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M.C. White
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Mary Castle White
(Ph.D. Thesis)

Computer Science Research Department
Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

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MULTIPLE CAUSE OF DEATH MORTALITY PATTERNS AMONG CALIFORNIANS

by

Mary Castle White

Abstract

The purpose of this study was to (1) describe mortality patterns among the elderly using single versus multiple cause of death data and (2) examine ways that multiple cause of death data can best be processed, analyzed and presented.

Deaths among white Californians aged 65 and older for the years 1970, 1975 and 1980 were analyzed. Overall, mortality rates decreased over time, at all ages and for both sexes but more so for females, although the number of causes of death increased with age. Underlying cause mortality rates were compared to rates based on any mention of a cause on the death certificate; diabetes and atherosclerosis were more frequent causes of death than would be indicated by single cause statistics, and heart diseases other than ischemic heart disease increased in mentions on the death certificates while ischemic heart disease underlying mortality rates decreased.

Pairs of causes of death showed increased likelihood of occurrence of a number of combinations of chronic diseases. In all pair combinations studied, the addition of another serious chronic disease lowered the mean age of death, with the exception of atherosclerosis, which in combination with another primary cause of death resulted in an older mean age of death. This result combined with higher number of causes per death but lower mortality rates among females raised interesting questions about interpreting more causes on death certificates as an indication of a sicker person at time of death.

This study confirmed morbidity and mortality work of others that mortality of older adults is decreasing but that the number of causes of death per person is increasing. Sin-

gle cause of death statistics may be arbitrary, either as physician terminology preferences dictate or as determined by coding rules set by the National Center for Health Statistics, and may no longer be accurate in populations where multiple concurrent disease processes are common. The methods used by others were contrasted with those used in this study, keeping in mind the limitations of mortality statistics, and recommendations were made for changes in the database to facilitate its use in epidemiologic research.

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ACKNOWLEDGMENTS

INTRODUCTION

Background

Recent changes in life expectancy in the United States, coupled with the aging of the population in general, are two of the reasons for increased attention focused on the health of the elderly. During the period between 1969-71 and 1979-81 the life expectancy at birth increased 3.2 years, from 70.7 to 73.9. In the prior ten-year period the increase in longevity was only 0.8 years (1). Although much of the increase in life expectancy in the past was due to improvements in infant survival, mortality rates have been decreasing for all age groups 65 and older and life expectancy at age 65 has increased for both males and females since 1940 (2).

The age structure of the U.S. population has changed as well, with an increasing proportion of persons in the older age groups (2,3). Since 1960 the elderly, defined in this report as those age 65 and older, have grown in numbers from 16.7 million to 25.9 million in 1980, and have grown proportionately more as a group than those below age 65 (3). In 1920 less than 5 percent of the population was older than 65; in 1970 it was nearly 10 percent; and in the year 2000 the proportion of elderly is projected at nearly 20 percent (4).

Mortality Statistics

Mortality statistics have been used for many years to show patterns in causes of death, to help elucidate hypotheses about disease etiology, and as a surrogate measure for the health status of a population. The process of recording deaths in the United States is one of the oldest and most extensive public health surveillance systems (5). Mortality can be measured in a number of ways, but commonly mortality rates are generated, either for an entire group or for a specific age, race, sex or by another characteristic. A mortality rate is the number of deaths in a given time period divided by the number of person-years lived in the time period by those at risk for death. For this study, the number of deaths comes from United States vital statistics gathered by the National Center for Health Statistics, and the person-years lived comes from the best estimate, the midyear population of the group studied, from U.S. Census Bureau data.

The Death Certificate

Deaths have been recorded for many years, beginning, as with other vital events such as marriages and births, as listings in parish registers. The concept of maintaining a register of deaths for the U.S. was introduced in the 1800s. In 1885 John Billings encouraged the establishment of death registration areas to improve the completeness of national vital events surveillance (6). Certain states and cities with at least 90 percent complete registration of deaths were included in a registration area. Between 1885 and 1915 registration areas were established across the U.S., providing a new, although incomplete look at national statistics. The areas were mainly urban and included about 40 percent of the U.S. population (7).

Death certificates were introduced as legal documents in the U.S., as were most of the other vital statistics measurements. State laws required the registration of deaths, and by 1915 every state had adopted a vital registration law. In 1902 a newly created Bureau of the Census began collecting copies of death certificates on an annual basis in ten states

and in a number of cities with adequate registration data, but in 1915 23 states were still outside death registration areas, except individual cities within the states (6). By 1933 all of the United States was included in the Death Registration Area, with the addition of Texas (8). In the U.S. mortality reporting has attained virtual completeness over the past 20 years, with the collection of death certificates from all areas of the country (9). The death certificate is still a legal document, used as proof for insurance, to obtain a burial permit, and to determine cause of death in court.

States use either the standard form recommended by the National Center for Health Statistics (NCHS) (Appendix A) or a somewhat modified form. Records from local health departments are sent to state offices, and the information is sent from there to NCHS for the tabulation of national statistics. Some states provide sets of data processed according to NCHS specifications and quality control standards, and others provide copies of death certificates for NCHS to process (10). Demographic information on the death certificate includes: race, sex, age, location of death, residence and occupation. Information is also kept on the certifier of the death and the burial or other method of handling the remains of the deceased.

At the state or national level, cause of death information is translated into the standard codes recommended by the World Health Organization (WHO) in its International Statistical Classification of Diseases (ICD) (11). Part 1 of the death certificate is a listing of the causal conditions leading to death: the immediate cause of death is entered first, followed by intermediate conditions and then the underlying cause. A second part allows for the addition of other significant conditions contributing to but not directly related to death. An example would be a person who died of septicemia as the immediate cause of death, due to pneumonia (a contributing cause), which resulted from the person having lung cancer (the underlying cause of death). The sequence of causes in Part 1 were developed from the concept that knowledge of and intervention to prevent the underlying

cause will block or postpone the events leading to death (12).

The classification of diseases and events such as accidents that are used on the death certificate was originally made to provide a more efficient basis for the storage and retrieval of diagnostic data by the World Health Organization (13). In 1950 the U.S. Public Health Service and the Veterans Administration began independent tests of the classification system for hospital indexing. In the next few years, medical centers around the U.S. and private and public organizations adopted the system for medical records and standard data collection. Following a study by the American Hospital Association and the American Association of Medical Record Librarians in 1956, the ICD coding system was found to be a good system for the indexing of hospital records of diagnoses and procedures. The first adaptation for such indexing was published in 1959, with a revision in 1962 (13). Since then, revisions of the ICD have been made regularly, with the latest revision (ninth) published in 1977 (11).

The classification of diseases is based on 17 general categories of diseases grouped by system, such as diseases of the circulatory system and diseases of the respiratory system, or by type of disease, such as infective and parasitic diseases and neoplasms. Although the certifier of death, a physician, determines the underlying and contributing causes of death, a medical coder or nosologist processing the certificate may change the data within certain WHO guidelines (14). This is to make sure that the causal sequence of diseases or events makes sense, and that the information conforms with WHO format. Once the information reaches NCHS, further reclassification may occur. The Automated Classification of Medical Entities (ACME) is a computerized algorithm which evaluates the causes of death and selects the best underlying cause. Using the example given previously, ACME would select lung cancer as the underlying cause, even if the physician had listed pneumonia as the underlying cause and lung cancer as the intermediate cause. Moreover, ACME may combine causes that are listed by the physician separately. For

example, hypertension and stroke listed as intermediate and underlying causes, respectively, would be recoded as the single underlying cause, stroke with mention of hypertension.

Census Data

The most widely used estimate of person-years at risk for the generation of mortality rates is the midyear estimate of a population based on the census count. The Census Bureau makes interpolations from the April 1 census for intercensal years and extrapolations for postcensal years to provide a consistent estimate for each July 1. The United States began a system of census counts in 1790 because of political motivation to determine representation from the states in Congress (15). A Census Office was formally established to conduct the census of 1850, but the office was disbanded and reestablished with each census though 1900 (16). By 1890, a basic population questionnaire included over 30 items. A permanent Census Bureau was developed in 1902 and tabulation of data was streamlined by the use of a punchcard machine developed for the 1890 census.

In 1940 the Census Bureau began sampling households to decrease the amount of data and time needed to process it. By 1970 every household received a short form, and a sampled subset of the households received additional questions on a long form. About 60 percent of the total U.S. population received questionnaires by mail, and the remainder of the population was tabulated by house-to-house canvass, using either the same short or long form as those mailed. Enumerators followed up on households with incomplete or unreturned questionnaires; the Bureau believed that mailed questionnaires with followup would save considerable personnel time. Electronic computerization began with the processing of the 1950 census, with complete computerization of the data in the 1960 census. Missing data on the census forms are supplied by allocation, using the previous stored record to fill in the missing data element. The data are then weighted according to the sampling proportion, to give complete count information for an area that was sampled.

Quality of Mortality Statistics

In 1964 Dorn and Moriyama described the characteristics of the optimal mortality statistics for research (17):

Statistics of causes of death should:

a. accurately reflect the conditions that contribute to the fatal outcome in the opinion of the medical certifier;

b. show the relative importance of the various diseases, injuries, and acts of violence as causes of death; and

c. reliably represent the time trend of the frequency with which the various diseases, injuries, and acts of violence are reported as bringing about death.

The accurate determination of the cause of death and the accurate reporting of demographic information on both the death certificate and the census are central to the study of mortality patterns using vital statistics data. Over the years since the systematic collection and tabulation of death certificate information began in the U.S., there have been a number of questions raised about the validity of these data. Among the concerns are the accuracy of age reporting and the difficulties in determining the true cause of death. Age is one of the most significant variables in any analysis of health data, and accurate age-specific rates are necessary to get a valid picture of the epidemiology of a disease. Determining the true cause of death may be more difficult in the elderly as a specific subpopulation, since there may be several co-morbid conditions and the disease underlying the death may be hard to determine. And, changes in the coding structure and rules of the ICD are important to note in the interpretation of time trends in mortality rates.

Other considerations in the evaluation of mortality statistics are the accuracy of residence in both the death certificate and the population statistics. In a study of the correspon-

dence between residence on the death certificate and matched census record, researchers found close agreement, and the differences decreased inversely with the population size of the area (18). In areas with small populations of the elderly, however, small discrepancies in the correspondence between residence for census and residence on the death certificate can cause major and illogical problems in mortality rate evaluation.

Age Reporting

Age can be misreported in a number of ways. First, the age of the decedent on the death certificate is generally reported by the person him- or herself, at the time of hospitalization, or by a friend or family member after death. Age on the census count is by self-report. Questions can be asked whether there is misreporting of age; in what direction does the misreporting occur; is the misreporting the same on the death certificate as on the census; and over time, is there a change in the amount or degree of misreporting. Finally, there remain the questions of how the misreporting affects mortality rates and what can be done to account for errors.

Rosenwaike suggests that among the elderly, common problems in census age reporting include: 1) overstatement of age to obtain social status; 2) rounding off of age at 5 year intervals, or "age-heaping"; and 3) under- and over-reporting of certain population groups due to errors in census data processing (19). One way to examine the accuracy of census data is to compare the number of deaths with previous census numbers, but this method raises questions about the reliability of age reporting between the two data sources. The agreement of age reporting between the age on the census and the age at death was tested in the 1960 study "Comparability of Age on the Death Certificate and Matching Census Record" (20). Based on a sample of death certificates occurring May-August, 1960 matched to 1960 census records, Hambright showed higher agreement on age among whites than nonwhites and overall, in whites aged 45-99 years, agreement within a year in close to 90 percent of the matched pairs.

A number of researchers have examined the accuracy of census counts among the elderly by using mortality data. Rosenwaike in 1968 and again in 1979 used mortality counts and the method of extinct generations to estimate the U.S. population age 85 and over and compare the estimates to the 1950 and 1960 census counts, respectively (21,22). The method uses age at death to recreate a past birth cohort. This birth cohort equals the sum of the deaths at increasing ages over the years and can then be compared to the census count of a given year for the cohort.

In the first analysis, Rosenwaike found a difference between the 1950 census and the extinct generations estimate of only about 2 percent for all races and both sexes, but this difference was highest in the 95-99 age group, about 15 percent (21). The second analysis was done for the 1960 census and by race (white vs. nonwhite) and sex (22). He then recalculated the data from both censuses by age, sex and race (19). Overall, the differences in the estimated birth cohort reaching age 85 or over in 1950 differed from the 1950 census by less than 0.5 percent and the same results were shown for the 1960 comparison. Among whites, differences in the largest age group (85-89) for both males and females were about 2 percent calculating the difference as a percent of the census estimate. There were large differences, however, in estimates of the 100 and over age group, for whom the extinct generations estimates were about the half the reported census count.

These studies show that there is some difference in the age reported at death as compared to the age reported on the census among those age 85 and over. Overall, counts are higher in the extinct generations estimates than shown in census enumerations of those 85 and over. This may indicate under-enumeration of the older population, or, less likely, under-reporting of age at these very old ages. But in particular, the differences reverse and are more pronounced at higher ages, showing higher numbers of the very aged in the census than there are in those age groups as measured by death certificates, which may be a reflection of overreporting of true age in the census. The reliability of census counts for

the very old are questionable.

Data processing errors in census counts have been reported which may account for additional differences between reported age on the census and on the death certificate. In 1970, placement of questions on the census forms led to mismarking of forms and errors in age tabulations. As many as 100,000 persons were counted as 100 years or over and, according to one estimate, 90 percent of the persons in this category were actually under 65 years of age (23). Rosenwaike calls those 90 percent "false centenarians", and states that they account for about 7 percent of the total population age 85 and over (19). Data were improved in the 1980 census because of changes in the forms and fewer errors in marking them. Additional errors may have resulted from sampling or allocation processes in the census. Sampling errors are those which occur from the selection of the housing units for the census sample. Nonsampling errors are all the other errors that may occur in the collection and processing of the data. Allocation errors may have occurred from the procedure used to fill in missing data on census forms.

Cause of Death

Equally important in the study of mortality patterns is the concern over the validity of the cause of death listed on the certificate. There are two times when errors can occur in the collection of this information: one is at the time the physician fills out the death certificate, and the second is when the information is coded at the National Center for Health Statistics.

Ideally, the person filling out the death certificate is the physician who is familiar with the patient, has been involved in the patient's care and history, and knows the medical cause of death. Unfortunately, the physician present at the time of the person's death may not have or take into account all the pertinent data about the patient's condition (24). Further, there are questions about regional and training differences in medical knowledge and practice leading to preferential listing of certain causes over others as

underlying cause of death. and changes in coding preferences over time. These sources of artifactual error can result in random or systematic changes in mortality rates over time, regions, reported by practitioners with different training experiences, or from different institutions (25). Although the establishment of a worldwide classification of diseases increased consistency in reporting, there is still difficulty in determining the validity and the reliability of the information provided by the large number of physicians who determine the cause of death.

Much research has been done to determine the validity of the cause of death as listed on the death certificate as it compares to other sources of data on morbidity and mortality. A large number of studies to investigate this comparability have been summarized in an annotated bibliography published by the National Center for Health Statistics (26). Some studies have compared death certificate diagnoses to those on medical records to assess the reliability of mortality statistics. Percy and her colleagues compared the coding of malignant neoplasms on the death certificate with the hospital record of patients identified by the Third National Cancer Survey (27). They found that among all ages grouped, agreement on the death certificate and the hospital records was 82 percent. The errors she found on death certificates were the overreporting of colon cancer and underreporting of cancer of the rectum. She concluded that while mortality rates for individual cancers would not change much because of the proportionally small numbers, results of time trends could be biased if death certificates were changed to agree with hospital records. In another study, Gittelsohn and Sennings matched hospital records with 10,000 death certificates among Vermont residents in 1969-1975 (28). The data were not broken down by age group, but there was agreement of 71 percent or more for coding of cancer of the lung, breast, colon, prostate, ovary and uterus. There was less agreement on the hospital record and the death certificate for ischemic heart disease, 65 percent, and for cerebrovascular diseases, 69 percent.

Researchers in the Framingham Study also looked at the accuracy of death certificate coding for persons in the cohort who died with known stroke (29). Of the 280 deaths where stroke was present, 113 did not have mention of stroke on the death certificate, a 40 percent false negative rate. This false negative rate increased with an increase in the age at death. Among the 216 certificates which did list stroke, 46 were incorrect in that listing, a false positive rate of 21 percent. These studies and others examined the reliability of diagnoses on the death certificate as compared with the medical record.

Other studies of death certificates have focused on their comparability to autopsy results. Florey and his colleagues studied death certificates among residents of New Haven, Connecticut who died between 1962-1964 (30). They reported agreement in the diagnosis of stroke between certificates and autopsies in 65 percent of the cases. In another study, Schottenfeld and his colleagues found that the most common underlying cause categories, neoplasms and vascular diseases, had high concordance between autopsy results and the death certificate cause of death, 92 and 86 percent, respectively (31). The least agreement was among deaths from digestive, 60 percent, and respiratory causes, 58 percent. They concluded that within broad diagnostic categories the net changes based on autopsy results compared to clinical judgment alone would not alter vital statistics significantly. Kircher's report of agreement between autopsy and death certificates was based on a random selection of autopsies performed in Connecticut in 1980 (9). He found discrepancy in major disease category for underlying cause in 29 percent of deaths, and discrepancy in specific disease category within a correct major category in 26 percent of deaths.

