Codes)	United States			Canada			U.S. and Canada rate difference[a] (percent)
		Number	Percent	Rate (per 100,000)	Number	Percent	Rate (per 100,000)	
	All causes	*816,977*	100.0%	**4,4524**	68,545	100.0%	**3974.3**	**120%**
1	**Diseases of hea@ (390-398, 402s 404-429)**	*327,640*	40.1	**1,785.6**	*23,215*	**33.9**	**1,346.0**	**327**
2	**Malignant ~ne) *neoplasms* and lymphatic and hematopoiec tissues (140-208)**	**157,776**	**19.3**	**859.9**	*15,591*	**227**	*804.0*	**-4.9**
3	Cerebrovascular **(430-438)**	79,458	**9.7**	*433.0*	*7511*	*11.0*	435.5	**-0.6**
4	Pneumonia and influenza (460-487)	**37,423**	**4.6**	*204.0*	*3211*	**4.7**	186.2	**9.5**
5	Chronic obstructive disease amdauedandibom (490-496)	**29,661**	**3.6**	*161.6*	**2,293**	**3.3**	*133.0*	**21.6**
6	**Diabetes mellitus (250)**	***21,399***	**2 6**	*116.6*	*1767*	**2 6**	*1025*	*13.8*
7	Accidents and adverse effects (E800-E949)	*13,307*	**1.6**	**72.5**	*1,537*	**2 2**	*89.1*	*-18.6*
	Motor vehicle (E81O-E825)	**3,200**	*0.4*	**17.4**	**254**	*0.4*	**14.7**	**18.4**
	All other accidents and adverse effects (E800-E807,E826-E949)	**10,107**	*1.2*	**55.1**	**1,283**	*1.9*	**74.4**	**-25.9**
8	**Artherosclerosis (440)**	*11,761*	**1.4**	64.1	1,434	**21**	83.1	**-229**
9	**Nephritis nephrotic syndrome and nephrosis (580-589)**	*9,321*	**1.1**	**50.8**	**892**	**1.3**	*51.7*	**-1.8**
10	**Septicemia (038)**	*9,147*	*1.1*	**49.9**	*216*	*0.3*	**125**	*298.0*
	All other causes	*120,084*	*14.7*	**654.4**	*11,132*	*16.2*	**645.4**	*1.4*

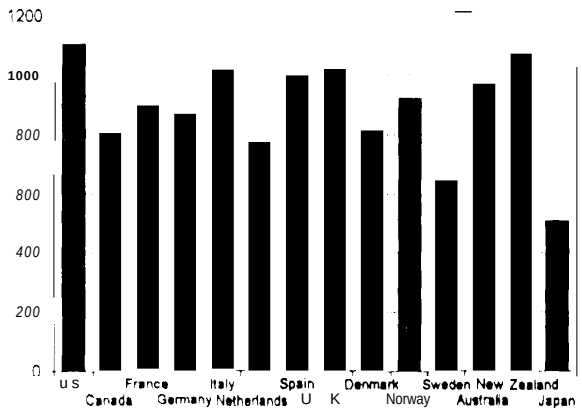
KEY: ICD = International Classification of Diseases-9 code.

[a]The rate difference represents how much greater or smaller the U.S. rate is relative to Canada's rates. It is calculated as the U.S. rate minus the Canadian rate, divided by the Canadian rate.

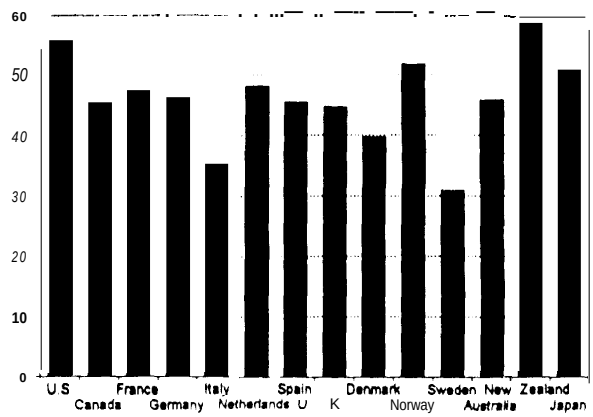
SOURCES: Statistics Canada, *Health Reports* 3(1) (suppl.) (Ottawa, Ontario: Statistics Canada, 1991); U.S. Department of Commerce, Bureau of the Census, Current Population Reports, *U.S. Population Estimates by Age, Sex, Race, and Hispanic Origin: 1980 to 1991*, Pub. No. P25-1095 (Washington, DC: U.S. Government Printing Office, February 1993; U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, unpublished tables, Hyattsville, MD, 1993.

Figure C-1—Age-Specific Death Rates (per 100,000), Males, United States and Selected Countries,[a] 1987-88[b]

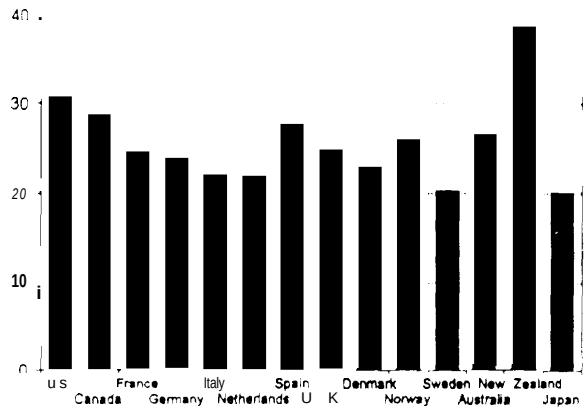
Under age 1



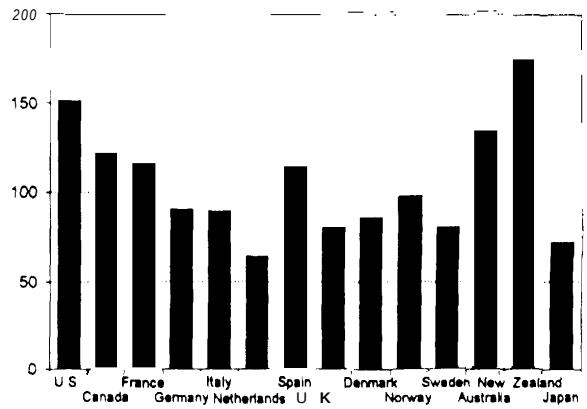
Age 1-4



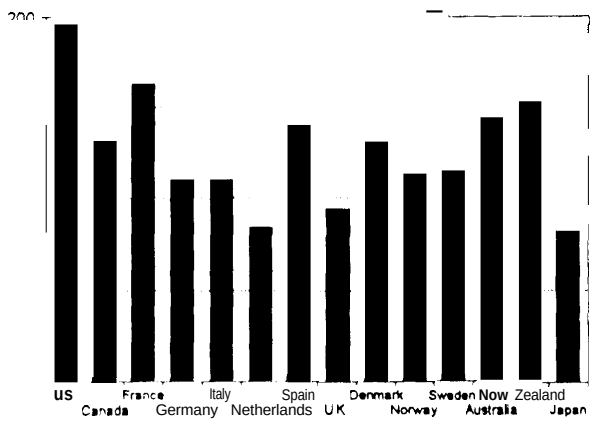
Age 5-14



Age 15-24



Age 25-34



Age 35-44

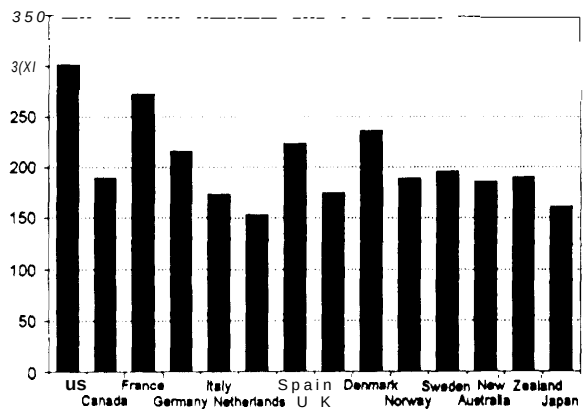
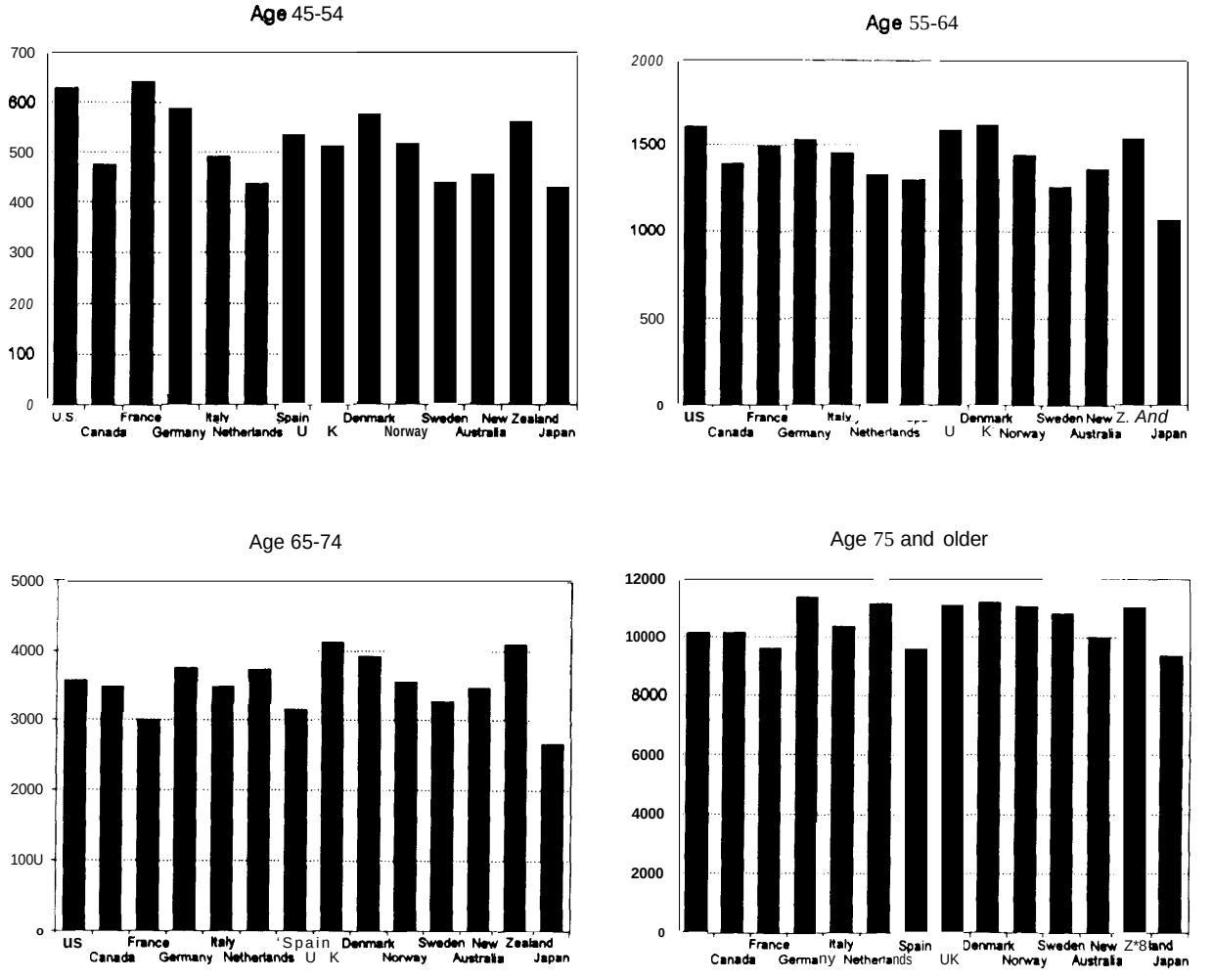


