

SECTION III.

METHODOLOGY

Mortality and Its Risk Factors in Connecticut, 1989-1998

Origin of the Mortality Data

Mortality data in this report are taken from the Connecticut Death Registry. Virtually all deaths occurring to Connecticut residents in the United States and Canada are included in this data base. Mortality data are derived from the cause of death information reported on Connecticut death certificates that are completed by funeral directors, attending physicians, medical examiners, or coroners. Sociodemographic information on death certificates is often based on report by next of kin. Original records are filed in the state registration offices.

Several causes of death may be entered on the death certificate. Causes include all diseases, conditions, or injuries that may have resulted in or contributed to death as well as the circumstances or the event that produced any injuries. Tabulations of cause-of-death statistics in this report are based solely on the “underlying” cause of death unless otherwise stated. The underlying cause of death is the disease or injury that initiated the series of events leading directly to death or the circumstances of the event that resulted in the fatal injury. Examination of the combination of causes can shed additional light on factors related to mortality. Therefore, for selected diseases both underlying and contributing causes of death are used as the basis for defining categories in this report. For example, diabetes is the underlying cause of death for approximately 500 to 600 Connecticut residents per year. “Diabetes-related deaths,” those deaths for which diabetes may be an underlying and/or a contributing cause, account for almost five times as many Connecticut resident deaths annually as does diabetes alone. Appendix I contains the cause of death categories included in this report with their respective ICD-9 codes.

Classification of Diseases

Classification of cause of death data is based on the Ninth Revision of the International Classification of Diseases (ICD-9), the internationally accepted coding system for determining the underlying and contributing causes of death (World Health Organization 1977). The ICD is revised periodically to take into account the discovery of new diseases and advances in medical diagnoses. This report uses the ninth revision of the International Classification of Diseases, or ICD-9. ICD-9, used since 1979, is replaced by the tenth revision (ICD-10) beginning with 1999 deaths. Changes adopted with the ICD-10 coding will affect how the leading causes of death are determined and may have an impact on the rankings of these causes (Anderson and Rosenberg 1998).

Selection of Cause of Death Categories

The 28 causes of death discussed in this report are a subset of 62 leading causes of death among Connecticut residents for which this analysis was performed. Summary tables of age-adjusted mortality rates (AAMR) and years of potential life lost rates (YPLL) by gender, race, and ethnicity and detailed analyses for the 62 causes of death are located in Appendix VII of this report.

The 62 selected causes of death were derived from the National Center of Health Statistics (NCHS) List of 72 Selected Causes of Death and HIV Infection (National Center for Health Statistics 1994a); the *Healthy People 2000* and *Healthy People 2010* target area categories (U.S. Department of Health and Human Services 1990; U.S. Department of Health and Human Services 2000); and the Council of State and Territorial Epidemiologists (CSTE) Indicators for Chronic Disease Surveillance (Lengerich 1999; Lengerich 2000). Selection of multiple-cause-of-death categories was based partly on an analysis of the ratio of multiple to underlying causes listed on 1997 Connecticut resident death certificates for 33 leading causes of death. Higher ratios identify conditions that are more likely to be listed as contributing rather than underlying causes of death. Such conditions may be important, but frequently overlooked, contributors to mortality. Based on this analysis, contributing causes of death selected for inclusion into this study are diabetes-related, septicemia-related, COPD-related, atherosclerosis-related, nephritis-related, and hypertension-related. Also, despite a relatively low ratio, the category “heart-disease-related deaths” was included due to the large number of additional deaths identified by considering contributing cause of death information. We determined the final list of cause-of-death groups in consultation with local health directors and with Department of Public Health (DPH) staff involved with health programs and surveillance.

Categories included in this report are ranked according to the NCHS leading causes of death. In addition to “all causes of death,” there are a total of 14 broad cause-of-death category titles and 13 related or sub-categories (Appendix I). The 14 broad cause-of-death groups account for 82 percent of the total number of deaths (288,034) that occurred in the State during the 1989 to 1998 period.

Statistical Measures Used in This Report

This report provides an overall evaluation of age-specific mortality rates, age-adjusted mortality rates (AAMRs), and years of potential life lost rates (YPLL) for the state of Connecticut (CT) for the period 1989-1998. AAMRs and YPLLs for the period 1989-1991 (or 1992-1994 for select causes) are compared to those for the time period of 1996-1998 for any statistically significant differences. Subgroup analyses by gender, race, and ethnicity are provided for most causes of death.

Several methodological enhancements have been introduced in this report to provide a systematic and comprehensive assessment of the mortality patterns evaluated. These enhancements include the following:

- The margin of error for AAMRs and premature mortality (YPLL) statistics were calculated, thus allowing for a critical evaluation of changes over time and between-group differences;
- Trends over the study period (1989-1998) were assessed using logistic regression models in addition to the basic assessment of changes between 1989-1991 (or 1992-1994) and 1996-1998 found throughout this report. The development of these models allowed us: to estimate the 1989-1998 (or 1992-1998) trend slope, that is the average annual percent change in AAMR, and also to evaluate the statistical significance of these trends; to identify single year rates that do not lie on the trend line; to identify age groups whose trend line differs from the overall trend; and to make these assessments while adjusting for age and adopting appropriate significance thresholds for multiple comparisons.
- Disparities in AAMRs by race and ethnicity were assessed using logistic regression models in addition to making group comparisons for 1996-1998 AAMRs. The development of these models allowed us to identify age groups in which the disparity differed from the overall black/white or Hispanic/white difference in AAMRs and to identify age-specific disparities when no overall disparity was identified.

In addition, Connecticut AAMRs are compared to U.S. AAMRs, and to the Year 2000 Objectives for the state of Connecticut (Connecticut Department of Public Health 1999) and the United States (National Center for Health Statistics 1994b) for most cause of death groups. The leading causes of death among Connecticut residents are ranked by age, gender, and race and ethnicity (Appendix V). The population bases for computing rates were obtained from U.S. Census figures. Additional information on these statistical measures and methods, population denominators, and the definition of terms is presented in Appendix II. Detailed explanations of statistical models used and examples of the use of age-adjustment in calculating mortality and years of potential life lost rates are described in Appendix III and Appendix IV, respectively. Some of the data presented in this report are based on unpublished tables. These and other mortality data are available on the Connecticut Department of Public Health web page <http://www.dph.state.ct.us>.

Age Standardization of Death Rates: The 1940 and 2000 Standard Populations

Age-adjusted mortality rates (AAMR) and years of potential life lost rates (YPLL) are calculated per 100,000 population using the 1940 and 2000 U.S. standard million population. This adjustment of the mortality rates shows what the rates would be if the Connecticut population had the same age distribution as the U.S. population in 1940 and 2000. The AAMR and YPLL rates were calculated using the 1940 U.S. standard million in order to compare Connecticut's rates with the Connecticut and U.S. Year 2000 Objectives and U.S. AAMRs, which are based on the 1940 U.S. standard

million. AAMRs and YPLLs based on the 2000 standard population are used to compare subgroup populations by sex (male, female) and by race/ethnicity (white, black, Hispanic, Asian Pacific Islander, Native American) in Connecticut. Use of the 2000 standard has two major advantages. First, it more closely approximates the age distribution of Connecticut's population during the period 1989-1998; and secondly, it conforms to the new national standard. Beginning with 1999 deaths, the National Center for Health Statistics is reporting mortality rates adjusted by the 2000 standard million population. The impact of the shift in age standardization from 1940 to 2000 standard population is discussed in detail in Appendix IV-C.