Among studies of the elderly, Kohn reported that the elderly who are autopsied have not died of the causes most frequently listed in vital statistics reports of common causes of death (32). Further, fewer autopsies are performed on persons as age of death increases. Among persons dying at age 85 or older, only 5 percent are autopsied. Battle and his colleagues also found a decreasing autopsy rate with age, from 23.4 percent for ages 60-69,

7.4 percent for those 80-89, to 1.1 percent in those 90 and older (33). The population of deceased who receive autopsies is not believed to represent the population of deceased at large, but rather those for whom the diagnosis at death is unclear or those who have diseases of interest for research or education. Among the elderly there is the additional problem of many fewer autopsies performed proportionately than on those in younger age groups. Therefore the use of autopsy studies to verify the cause of death may not be as useful as the studies comparing death certificates to hospital records, which had overall higher agreement rates for diagnoses.

An additional concern with the validity of death certificate data is physician preference in terminology and changes in the ICD classification system used for coding and tabulating death statistics. Trends in disease rates over time may be artifactually changed because of terminology used on the death certificate. Sorlie and Gold examined this possible cause of error by coding deaths from heart disease in Maryland (34) using the eighth and ninth revisions of the International Classification of Diseases (13,11). Rates of chronic ischemic heart disease changed because of the differences in terminology used by the certifier and differences in classification of the disease between the two revisions. Each revision of the ICD has resulted in problems in comparability of death statistics from one revision period to the next, because of regrouping of diseases. The National Center for Health Statistics studied the comparability of the eighth and ninth revisions by recoding a sample of 1976 (eighth revision period) deaths using the ninth revision (35). For example, the code for unspecified cardiovascular disease was separated from that for ischemic heart disease in the ninth revision, resulting in an increase in deaths assigned to all other forms of heart disease (49,810 to 124,701), and a reduction in ischemic heart disease deaths. The NCHS has provided comparability ratios for many groups of diseases to allow meaningful comparisons between revision periods. These ratios are age adjusted, however, precluding their use for age-specific analyses.

There is also the possibility of error when NCHS staff code the death certificate data. The Center has guidelines for the trained nosologists to use in the classification of causes of death, to standardize and make logical sense of cause of death information. The coding rules make certain causes of death preferentially listed as the underlying cause. The information on the death certificate can be changed, therefore, to conform with usual pathways and courses of diseases and the logical medical progression of a disease toward death. Because of these rules and the necessity for strict adherence to them, there is the possibility of some misclassification of death certificate information at this point in the data collection and tabulation process. Curb and colleagues studied the interobserver and intraobserver variability among 3 nosologists coding 766 death certificates (24). Agreement was 90 percent overall between observers and higher for broader categories of codes versus more specific codes. The National Center for Health Statistics also conducted a study of quality control in coding death certificates and found high agreement rates, 97 percent, among nosologists; agreement rates in this study also increased when causes were collapsed into broader categories (36).

Multiple Cause of Death Statistics

In view of the many problems associated with the study of mortality statistics for the elderly, some researchers have advocated the use of multiple cause of death data. Five times between 1900 and 1968 the National Center for Health Statistics coded more than just single cause of death information: the underlying plus one associated cause were coded in 1917, 1925, 1936, and 1940; in 1955 up to 5 conditions were coded (37). Recently, NCHS made available public use data tapes which include two different coding schemes for all the cause of death information on the death certificate as well as the single underlying cause code for the years 1968-1978 and 1979-1983 (38). The reason why this information is now available for analysis is the modernization of the mortality statistics program at NCHS, with computer generation of the coding schemes.

Researchers have used multiple cause of death data in the past, however, without the tabulated information from NCHS. In 1967 Winkelstein and his colleagues published a report on the relationship of air pollution and economic status to mortality from respiratory disease (39). In addition to the underlying cause of death data, the researchers reviewed the contributing causes of death directly from death certificates for evidence of respiratory conditions. They found that the review of death certificates increased the number of cases of respiratory disease related deaths from 162 to 241.

Using the relatively new multiple cause of death data from NCHS, researchers in North Carolina investigated hypertension-related deaths for 1968-1977. They wanted to test whether the conclusion that the decline in cause-specific circulatory disease mortality rates was real or an artifact, by using the multiple cause of death data. They found that there was a decline in hypertension as a contributing cause of death, suggesting that there was a real reduction in the contribution of hypertension to total mortality (40).

Uses of Multiple Cause of Death Statistics

There are a number of potential uses for this new data to shed more light on mortality patterns. Omran has suggested that the U.S. has undergone the epidemiologic transition that accompanies socio-economic modernization (41). This includes the transition from infectious to chronic diseases as the major causes of morbidity and mortality. Because of the nature of chronic disease mortality from a number of conditions, a single cause of death is not as useful to study. Chamblee discusses the potential uses and limitations of this data (42). The occurrence of diseases which contribute to chronic disease mortality, such as diabetes, but which are rarely listed as the underlying cause of death, has not been well studied because of the limitations of single cause data. Goodman supports this idea in his study of 7 infectious diseases and complications related to 2, measles and varicella (43). Both authors (42,43) suggest that the multiple cause data can give information on the constellations of chronic diseases associated with mortality patterns in groups.

Further, these data can indicate whether a perceived decline in an underlying cause is valid or an artifact of its position on the death certificate.

This is especially important in studies of the elderly, where the prevalence of many chronic diseases at death is high. Manton advocates the use of multiple cause data in the investigation of patterns in this group to answer questions about life expectancy and the quality of life in this increasing population (44).

Summary: Mortality Statistics

Mortality statistics have been used for many years both to show patterns in causes of death and as one of many measures of health status in a population. There are a number of places where problems can occur in the accurate determination, coding and tabulation of vital statistics on deaths. Errors in cause of death can occur in the age determination of the deceased person on the death certificate or in the census counts of populations at risk, in misclassification by the reporting physician or in code changes at the NCHS. The results of studies to evaluate the validity and reliability of mortality statistics are not encouraging. Although agreement on age reporting between census and death certificates appears close, misreporting of age, especially among the extreme aged presents problems in evaluation of mortality rates. Problems in cause determination and changes in codes have also shown to result in artifactual changes in mortality rates. Glasser points out, however, that the accuracy needed depends on the nature and purpose of the investigation (45). Broader groups of diseases and an open-ended age group starting at age 85 may lessen errors in accuracy. Continued improvement in coding classification and rules, education of certifiers and quality control checks of census data will result in more accurate data. Careful selection of groups and the level of detail, whether age or cause of death, and consideration of changes in coding schemes over time will minimize errors and maximize the usefulness of the study of mortality statistics.

Among the elderly, there are additional problems of multiple diseases which make the determination of a single cause of death difficult. The U.S. has made a transition to a population with a high expectation of life and one for which multiple chronic diseases have replaced infections as the primary cause of death. Data on multiple causes of death have several advantages over single cause data, including: the ability to study disease combinations associated with high mortality; the understanding of the role of non-mortal diseases in contributing to death; and the ability to answer questions on increases and declines in causes of death in a more accurate way. The next few years, when the use of this data is more fully explored, will reveal its true usefulness in describing mortality patterns in a developed society such as the U.S., and patterns in the growing population of the elderly.

Study Purpose

This study is an examination of two sets of questions. First, what are the multiple cause of death mortality patterns among the elderly? Do the mortality rates and patterns by cause differ when considering all causes of death reported on the death certificate as compared to a single cause per death? Are certain combinations of causes associated with higher mortality rates or different age distributions? Second, what are practical ways to examine multiple cause of death data? Can this complex and large dataset be studied practically, and, if so, are the resulting data better than data from the study of single cause mortality statistics? Can the study of multiple causes show patterns which are different from those seen in single cause tabulations? Does the study of multiple causes show new information on diseases, such as those not usually considered fatal, that would not be seen from the study of single cause mortality statistics? What are the implications for the National Center for Health Statistics, which makes these data available for researchers and generates summary statistics from them? What are the implications for future mortality research?

METHODS

Data Sources and Data Elements Studied

Single Cause of Death

Mortality data were obtained from NCHS public use multiple cause of death data tapes for the years 1970, 1975 and 1980 (46). These tapes held numerous pieces of information per death, on a multiple reel set for each year. From the 1970 and 1975 data tapes, data elements extracted included sex, age, race, residence, the number of causes of death per person and the causes of death. Cause of death was coded using the International Classification of Diseases, Adapted (ICDA, eighth Revision) for 1970 and 1975 (13). The Classification was revised by the World Health Organization during the study period, therefore the 1980 tapes were coded according to the ninth Revision of the International Classification of Diseases (11). The data available for 1970 and 1975 included up to 14 causes of death. The data elements were the same for 1980, except that the number of possible causes of death per record increased to 20.

This is a study of mortality patterns among California Whites over the age of 65, by sex and age, for the three years, 1970, 1975 and 1980. Age was grouped into 5 categories, in 5 year intervals beginning with age 65 to the open-ended category, 85 and older, for the mortality rate by cause of death analyses. Data were analysed by single years of age to the open-ended category, 100 and older, for the life table analyses. Data were available for single years of age over 100, from both mortality and population sources, but the suspected age misreporting at these older ages made rates biased.

Causes of death were recorded twice, named by the National Center for Health Statistics as entity axis causes and as record axis causes (47). Entity causes are conditions listed exactly as they appeared on the death certificate, with the position on the certificate

included with the cause. Record axis causes have undergone the same processing at NCHS that is performed to generate the underlying cause of death, therefore they do not overlap nor contradict each other, and are more comparable to the single underlying cause mortality statistics. Because the International Classification of Diseases (ICD) was developed for the most complete description of deaths by single causes, many of the codes include more than one disease. The following example shows how this difference in coding mechanisms results in differences between the entity and the record axis causes.

A death certificate has acute myocardial infarction listed as the underlying cause of death and hypertension as a contributing cause. Under the ICD eighth Revision code, the entity axis causes are 410.9, Acute Myocardial Infarction without mention of Hypertensive Disease, and 400.0, Malignant Hypertension without mention of Organ Damage. The record axis cause is a single code, combining the 2 death certificate entries into one cause, 410.0, Acute Myocardial Infarction with Hypertensive Disease.

The codes, which were designed to collapse as much information as possible into one cause, can be contradictory when the entity axis causes are studied. The entity axis causes are useful for the study of mention of disease or position of a condition on the death certificate. The record axis causes are more useful for person-based statistics and comparisons with single cause of death mortality rates. For this study, therefore, record axis causes were used, and the number of causes of death per person was the number of record axis causes.

Causes of death, for single as well as multiple cause statistics, were grouped into 59 causes because there are several thousand individual codes in the ICD. Further, changes in terminology or physician preference over time could result in artifactual variation in the frequency of causes when the more detailed causes were studied. The use of more general disease groups helps to minimize such variation and provides more manageable

data to study. The NCHS recoded groups, 69 causes for ICD-8 and 72 causes for ICD-9, were used as a basis for the groups made for this study. Those groups of diseases clearly related to childhood or to pregnancy were eliminated. Other groups of causes were added. Since NCHS reports single cause of death statistics for deaths attributable to external injury by using the external codes (E precedes the number) rather than the nature of injury codes (N precedes the number), groups of causes were added to represent the nature of injury causes. For example, a person dying of a blow to the head would be coded in terms of the kind of accident for the purpose of single cause statistics, such as a fall, rather than the nature of the physiologic injury resulting in the death, such as a concussion. The nature of injury causes never appear as underlying causes of death and therefore do not appear individually or in groups used by NCHS for its publications. The record axis causes, however, would include the concussion as well as the fall. The numbers used for the N codes and the E codes are the same, 800-999, with a flag to indicate whether the code is an external cause or a nature of injury. For this study, nature of injury codes were multiplied by 10 to give a set of numbers unique from the external cause codes, and logical groups were made. These elimination of some groups (the pediatric and pregnancy-related causes) and the addition of nature of injury groups made a total of 59 cause groups.

The groups of diseases made by NCHS for 1970 and 1975 were from the eighth ICD revision and the groups for 1980 were from the ninth ICD revision. The individual codes comprising the groups were altered during the revision; Appendix B shows the group name for this study, the NCHS group name and the corresponding individual ICD codes in each of the 59 groups studied here. For the remainder of this discussion, cause of death unless specified otherwise will refer to one of the 59 cause groups, which were mutually exclusive and exhaustive.

Meaningful comparisons of causes of death over time are difficult for a number of reasons.

Changes in diagnostic and treatment technology and terminology, evolution of the ICD, and changes in the frequency of diseases are a few reasons for difficulties in direct comparisons of disease groups over time. Although the groups shown in Appendix B may have the same name from the eighth revision of the ICD to the ninth, the codes and definitions of diseases comprising the groups may have changed. With each revision of the International Classification of Diseases by the World Health Organization has come some discontinuities in the comparability of data from one revision period to the next. Changes in the categorization of causes between the eighth and ninth revision or changes in the coding rules could account for or mask differences found in the proportions of certain causes. Following each revision of the ICD, research was done to compare the old to the new coding scheme, by recoding a sample of deaths from the previous ICD revision using the new ICD revision. The ratio of the number of deaths coded in the new ICD scheme to the number of deaths coded in the previous ICD scheme, for a given disease category, was called a comparability ratio. In some cases the additions to a category offset the elimination of others from a category of causes, resulting in a comparability ratio near one, and in other cases the changes in procedures or definitions of cause categories resulted in comparability ratios quite different from one. Researchers could then adjust data from the previous ICD period, by multiplying each ratio by the number of deaths recorded in that category, and compare the adjusted data with deaths from the current ICD period. Comparability ratios were available from NCHS publications for disease groups, comparing the ICD-9 to ICD-8 (35). These ratios, shown in Appendix C, were applied to the number of deaths in each group in 1970 and 1975 to make the number of deaths comparable with the 1980 data.

Three counts were made for each cause of death group: underlying, any mention and contributing. First, underlying cause of death codes were grouped into one of the 59 causes. Underlying cause of death was easy to process from the public use data tapes, since it was a separate data element and only one was recorded for each person. Second, any mention

of a cause was obtained by using the record axis codes on the data tapes, grouping and removing duplicate causes from each record. By this processing, the summary statistics for any mention of a cause were person-based, that is, no more than one specific cause was listed per person, and rates of any mention of a cause could be calculated.

Some manipulation of the data was necessary to extract contributing causes, or causes with the underlying cause removed. The underlying cause codes were grouped into one of the 59 groups, as were the record axis codes for each person. The underlying cause was then matched to each record axis cause, and where a match occurred, the matching record axis cause was removed. A match should have occurred on each record, since the underlying cause and the record axis causes were processed using the same NCHS procedures. However, NCHS reports that the automated translation of death certificate information into meaningful record axis codes occasionally resulted in causes which did not include an exact match with the underlying cause, which was processed separately. The proportion of records on which the underlying cause code is not present in the record axis codes varies from one year to the next, but is never larger than 1 percent (48). NCHS has recognized this problem, and beginning in 1985 the record axis causes will be processed with the underlying cause removed so that the resulting record axis codes can be combined with the underlying cause as used in NCHS single cause statistics. Contributing causes, with the underlying cause removed in at least 99 percent of records, were then searched for duplicates, to make them person-based for the calculation of rates.

Number of Causes per Death

The number of causes of death for each age-sex group was studied, using the number of record axis codes, as opposed to the number of entity axis codes, since the former represented the number of non-overlapping codes recorded for each certificate, including the underlying cause code. One should remember, however, that when these codes were grouped into one of the 59 causes for this study, duplicates resulted, which were

eliminated in further calculations: the number of causes per person *using the 59 cause groups* was not investigated in this study.

Pairs of Causes of Death

Pairs of causes were investigated for 1980 deaths in two ways, each using the record axis codes transformed into cause groups and after elimination of duplicate causes on a record. First, unique pairs were counted from all the causes listed on the death certificate, in such a way that only one pair for each two causes was counted, for example, counting 30,40 once and not counting 40,30. Therefore, although a person could have more than one pair, he or she could only have one of a specific pair, making the counts of pairs for each age-sex group person-based for the calculation of rates. Second, pairs were counted with the underlying cause removed from the record. The same method was used, giving person-based counts of unique pairs of causes that were among those contributing to but not the primary cause of the death.

Population Data

Population data were from the recently available Mortality Surveillance System (MSS) database, provided by NCHS, for the years under study (49). This database was chosen because of its consistency over the time period studied. The population numbers for 1975 were intercensal estimates based on the 1970 and 1980 censuses. The methodology for intercensal estimates was a modification of the method used by the Bureau of the Census for postcensal estimates, and included the revisions made by the Census Bureau to correct errors and to reassign race to make the 1970 and 1980 censuses comparable (49).

Statistical Methods

Single Cause of Death Rates

Age-sex-specific rates for all causes combined and for each group of underlying causes were calculated by dividing the number of age-sex-cause-specific deaths by the midyear population estimate for that age-sex group. The same method was used to calculate the rate of contributing causes, that is, conditions appearing on the death certificate but not listed as the underlying cause, and to calculate the rate of any mention of a cause. For all rates calculated for 1970 and 1975, each numerator was multiplied by the comparability ratio shown in Appendix C.

Calculation of Rates of Pairs of Causes

Since the pairs of causes were person-based, that is each person could have more than one pair but only one of a specific pair, rates were calculated in the same manner for pairs of causes as for single causes. This was done for all pairs and for pairs of contributing causes with the underlying cause removed.

Comparison of Rates Over Time

Comparisons of total rates and rates of specific causes over time were made for each age-sex group. Death rates from all causes or from a certain underlying cause produced a relatively straightforward analysis of the rate's increase or decrease over time. Information on the role of a cause in contributing to mortality enabled extension of the analysis, and the calculation of rates based on any mention of a cause gave the total picture of a cause's contribution to mortality over the time period studied.