Figure C-1—Age-Specific Death Rates (per 100,000), Males, United States and Selected Countries,[a] 1987-88[b]
(Continued)

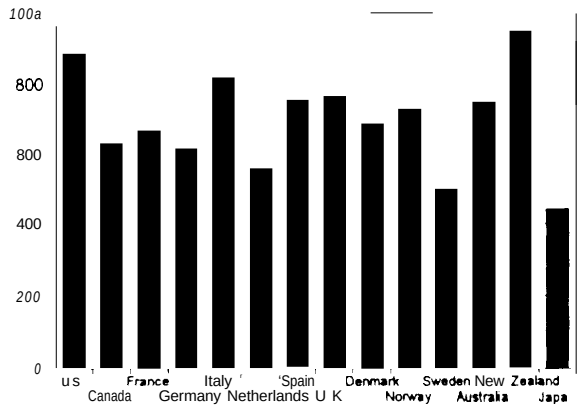


a Data for Germany from former Federal Republic Of Germany.
b Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

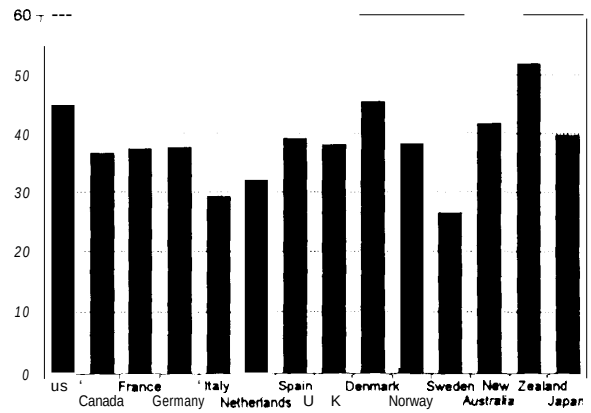
SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-2—Age-Specific Death Rates (per 100,000), Females, United States and Selected Countries,[a] 1987-88[b]

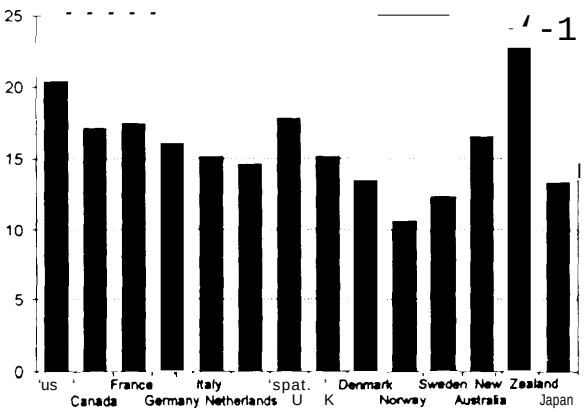
Under age 1



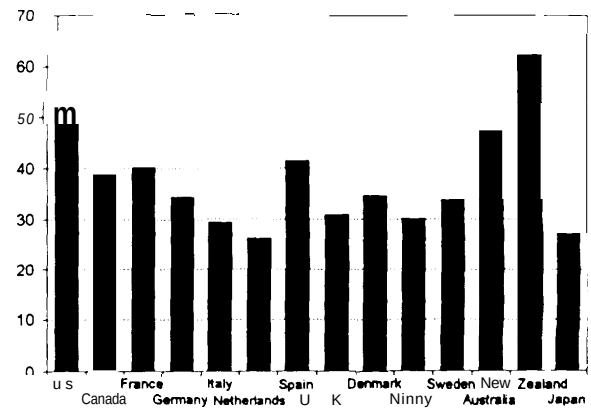
Age 1-4



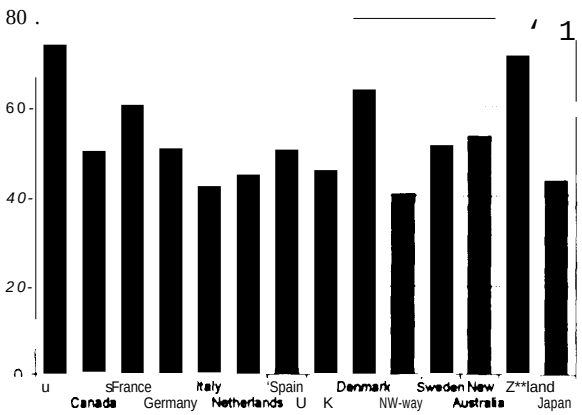
Age *5-14*



Age 15-24



Age 25-34



Age 35-44

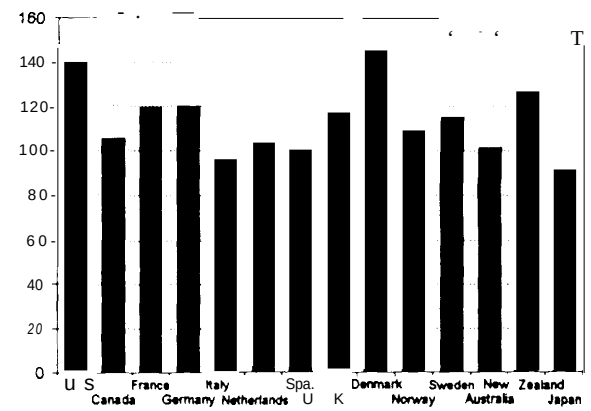
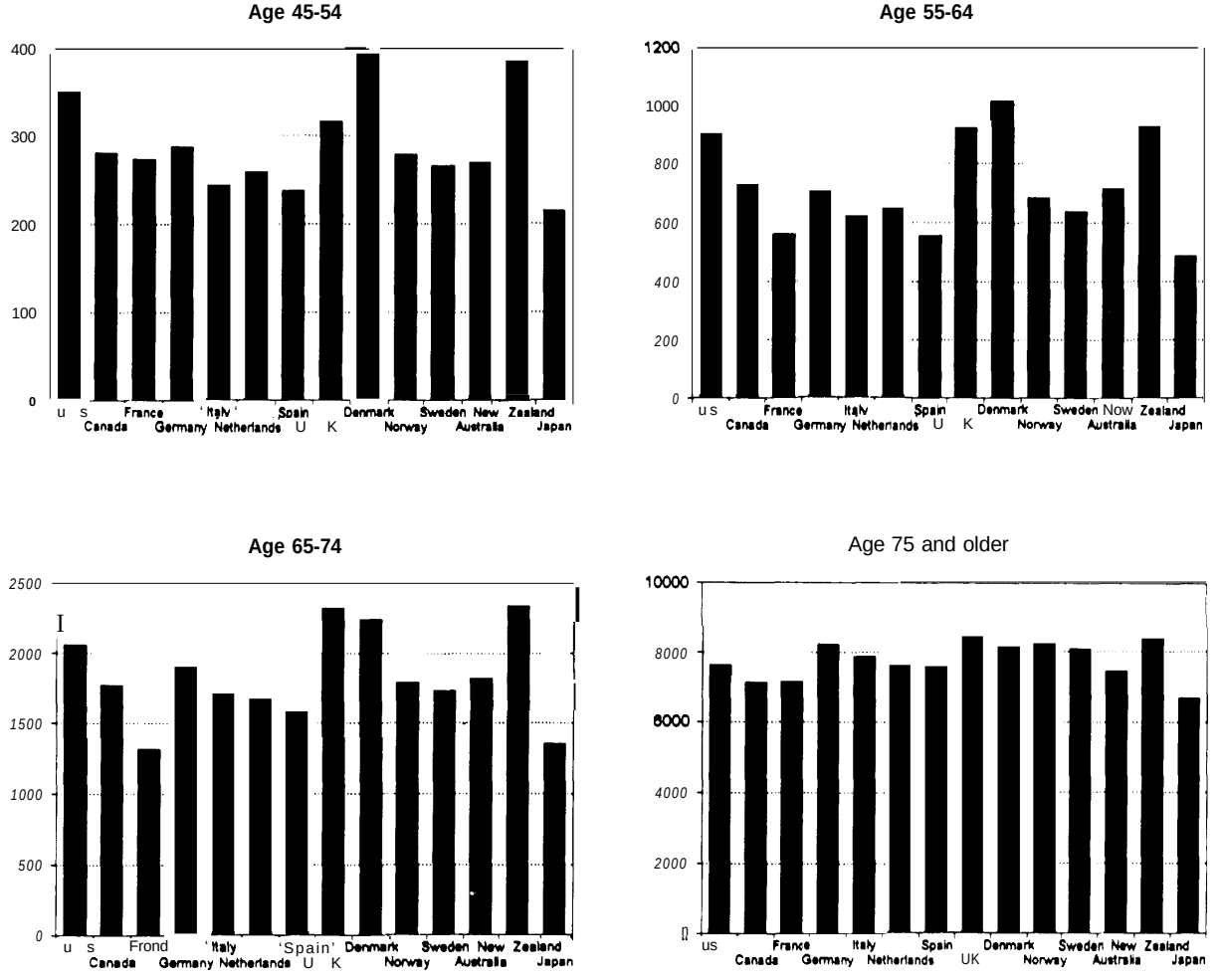


Figure C-2—Age-Specific Death Rates (per 100,000), Females, United States and Selected Countries,[a] 1987-88[b] (Continued)



● Data for Germany from former Federal Republic of Germany.
b Rates are for 1088, ● xcopt for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World* Health *Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992),

Figure C-3—Age-Specific Death Rates (per 100,000) for Accidents,[a] Males, United States and selected Countries,[b] 1987-88[c]