A log-linear measure compared the underlying to contributing rate for each cause to show changes in the role of the specific cause as a primary versus a contributing cause of death over time. Underlying and contributing rates for 1970 and 1980 were used, to determine

whether the trend shown in single cause of death statistics (underlying cause) was paralleled by the trend in the rates shown by the same cause as a contributor (contributing cause). The following expression was used to reflect differences in trend between underlying and contributing rates for each cause:

$$difference = [\log(und_{70}) - \log(cont_{70})] - [\log(und_{80}) - \log(cont_{80})]$$

where $[\log(und_{70})]$ and $[\log(und_{80})]$ were the logarithms of the underlying rates for 1970 and 1980, respectively, and $[\log(cont_{70})]$ and $[\log(cont_{80})]$ were the logarithms of the contributing rates for 1970 and 1980, respectively, for each cause. This standardized the differences, called z-scores, to make them comparable.

Z-scores were calculated under the null hypothesis that there was no difference between the trend seen in the underlying rates and that seen in the contributing rates for each cause from 1970 to 1980, using the formula:

$$Z = \frac{difference - 0}{standard\ deviation\ of\ the\ difference}.$$

The standard deviation of the difference was calculated as the square root of the variance, or

$$variance = \frac{1}{und_{70}} + \frac{1}{cont_{70}} + \frac{1}{und_{80}} + \frac{1}{cont_{80}}$$

where und_{70} and und_{80} were the underlying rates for 1970 and 1980, respectively, and $cont_{70}$ and $cont_{80}$ were the contributing rates for 1970 and 1980, respectively, for each cause.

Any z-score calculated for a given cause that was more than 1.645 or less than -1.645 was taken as an indication that the trend seen for underlying cause death rates differed from the trend seen for contributing cause death rates more than would be seen by chance alone. This is essentially a measure of interaction. Positive scores indicated either that

the underlying rate decreased while the contributing rate increased or stayed the same or that the underlying rate stayed the same while the contributing rate increased. For example, if a disease were thought to be declining over time, a positive score would indicate that the disease was not necessarily occurring less frequently, but rather that its role was changing from underlying the death to contributing to mortality; the occurrence of the disease overall might be the same or actually increasing. The reason could be anything from earlier detection and better treatment to changes in coding rules making another disease preferentially the underlying cause. Negative z-scores indicated either that the underlying rate increased while the contributing rate decreased or stayed the same or that the underlying rate stayed the same while the contributing rate decreased over time. This would be seen in the case of a disease that was gaining importance as an underlying cause relative to its role as a contributing cause.

Analysis of Independence of Causes Occurring in Pairs

For deaths in 1980, each pair of causes was analysed to determine if its occurrence was the same as that expected if the causes occurred independently of one another in the population. For example, if one cause appeared on 50 percent of the death certificates, and another occurred on 10 percent of certificates, they would be expected to occur jointly 5 percent of the time, if each were independent of the other. A "z" score was calculated for the occurrence of each pair, using the following method:

	Disease B Present	Disease B Absent	Total
Disease A Present	f_{11}	f_{12}	n_1
Disease A Absent	f_{21}	f_{22}	n_2
Total	m_1	m_2	N

where f_{11} = observed number of occurrences of disease A and disease B, and where $n_1 + n_2 = m_1 + m_2 = N$. This score measured the degree of non-independence; a score of zero would indicate independence.

The expected number of pairs of disease A and disease B were found by:

$$\frac{(n_1)(m_1)}{N}, \text{ and the z-score for each pair occurrence was calculated by}$$

$$z = \frac{f_{11} - \dfrac{(n_1)(m_1)}{N}}{\sqrt{\dfrac{(n_1)(m_1)}{N}}}$$

When the z-score was positive, the number of occurrences of the pair exceeded that expected by chance alone under the assumption of independence of the causes in the pair; when it was negative, the number of pair occurrences observed was less than that expected by chance alone under the assumption of independence of causes in the pair.

Life Table Analyses

Selection of Cohort versus Period Methods

Life table analyses of 1980 deaths were done using the formulae and techniques of Chiang (50). A complete list of life table formulae used for this study are presented in Appendix D.

Cohort and period life table methods were evaluated for appropriateness to these data. In cohort life tables a group is followed until death, loss to follow-up or the end of the study, and resulting mortality rates are estimates of the mortality experienced by persons in each age. Calculations using these mortality rates can then provide projections of average age of death and years of life remaining for a population the cohort is thought to represent. Period life tables use mortality rates for each age in an observed population at one given time. The life table constructs a synthetic cohort from these observed mortality rates, exposing those surviving each age to the mortality rates experienced by those in the next older age. Since the data available for this study were deaths and midyear population estimates, period life table methods were used for the calculation of expecta-

tion of life at each age.

Although cohort life tables may reflect the actual mortality experience of the group, they have drawbacks when generalized as do period life tables. As with any epidemiologic method used on a subgroup, the results may not be generalizable to a larger population if the selection of the subgroup was not appropriate. Another problem for both cohort and period life table analyses is the static nature of the calculations; mortality rates are fixed and populations are projected forward in time with an assumption of unchanging mortality probabilities. There are two additional properties in evaluating period life table analyses in contrast to cohort life table analyses. One is the cross-sectional nature of the period or current data. Calculations using observed mortality rates in a population create the synthetic cohort for whom average age of death and years of life remaining can be estimated as for cohort life tables. Whereas the mortality rate observed for an age may represent cumulative forces of mortality experienced uniquely by those who reach that age at that given year, that same rate is applied to younger persons as they subsequently move through that age. A mortality rate for a given age in an observed population is in part a reflection of the unique experiences of that age group; using the same rates on younger persons as they grow to that age may be inappropriate and the results misleading. The second property in the use of period life tables to project expectation of life is the assumption that the population not changed by immigration or emigration.

Life Table Calculations

Calculations for cohort life tables begin with the l_0 term, sometimes called the radix, which represents the proportion or number of the population alive at age 0. It is arbitrarily set at the first x value at one, resulting in proportions for subsequent l_{x+1}, l_{x+2}, and so on, or, more commonly, it is set at 100,000 giving the number of life table persons alive at age 0. Furthermore, a life table can be constructed for a cohort of any age. For example, the radix could be the number of persons aged 65, as is the case for this study,

where $l_0 = l_{65}$. Other life table values are calculated based on the radix selected. An estimate of the conditional probability of death given that a person is alive at age x, q_x, can be calculated directly for cohort life tables from the population numbers adjusted to the radix, as

$$q_x = 1 - \frac{l_{x+1}}{l_x}.$$

By contrast, the basis for the calculation of the standard period life table, appropriate for this study, was the cross-sectional observation of mortality rates in the population, M_x. The number of deaths in the population (D_x) was divided by the midyear estimate of the population at each age (P_x). P_x was used as an estimate of the number of person-years lived by the population to calculate the mortality rate for each age. The interval used for this analysis was one year, that is, mortality by single years of age was used, and the analysis included ages 65 to 99 with an open-ended age group of 100 and older. Since the interval used was one year, some expressions presented below were simplified since the interval length is 1.0. Appendix D has complete formulae for calculations when intervals of length greater than one are used. The conditional probability of death in an age interval x to $x+1$ was calculated indirectly by manipulating the observed M_x value for each age. Also needed for this calculation were estimates of the number of years lived by those who died during the age interval x to $x+1$. As assumed by Chiang (50), this expression, a_x, was set at .5 for all ages from 65 to 100 and older. In other words, deaths during an interval were assumed to have occurred uniformly throughout the interval, resulting in an average of one-half year of life added to the number of person-years lived in that interval by those who died.

The probability q_x was calculated from the M_x values using the following formula:

$$q_x = \frac{M_x}{1 + (1-a_x)M_x}$$

in the interval age x to $x+1$. Note that the value q_x is approximately the mortality hazard rate when the probability of death is small. For the remainder of this report, the q_x values presented in tables and figures may be called by this term. This value of q_x can be related to the value calculated for cohort life tables, found by the formula:

$$q_x = 1 - \frac{l_{x+1}}{l_x}, \text{ which is equivalent to } q_x = \frac{l_x - l_{x+1}}{l_x}.$$

Substituting deaths and population for the M_x values in the period life table formula,

$$q_x = \frac{D_x}{P_x + (1-a_x)D_x}.$$

The terms $l_x - l_{x+1}$ and D_x both represent the deaths in the population in age interval x, the former adjusted to the cohort life table radix and the latter in numbers observed in the population. The term l_x from the cohort calculation represents the life table number alive at age x. The term $(1-a_x)D_x$ adjusts the midyear population estimate (P_x) upward to include those who died during the interval so that both denominators represent the person-years at risk of dying during the age interval x. Although not as precise as its counterpart in cohort life table calculations, the period life table q_x estimates the mortality hazard using mortality rates from a population observed at a single point in time. The term q_w, or the mortality probability for the open-ended age group, was set at one, since all in this age group eventually died.

The variance of the mortality probability was estimated using the following formula,

$$S_{q_x}^2 = (\frac{1}{D_x})(q_x^2)(1-q_x)$$

and the standard error of the estimate of q_x is

$$S.E.(q_x) = q_x \sqrt{\frac{1}{D_x}(1-q_x)}.$$

The q_x values calculated in this study for all but the open-ended interval were then used to determine l_x values. The radix, in this case l_{65}, was set at 100,000. Using the formula

$$l_{x+1} = l_x (1-q_x)$$

the life table number of the population alive at each age were calculated, as were the life table number of the population who died during an age interval, d_x,

$$d_x = l_x - l_{x+1}.$$

The number of years lived (L_x) by the all the persons in the life table cohort at each age from 65 to the open-ended age group, 100 and older, was calculated by the formula

$$L_x = l_{x+1} + a_x d_x.$$

This term included the number of years lived by those who survived the interval to age $x+1$ plus a_x, the number of years lived by those who died in the interval from age x to age $x+1$. L_w, the number of years lived by those in the open-ended age interval, was calculated as

$$L_w = .5 l_w,$$

since no one survived the interval and the number beginning the interval equal the number who died in the interval, in this case $l_{100} = d_{100}$. Chiang suggested the formula

$$L_w = \frac{l_w}{M_w},$$

since none survive the open-ended interval, therefore $l_w = d_w$, and since $M_x = \frac{d_x}{L_x}$. The use of the formula $L_w = .5 l_w$ was based on its comparability with survival analysis, more commonly used in the epidemiologic literature. Furthermore, the difference between the two approaches has essentially no impact on summary calculations, since less than 3

percent of the 100,000 cohort members exceed age 100.

The sum of the L_x values, denoted T_x, was divided by l_x, to give the average number of remaining years of life expected for those alive at age x, or

$$e_x = \frac{T_x}{l_x}.$$

The variance of the estimate of years of life remaining at age 65, e_{65}, was calculated using the following formula (50),

$$S_{e_{65}}^2 = \sum_{i=65}^{w-1} P_{65i} [(1-a_i)n_i + e_{i+1}]^2 S_{q_i}^2$$

where P_{65i} represented the estimate of the survival probability from age 65 to interval i and the variance of q_i was calculated from the previous expression $S_{q_i}^2$.

Life tables were made for white California males and females using 1980 mortality data. Estimates of the expectation of life remaining, by single years of age over 65 to those 100 years and older, were calculated for each sex as a baseline for further analyses.

Competing Risk Life Table Analyses

Life table methods project the population's mortality experience forward in time with no change in any mortality rates. Competing risk analysis is one way to modify mortality rates and compare the altered projections with those anticipated when rates are fixed. Although it is most common to "remove" a cause of death completely and generate life tables with the remaining causes present, the method can be used to modify mortality, that is remove a portion of the deaths from the cause rather than all the deaths from the cause. Using the most common underlying and the most common contributing causes of death, mortality rates for 1980 were altered to eliminate certain causes, using the methods of Chiang (50) and Keyfitz (51). The resulting changes in the expectation of life

remaining, e_x, were then compared to each other and to the baseline expectation of life at age 65 when mortality rates were fixed at the 1980 levels.

The life table methods and formulae remained the same for this analysis, as shown above and in Appendix D, with the exception of the calculation of the probability of death, q_x. This term was altered to remove a cause of death, as follows. The formula introduced earlier to calculate the probability of death,

$$q_x = \frac{(n)(D_x)}{P_x + (.5)(n)(D_x)},$$

simplified in this analysis of single years of age to

$$q_x' = \frac{D_x}{P_x + (.5)(D_x)},$$

was modified to remove deaths from the cause of interest, D_x^{cause}, giving

$$q_x' = \frac{(n)(D_x^{total} - D_x^{cause})}{P_x + (.5)(n)(D_x^{total}) - (.5)(n)(D_x^{cause})}$$

was simplified in this study of single years of age $(n = 1)$ to

$$q_x' = \frac{D_x^{total} - D_x^{cause}}{P_x + (.5)(D_x^{total}) - .5(D_x^{cause})},$$

the probability of death from all other causes when the cause of interest was removed.

The modification of the conditional probability of death reflected, in the numerator, deaths due to all remaining causes following the removal of deaths (all or a portion) due to a specific cause. In the denominator, persons estimated to have been alive at the beginning of but who died during the interval at age x were added to the midyear population, as in the standard life table. This estimate of persons at risk, however, was reduced by the number of persons who did not die of the "removed" cause, but who

would have died of one of the other causes. This number was estimated as one half the number of persons who died of the "removed" cause, and the removal of this number from the denominator increased the q_x term for the remaining causes, frequently called the net probability of death with the cause of interest removed.

Competing risk analyses of a number of common underlying and contributing causes of death were done for 1980 deaths among males and females. This method enabled comparison of changes in expectation of life at age 65 when a cause was removed as underlying the death or when any mention of the cause on the death certificate was removed. Results provided further evidence of the usefulness and the appropriateness of calculating mortality by underlying cause versus any mention of a cause.

Multiple Decrement Life Table Analyses

Another set of life table methods examine the risk of mortality in the presence of other diseases, apportioning the total q_x according to specific causes of death. For this analysis as well, the life table formulae on Appendix D were used, with changes in the q_x value to allow its division into component parts from specific causes. The formula for q_x for all causes of death, simplified with $n = 1$, was

$$q_x = \frac{D_x}{P_x + (1-a_x)(D_x)},$$

and was simplified further, since $a_x = .5$, to

$$q_x = \frac{D_x}{P_x + (.5)(D_x)}.$$

The specific causes of death are represented by $D_x^{(i)}$, and the probabilities of death for each of the i causes are represented by $q_x^{(i)}$, and

$$q_x^{(i)} = \frac{D_x^{(i)}}{P_x + (.5)(D_x)}.$$

The denominator remained the same for each cause i as it did for all causes, because the same number of persons at the beginning of each age interval x were at risk for each cause i. Then, solving for the denominator $P_x + (.5)(D_x)$ common to both equations,

$$\frac{D_x^{(i)}}{q_x^{(i)}} = \frac{D_x}{q_x}$$

and the probability of death for each cause i was, then,

$$q_x^{(i)} = (\frac{D_x^{(i)}}{D_x})(q_x).$$

Unlike the competing risk analysis where causes were removed and the remaining q_x term adjusted upward to give a net probability of death, the mortality probability was reduced by division into all its specific i parts,

$$D_x = \sum D_x^{(i)}$$

and

$$q_x = \sum q_x^{(i)}.$$

Multiple decrement life table analyses were done on 1980 California deaths for white males and females. The most common underlying causes of death were examined to show their contribution to the overall mortality patterns. Plots of cumulative distributions of mortality probabilities for these causes ($q_x^{(i)}$) were compared to see both the relative contribution as well as the age distribution for each specific cause of death examined. For this analysis, a cause group "all cancer" was made, including all malignant cancers from specific and nonspecific sites.

Using mortality rates generated from any mention of a cause, multiple decrement life table techniques were used to apportion the $q_x^{(i)}$ for a number of specific causes. In this analysis, the q_x for a given cause was considered the whole, and divided according to its

contribution as a cause of death with and without another cause. In a similar way, then, plots of cumulative distributions of mortality probabilities were compared for the relative contribution and for the age distribution of mortality of a specific cause with and without an associated cause. For example, ischemic heart disease (IHD) and diabetes were examined. Cumulative plots of mortality probabilities for IHD without diabetes were compared to plots of IHD with diabetes, to show the proportion of IHD mortality that was paired with diabetes and the differences in the age distributions of those dying with IHD with and without diabetes. Pairs studied included major underlying causes such as IHD, cerebrovascular disease and all cancer, each paired with and without other common diseases such as diabetes, atherosclerosis, and chronic obstructive pulmonary disease.

RESULTS

Overall mortality rates, for all causes, by age and sex are presented, followed by tabulations of the number of causes reported per death for the same age and sex groups. Then mortality rates by single cause are presented in three ways: mortality rates for the condition as underlying cause of death, as a secondary or contributing cause, and mortality rates when considering any mention of the condition on the death certificate. Trends in the mortality rates by selected causes, whether underlying or contributing to the death, are also shown in this presentation of the single cause analysis.

The multiple cause analysis is presented next, beginning with mortality rates by pairs of causes. Life table analyses are presented finally, showing the impact of removing a cause of death and the relative contribution of single causes of death and pairs of causes of death to overall mortality.

Mortality Rates by a Single Cause

All Cause Mortality Rates

All cause mortality rates for white Californians for 1970, 1975 and 1980 are shown on Table 1. Overall, rates ranged from 3000 to nearly 20,000 per 100,000 for males, and from over 1600 to about 16,000 per 100,000 for females. Mortality rates for males and females were higher in older age groups than in younger age groups, both for each time point studied and when looking at age cohorts over time; rates were higher for males than for females at all ages; and the rates generally declined over the time points studied from 1970 to 1980. For both males and females, mortality rates decreased more in the period between 1970 and 1975 than in that between 1975 and 1980, with male mortality rates decreasing 7 percent then 5 percent and female mortality rates decreasing 7 percent then up 2 percent in the two successive time points, respectively. Among males, the rates were lower in successive time points in all age groups except those 85 and older. The declines

were generally higher in the younger age groups; among those 65-69, mortality rates decreased 11 percent from 1970 to 1975 and 8 percent from 1975 to 1980, whereas among those 80-84, mortality rates decreased 7 percent from 1970 to 1975 and 4 percent from 1975 to 1980. In the age group 85 and older, the decrease from 1970 to 1975 was 5 percent, followed by an increase in mortality rates of 3 percent.