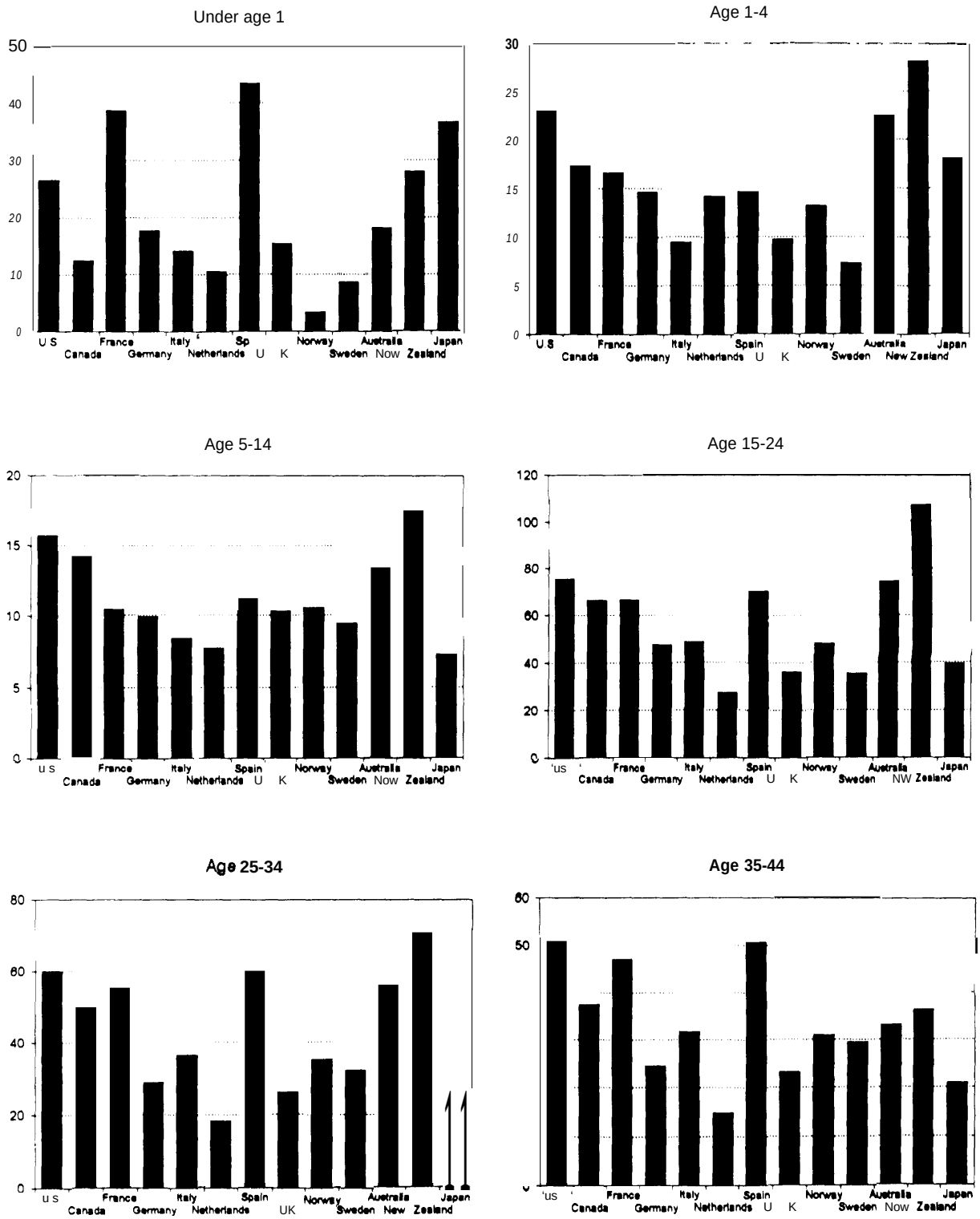
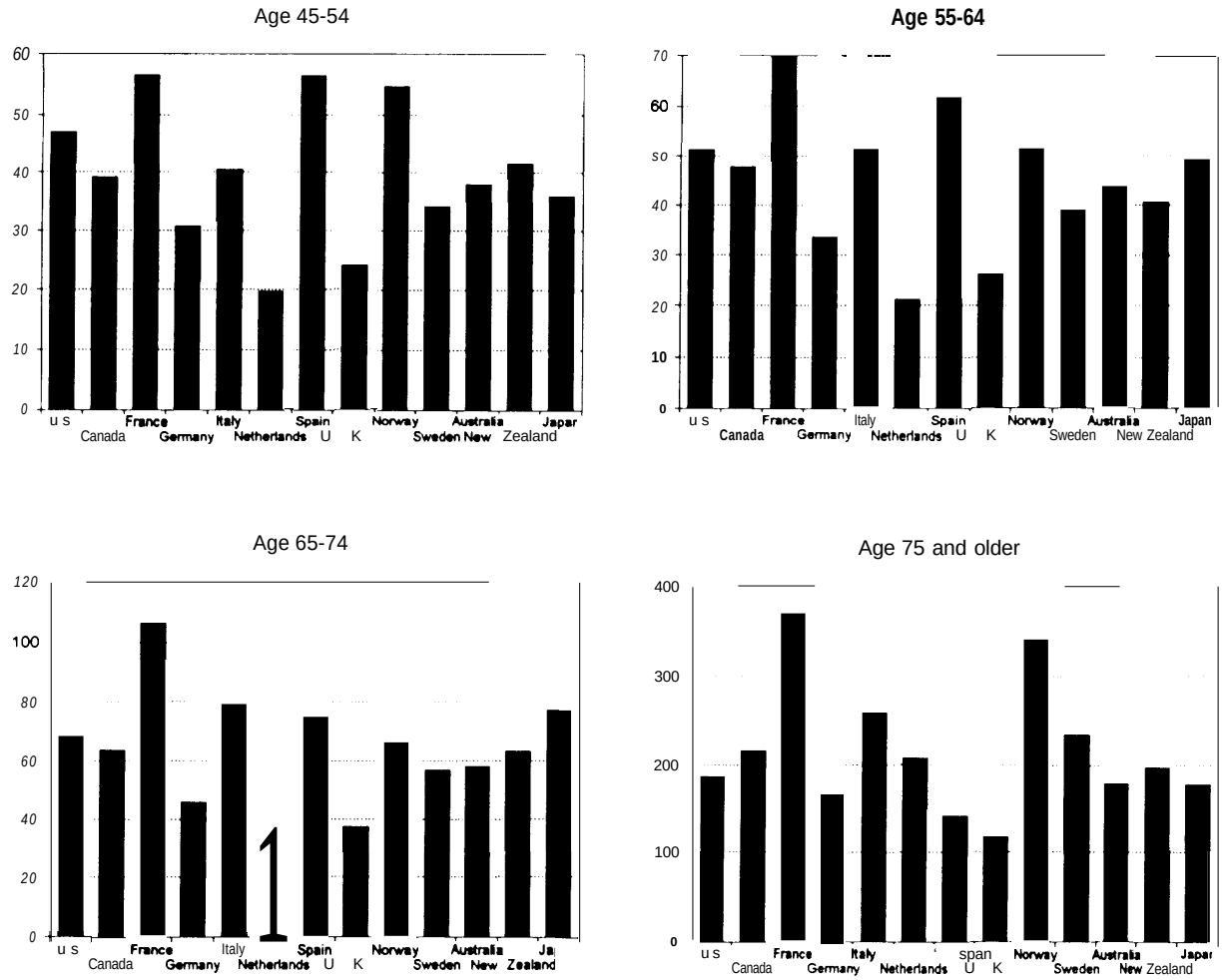


Figure C-3-Age-Specific Death Rates (per 100,000) for Accidents,[a] Males, United States and Selected Countries,[b] 1987-88[c] (Continued)



a "Accidents" includes International Classification of Diseases-9 basic tabulation list codes E47-E53, accidents and adverse effects.
b Data for Germany from former Federal Republic of Germany.
c Rates are for 1888, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-4—Age-Specific Death Rates (per 100,000) for Accidents," Females, United States and Selected Countries,[b] 1987-88[c]