Among females, mortality rates were uniformly lower than those among males, and the same pattern of smaller declines between the second and third time point than between the first and second holds as among males. There is, however, no clear pattern of larger declines among younger age groups. In those 65-69, mortality decreased 7 percent then 2 percent between 1970-1975 and 1975-1980, respectively, whereas mortality among those 75-79 decreased 12 percent then 6 percent. In both age groups 70-74 and 85 and older, mortality rates increased from 1975 to 1980, .6 percent for the former and 2 percent for the latter.

These rates were close to U.S. rates for whites in the years studied, up to 7.1 percent less in males age 70-74 in 1970, 9 percent less in males 75-79 in 1975, and 6.5 percent less than males aged 65-69 in 1980 than the rates seen for the entire U.S. for white males (52, 53, 54). In general, California white males had lower mortality rates than did white males in the U.S. The same pattern was true for females, especially in 1970 and 1975, when mortality rates were over 10 percent higher for all U.S. white females than they were for California white females. In 1980, the rates were much closer, with less than a 3 percent difference.

Number of Causes per Death

Table 2 shows the mean number of causes listed per death certificate, by age-sex group for the three years studied. Males and females were similar overall in the mean number of causes listed per certificate, males ranging from 3.02 to 3.06 and females from 2.99 to 3.05. For both males and females in all age groups, death certificates had an average of

close to three causes listed, ranging from 2.89 to 3.14. With the exception of the oldest age group, the average number of causes per death certificate increased with age in each of the three years studied, looking both within one year and following age cohorts. Females had more causes listed, on average, in the 65-69 age group, results were identical for those 70-74, and males uniformly had higher average numbers of causes listed than did females in the older age groups, in each of the years studied.

Table 3 shows, for 1980, the complete distribution of the number of causes listed per death certificate by age-sex group. Although the mean is near three for all age-sex groups, the distribution shows that the range includes twelve causes for males and fourteen causes for females.

Tables 4 and 5 show, for males and females in 1980, the proportion of deaths in each age group that had two or more causes listed on the death certificate, by each underlying cause of death. The category signs, symptoms and ill-defined conditions, when listed as the underlying cause of death, had the lowest proportion overall of deaths listed with at least one other cause. The infectious diseases nearly always were listed with other causes, except tuberculosis, which was listed singly as underlying cause as much as 25 percent of the time in females (age 70-74) and as much as 22 percent of the time for males (age 75-79). For males (Table 4), malignant cancers were listed with at least one other cause 76 to 85 percent of the time, excluding cancer of the breast; for females (Table 5), malignant cancers were listed with at least one other cause 73 to 82 percent of the time. Heart diseases were also listed alone infrequently; in both males and females IHD was listed more than 90 percent of the time with at least one other cause. Of the heart diseases, hyptertensive heart disease and all other heart disease had the lowest proportion of deaths listed with at least one other cause.

Underlying Cause Mortality Rates

Underlying cause of death rates and ranks in order of frequency for the 3 years studied are shown for the five age groups on Tables 6.1 to 6.5 for males and on Tables 7.1 to 7.5 for females. All cause of death groups are represented in these tables, therefore the rates add to the overall rate for each group, but the first five ranked causes in each year studied account for half or more of the deaths in each age-sex group. In all age groups, for both sexes and in all three years, ischemic heart disease (IHD) was the most frequent cause of death, accounting for between 30 and 39 percent of deaths among males and 22 to 41 percent of deaths among females. For both males and females, IHD accounted for a larger proportion of deaths in older age groups, and in all age-sex groups this proportion decreased over time, with the single exception of females age 85 and older, for whom IHD mortality was 40 percent of all mortality in 1970 and 41 percent in 1975.

In each age group of males (Tables 6.1 to 6.5), other main underlying causes of death in addition to IHD were cancer of the respiratory tract, cerebrovascular disease (CVD), chronic obstructive pulmonary disease (COPD), other heart diseases and cancer of the digestive organs. Over the years studied, CVD dropped in rank from third to sixth in order of frequency for males 65-69, and from second to fifth in males 70-74. In older age groups, however, CVD remained as the second leading cause of death among males. Cancer of the respiratory tract, the second leading cause among males age 65-69, moved from the fourth to third to second rank among those 70-74 over time, while not being in the list of top causes in those 75-79 and older age groups.

Among females in the age groups studied and over time (Tables 7.1 to 7.5), there were more and different causes of death in addition to IHD that comprised the top five underlying causes than among males. These causes included CVD, cancer of the digestive organs, cancer of the genital organs, cancer of the respiratory tract, other heart diseases, diabetes, atherosclerosis and cancer of the breast. CVD remained second in rank of causes, for all age groups and over the three years studied, except in those 65-69 in 1980,

for whom it fell to fourth, after IHD, cancer of the digestive organs and cancer of the respiratory tract. Genital cancer, fourth in rank for females age 65-69, fell with time in this age group and generally was less frequent as an underlying cause of death in older age groups as well as over time. By contrast, respiratory cancer, seventh in frequency among females 65-69 in 1970 and 1975, was the third leading underlying cause of death in 1980 for this age group, and went from twelve to ten to six for those 70-74. In each older age group also, this cancer became more common than other underlying causes over time, but its rank was much lower at the start. As for males, underlying mortality rates from heart disease other than IHD were ranked higher over time for females in all age groups. Diabetes, by contrast, ranked between fifth and eleventh in frequency as an underlying cause of death among females in 1970 and fell to lower ranks in all age groups in subsequent years. Atherosclerosis, although also dropping in rank of frequency in all female age groups over time, ranked uniformly higher in older age groups than younger, for example in 1980 ranking sixth as underlying cause among those 85 and older but only twenty-fourth among those 65-69.

Contributing Cause Mortality Rates

Tables 8.1 to 8.5 for males and 9.1 to 9.5 for females show the mortality rates and ranks of frequency for contributing causes of death for the three years studied. Among males, the top five contributing causes did not change appreciably over the time points, and were similar among the five age groups. The category "all other heart disease" was consistently the most frequent contributing cause, in most age groups and most time points at least twice as high as the cause ranked second, and in all age groups and time points higher than the mortality rate for IHD as an underlying cause. Other top contributing causes among males were signs, symptoms and ill-defined conditions, other non-specific malignancies, and the broad category "all other". Ranked also high, in addition to these non-specific and complications categories, were atherosclerosis, COPD, pneumonia, IHD, diabetes, and CVD. Atherosclerosis as a contributing cause had a lower rank in

successive time points in all age groups.

All other heart disease mortality ranked first among contributing causes for females in all age groups as well as for males. The categories signs, symptoms and ill-defined conditions and other non-specific malignancies were among the top contributing causes in all age groups, as were atherosclerosis, diabetes, CVD, and pneumonia. In contrast to the rates among males, COPD contributing mortality rates among females were less high than rates for other causes in all age groups and over time. As with males, atherosclerosis was increasingly important as a contributing cause of death in older age groups, but its rank fell over time.

Any Mention of a Cause Mortality Rates

Tables 10 and 11 show 1980 mortality rates by age group for any mention of a cause on the death certificate, whether as underlying or contributing to the death, for males and females, respectively. The causes are in order of decreasing size according to the youngest age group in each table. These tables can be compared to the corresponding table of underlying causes and ranks for 1980 for each age group, from Tables 6.1 to 6.5 for males and Tables 7.1 to 7.5 for females. It is important to remember that the deaths represented in the mortality rates for each cause in Tables 10 and 11 are not mutually exclusive; death certificates had an average of about 3 causes. By contrast, the deaths represented in the underlying mortality rates in Tables 6.1 to 6.5 and 7.1 to 7.5 are in mutually exclusive groups; each death certificate had only one cause designated as the underlying cause.

Among males age 65-69, the importance of ischemic heart disease and all other heart disease is clear by the high rates of occurrence on death certificates. Next seen are the diseases and conditions representing complications of underlying the main disease process, such as signs, symptoms and ill-defined conditions, other, non-specific cancer and pneumonia. Chronic obstructive pulmonary disease, however, is a disease complex which can

be either a complication or an underlying condition; in this age group it emerged as a more common cause of death overall than it appeared in the underlying cause table in 1980 (Table 6.1). Atherosclerosis and diabetes also were more common in overall mentions than as seen in the underlying cause tables.

In the older male age groups, the same relationships between causes held with some interesting exceptions. Mentions of cerebrovascular disease increased markedly with age, making its rank in order of frequency move from seventh to third in the oldest age group. This matches the move of CVD from sixth to second in frequency of this disease as an underlying cause of death (Tables 6.2 to 6.5). Pneumonia, a complication of other diseases or a primary disease on its own, also increased in frequency with older age groups to become the fifth most commonly mentioned cause of death among males aged 85 and older. Atherosclerosis also was increasingly more common on death certificates in older age groups than in younger male age groups.

Table 11 shows 1980 mortality rates for any mention of a cause for females, also ordered according to rates in the youngest age group. This table differs from that for males in the fewer mentions of respiratory cancer, in proportion to mentions of other diseases. As with males, CVD moved in rank to the third most commonly mentioned cause of death among females aged 85 and older, and pneumonia and atherosclerosis also moved to higher ranks with older age groups. The rate of mention of atherosclerosis was twice as high among males as among females in the 65-69 age group, 210 to 107 per 100,000, respectively; among those 85 and older, rates of mention of this disease nearly converged, 3119 per 100,000 for males and 3038 per 100,000 for females.

Underlying and Contributing Mortality Rates by Selected Causes

Tables 12-21, while not showing information different from that presented in Tables 6.1 to 6.5, 7.1 to 7.5, 8.1 to 8.5 and 9.1 to 9.5, present mortality rates by the most common causes of death for a more direct comparison of the underlying and contributing mortality

rates by age group and sex. Ischemic heart disease mortality rates (Table 12) increased uniformly with higher age groups, and decreased over time in all age groups except males 80-84 and 85 and older, for whom the contributing rates remained roughly the same between 1970 and 1975. Males had over twice the rate of females in the younger age groups, and the rates were still higher than those for females in the older age groups, but not by as high a margin. The total mortality rates for IHD, both as underlying cause and contributing to the death, were about 20 percent higher among males in 1970 and up to 26 percent higher among males (age 80-84) in 1980 than the figures for underlying cause alone indicate. Similarly, the IHD mortality rates for females were about 22 percent higher in 1970 and 22 to 27 percent (age 80-84) higher in 1980 than the underlying cause rates alone show.

By contrast, Table 13 shows the mortality rates for all other heart disease, the most frequent contributing cause of death for both males and females. When added to show the total mortality contribution from this category, the rates for 1980 exceed the underlying IHD rates. It is important to remember, however, that although there is no overlap between those counted to calculate underlying and contributing rates within a cause, there is likely much overlap *between* categories such as IHD and all other heart disease, many deaths having both causes recorded. The important finding here, then, is that the number of persons with heart disease is higher than single, underlying rates would lead researchers to believe, and that some cause categories are frequently reported but as a contributing rather than underlying cause. Unlike IHD, underlying mortality due to all other heart disease increased within age groups over time. As a contributing cause of death, all other heart disease increased between 1970 and 1975 and then decreased markedly between 1975 and 1980 in all age-sex groups.

Table 14 shows mortality rates for malignant neoplasms of the respiratory tract. In contrast to the heart disease data, rates for this cancer are not nearly as high, in the range of

281 to 527 per 100,000 for males, and 47 to 147 per 100,000 for females. And in contrast to IHD, mortality rates for both males and females increased over the time points studied. In males, underlying rates increased with age in younger age groups, then decreased in oldest age groups. Following cohort mortality rates over the time points, mortality rates increased with age in males aged 65-69 and 70-74 in 1970, but fell for older cohorts, as far as the data allows one to see. For males aged 75-79 in 1970, underlying mortality decreased between 1975 and 1980 as did rates for those aged 80-84 in 1970 from the time points 1970 to 1975. In females, the underlying mortality rate from respiratory cancer did not show a consistent pattern with age. The role of the contributing mortality rates was smaller for respiratory cancer than it was for heart disease, in males adding only 10 percent to the underlying rates for the younger age groups, but increasing with age to an additional 25 percent for the oldest age group. The same relationship held for females, in 1980 adding 9 percent to the underlying rate among those 65-69 and 23 percent to the rate among those 85 and older.

Chronic obstructive pulmonary disease underlying and contributing mortality rates are shown in Table 15. As with respiratory cancer, male mortality rates were higher than female rates. In 1970, male rates were approximately four to six times those of females, whereas in 1980 male rates were still higher, but by a factor of about three. Male rates, both underlying and contributing, decreased from 1970 to 1980, while COPD rates for females increased over time as an underlying cause and had no clear pattern over time as a contributing cause. In both males and females, the contributing cause rate was higher than the underlying cause rate, illustrating the underestimate of COPD when underlying rates alone are used.

Table 16 shows mortality rates for cerebrovascular disease. Within each year studied, underlying CVD rates roughly doubled with age and contributing rates nearly doubled, for both males and females. Following cohorts, however, mortality rates increased with

age but not as much: among males, underlying rates increased about 60-70 percent from the first to the second time point and 35-48 percent from the second to the third; among females, increases were higher, from 60-83 percent from 1970 to 1975 and 63-85 percent from 1975 to 1980. CVD was more frequently reported as the underlying cause than as the contributing cause of death.

Mortality rates for cancer of the digestive organs, shown in Table 17, were fairly completely reflected by the underlying rates, especially in younger age groups. Contributing rates added 11 percent and 10 percent to the underlying mortality rates for 65-69 year old males and females, respectively, in 1980, increasing to 35 percent and 26 percent for males and females aged 85 and older. Rates increased with age for both males and females, within cohorts as well as in each year.

Table 18 shows breast cancer mortality rates for females, which also increased with age. For those aged 65-69 in 1970, the breast cancer underlying mortality rate was 4.71 per 100,000; in 1975 and 1980 the rates for this age group increased markedly to over 100 per 100,000.

Table 19 shows mortality rates due to malignant neoplasms of the genital organs for males and females. This group of causes was reported proportionately more often as a contributing cause among males than among females, probably a reflection of the different diseases for each sex and their severity. For males, genital cancer mortality rates increased with age, both each year studied and within cohorts. Over time, underlying mortality increased except among males 70-74, while contributing mortality generally decreased. In females, genital mortality rates also increased with age. In the younger age groups, through 75-79, underlying mortality rates decreased over time, while the rate stayed the same for those 80-84 and increased slightly for those 85 and older. There did not seem to be a pattern over time for genital cancer as a contributing cause for females.

Atherosclerosis, even more than COPD, was a chronic disease more often reported as a contributing cause of death than as an underlying cause. Rates for this cause are shown in Table 20. Among males, the underlying and contributing rates both roughly doubled with age. In females, the contributing rates roughly doubled with age, but the underlying mortality rates from atherosclerosis nearly tripled in each older age group. Male and female mortality rates, therefore, were very close in the older age groups, and in fact in 1980 the atherosclerosis mortality rate for females aged 85 and older exceeded that for males, 674 per 100,000 compared to 598 per 100,000, respectively.

Table 21 shows mortality rates due to diabetes. This disease was also up to roughly four times more commonly reported as a contributing than as an underlying cause of death. Rates increased with age in both males and females and decreased over time in all age-sex groups. Although underlying mortality rates for males were consistently higher than those for females except for those aged 65-69 in 1980, the rates were close for the two sexes, especially in 1980.

Underlying and Contributing Mortality Rates Over Time

Overall mortality rates decreased from 1970 to 1980, but within each age-sex group and for each cause, there were variations from this pattern of overall decline. Tables 22 and 23 examine, for males and females, respectively, whether the trend over time for each cause was the same, whether it was underlying or contributing to the death. The calculated z-scores provide a commensurate, standard measure to compare causes and the difference in underlying and contributing rate trends. In each table, the z-scores are ordered from largest to smallest, according to the 65-69 age group. Scores were positive when the underlying rate decreased and the contributing rate increased or stayed the same or the underlying rate stayed the same and the contributing rate increased; scores were negative when the underlying rate increased and the contributing rate decreased or stayed the same or the underlying rate stayed the same and the contributing rate

decreased over time. A score of zero would occur when the underlying rate and contributing rate either increased or decreased equally or when both rates stayed the same from 1970 to 1980.

For males (Table 22), the category "all other" had the highest positive score, increasing with age as well. The other high positive scores were among diseases that are often related: hypertension, nephritis, hypertensive heart disease, CVD, and hypertensive heart and renal disease, all of which except hypertensive heart disease increased with age. All other accidents (other than motor vehicle) also had high positive scores, increasing with age. Hyperplasia of the prostate showed a positive z-score for males 85 and older, indicating a lack of parallel trend between this disease's role in underlying and contributing to death in this oldest age group. These positive scores indicate the increased role of the cause in contributing to the death, in the presence of either the same or declining underlying rates for the cause.

High negative scores for males (Table 22) were all other heart disease, other diseases of the endocardium, other unspecified cancer, pneumonia, COPD, and atherosclerosis. The divergence in trends for these diseases seemed to be larger with older age groups, as with the positive score, but particularly in pneumonia, which had a five fold increase in score from the youngest age group to those 85 and older. These negative scores indicate the increasing role of this cause as an underlying cause of death rather than a contributing cause.

The same approach using z-scores for females is presented in Table 23. The category "all other" had the highest positive score for those aged 65-69 as with males, but the score was not as high and did not consistently increase with age. Hypertension scored higher than the category "all other", and increased markedly with older age groups, indicating the increasing importance of this disease as a contributor to mortality. All other (excluding motor vehicle) accidents and cerebrovascular disease, as with males, showed

increasingly positive scores with age. Hypertensive heart disease in females, in contrast to that in males, had a negative score in those 65-69, emphasizing the disease's role as underlying mortality, a score near zero for those 70-74, indicating no change over time in relative underlying and contributing roles, followed by increasing positive scores in higher age groups, indicating a more important role of the disease as a contributor to rather than underlying mortality. Negative scores among females were calculated for all other heart disease, showing similar trends as those among males, and for other diseases of the endocardium and atherosclerosis. As with males, pneumonia showed increasingly negative scores with age, indicating its more important role in older ages as the underlying cause. Chronic obstructive pulmonary disease had higher negative scores for older age groups to those aged 80-84, but the score dropped from -4.592 to -3.142 in females 85 and older.

Summary: Mortality Rates by a Single Cause

Among males, IHD was the leading cause of death in all age groups in the three years studied. In the youngest male age group, 65-69, respiratory cancer was the second most frequent cause of death. Respiratory cancer was ranked less high in older age groups, and in the age group 70-74 a possible cohort effect can be seen; this cause was 4th in 1970, but in 1980 for the same age group it ranked second. The respiratory cancer mortality rate for this cohort of 70-74 year olds in 1980 may correspond with higher smoking rates than for those men 70-74 in 1970. Cerebrovascular disease was the third leading cause of death in 65-69 year old males in 1970, falling in subsequent years possibly due to better diagnostic and therapeutic management of this disease; however, by age 75-79 CVD remained the second leading cause of death, consistent over time, among older males. Chronic liver disease was among the top ten causes only in the younger age groups, which may represent earlier deaths, in middle ages, from alcohol-related diseases. By contrast, pneumonia rose to one of the top ten causes of death as age increased, as did atherosclerosis.

Patterns of underlying mortality for the youngest and the oldest age groups among males

between 1970 and 1980 are summarized as follows.

Time and Age Comparisons of Ten Leading Underlying Causes for Males

| | Age 65-69 | | Age 85 and Older | |
Rank	1970	1980	1970	1980
1	IHD	IHD	IHD	IHD
2	Ca Resp	Ca Resp	CVD	CVD
3	CVD	All Other Ht	Athero	All Other Ht
4	COPD	Ca Digest	Pneumonia	Pneumonia
5	Ca Digest	COPD	Ca Digest	All Other
6	All Other	CVD	COPD	Ca Digest
7	Chron Liver Dis	All Other	All Other Ht	COPD
8	All Other Ht	Ca Other,Unspec	All Other	Ca Genital
9	Ca Other,Unspec	Chron Liver Dis	Ca Genital	Athero
10	All Other Acc	Ca Genital	All Other Acc	Ca Resp

Among females, as among males, IHD was the leading cause of death in all age groups in the three years studied. Unlike males, females with the exception of those 65-69 in 1980 consistently had CVD as the second leading cause of death in all years studied and in all age groups. Many of the same diseases as for males were among the leading causes for females. Cancer of the respiratory tract was lower on the list than it was for males, except in 1980 among 65-69 year olds. This may represent the effects of later smoking exposures, expressed in this youngest cohort of females. Genital cancer, which is comprised of entirely different diseases for females, had a higher rank for females than it did for males in younger age groups, but dropped off the list for older ages. This may reflect earlier deaths for female genital cancers in contrast to prostate cancer which increasingly affects men at older ages. As for males, pneumonia and atherosclerosis became more frequent underlying causes of death for females with increasing age. Diabetes was among the top ten causes in 1970 for all ages except those 85 and older, for whom it was 11th, but fell to lower ranks in 1975 and 1980. This may be due to the increased early casefinding that occurred in the 1970s combined with improved management. Mortality from breast cancer for females in 1970 was very low, ranked 31st, but was within or near the leading ten causes of death in all other age groups and over the other years studied. This marked increase in breast cancer mortality may represent

delays in deaths from the disease at earlier ages. With improved diagnosis and early, improved therapy, lives may have been prolonged, resulting in the impact of this disease showing at later ages.

Patterns of underlying mortality for the youngest and the oldest age groups among females between 1970 and 1980 are summarized as follows.

Time and Age Comparisons of Ten Leading Underlying Causes for Females

	Age 65-69		Age 85 and Older	
Rank	1970	1980	1970	1980
1	IHD	IHD	IHD	IHD
2	CVD	Ca Digest	CVD	CVD
3	Ca Digest	Ca Resp	Athero	All Other Ht
4	Ca Genital	CVD	Pneumonia	All Other
5	All Other	All Other Ht	Ca Digest	Pneumonia
6	COPD	Ca Breast	Hyp Ht Dis	Athero
7	Ca Resp	All Other	All Other Acc	Ca Digest
8	Ca Other,Unspec	COPD	All Other	Hyp Ht Dis
9	Diabetes	Ca Genital	All Other Ht	COPD
10	Chron Liver Dis	Ca Other,Unspec	Ca Breast	All Other Acc

When all mentions of a cause on the death certificate were counted, the ranks of causes were different from those found for the underlying causes of death alone. The leading 15 causes are shown below for the youngest and the oldest age groups among males in 1980.

Age Comparisons of Ranked Causes of Death when All Mentions were Counted

Rank	Age 65-69	Age 85 and Older
1	All Other Ht	All Other Ht
2	IHD	IHD
3	Signs,Symp Ill Def	CVD
4	COPD	Signs,Symp Ill Def
5	Ca Other,Unspec	Pneumonia
6	Ca Resp	Athero
7	CVD	All Other
8	Pneumonia	COPD
9	Ca Digest	Nephritis
10	All Other	Ca Other,Unspec
11	Athero	Ca Genital
12	Diabetes	Ca Digest
13	Chron Liver Dis	Diabetes
14	Nephritis	All Other Acc
15	Hypertension	Fx,Trauma,Burn

Among males in both the youngest and the oldest age groups, all other heart disease was ranked first, followed by IHD. COPD ranked higher than respiratory cancer. Cerebrovascular disease, however, remained high on the list of causes, showing its role in contributing to deaths especially in the oldest age group. Some of the chronic diseases not usually listed as primary cause of death, such as atherosclerosis and nephritis, emerged higher on the ranked list of causes when all mentions on the death certificate were counted.

The leading 15 causes are shown below for the youngest and the oldest age groups among females in 1980.

Age Comparisons of Ranked Causes of Death when All Mentions were Counted

Rank	Age 65-69	Age 85 and Older
1	All Other Ht	All Other Ht
2	IHD	IHD
3	Signs,Symp Ill Def	CVD
4	Ca Other.Unspec	Signs,Symp Ill Def
5	CVD	Athero
6	COPD	Pneumonia
7	Diabetes	All Other
8	Ca Digest	Diabetes
9	All Other	Hypertension
10	Ca Resp	All Other Acc
11	Ca Breast	Ca Digest
12	Pneumonia	Ca Other,Unspec
13	Athero	Nephritis
14	Hypertension	Fx,Trauma,Burn
15	Nephritis	COPD

Among females, the same reverse occurred as all other heart disease mentions were more frequent than were IHD mentions, in both the youngest and the oldest age groups. As for males, atherosclerosis and pneumonia were more frequent for females than indicated by underlying cause statistics. COPD, listed as a common cause for females 65-69, was less common among females in the oldest age group. Diabetes was among the leading ten causes of death mentioned for both age groups in 1980, although it was not among the leading ten *underlying* causes in 1980 in either age group.

Mortality Rates by Pairs of Causes

Mortality rates in 1980 by pairs of causes are shown in the next series of tables. Tables 24 and 25, for males and females, respectively, show the mortality rates for all pairs of causes, ranked in decreasing order of frequency according to the 65-69 age group and including only pairs with mortality rates exceeding 100 per 100,000 in at least one age group. There is no particular order to the pair names, and no indication which disease of the pair, if either, was the underlying cause of death. Some of the pairs, such as specific cancer sites and other, unspecified cancer, which would include metastases, or accidents paired with fractures, trauma or burns are pairs that might logically occur and therefore may be of less interest. Pairs such as specific diseases with signs, symptoms and ill-defined conditions are hard to interpret, since they may represent complications listed on the death certificate that accompany end-stage disease.

The predominance of IHD, which was the most common underlying cause of death, and all other heart disease, the most common contributing cause of death, is clear from both male and female mortality data. Among males (Table 24), all other heart disease combined with CVD, atherosclerosis or pneumonia and IHD paired with atherosclerosis or CVD all had showed marked increases with age; by contrast, diabetes paired with IHD or "all other" diseases had a more moderate increase with age. COPD combined with all other heart disease, signs, symptoms and ill-defined conditions and IHD were common pairs, increasing in frequency with age. Respiratory tract cancer and other, unspecified cancer increased with age through age 75-79 then decreased in frequency in older age groups.

Among females (Table 25), IHD and all other heart disease were the most frequent paired causes of death in all age groups, as in males. In contrast to male rates, female rates for respiratory cancer and other, unspecified cancer were much lower, decreased with age and were lower in order of frequency than were other pairs of causes. For the pairs IHD with

atherosclerosis. hypertension. or CVD and all other heart disease combined with CVD, female rates were much lower than male rates in the younger age groups, but the rates nearly converged in the oldest age groups.

Pairs of contributing causes with the underlying cause of death removed are shown in terms of rates per 100,000 for each sex in Tables 26 and 27. These tables, too, are ordered according to decreasing frequency in those 65-69 and only report pair rates of 100 per 100,000 and more. The predominance of heart disease in the contributing causes is clear in these tables as well, in both males and females. Among males (Table 26), atherosclerosis, cerebrovascular disease, pneumonia or COPD combined with all other heart disease was a frequent pair, and mortality rates for each of these pairs increased with age.

For females (Table 27), atherosclerosis, cerebrovascular disease, and pneumonia combined with all other heart disease were the most remarkable pairs among contributing causes of death alone, and these pair rates increased consistently with age. Mortality rates for the pair COPD with all other heart disease were not ranked as frequent among females as among males, and the rates were about one third those of males in each age group.

The number of occurrences of pairs of causes is determined in large part by the predominant causes of death in the population. In this population, heart disease paired with other chronic diseases formed the majority of pairs seen. Tables 28 and 29 for males and females, respectively, show results of an analysis of the expected number of pairs compared to the number of pairs actually seen, in 1980, using a z-score measure to standardize and remove frequency as a confounder in exploring the distribution of pairs of causes. The z-scores calculated for each pair were ordered according to the youngest age group in each table, and only the highest z-scores and the scores for unusual pairs are shown in the tables. A high z-score indicated that the pair occurred more frequently than one would expect if the two causes occurred independently of one another. Ischemic heart disease and all other heart disease; malignant neoplasms combined with other, unspecified cancers

which include metastases; and homicide with fracture, trauma and burn are obvious examples of pairs that would be expected to occur together. And as in earlier analyses, pairs of specific causes with signs, symptoms and ill-defined conditions or with the "all other" category are difficult to interpret because the nonspecific causes may be undefined or represent end-stage disease complications. These tables present, therefore, pairs of specific causes that were not considered parts of the same disease but which represented two more separate disease processes occurring together.

More than half the pairs had z-scores that were above zero, indicating that their occurrence together was more often than expected by chance alone. The negative scores, indicating a less common occurrence than expected, were small, never reaching -1.00; positive scores for all pairs ranged from close to zero to 365.633 in males, 431.062 in females. Among males (Table 28), pairs of interest were chronic obstructive pulmonary disease combined with all other heart disease and with IHD. Diabetes and IHD and diabetes and all other heart disease were also pairs which occurred together more often than expected. Although the z-scores decreased with increasing age, the same pairs in the same order occurred more often than expected in older age groups as well.

Among females (Table 29), the z-scores were mostly higher than those generated for males, in all age groups, except IHD with COPD. The z-score indicating non-independence was higher for diabetes with IHD in all female age groups than for the pair COPD with all other heart disease, a reversal of the score ranks for males. As among males, hypertension combined with IHD, CVD and diabetes were pairs that occurred more often than expected.

Tables 30-37 show z-scores evaluating causes in pairs with one cause specified, for 1980 deaths. Again, scores were ordered from high to low according to the youngest age group. In these tables, since one cause of the pair had been specified, all possible pairs were presented. These measures are useful to show the diseases most commonly linked with

the predominant contributing causes of death.

Tables 30 and 31 show z-scores for pairs with diabetes for males and females, respectively, for 1980 deaths. Among males (Table 30), diabetes occurred with IHD, all other heart disease, hypertension, CVD and atherosclerosis more than would be expected if the occurrence of each disease in the pairs were independent. Diabetes combined with the different cancer categories had much lower z-scores, indicating that the disease processes were more likely to be occurring independently. Table 31 shows diabetes pairs for females, and the same heart and vascular diseases appeared to occur with diabetes more often than expected. As among males, cancers and infectious diseases were more likely to be independent of diabetes than were the heart and vascular diseases.

Tables 32 and 33 show z-scores for pairs of causes with atherosclerosis. For both males and females, IHD and CVD had the highest z-scores of non-independence. Atherosclerosis combined with hypertension, diabetes and all other heart disease were also pairs that had markedly higher z-scores than did other pairs with atherosclerosis, in both males and females. For most pairs and in most age groups, females (Table 33) had higher z-scores than did males (Table 32). However, atherosclerosis and COPD among males aged 65-69 had a higher score than among females; in older age groups the scores for males and females for this pair were nearly equal. In both sexes atherosclerosis and certain infections, namely pneumonia, influenza and septicemia, occurred together more often than expected. Other infections appeared to occur independently of atherosclerosis in both males and females. As with diabetes, the occurrence of atherosclerosis with malignant neoplasms had lower z-scores, for both males and females. Atherosclerosis and nutritional deficiency occurred together more than expected, and the non-independence of these causes of death increased with age, especially among females, unlike other pairs which in general showed smaller z-scores in older age groups.

Pneumonia paired with other causes of death in 1980 is shown for the two sexes on Tables 34 and 35. In general, many causes occurred with pneumonia more than would be expected if the causes occurred independently. The z-scores indicating non-independence, however, decreased with older age groups for nearly all pairs, in both males and females. This would suggest that pneumonia was not increasing in its importance as a contributor to death with other causes among the very old. As might be expected, high z-scores were calculated for pairs of pneumonia with other respiratory diseases, such as COPD and respiratory cancer, which would be likely to occur together on death certificates. Pneumonia in males occurred more frequently with CVD, nephritis and nephrosis, and chronic liver disease, diseases that might be associated with coma and resulting respiratory complications. Pneumonia and nutritional deficiency occurred more often than expected, and had a high rank among scores of pairs with pneumonia. Unlike the pair of pneumonia with atherosclerosis, this pair's z-score decreased in older age groups.

Tables 36 and 37 show z-scores calculated for pairs with septicemia, for males and females, respectively. As might be expected, septicemia occured more often than expected with other infections, including nephritis, pneumonia, kidney infection and meningitis. Septicemia and complications of medical care were paired more often than expected if independent, not a surprising result. Non-independent pairs with septicemia, for both males and females, were more often diseases and conditions representing possible trauma, surgical intervention or other infections, rather than the main underlying chronic diseases such as IHD or CVD.

Life Table Analyses

Table 38 shows the average number of years of life remaining for White Californians who reached age 65 in 1980. Females who lived to age 65 had a life expectancy of 83.19 years, compared to 79.24 years for males who reached age 65 in 1980. For each year of life beyond age 65, females had a higher remaining life expectancy, although at very old ages this difference between the sexes was proportionately smaller.

Figures 1 and 2 show the standard life table curves calculated for the study population in 1980. Figure 1 shows the survival (L_x) curves for males and females, with the average life expectancy at age 65 noted on each curve. Males had lower proportions of persons surviving at each age compared to females. Figure 2 shows the corresponding q_x curves, which are estimates of hazard functions, for males and females. The fluctuations present in the hazard functions and not present in the L_x curves are an indication that q_x is a more sensitive measure of the mortality of the population, whereas the nature of the L_x curve yields a smoothed survival curve.

Competing Causes of Death

Table 39 shows the results of the analysis using competing cause life table techniques. Under the assumption that mortality rates remained the same, the removal of ischemic heart disease as an underlying cause of death added nearly 3 years of life to 65 year olds, and more added years to males than to females. The next largest impact among the causes examined resulted from the removal of cerebrovascular disease as an underlying cause of death. Although the gains in life expectancy were much less than those for ischemic heart disease, the gain for females was nearly twice that for males. Removing all other heart disease resulted in gains that were nearly equal for males and females, and ranked third. Lung cancer and chronic obstructive pulmonary disease were more important underlying causes for males than for females, and their removal added .51 and .43 years for males, compared to .28 and .25 years for females. By contrast, cancer of the

digestive organs was a more serious underlying cause for females, and its removal added .49 years of life, compared to .07 years of life added for males.