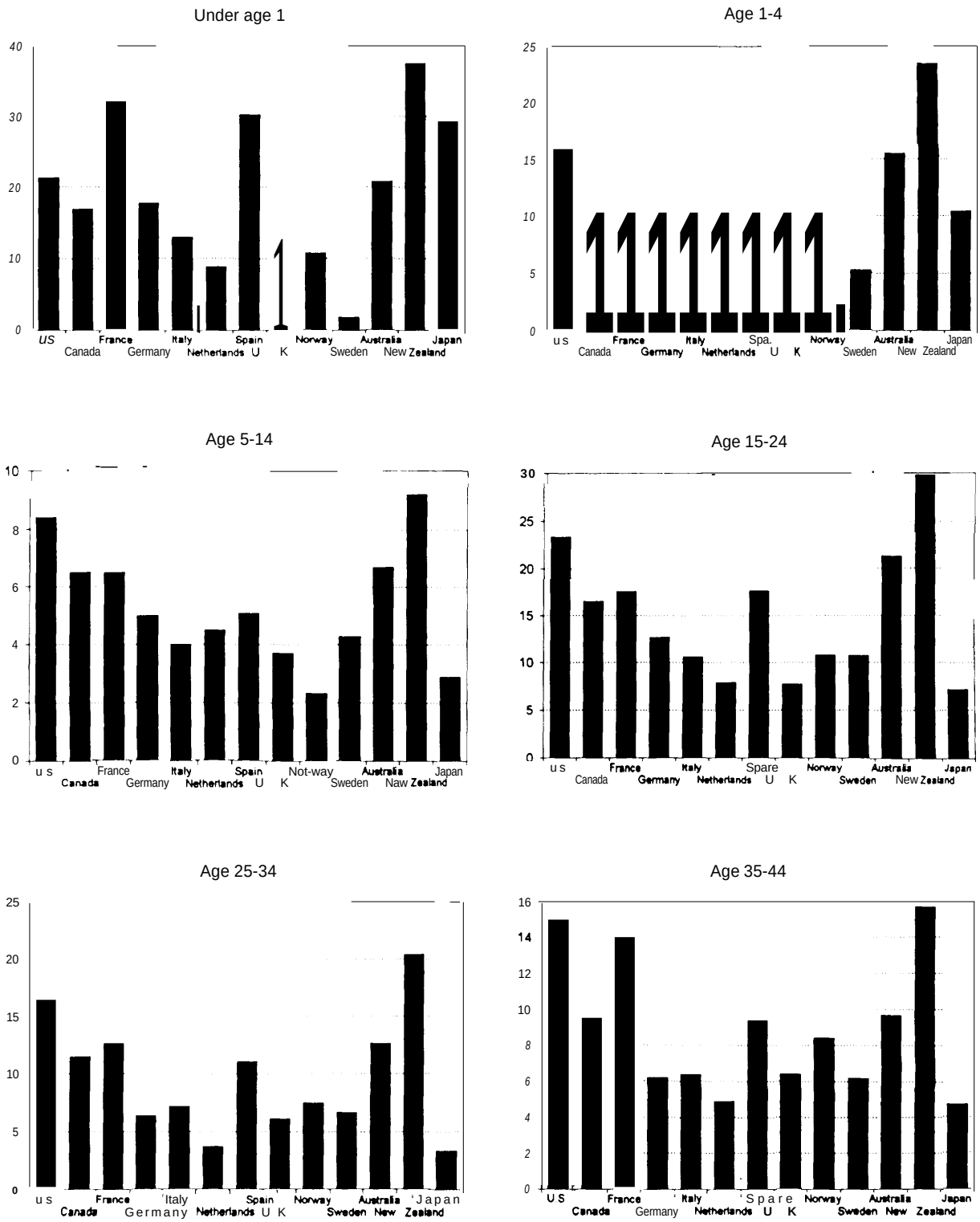
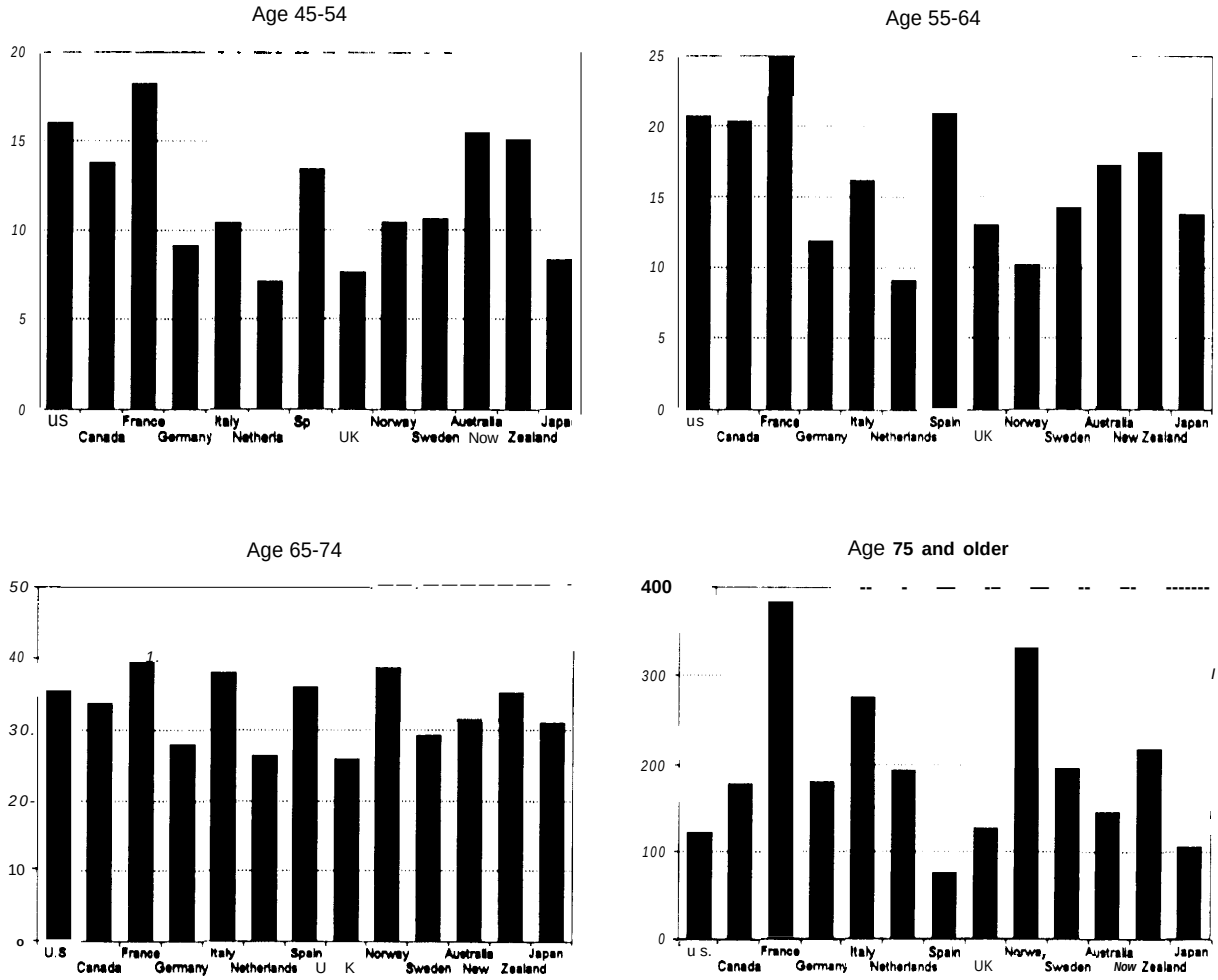


Figure C-4--Age-Specific Death Rates (per 100,000) for Accidents,[a] Females, United States and Selected Countries,[b] 1987-88[c] (Continued)



a "Accidents" Includes International Classification of Diseases-9 basic tabulation list codes E47-E53, accidents and adverse effects.
b Data for Germany from former Federal Republic of Germany.
o Rates are for 1988, ● xoept for Italy, New Zealand, ● nd Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992),

Figure C-5—Age-Specific Death Rates (per 100,000) for Homicide and Other Violence,[a] Males, United States and Selected Countries,[b] 1987-88[c]

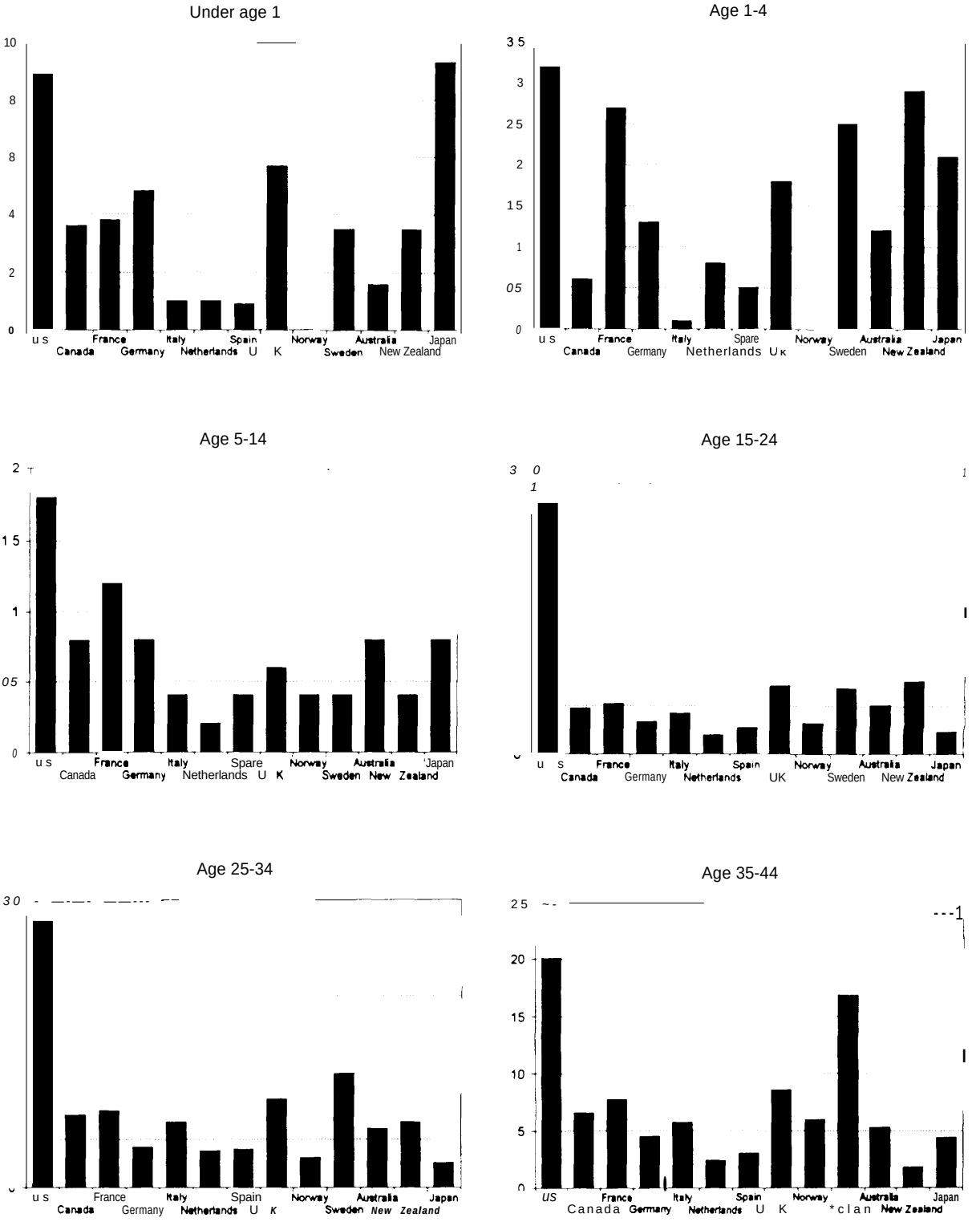
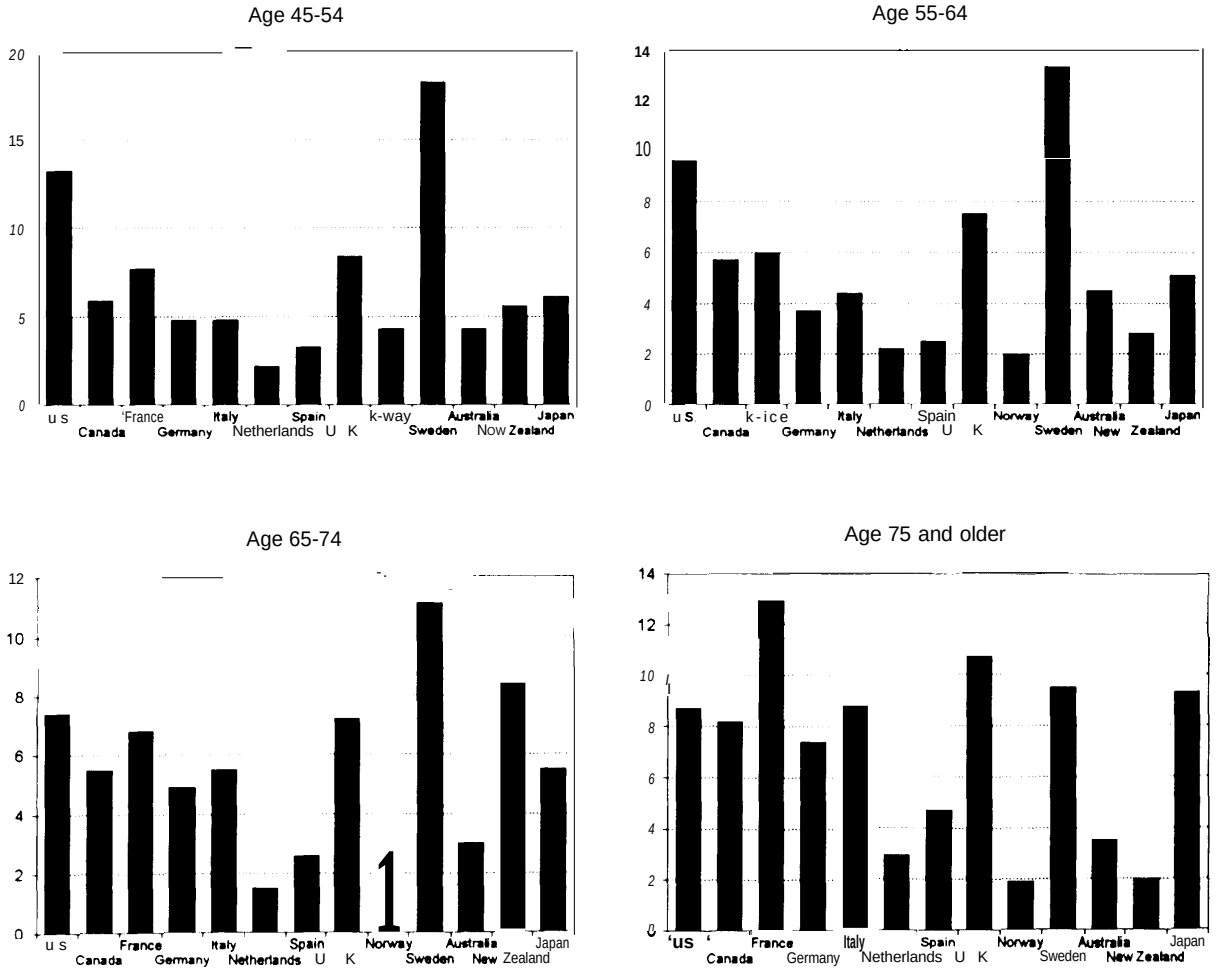