Table 39 also shows the impact of removing any mention on the death certificate of the causes studied. For those causes that most often appeared as the underlying cause rather than a contributing cause, because of the natural severity of the illness or because of coding rules, the number of years added when any mention of the cause was removed from the death certificate did not change appreciably. Among females, removal of any mention of respiratory cancer increased the added years of life expectancy only .04 compared to the years added when it was removed as an underlying cause of death. By contrast, removing any mention of hypertension, in both males and females, multiplied the number of years added to life expectancy ten fold when compared to removing hypertension as an underlying cause of death. Among the causes examined, removing any mention of all other heart disease added the most years to life expectancy, 4.73 for males and 4.56 for females. Removing any mention of ischemic heart disease still had a big impact on life expectancy, adding almost 4 years for males and over 3.5 years for females. When any mention of digestive cancer was removed, the difference in life expectancy gains between males and females disappeared, and for both sexes the gain was about a half year.

Figures 3-14 show hazard functions for males and females for all deaths and with selected causes of death removed, either as underlying cause or as any cause mentioned on the death certificate. The graphs show the impact of removing a specific cause of death on the mortality at different ages. Figure 3 shows the removal of ischemic heart disease. For both males and females, the impact on mortality was greater with increasing ages, and greater when the disease was removed as underlying cause, with only moderate additional gains when any mention of IHD was removed. Figure 4 shows the removal of all other heart disease for males and females. The pattern is similar to that shown on Figure 3, removing ischemic heart disease. In both figures, the proportion of deaths caused by

these two categories of heart disease was so high that their removal altered the hazard functions considerably. Removing underlying IHD in males (Figure 3) resulted in a lower mortality probability for males than the all cause mortality probability for females. In both Figure 3 and Figure 4, removal of any mention of these causes resulted in hazard functions for males and females that were much closer, even suggesting convergence of the probabilities at the oldest ages. Figure 5, by contrast, shows the changes in the probability of death when diabetes was removed. The decreases in the hazard functions, for both males and females, were most pronounced when any mention of diabetes was removed, and the changes were more uniform throughout the age span from 65 to 100 and older.

Changes in hazard functions when certain cancers were removed are shown in Figures 6-9. Different patterns were seen for males and females in Figure 6. Removing digestive cancer as underlying cause made negligible changes in the probability of death for males, whereas removing any mention of this cause decreased the hazard function, and this change was more pronounced in the ages 86-94 than in earlier or later years. For females, the probability of death decreased when digestive cancer was removed as underlying cause, and removing any mention of this cause did not further decrease the hazard function by much. Moreover, the changes in the hazard function for females were uniform throughout the age range studied. Since digestive cancer includes stomach cancer and colon cancer, the differences seen may represent the epidemiologic patterns of different diseases grouped in this category. Figure 7 shows the impact of removing respiratory cancer. Removing this cause of death had an impact on mortality probability for males, but little impact on that for females. The main impact was seen when respiratory cancer was removed as underlying cause of death, and at younger rather than older ages. Figure 8 shows, for females only, the removal of breast cancer; there was little affect on overall mortality probability, but more can be seen at older ages than at young ages. Removal of genital cancer, shown on Figure 9, resulted in a bigger change in the hazard function of

males than in that of females. The impact also seemed greater at older than at younger ages for males, indicating the importance of cancer of the prostate among older men. For females, removing genital cancer had little affect on the hazard function of those living beyond age 65.

Figure 10 shows that removal of hypertension as an underlying cause, for both males and females, had little affect on mortality probabilities. When any mention of the cause was removed, the affect on the hazard function was somewhat larger for females than it was for males, but uniform throughout the age range. Removal of cerebrovascular disease as an underlying cause of death had close to the same impact on the hazard function as removing any mention of the disease, for each of the sexes (Figure 11). This affect increased with age for both males and females. By contrast, removing atherosclerosis as an underlying cause had a similar affect on male probability of death as it did on female probability of death, but for each sex the removal of any mention of atherosclerosis decreased the mortality probability considerably more.

Figures 13 and 14 show the hazard functions when pneumonia and chronic obstructive pulmonary disease were removed, respectively. For the younger ages in both sexes, the impact was greater when any mention of pneumonia was removed, compared to the impact when pneumonia was removed as an underlying cause. However, in the older ages, the impact of removing pneumonia as the underlying cause of death increased, as this cause of death became more important for both males and females. Similar to Figure 6, removing respiratory cancer, Figure 14 shows the importance of chronic obstructive pulmonary disease among males, and the larger impact its removal had on the hazard function of males as compared to the impact of its removal on female mortality probabilities.

Multiple Causes of Death

The probability of death from all causes, shown in graphic form in Figure 2, is given by single years of age for males on Table 40 and for females on Table 41. Mortality from leading causes of death, eleven for males and twelve for females, are presented to show the relative contribution of each cause to the overall mortality at each age. Among males, ischemic heart disease represented about one third of, all mortality, at each age studied, and the conditional probability of death from this cause increased consistently with age until age 95. Mortalities for all other heart disease also were higher at increasing ages. Respiratory cancer, the second largest probability among those at earlier ages, represented about 13 percent of all mortality at age 65, 10 percent at age 70, 6 percent at age 80, 2 percent at age 90 and less than 1 percent at age 98. The conditional probabilities of death for respiratory cancer remained roughly the same up to age 90, at which age probabilities were lower. Chronic obstructive pulmonary disease, like IHD, showed increasing probabilities of death with increasing age. Although cerebrovascular disease among males at earlier ages represented a small portion of overall mortality, about 5 percent, the mortality probabilities for this cause increased rapidly with age, and at older ages CVD represented about 14 percent of overall mortality. In earlier ages, respiratory cancer mortality probabilities were higher than those for digestive cancer, but around age 80 digestive cancer probabilities began to exceed those for respiratory cancer.

Mortality probabilities for females, shown on Table 41, include breast cancer. IHD and all other heart disease probabilities increased with age as they did among males, but IHD did not account for a third of mortality until older ages. The more rapid increase in mortality probabilities for these heart disease causes among females resulted in near convergence of probabilities among females and males at older ages. Respiratory cancer was about one quarter to one third the probability seen among males, at each age, and as among males no consistent pattern with age was seen. Unlike that seen for males, chronic obstructive pulmonary disease showed fluctuation but no consistent pattern with age for

females. Cerebrovascular disease among females represented a higher proportion of mortality than it did among males, close to 20 percent at older ages. Diabetes mortality probabilities generally increased with age among females, although the small numbers seen for whom diabetes was listed as the underlying cause of death made the probabilities fluctuate. Digestive cancer probabilities were higher than those for respiratory cancer at older ages, as seen among males.

Tables 42 and 43 show, for males and females respectively, the cumulative probabilities of death from these same eleven and twelve major causes of death; as previously, the twelfth cause shown for females was breast cancer. For males (Table 42), half the IHD and all other heart disease deaths occurred by age 80. By contrast, deaths from respiratory cancer occurred earlier, for whom the median age of death was between 74 and 75. Of those who died of digestive cancer, mortality occurred for more than 50 percent by age 77, whereas among those who died of genital cancer, predominately cancer of the prostate, 50 percent mortality was reached by age 81. Deaths from atherosclerosis occurred at later ages; cumulative probability of death had reached 50 percent by age 85.

The cumulative probabilities among females (Table 43) showed a later age at death for those dying of IHD and all other heart disease, 50 percent mortality reached by age 85 and 86, respectively. The age pattern among those who died of respiratory cancer was similar to that seen for males. Over 50 percent mortality among those who died of digestive cancer was reached by age 80, 3 years older than the median age seen for males. Breast and genital cancer mortality occurred at earlier ages among females, with over 50 percent mortality occurring by age 77 and 78, respectively. As compared with males, deaths from atherosclerosis occurred at later ages for females; the median age at death was between 89 and 90.

Tables 44-47 are similar to Tables 40-43, showing first the conditional probabilities of death and then the cumulative probabilities of death for males and females separately. In

this series of tables, however, the category all cancer was used to compare with other causes, rather than the separate cancer causes. Tables 44 and 45 show conditional probabilities of death for males and females, and 46 and 47 show cumulative conditional probabilities for males and females. The role of all cancers was much higher, as would be expected, than the role of individual cancers in causing mortality. Among males (Table 44), all cancers accounted for the second largest probabilities of death at all ages, after ischemic heart disease. Although the probabilities increased from age 65 to about age 80, at later ages the probabilities of death from all cancer showed no distinct pattern. Since this category represents several diseases with specific age distributions, it is not surprising that no pattern emerged when the diseases are grouped. Among females (Table 45), all cancers had higher probabilities of death than did ischemic heart disease at earlier ages; at later ages, however, mortality probabilities for all other cancers did not increase as much as did mortality probabilities for IHD, and the ranking reversed. Although all cancer mortality probabilities for females were never as high as those for males, they were closer at younger ages than at older ages. This may again reflect the combination of multiple diverse diseases rather than any specific pattern.

Tables 46 and 47 show, for males and females respectively, the cumulative conditional probabilities of death with all cancers grouped into one category for comparisons with other diseases. The same data are shown graphically in Figures 15 and 16. Among males (Table 46), the mean age of death was between 76 and 77; compared to the other causes, only deaths from chronic obstructive pulmonary disease occurred as early, with half of those deaths occurring by the age of 78. Deaths from other causes occurred on average later than did deaths from cancers. Like males, females who died of cancer (Table 47) had an average age at death between 77 and 78. The difference between this relatively young average age at death and the ages for other causes was much more pronounced among females than it was among males.

Graphically, the nine causes of death. with all cancers grouped, are shown on Figures 15 and 16 to show differences in age at death distributions for males and females. Again, the younger age pattern for all cancer deaths was evident for both sexes. Atherosclerosis and pneumonia in both males and females had the oldest pattern. Although the patterns were similar for males and females, the difference between the cumulative hazard functions of the causes affecting younger ages (all cancer, COPD and diabetes) and those affecting older ages was wider than the difference in hazard function patterns for males.

Pairs of Causes of Death

Multiple cause of death life table methods were used to show conditional and cumulative conditional probabilities of death for the primary causes of death with and without other causes. This analysis shows the contribution of a second cause of death to the mortality probability and to the average age of death. As done previously, each analysis is presented as a table of conditional probabilities (Tables 48-57) and graphically in a figure of cumulative conditional probabilities (Figures 17-26), separately for each sex. In each table, the probabilities for the main cause are divided into those with and without a second cause; the probabilities do not add across the age to the probability for the main cause, rather each pair analysis (the main cause with and without one second cause) adds to the probability for the main cause.

Tables 48 and 49 and Figures 17 and 18 show the mortality probabilities for the main cause IHD and those for IHD with and without diabetes, atherosclerosis and chronic obstructive pulmonary disease. For males (Table 48), the addition of diabetes to IHD did not appreciably change the magnitude of mortality probabilities. Those males who died of IHD with diabetes had younger ages at death than those without diabetes, as shown on Figure 17. Similarly, the addition of atherosclerosis to IHD did not appreciably change mortality probabilities at early ages, but at older ages an increasing proportion of deaths from IHD included atherosclerosis. The graphic display of this pair, shown on Figure 17

(middle graph), differs from that seen for diabetes; the mean age at death for those who died from IHD and atherosclerosis was older than that for those who died from IHD without atherosclerosis. For the pair IHD with COPD, the pattern seen resembles that of IHD with diabetes; addition of COPD did not appreciably change the mortality probabilities and the pair had a younger mean age at death than that seen for those who died from IHD without COPD.

Table 49 shows that, as among males, the proportion of the mortality probability at each age for females with IHD and diabetes was very small compared to those with IHD without diabetes. The graphic presentation (Figure 18) is similar to that for males, but showing a larger age difference between the mean age of death for those females who died of IHD with diabetes (younger) and those who died of IHD without diabetes. Similarly, the proportion of IHD mortality with atherosclerosis increased with age among females as among males, and the graphic presentation is nearly identical for both sexes, again showing the older mean age of death of those who died from IHD with atherosclerosis as compared to those who died from IHD without atherosclerosis. The addition of COPD to mortality from IHD did not change the IHD mortality probabilities as much for females as it did for males, although for those females who did die from the pair, the mean age of death was younger and the difference between ages at death for those with and without COPD was larger at all ages.

All other heart disease was examined next, and is shown on Tables 50 and 51 and Figures 19 and 20, paired as before with diabetes, atherosclerosis and COPD. Among males (Table 50 and Figure 19), the patterns seen for the three pairs were similar to those seen for IHD; the mortality probabilities for those who died from all other heart disease with atherosclerosis were lower at earlier ages, although the mean age at death was about the same. Similarly, the mortality probabilities for those who died from all other heart disease with COPD were lower at earlier ages than those seen for IHD with COPD. The

same pattern held for all other heart disease combinations for females (Table 51 and Figure 20), paralleling that seen for IHD. Those females who died of all other heart disease and COPD had a younger mean age of death and a higher cumulative hazard function at every age than did those females who died of IHD and COPD.

Hypertension combined with and without diabetes, atherosclerosis and COPD is shown on Table 52 and Figure 21 for males and on Table 53 and Figure 22 for females. The addition of diabetes changed the conditional mortality probabilities for males more at younger ages than at older ages, but in general diabetes did not alter the probability of death from hypertension. Of those males who died from hypertension with diabetes, however, the cumulative hazard function was higher, that is, the mean age of death was younger. Those who died from hypertension and atherosclerosis, by contrast, had a lower cumulative hazard function and an older mean age of death than did those who died from hypertension without atherosclerosis. And, in the same pattern as that seen for COPD combined with IHD and with all other heart disease, the addition of COPD to hypertension lowered the mean age of death for males. Among females (Table 53 and Figure 22), the addition of diabetes to hypertension resulted in a younger age of death, and the impact of this pair was somewhat larger, i.e., there was a larger difference in mortality probabilities between those with hypertension without diabetes and all hypertension than that seen in previous graphs for females with diabetes. Addition of atherosclerosis to hypertension resulted in lower cumulative mortality probabilities and an older mean age of death as compared with hypertension without atherosclerosis. The combination of hypertension with COPD among females resulted in a markedly higher cumulative hazard function and a lower mean age of death, although the impact of this pair on overall hypertension mortality was small.

Cerebrovascular disease combined with diabetes, atherosclerosis and COPD is shown for males on Table 54 and Figure 23 and for females on Table 55 and Figure 24. Again, the

addition of diabetes, atherosclerosis or COPD did not appreciably change the male or the female mortality probabilities for CVD. The same patterns held for both males and females, that is that the age of death was lower when diabetes or COPD was added to CVD and the age of death was higher when atherosclerosis was added to CVD. The differences were less, however, than in previous pair combinations, and the hazard functions were shifted to the right indicating overall older mean ages of death for CVD. Among females the pattern is shifted still further toward older ages for mortality from CVD.

All cancer combined with the diseases IHD, diabetes, atherosclerosis and COPD are shown on Table 56 and Figure 25 for males and on Table 57 and Figure 26 for females. The proportion of all cancer mortality from those who had COPD is larger than the proportion with either diabetes or atherosclerosis for males, which may reflect the contribution of lung cancer and related chronic lung disease to the all cancer category. Also among males, the mean age of death for those with cancer and diabetes or COPD did not change compared to those without the second cause, whereas all cancer with atherosclerosis and all cancer with IHD showed lower (older mean age at death) cumulative mortality probabilities than did all cancer without the second cause. Among females (Table 57 and Figure 26) the patterns were similar to those among males for all cancer combined with and without IHD, diabetes, atherosclerosis or COPD, but the cumulative hazard function curves were shifted to the right, indicating older ages at death. Also different among females was the more marked increase in cumulative mortality at earlier ages among those who died of all cancer with COPD.

DISCUSSION

The purpose of this study was twofold: first, to describe mortality patterns in the elderly, using single and multiple cause of death data, and to compare and contrast the results using each set of data, for example, to assess the biases incurred by using only single rather than multiple cause of death information in the description of mortality in the elderly. The second purpose was the examination of ways to analyze and present information on multiple causes of death in a meaningful way.

Mortality Patterns in the California Elderly

Data selected for use in this study constitute the deaths of all whites aged 65 and older in California in 1970, 1975 and 1980. Differences in mortality rates between this population and its subgroups and the U.S. population of whites as a whole may be due to a wide range of factors. Possible explanations for the lower California mortality rates include selective migration of healthy elders to the state, lifestyle and healthcare delivery system differences, environmental factors and others which are beyond the scope of this study.

Decreases in total mortality rates and increases in life expectancy over time were seen overall, with smaller changes in the second time period, 1975 to 1980, than in the first, 1970 to 1975. By age and sex, mortality rates in the oldest groups for males and especially for females actually increased between 1975 and 1980. This may be due to the continuing impact of earlier exposures to smoking and possibly lifestyle factors on subsequent heart and respiratory disease among the oldest age groups; the lower rates in younger age groups may be evidence of passage of the ischemic heart disease "epidemic".

The common diseases of older ages were seen among white Californians, and these were similar to those listed by NCHS as the leading causes of death in the U.S. (54). The lead-

ing causes of death for all ages for the U.S. show evidence of the aging of the population and the relatively small role of infant mortality on overall mortality. The causes seen in this study were similar to those seen in the U.S.: heart disease, particularly ischemic heart disease, and respiratory cancer in younger ages, and increasing frequency in older ages of diseases associated with aging: cerebrovascular disease, atherosclerosis and pneumonia.

Using single cause of death statistics, ischemic heart disease topped the list of common causes of death for both males and females, although it decreased over time; the predominance of this cause over other causes accounted for much of the decreases over time in total mortality rates. Respiratory cancer mortality rates, paralleling smoking and environmental exposures in males, increased over time in older age groups and decreased over time in younger males, with less smoking or exposure to cigarettes with lower tar and nicotine (55). The underlying mortality rates from chronic obstructive pulmonary disease showed a decreasing differential between male and female rates over time, paralleling the increase in smoking among women. These rates, however, were still lower than male rates, possibly because the exposures were less intense or occurred after filtered cigarettes were commonly available. Cerebrovascular disease decreased in younger age groups as an underlying cause, but became more predominant in older age groups in both males and females.

Using any mention of a cause on the death certificate, heart diseases, including ischemic heart disease and "all other heart disease", remained the most frequent causes mentioned on death certificates. The reported decline in IHD over time (56) was borne out by these data, evident in both underlying cause mentions and in contributing cause mentions. Declines using all mentions of IHD were less, however, than those using single cause statistics. For example, declines in males aged 65-69 were 12 percent then 23 percent in the periods 1970-1975 and 1975-1980, respectively. Using all mentions of IHD, these declines were less (10 percent then 22 percent) over the same time periods. These data

suggest that improved treatment making the disease secondary to another cause at death may be a factor as well as decreases in IHD incidence.

All other heart disease mentions, however, not only increased over time as underlying cause but also represented the category most frequently mentioned of any. This category included diseases of pulmonary circulation, endocarditis and pericarditis, and nonspecific conditions such as cardiomyopathy, heart failure, and ill-defined complications of heart disease (11). One should therefore interpret ischemic heart disease mortality declines in the elderly with caution, since the diagnosis at death of heart failure or ill-defined complications of heart disease may represent IHD. Other diseases which were more commonly recorded as contributing to rather than underlying a death included diabetes and atherosclerosis.

One runs headlong into the limitations of vital statistics data in general and multiple cause of death data in particular in interpreting these findings. It is not possible to separate cases for whom causes of death were "equal" contributors, in which the use of rates of any mention of a cause would be completely acceptable, from cases for whom one cause was clearly the underlying disease process and the other causes were either simply present or truly contributing to the death. Coding rules which sometimes arbitrarily assigned as underlying one cause over another and individual physician terminology preferences further complicate the interpretation. It is evident, however, that underlying mortality statistics, often used as a starting point for studies or as a justification for funding, may underestimate mortality from chronic diseases such as diabetes and atherosclerosis and may possibly overestimate other diseases preferred by physicians or coding rules. This study showed that, for diseases such as specific cancers, underlying cause statistics were generally adequate. For example, for deaths among males aged 65-59 in 1980, respiratory cancer and cancer of the digestive organs listed as underlying cause represented 91 percent and 90 percent, respectively, of all mentions of these cancers on

death certificates.

Analysis of trends in underlying and contributing causes of death revealed that accidents (other than motor vehicle) became less important as an underlying cause than as a contributing cause of death. This could represent changes in management of the consequences and complications of trauma among the elderly, such that deaths were not primarily due to the accidents but due to another cause, or it could represent a decrease in the frequency of accidents. As with all other findings, coding rule and physician terminology preference changes could account for this, although there is no evidence in the literature to support either explanation as a reason for changes in the role of accidents as a cause of death in the elderly. Another trend was the change in hyperplasia of the prostate from underlying cause to a contributor among males, and the same trend for hypertension and hypertension-related diseases in males and females. Both trends could be due to better casefinding, early diagnosis and better management of these diseases; for hypertension, the fifteen year period from 1968 to 1982 included increased hypertension awareness and treatment programs (57).

All other heart disease and other diseases of the endocardium were more commonly listed as underlying than as contributing causes of death over time. Coding and physician terminology preferences, or even medical practices such as less rigorous testing to make a definitive diagnosis of ischemic heart disease in the elderly leading to a less specific cause on the death certificate, may be important factors which could not be fully investigated using only death certificates. This finding, however, again points out the complex problem and possible biases in interpreting changes in mortality by using underlying mortality statistics alone.

Analysis of pairs of causes of death, with the confounding effect of the frequency of a given cause removed, revealed that pairs of chronic diseases occurred together more often with age. This is consistent with the earlier observations that the number of causes of

death per person increased with age. Common contributing causes of death such as diabetes, atherosclerosis and COPD occurred more commonly with heart diseases and cerebrovascular disease, and less commonly with cancers or infectious diseases. Again, it is difficult to know the relative contribution of each cause in a pair to the mortality of the individual. The information does support, however, findings from morbidity studies showing an association between diabetes and heart disease (57), diabetes and hypertension (58) and chronic obstructive pulmonary disease and respiratory cancer (59).

The expectation of life for all U.S. whites aged 65 in 1980 was similar to that found for white Californians, 14.26 and 14.24 for males and 18.55 and 18.19 for females, respectively (60). Life table analyses showed the impact of ischemic heart disease on male mortality rates, such that there was near convergence of male and female rates at later ages under the hypothetical situation with IHD removed. As in other analyses, when all mentions of a cause were counted, life expectancy gains on removal of the cause were greater.

The number of causes of death per person did not change much over the time periods studied, within each age-sex group. In comparison to multiple cause of death data collected by NCHS in 1955, however, the average number of causes per death increased (61), from 2.09 and 2.12 in white males aged 65-84 and 85 and older, respectively, and from 2.04 and 2.12 in the same age groups for females. The numbers for 1980 were over 3 causes per death. One must note, however, that these mean values are slightly biased since in 1955 only 5 causes were tabulated, although they reported that only 2 percent of death certificates had 5 or more causes listed; in this study, over 13 percent of deaths had 5 or more causes listed.

The number of causes per death increased, both in 1955 and in the present study years, with age. This finding, combined with decreasing overall mortality rates and increased life expectancy for the elderly, implies that the incidence of disease was not decreasing but that lives were prolonged through better management of disease or other reasons. In

fact. earlier or better casefinding for certain diseases with treatment at less severe stages or actual increases in disease incidence, such as respiratory cancer and IHD which have increased since 1955, may account for the larger number of causes per death, even though overall mortality rates have declined. Barrett-Connor suggested in her study of cardiovascular risk factors in those over age 50 that there has been a shift in risk factor distribution to older ages (62). This study showed what might not be risk factor shift but a shift in risk of death from other causes.

Olson and her colleagues tabulated data provided by NCHS for 1955 California deaths (63). Her study included California deaths among non-whites as well as whites and therefore is not entirely comparable to this study. Numbers of causes per death were slightly higher than the national average, and the number for males and females was nearly equal at 2.24 and 2.28 causes per death, respectively. Her study of California deaths focused on diabetes and showed that the proportion of deaths with diabetes increased with age, peaking at the age group 65-74 and falling in the oldest age group, for both males and females.

White and her colleagues compared Olson's results to all 1980 California deaths (64), and showed the increase in the proportion of death certificates with mention of diabetes over time, supporting the idea of better casefinding or an increase in the disease. When both the 1955 data and the 1980 data were compared with U.S. National Health Survey data, diabetes prevalence decreased in the oldest age groups in 1957-1959, as did mentions on death certificates; in 1979-1981, however, diabetes prevalence increased with age for both males and females. This finding, combined with a lower proportion of deaths with diabetes in the oldest age groups supports the idea of better management of the disease rather than earlier deaths from diabetes.

Fries stated in 1980 that decreases in mortality rates and the increase in average life expectancy are offset by a fixed human lifespan (65). He suggested that improvements in

lifestyle, the environment and healthcare have essentially eliminated infectious diseases as the major health concerns and have postponed the onset of chronic diseases to later ages. His prediction of a fixed lifespan, with an average age of death at 85 and a maximum life potential of about 110, was based on the convergence of expectation of life plots over time and on experiments by Hayflick in which cells doubled a finite number of times (66). He concluded that in time people will live longer, healthier lives until the maximum age is attained and natural death occurs.

Fries' theory generated a considerable amount of controversy, for many reasons including his prediction that fewer healthcare dollars would be needed because chronic diseases would account for a successively smaller proportion of time in the average lifespan. Schneider and Brody pointed out the danger of limiting healthcare policy and planning decisions based on predictions of fewer and healthier older adults (67). They gave evidence, including the decrease in mortality rates which resumed following a plateau in the 1960s and in particular data showing the largest decreases in mortality among those over age 85. This study of white Californians showed overall mortality declines but specifically showed larger decreases in age groups up to age 85 between 1970 and 1975, with increases in mortality for males and females aged 85 and older between 1975 and 1980. Differences between this study and national findings may be due to the California population differing from the entire U.S. and the inclusion of races other than white in their data.

This study supports the idea that elders have more, rather than fewer, chronic diseases at death. The question remains, however, were they sicker? There is evidence from morbidity studies that the number of older persons with chronic diseases and the disabilities associated with these diseases have increased (68,69). Unfortunately, mortality statistics alone can not indicate whether persons dying with multiple causes were sicker at death, what the duration of their illnesses was or how much disability they experienced during

their lives. Improvements in diagnostic methods alone could increase the number of "causes" of death, if physicians were simply to list known diseases. In this study females had more causes of death listed than did males, although mortality rates among females in all age groups and for all causes were lower. Logic might hold that the more diseases a person has, the sicker he or she is and death will come earlier. A question remains, however, unanswered fully by this study, as to whether more causes in some cases was an indication of more healthcare; were there persons who came to medical attention earlier or more often and therefore had earlier and more treatable conditions, which nonetheless got mentioned on the death certificate? This could be an explanation for lower female mortality rates.

This study also showed that, for some common chronic diseases studied, the cumulative mortality probability curve for those with a given chronic disease *with* atherosclerosis was lower than the cumulative mortality probability curve for the disease *without* atherosclerosis, indicating that those who died with atherosclerosis died later than those who died without atherosclerosis. For all other combinations studied, the addition of a second chronic disease lowered the cumulative mortality curve, and resulted in earlier deaths. Atherosclerosis, involving the accumulation of lipid-containing material in blood vessel linings, is the principal cause underlying myocardial and cerebral infarction, when such atheromas are released into the bloodstream. Atherosclerotic fatty streaks are commonly found in children, and the further development of plaques is thought to be diet- and age-related (70). A diagnosis of atherosclerosis may, therefore, directly reflect age, thus explaining the older pattern of mortality when atherosclerosis was present. Alternately, the signs and symptoms of atherosclerosis, including pain in the extremities and resulting gait difficulties, may lead older adults to healthcare and treatment earlier and prolong life. These data showed interesting patterns but as usual questions of interpretation remain.

Analysis of Multiple Cause of Death Data

The second purpose of this study was an investigation of methods of analysis and description of multiple cause of death data. Perhaps the initial and most useful analysis was based on the tabulation of any mention of a cause on the death certificate forming the numerators of mortality rates. After removing duplicate citations per record, this rate alone and when contrasted with the underlying rate provided the most accurate view of the overall impact of a condition on mortality and removed the bias incurred when only single causes are used. In this study, for example, atherosclerosis mortality rates by any mention on the death certificates were among the top six causes of death for all age and sex groups. Atherosclerosis was four to over ten times more likely to be reported as a contributing cause as an underlying cause.

Other researchers have used these rates, especially in the analysis of diseases not commonly listed as underlying cause, whether by severity, physician preferences or coding rules. Milham studied mortality by occupation using all mentions of a cause and found an excess in rheumatoid arthritis in farmers, and asbestosis in plumbers, pipefitters and steamfitters (71). Fife contrasted the role of injury as underlying cause of death in all age groups, and found that using underlying statistics alone underestimated by 50 percent the rate of mortality associated with injury among those 75 and older (72).

The average number of causes per death and the distribution of deaths by number of causes reported were useful as a comparison to data from 1955 (61) showing the increase in the number of conditions reported at death in this study. Tabulation of specific diseases according to whether they were reported alone or with other causes is an indication of the severity of conditions, although coding rules such as those which select a malignancy over all other causes as the underlying cause made interpretation difficult. Moreover, deaths from accidents and injuries always had more than one cause listed, only because the record listed the accident as underlying and the nature of injury as a contri-

buting cause, such as motor vehicle accident and concussion. For all accidents, injuries and external events causing death, therefore, the count of causes per death was always at least two. Israel reported that violent or external causes reported as the underlying cause of death in 1979 frequently were reported alone (73). It is unclear how their statistics were obtained, unless for those deaths one cause was subtracted from the number reported to account for the automatic reporting of two causes. In this study all accidental causes were reported with the nature of injury causes, therefore biasing the number of causes per death upward. A similar bias may have occurred when primary cancer was the underlying cause and a secondary unspecified metastasis was a contributing cause, resulting in a count of two causes for the same condition.

Another method used in this study to describe multiple causes of death was the generation of summary statistics to compare trends in underlying and contributing rates for a given cause over time. A log-linear model was used, which measured how different from parallel the underlying and contributing rate trend lines were, regardless of whether the trend from 1970 to 1980 increased, decreased or stayed the same. The model and resulting z-scores were easy to understand and comparable.

Manton also compared trends in mortality rates, using underlying (UC) rates compared to multiple cause (MC) rates (44), which in this study were called any mention of a cause rates. He called the MC/UC ratio an indicator of the severity or lethality of the cause, and generated an index to show the trend:

$$\frac{MC_{t_2} / UC_{t_2}}{MC_{t_1} / UC_{t_1}}$$

where the severity ratio at time 2 (t_2) is compared to the severity ratio at time 1 (t_1). He interpreted an index over one as a relative increase in the role of the disease as a contributing cause of death, or a relative decrease in its role as an underlying cause. Indices

less than one signified the opposite, a decrease in the contributing cause role or an increase in its underlying role.

Both methods are comparable, and Manton's results are similar to those of this study, but there are some advantages to the method used in this study. The log-linear method may be easier to understand because it is additive rather than multiplicative. Further, it can be accompanied by graphics to show lines generated by rates at the two points in time and it may be easier to understand *all* the possible changes involved: either the underlying or the contributing rate may be increasing, decreasing or staying the same. Manton's interpretation of his trend index only suggests changes in the severity of the disease as a reason for the change in trend. Additional explanations include coding changes or physician terminology preferences over time. Mortality and morbidity studies have shown that the number of chronic diseases increases with age. Therefore the common chronic diseases would likely show a decrease in mentions as underlying cause relative to mentions as contributing cause simply because there are more of them per person and only one can be mentioned as underlying cause on the death certificate. Any conclusions about a decrease in severity of a given cause because it is less often called underlying may represent over-interpretation of the data.

The analysis of pairs in this study included mortality rates by pairs of causes and the most frequent pairs of contributing causes (excluding the underlying cause). These analyses were useful to show the range of combinations that occurred on death certificates, but the rates were influenced by the most common causes of death, ischemic heart disease, all other heart disease, and some of the secondary or nonspecific causes. The presentation of pairs excluding the underlying cause would be more useful if true "triplets" were tabulated, so that pairs *with* a specific underlying cause could be seen, which was not done in this study.

A measure that eliminated the influence of the frequency of a given cause was the z-score measuring the likelihood of the occurrence of a pair of causes. This standardized measure enabled comparisons between pairs whose individual member frequencies were different. A measure of independence was also made by Baum and Manton to investigate stroke-related mortality (74). They took into account whether or not the stroke was listed as the underlying cause of death and calculated the expected number of pairs when cause A was contributing with cause B as underlying the death:

$$expected \ \# \ = \ \frac{(\# \ B \ as \ underlying \ )(\# \ A \ as \ contributing \ )}{(\# \ A \ as \ contributing \ ) + (\# \ not \ A \ )}.$$

Baum does mention that the selection rules employed by NCHS to determine the underlying cause may bias the resulting ratios. For example, if the physician listed both stroke and ischemic heart disease, current coding rules would select IHD as the underlying cause regardless of the positions on the death certificate. Again the measure used in this study may be easier to understand, since it uses more common epidemiologic terms for investigating independence. Using any mention of a cause on the death certificate, however, equates diseases or conditions that may not be equal at all; this method in which neither cause is assumed to be underlying is simpler and may be preferable to a method based on coding rules and physician preference which may change over time.

Chandra and his colleagues analyzed pairs of causes of death using a case control study design (75). They examined all deaths in 1978 with an underlying cause of nervous system tumor and selected two controls for each death, matched by sex, age, race, county and year of death, from deaths with any other underlying cause. Odds ratios were calculated to indicate contributing causes occurring more frequently with nervous system tumors than with other underlying causes of death. They failed to show known associations between nervous system tumors and other conditions, possibly because of their methods. For example, their study did not show a relationship between nervous system

tumors and diabetes, although they stated the association has been reported. Because of the large proportion of deaths with ischemic heart disease as underlying cause and the relationship between IHD and diabetes, a large proportion of the controls selected may have had diabetes as a contributing cause. This association may have been stronger than the association between nervous system tumors and diabetes. This method of pair analysis may not be as useful as is the analysis of independence of pair causes to determine clusters of conditions.

Chamblee and Evans calculated the expected number of pairs of causes in the same way as done in this study (42), then used Yule's Q to measure the strength of the relationship between causes in the pair. They used the numbers from all deaths in 1976, calculating Yule's Q as follows for the example of diabetes and nephritis:

	Nephritis Present	Nephritis Absent	Total
Diabetes Present	3775	130730	134505
Diabetes Absent	22418	1752517	1774935
Total	26193	1883247	1909440

where $Yule's\ Q = \dfrac{(130730)(22418) - (3775)(1752517)}{(130730)(22418) + (3775)(1752517)}$

is equal to .39, representing the strength of the relationship between diabetes and nephritis. They acknowledged, however, that a measure of strength of the relationship between two causes of death needs additional control variables in order to be meaningful. They reported that the relationship could also be expressed as an odds ratio, $(1 + Q)/(1 - Q)$.

Wong and his associates used a matrix of causes for presentation of pairs, and made a cross-tabulation of pairs of causes for 7394 deaths of a cohort of white steelworkers for 16 categories of causes (76). They computed expected frequencies of pairs of causes from this table. Although their method is useful for specific, well-defined diseases, cross-tabulation of causes of death is cumbersome and the number of possible pair

combinations in a general study is large unless broad disease groupings are made and few age-sex groupings are used.