Figure C-5--Age-Specific Death Rates (per 100,000) for Homicide and Other Violence,[a] Males, United States and Selected Countries,[b] 1987-88[c] (Continued)



a "Homicide and Other Violence" includes International Classification of Diseases-9 basic tabulation list codes E55-E56.
b Data fo, Germany from former Federal Republic of Germany.
c Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1892),

Figure C-6-Age-Specific Death Rates (per 100,000) for Homicide and Other Violence,[a] Females, United States and Selected Countries,[b] 1987-88[c]

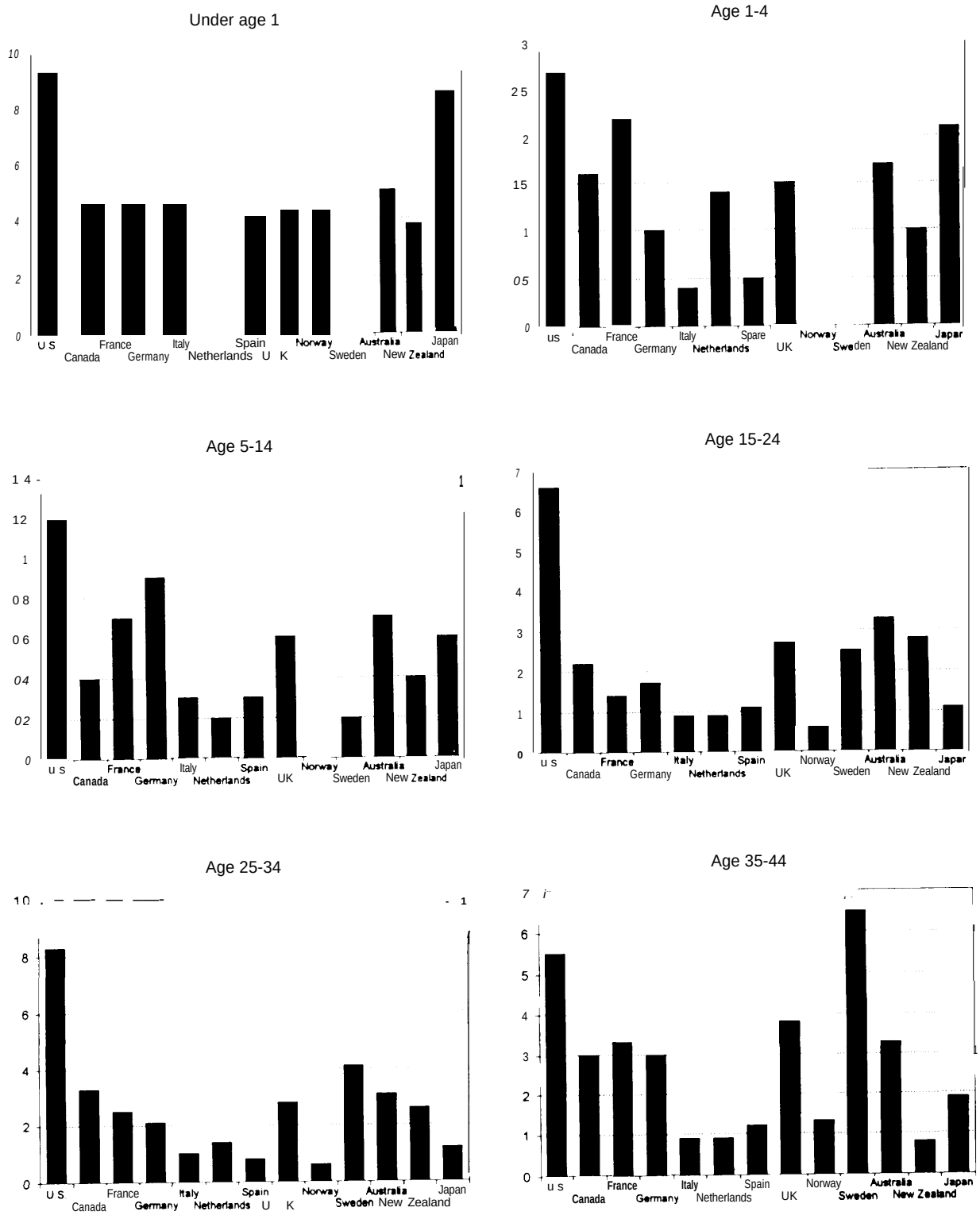
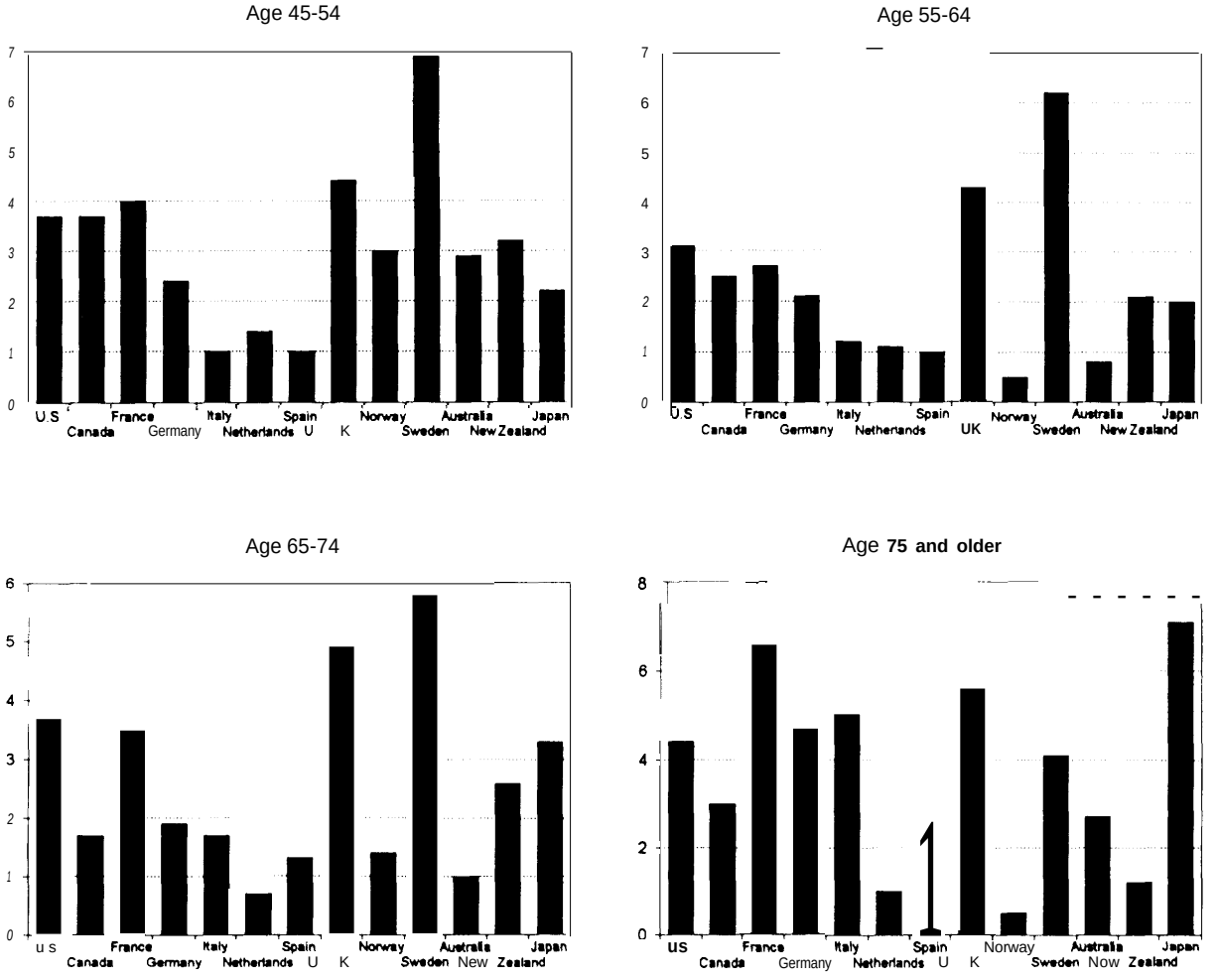


Figure C-6-Age-Specific Death Rates (per 100,000) for Homicide and Other Violence,[a] Females, United States and Selected Countries,[b] 1987-88[c] (Continued)



a "Homicide and Other Violence" includes International Classification of Diseases-9 basic tabulation list codes E55-E56.
b Data for Germany from former Federal Republic of Germany.
c Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics* Annual (Geneva, Switzerland: World Health organization, 1989, 1991, 1992).

Figure C-7—Trends In Age-Standardized[a] Death Rates (per 100,000) for-Injury and Violence,[b] Males, United States and Selected Countries,[c] 1955-84

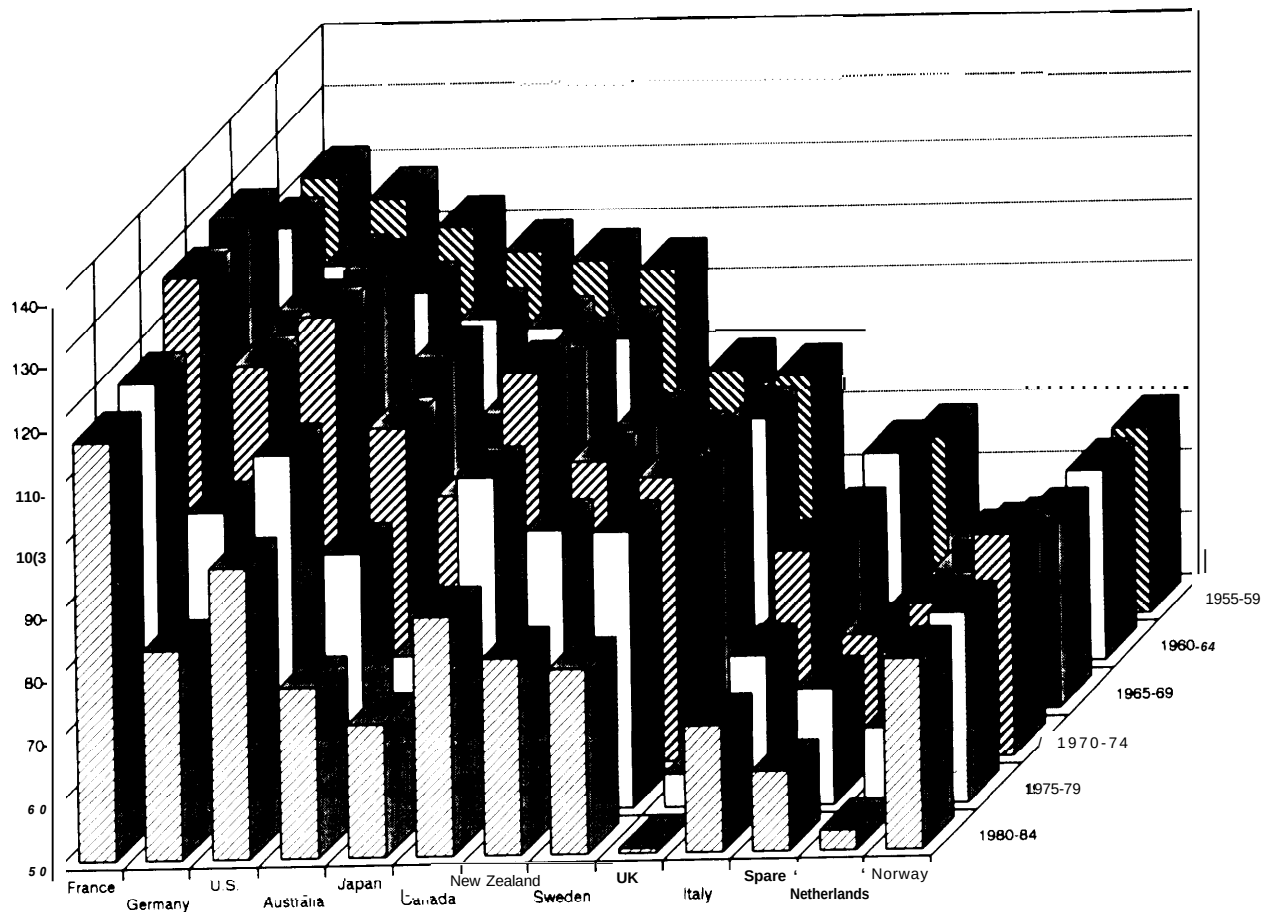
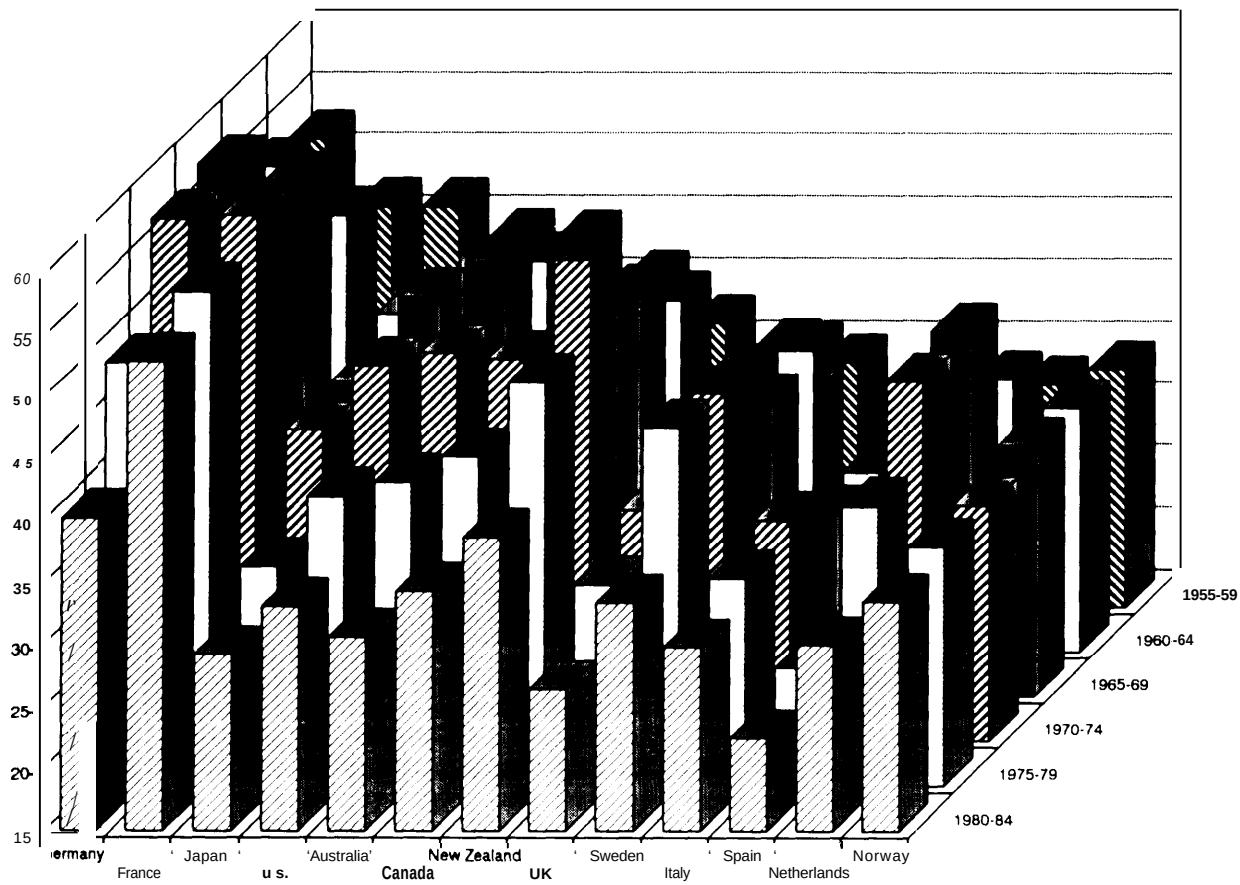


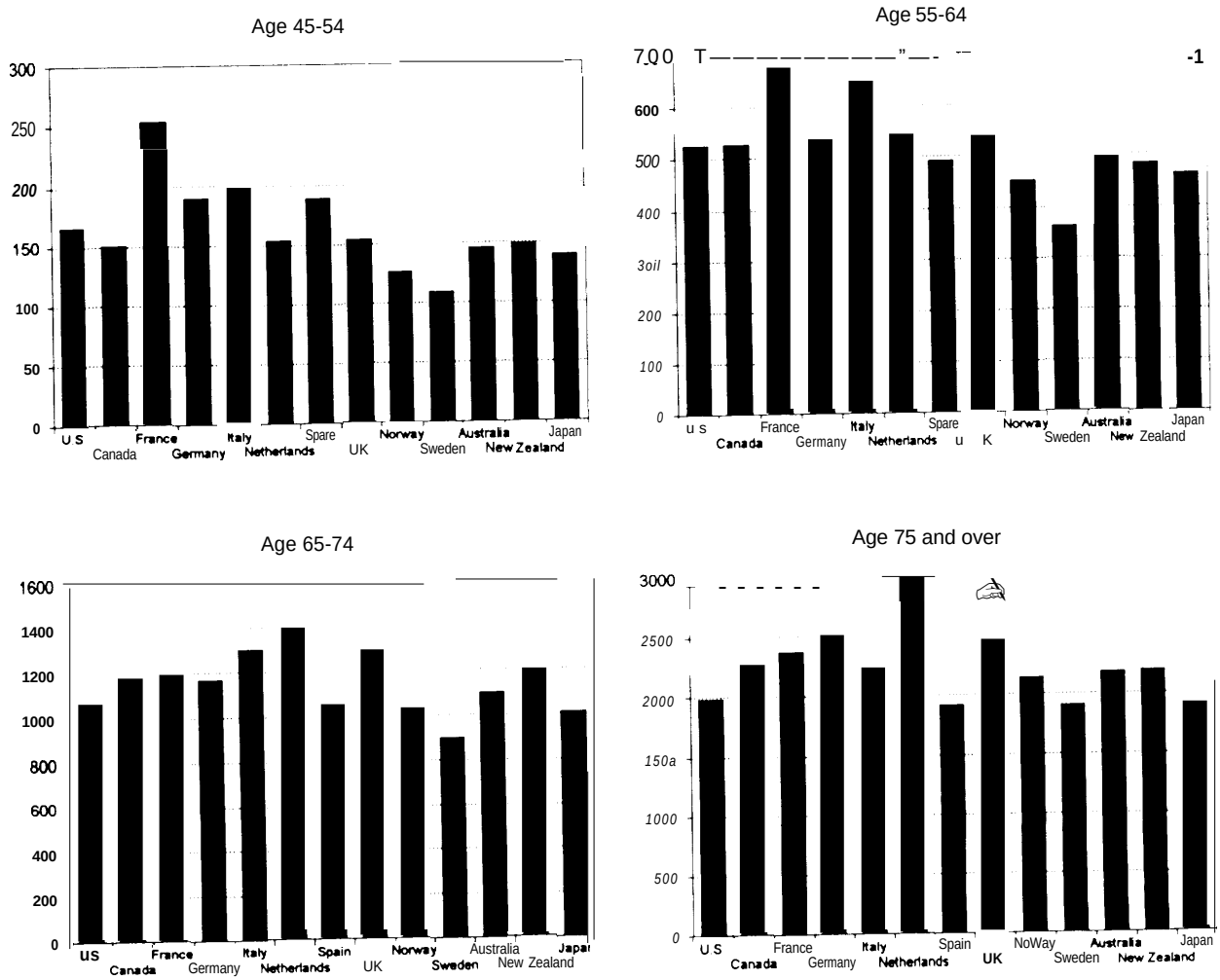
Figure C-7—Trends In Age-standardized[a] Death Rates (per 100,000) for Injury and Violence,[b] Females, United States and Selected Countries,[c] 1955-84 (Continued)



a The European standard population is used to age adjust rates.
b "Injury and violence" includes [international Classification of Diseases-9 basic tabulation list (x)&s E47-E56, which include accidents (E47-53), suicide and self-inflicted injuries (E54) and homicide and other violence (E55 and E56).
c Data for Germany from former Federal Republic of Germany.

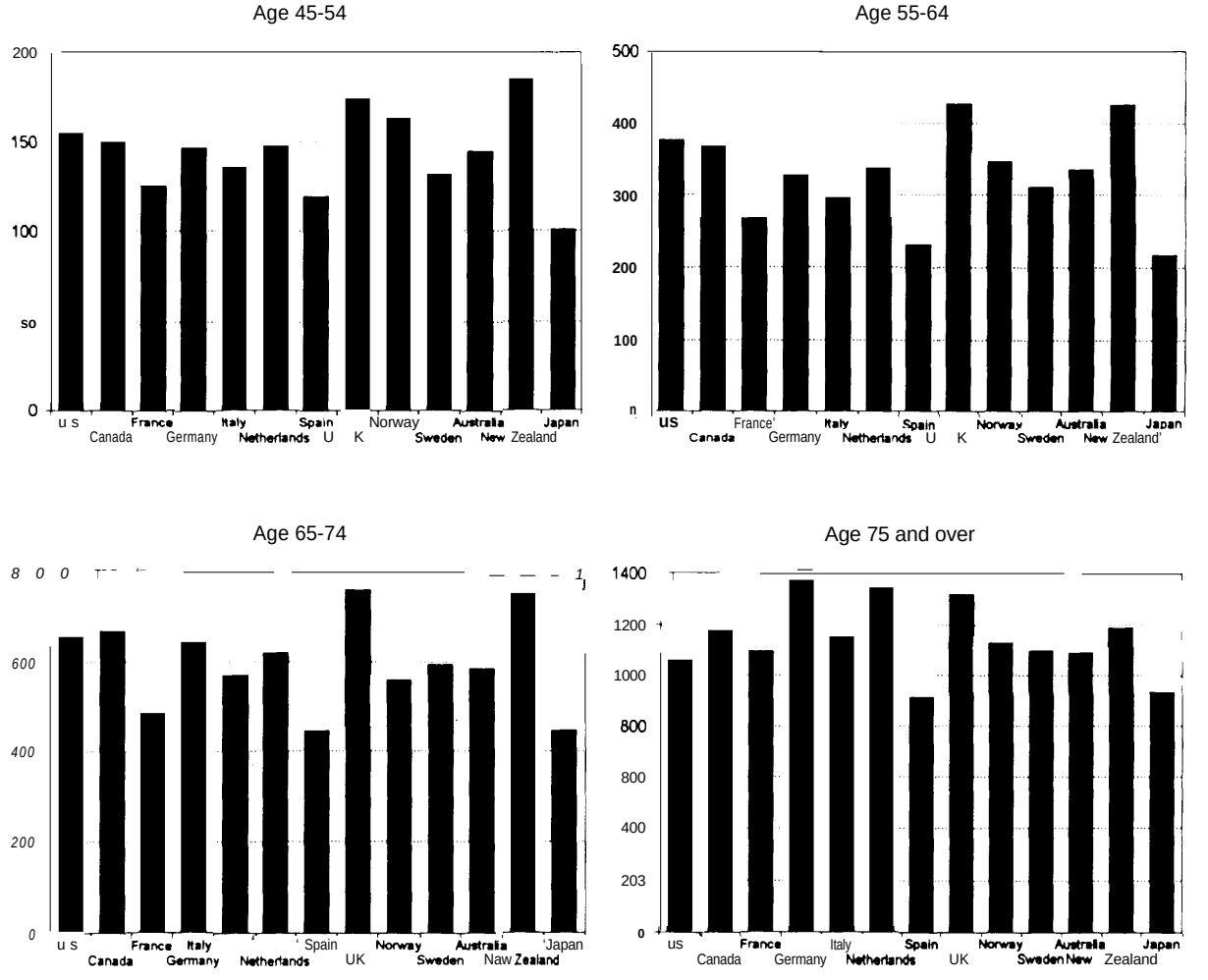
SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-8-Age-Specific Death Rates (per 100,000) for Cancer,[a] Males Age 45 and Older, United States and Selected Countries,[b] 1987-88[c]



a Cancer includes International Classification of Diseases-9 basic tabulation list codes 08-14.
b Data for Germany from former Federal Republic of Germany.
c Rates are for 1888, except for Italy, New Zealand, and Spain where 1987 rates are shown.
SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-9—Age-Specific Death Rates (per 100,000) for Cancer, Females Age 45 and Older, United States and Selected Countries,[a] 1987-88[b]



a Data fo, Germany from former Federal Republic of Germany.
b Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-10--Trends in Age-standardized[a] Death Rates (per 100,000) for Circulatory System Disease,[b] United States and Selected Countries,[c] 1955-84

Males

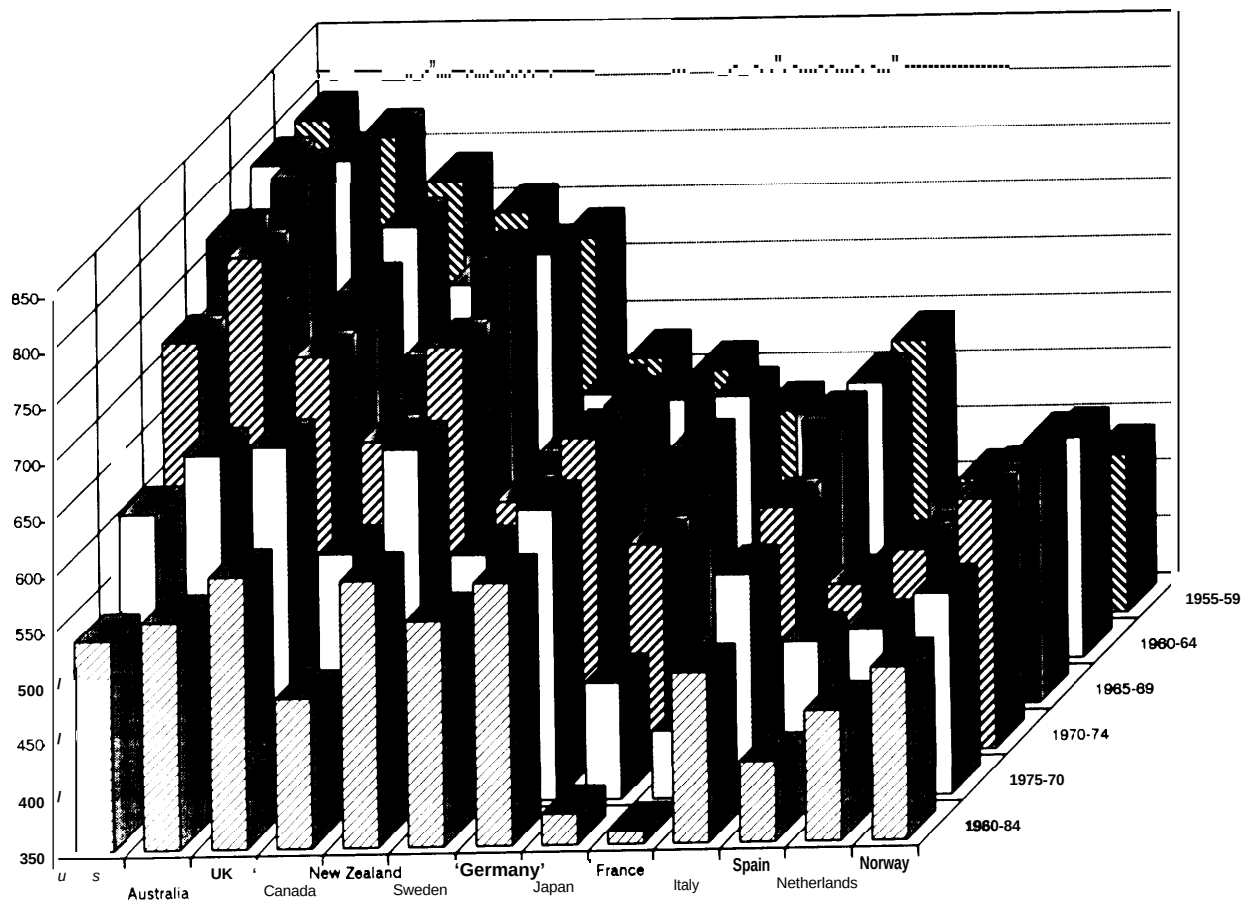
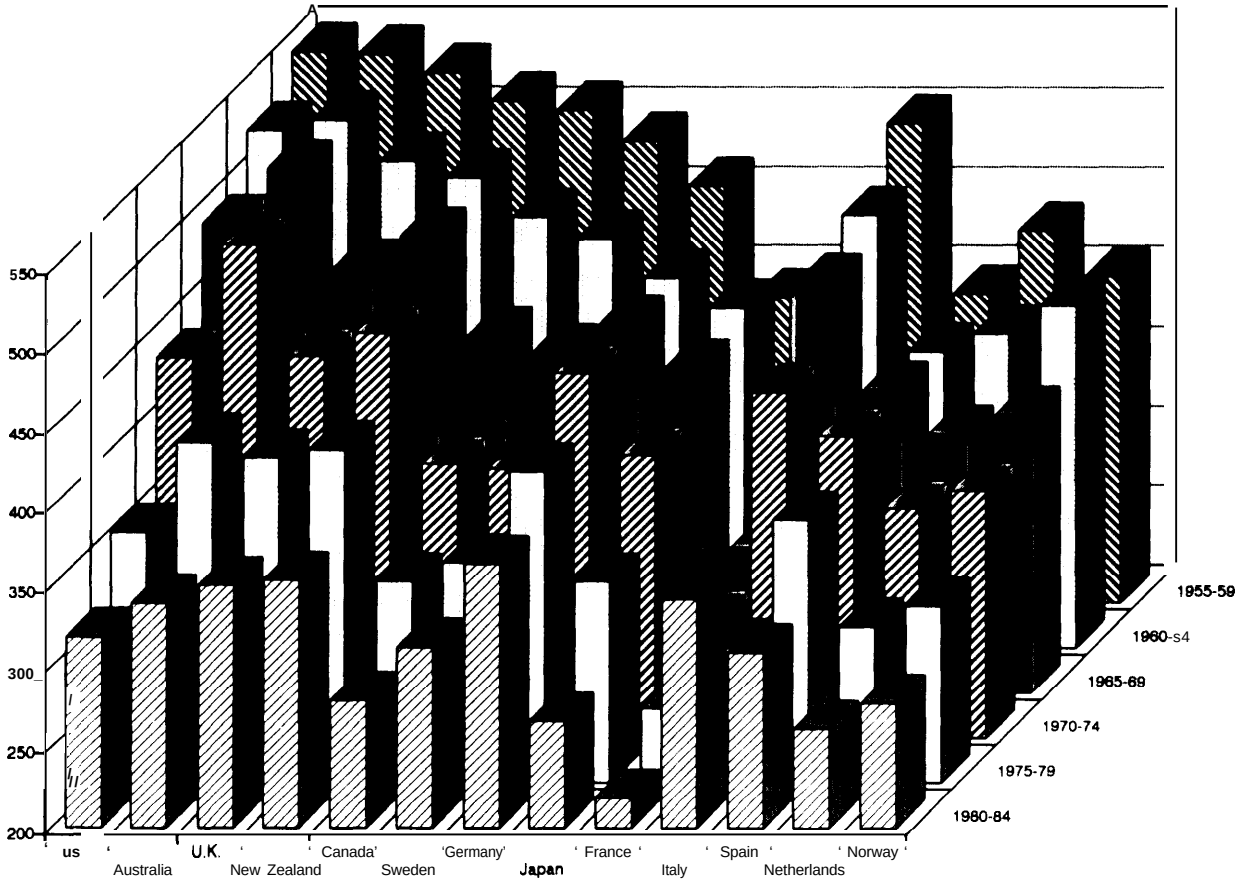


Figure C-I O-Trends in Age-Standardized[a] Death Rates (per 100,000) for Circulatory System Disease,[b] United States and Selected Countries,[c] 1955-84 (Continued)

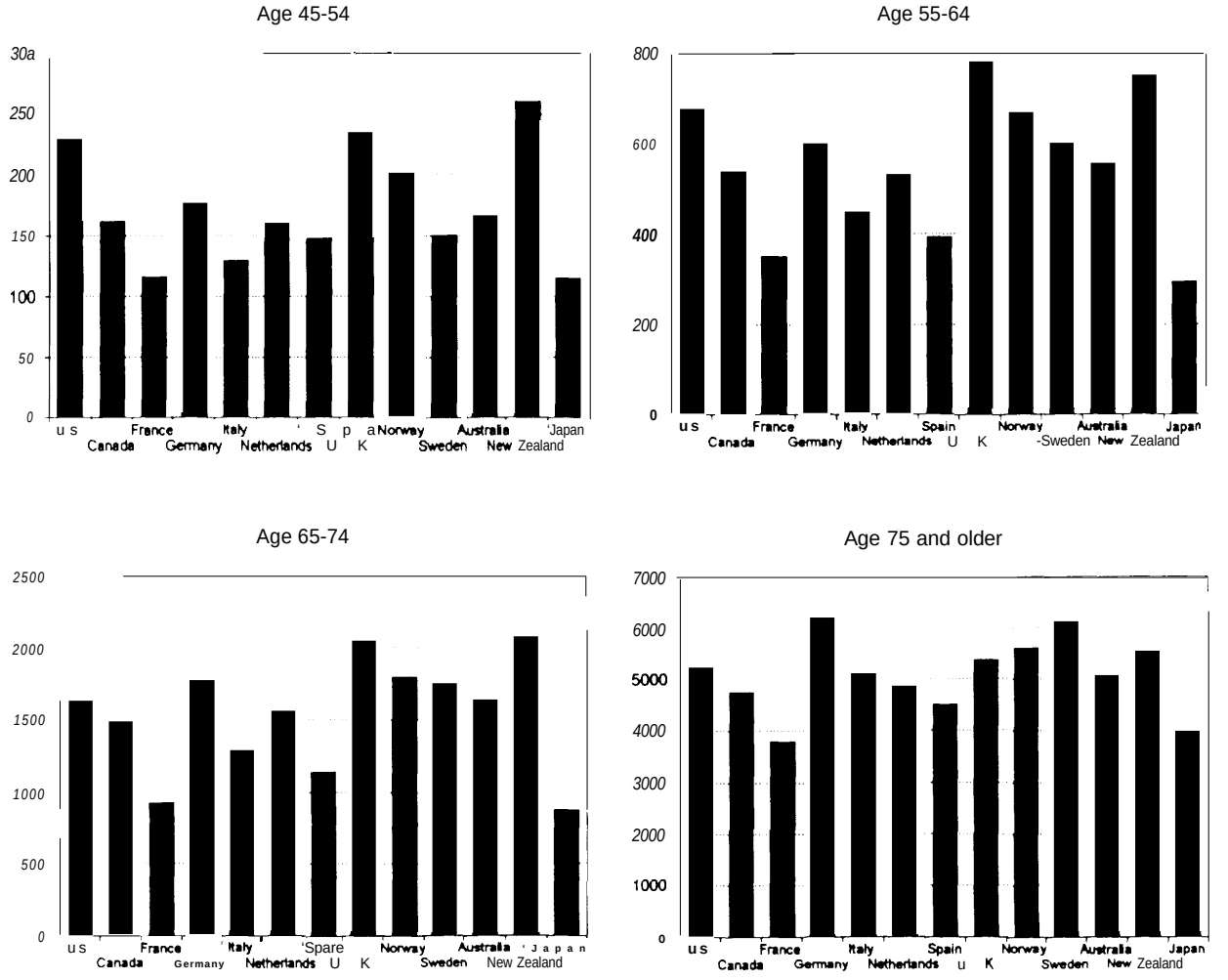
Females



a The European *standard* population is used to age adjust rates.
b "Circulatory system disease" includes International Classification of Diseases-9 basic tabulation list codes 25-30.
c Data for Germany from former Federal Republic of Germany.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

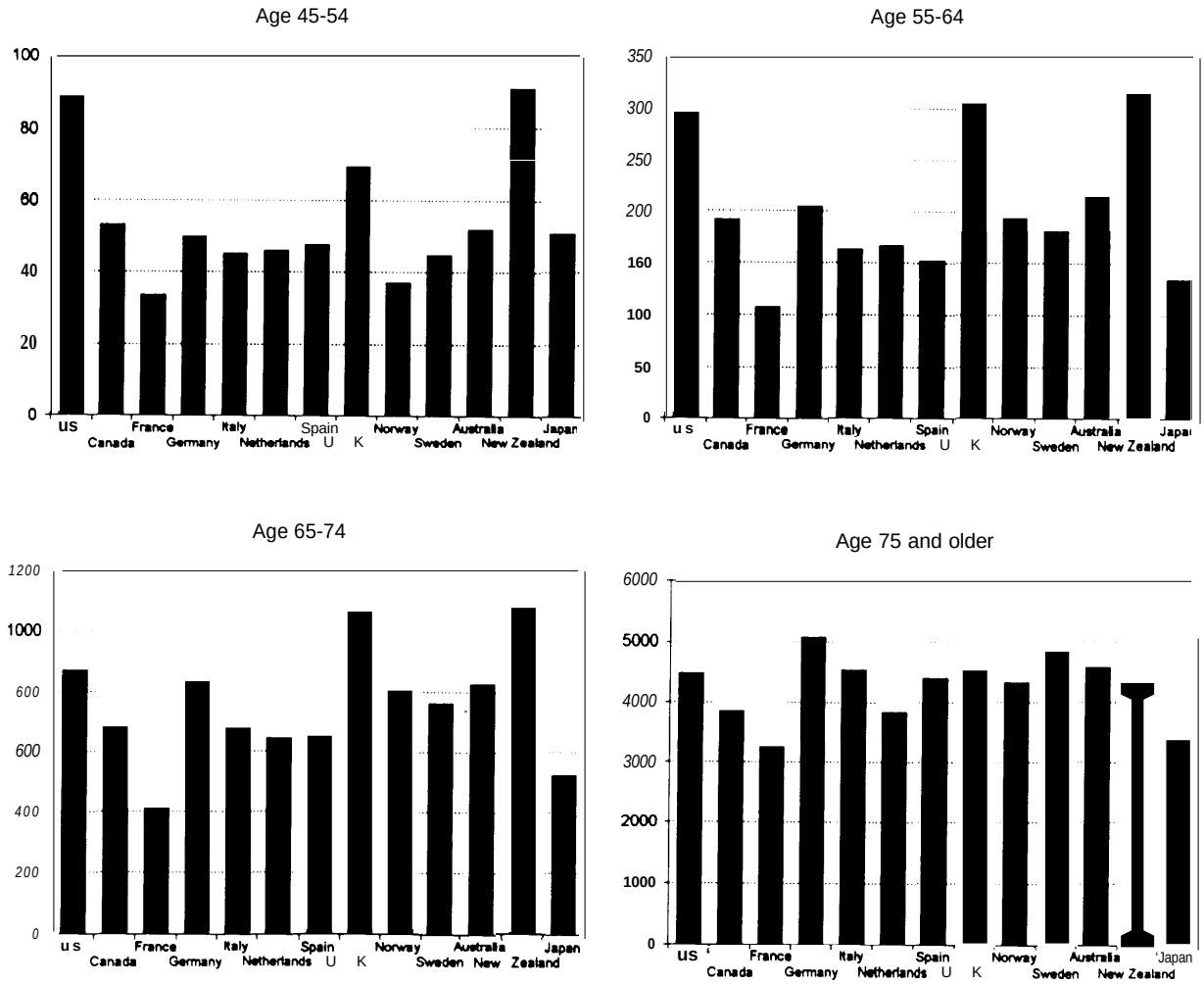
Figure C-11—Age-Specific Death Rates (per 100,000) for Circulatory System Disease,[a] Males Age 45 and Older, United States and Selected Countries,[b] 1987-88[c]



a "Circulatory system disease" includes International Classification of Diseases-9 basic tabulation list codes 25-30.
b Data for Germany from former Federal Republic of Germany.
c Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992).

Figure C-1 2—Age-Specific Death Rates (per 100,000) for Circulatory System Disease,[a] Females Age 45 and Older, United States and Selected Countries,[b] 1987-88[c]



a "Circulatory system disease" includes international Classification of Diseases-9 basic tabulation list codes 25-30.
b Data for Germany from former Federal Republic of Germany.
c Rates are for 1988, except for Italy, New Zealand, and Spain where 1987 rates are shown.

SOURCE: World Health Organization, *World Health Statistics Annual* (Geneva, Switzerland: World Health Organization, 1989, 1991, 1992),

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