The highest z-scores indicating non-independence of causes were presented in this study, as were all possible pairs with one cause of interest specified. In this way the number of possible pairs could be decreased to a more manageable number, and the relative likelihood of pair occurrences with one cause specified could be compared for different second causes and over different ages. For example, in previous analyses the mentions of pneumonia were described as increasing markedly with age for both males and females in 1980. In the pair analysis of the independence of pneumonia with other causes among males, three patterns of interest emerged. In all three patterns pneumonia occurred with the cause more often than would be expected by the frequency of each cause individually. For chronic obstructive pulmonary disease, the likelihood of joint occurrence with pneumonia decreased with age; for atherosclerosis it increased, and for ischemic heart disease joint occurrence likelihood stayed about the same. This analysis, combined with rates of any mention of a cause, can give further information on the possible role of diseases at death. The decrease in association between COPD and pneumonia at later ages, combined with the increasing rate of pneumonia anywhere on the death certificate, implies that pneumonia was less a complication of COPD and more a primary cause of death at older ages or associated with other causes. The opposite trend for atherosclerosis can lead to hypotheses of pneumonia as a complication of or an accompaniment to this circulatory disease. Z-scores were decreasing with age, as in the case of pneumonia as one cause in a pair, implying the emergence of pneumonia as an independent primary cause of death at older ages, especially since it increased markedly with age, or it can imply that pneumonia became the complication of a different set of primary diseases at older ages than at younger ages.

Life table analyses of multiple cause of death data were used to evaluate the relative con-

tribution of diseases, singly and in combination, to decreases in life expectancy. Further, survival and mortality curves were a graphic way of presenting multiple cause mortality data. With average years of life· remaining at age 65 (e_{65}) as a baseline, the calculation of cause elimination life tables showed added years of life if a certain cause were not present but mortality rates for other causes remained the same. Cause elimination in this study was presented for both the cause as underlying the death and for any mention of the cause on the death certificate.

Manton used this method as well, calling any mention of a cause "pattern of failure" (77). He further defined the gain in life expectancy, in order to interpret whether the gain represented many years for a few people or fewer years for a large group (78). He did so by weighting the added years by the proportion of the population who would have died of the disease if it had not been removed:

$$e_{65}^{weighted\ gain} = e_{65}^{all\ gain} \left(\frac{l_{65}^{all}}{l_{65}^{disease}} \right).$$

The calculation of gains in life expectancy assumes independence between causes of death, that is, that the mortality risk from a given (eliminated) chronic disease is independent of the mortality risks from other chronic diseases. This assumption is not medically supported; the elimination of a single cause is improbable, although the calculation of its removal is useful to assess its relative impact. Further, the mortality rates from other causes if a disease or cluster of diseases were removed would not be proportionately increased as implied under the hypothesis of independence. Because of the lack of independence of most chronic diseases, gains in life expectancy were treated as relative rather than as absolute measures. Gains in years remaining using competing risk methods were calculated simply as a way to demonstrate the relative contribution of single diseases to mortality among the elderly, rather than to make statements about the actual impact in terms of years of life for specific diseases or populations. Caution should be

exercised in interpreting life expectancy gains for specific populations, using the removal of any mention of a cause, when the causes are not independent in the population.

Multiple decrement life table methods were used in this study to divide mortality probabilities by specific underlying causes; this analysis was useful to show the relative magnitude of the contribution of each disease or category of diseases and graphically to show the age distribution associated with these diseases. Multiple decrement life table methods have been used by others in the analysis of mortality among the elderly (77,79,80). In this study, however, multiple decrement methods were used to analyze pairs of causes in a different way to show how mortality from a given cause changed with or without a second cause. Counts of any mention of a cause on the death certificate were used, but for each analysis the groups compared were mutually exclusive. For example, ischemic heart disease mortality probabilities were presented graphically alone and with the probabilities divided into those with and those without atherosclerosis. The two groups were mutually exclusive and the probabilities added to form the overall IHD mortality. This presentation showed the difference in age distributions for the main causes of death with and without atherosclerosis as compared to those main causes with and without diabetes or chronic obstructive pulmonary disease. Those dying of a disease with atherosclerosis had an older pattern of mortality as compared to those dying of the disease without atherosclerosis, whereas those dying of a disease with diabetes or COPD had younger mean ages of death as compared to those dying of the disease without diabetes or COPD. This analysis used multiple decrement techniques to divide mortality probabilities; while it is important to use any mention or "pattern of failure" counts to capture the full mortality impact of a cause, pair analysis using mutually exclusive groups is important as well. Analysis using triplets of causes using mutually exclusive groups is more unwieldy, but in the case of specific disease clusters this method may be the clearest and most accurate way to describe multiple causes of death.

Future Uses of Multiple Cause Mortality Data

The NCHS database for multiple causes of death is large, requiring computers capable of reading multiple-reel files, which precludes its use by many institutions and researchers. The tapes, which became available several years ago, list causes of death twice for each record (as described in the Methods chapter), based on an exploratory study using a sample of multiple causes from 1955 (81). Subsequent research using the database has been limited, possibly because of the size of the database, in spite of one paper discussing the potential uses of the data (42) and another encouraging its use (73) in prestigious journals. Single cause of death mortality tapes, by contrast, have also been available for research, and comprise single-reel files, one tape for each year; these data are more manageable by health department and institution computers and researchers.

Researchers have been interested in mortality statistics that capture issues beyond those reflected by a single cause of death for many years. The National Center for Health Statistics has responded in two somewhat conflicting ways. First, they tabulated up to two causes for a few single years prior to 1955, up to five conditions in 1955 and up to 14 then 20 causes of death for the years 1968-1983, and now intend to make this data available on an ongoing basis. NCHS has also responded to the need for more complete single cause of death information by joining multiple causes into the most comprehensive single conditions for underlying cause statistics. The International Classification of Diseases has evolved over the years to make single codes for diseases that often occur together but may represent two or more disease processes; NCHS has further combined and compressed disease categories by its coding rules to make the single, most comprehensive cause of death of all reported. The combined result of these activities has been the loss of information the fact that the data no longer reflects many of the complexities associated with multiple cause analysis. Moreover, the selection of one underlying cause, especially in deaths of older persons, can be arbitrary even with compressed and combined single causes; the underlying disease process is often not singular (82).

The relatively new and complete tapes of multiple causes of death have been provided for researchers but have not yet been widely in use. In its effort to provide all possible information, NCHS may have made the database too large for computer systems currently used. In this era of cost containment and medical care and research cutbacks, concern may be well founded that the multiple cause database, if not used, will no longer be provided. Some researchers have called for changes in the death certificate in order to accomodate situations where a single cause of death may not be clear (63). Another proposal is the complete change in the ICD, and changes in the NCHS system to combine causes, in order to decompress the codes which by their compression sometimes become contradictory when used for multiple cause analysis, and to make single codes that allow for multiple concurrent causes. Both suggestions involve major expense and effort with some loss in comparability to the past, and are unlikely to occur, especially since efforts are underway to make the classification of diseases, for both single and multiple cause analyses, internationally comparable (73).

There are specific ways in which NCHS could make the database easier to use and the data more accurate. First, to decrease its size, the dual coding system could be separated; researchers wanting tapes of the entity axis codes (before they are linked into codes comparable to underlying cause statistics) could get separate tapes from those wanting record axis codes which are comparable to single cause of death statistics. This would greatly decrease the size of each record and the cost of providing the database and increase the ease of database management. Further, if NCHS were to produce a set of multiple cause tapes using only the 72 cause categories, with duplicates from this compression on each record removed, the resulting tapes would be manageable by far more researchers. Persons wanting the specific ICD codes could request the more detailed database.

The record axis codes may be more useful to epidemiologists looking at overall mortality

patterns as a first step in examining a population. Currently the database lists the underlying cause separately followed by *all* the record axis causes; the underlying cause is among the record axis causes, but not always exactly the same, because of computer coding variations, a condition which is supposed to change in datasets after 1983 (48). Clearly the database could also be made smaller by including the underlying cause with a flag, followed by all other causes on the death certificate, rather than listing the underlying cause twice. Again, this scheme using the 72 cause compression for both the underlying and the contributing causes would be much easier for researchers to use.

The coding and reporting of accidents and external causes of death biases the number of causes per record upward; all such deaths have at least two causes in multiple cause lists, one for the event and one for the nature of the physical injury causing the death. In the proposed 72 category multiple cause database, external causes of death could be listed once for the purpose of counting the number of causes per record. Again, the use of flags could allow researchers to investigate the nature of injury data without interfering with the standard reporting of such causes, which is by external event.

Vital statistics on mortality will continue to be important in the study of trends in populations; the analysis of mortality in specific groups will continue to be an important first step in the development of hypotheses prior to the design of more definitive and expensive research to investigate disease etiology, prevention or control. In this era of longer life expectancy with multiple chronic diseases, analysis of multiple cause mortality statistics should become the usual precursor to co-morbidity studies. The findings of this study were intriguing in spite of the constraints of the database. Future evolution of the database should increase its potential use in epidemiologic research.

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TABLE 1

All Cause Mortality Rates per 100,000
Among White Males and Females Age 65 and Older
California, 1970, 1975 and 1980

Males

	Rate (Number of Deaths) per Year					
Age	1970		1975		1980	
65-69	3826.65	(9831)	3395.90	(10000)	3110.99	(10636)
70-74	5439.75	(10318)	5160.61	(10859)	4718.80	(11483)
75-79	8222.17	(10497)	7572.03	(10446)	7122.57	(11333)
80-84	12039.79	(8823)	11212.52	(9177)	10806.01	(9551)
85 and older	19365.94	(7935)	18459.01	(9329)	18990.06	(11391)
Total 65 and older	6885.01	(47404)	6425.29	(49811)	6093.10	(54394)

Females

	Rate (Number of Deaths) per Year					
Age	1970		1975		1980	
65-69	1842.07	(5917)	1705.98	(6292)	1666.21	(6982)
70-74	2844.98	(7618)	2614.90	(7682)	2631.05	(8765)
75-79	4921.39	(9813)	4334.16	(9815)	4068.23	(10310)
80-84	8233.34	(10478)	7083.60	(11117)	7045.95	(12028)
85 and older	16203.96	(13646)	14460.20	(16575)	14735.78	(21525)
Total 65 and older	4747.88	(47472)	4435.64	(51481)	4507.78	(59610)

TABLE 2

Mean Number of Causes of Death
Among White Males and Females Age 65 and Older
California, 1970, 1975 and 1980

Males

| Age | Mean and (Number of Deaths) per Year | | | | | |
	1970		1975		1980	
65-69	2.93	(9831)	2.89	(10000)	2.92	(10636)
70-74	3.00	(10318)	2.98	(10859)	3.01	(11483)
75-79	3.11	(10497)	3.04	(10446)	3.07	(11333)
80-84	3.13	(8823)	3.12	(9177)	3.12	(9551)
85 and older	3.14	(7935)	3.10	(9329)	3.12	(11391)
Total	3.06	(47404)	3.02	(49811)	3.05	(54394)

Females

| Age | Mean and (Number of Deaths) per Year | | | | | |
	1970		1975		1980	
65-69	2.94	(5917)	2.89	(6292)	2.94	(6982)
70-74	3.00	(7618)	2.98	(7682)	3.01	(8765)
75-79	3.06	(9813)	3.00	(9815)	3.06	(10310)
80-84	3.08	(10478)	3.02	(11117)	3.10	(12028)
85 and older	3.06	(13646)	3.02	(16575)	3.07	(21525)
Total	3.04	(47472)	2.99	(51481)	3.05	(59610)

TABLE 3

Number of Causes of Death per Death Certificate
Among White Males and Females Age 65 and Older
California, 1980

Males

| Number of Causes | Age Group | | | | | |
	65-69	70-74	75-79	80-84	85 and older	Total
1	1597	1462	1300	928	1065	6352
2	2886	2977	2757	2334	2792	13746
3	2939	3297	3394	2945	3570	16145
4	1928	2240	2352	2048	2428	10996
5	817	990	1032	855	1013	4707
6	311	337	334	284	343	1609
7	115	120	124	99	130	588
8	29	40	26	38	32	165
9	7	13	10	13	13	56
10	5	5	2	5	4	21
11	2	2	1	2	1	8
12	0	0	1	0	0	1

Females

| Number of Causes | Age Group | | | | | |
	65-69	70-74	75-79	80-84	85 and older	Total
1	1078	1229	1176	1193	1977	6653
2	1847	2151	2628	2940	5436	15002
3	1887	2473	3031	3672	7037	18100
4	1258	1747	2029	2658	4430	12122
5	576	758	991	1046	1812	5183
6	234	279	303	351	577	1744
7	61	85	102	116	189	553
8	29	24	34	37	48	172
9	5	11	10	11	13	50
10	6	6	4	2	4	22
11	1	0	2	1	2	6
12	0	1	0	1	0	2
14	0	1	0	0	0	1

TABLE 4

Proportion of Deaths with 2 or More Causes
Listed on the Death Certificate, by Underlying Cause of Death
Among White Males Aged 65 and Older, California, 1980

Cause	Age Group					Total
	65-69	70-74	75-79	80-84	85 and older	
Shigellosis,Amebiasis	-	-	1.00	-	-	1.00
Other Intest Inf	1.00	-	1.00	1.00	1.00	1.00
Tuberculosis	0.94	1.00	0.78	0.86	0.93	0.91
Whooping Cough	-	-	-	-	-	-
Strep Throat	-	-	-	-	-	-
Meningococcal Inf	1.00	-	-	1.00	-	1.00
Septicemia	1.00	1.00	1.00	0.97	1.00	0.99
Polio	-	-	-	-	-	-
Measles	-	-	-	-	-	-
Viral Hepatitis	1.00	1.00	1.00	1.00	1.00	1.00
Syphilis	1.00	1.00	-	1.00	1.00	1.00
All Other Infections	0.94	0.97	0.95	1.00	1.00	0.97
Ca Lip,Or/Pharynx	0.83	0.72	0.82	0.90	0.86	0.81
Ca Digestive	0.76	0.81	0.84	0.82	0.83	0.81
Ca Respiratory	0.79	0.82	0.81	0.81	0.88	0.81
Ca Breast	0.50	1.00	0.60	-	1.00	0.67
Ca Genital	0.81	0.80	0.80	0.86	0.89	0.83
Ca Urinary	0.77	0.87	0.84	0.86	0.90	0.85
Ca Other,Unspec	0.73	0.79	0.78	0.80	0.83	0.78
Leukemia	0.74	0.71	0.77	0.72	0.89	0.76
Ca Other Lymphatic	0.75	0.69	0.79	0.82	0.80	0.76
Benign Ca,in situ	0.74	0.91	0.93	1.00	0.85	0.87
Diabetes	0.98	1.00	0.99	1.00	1.00	1.00
Nutrit Deficiency	1.00	1.00	1.00	1.00	0.91	0.97
Anemia	1.00	1.00	1.00	0.93	0.89	0.95
Meningitis	1.00	0.00	1.00	0.67	-	0.78
Rheum Heart Dis	0.91	0.97	1.00	1.00	0.90	0.95
Hyp Heart Dis	0.62	0.66	0.70	0.80	0.74	0.69
Hyp Heart/Renal Dis	1.00	0.87	1.00	1.00	0.95	0.96
IHD	0.93	0.93	0.95	0.96	0.96	0.95
Other Dis Endocard	0.98	0.97	1.00	0.98	0.98	0.98
All Other Heart Dis	0.57	0.60	0.64	0.67	0.71	0.64
Hypertension	0.95	0.96	0.86	0.92	0.92	0.92
CVD	0.89	0.93	0.93	0.94	0.93	0.93
Atherosclerosis	0.94	0.99	0.94	0.96	0.89	0.93
Other Dis Arteries	0.85	0.85	0.82	0.87	0.85	0.85
Bronchitis	1.00	1.00	1.00	1.00	1.00	1.00

TABLE 4

Pneumonia	0.91	0.93	0.93	0.93	0.88	0.91
Influenza	1.00	0.83	0.67	0.89	0.89	0.87
COPD	0.93	0.94	0.95	0.96	0.96	0.95
Ulcer	0.94	0.90	0.96	0.97	0.95	0.94
Appendicitis	1.00	1.00	1.00	-	1.00	1.00
Hernia,Intest Obstr	0.92	1.00	0.92	1.00	1.00	0.97
Chron Liver Dis	0.90	0.90	0.89	0.89	0.83	0.90
Cholelithiasis	1.00	1.00	1.00	1.00	1.00	1.00
Nephritis	0.96	0.92	0.99	0.92	0.92	0.94
Kidney Infection	1.00	1.00	0.93	1.00	0.97	0.98
Hyper Prostate	1.00	1.00	1.00	1.00	1.00	1.00
Sign,Sym Ill Def	0.05	0.00	0.00	0.09	0.35	0.12
MVA	1.00	1.00	1.00	1.00	1.00	1.00
All Other Accidents	1.00	1.00	1.00	1.00	1.00	1.00
Suicide	1.00	1.00	1.00	1.00	1.00	1.00
Homicide	1.00	1.00	1.00	1.00	1.00	1.00
All Other External	1.00	1.00	1.00	1.00	1.00	1.00
All Other	0.95	0.97	0.96	0.96	0.97	0.96

- There were no deaths in this cause category.

TABLE 5

Proportion of Deaths with 2 or More Causes
Listed on the Death Certificate, by Underlying Cause of Death
Among White Females Aged 65 and Older, California, 1980

Cause	65-69	70-74	75-79	80-84	85 and older	Total
				Age Group		
Shigellosis,Amebiasis	-	-	-	1.00	-	1.00
Other Intest Inf	-	1.00	1.00	-	1.00	1.00
Tuberculosis	1.00	0.75	1.00	0.88	1.00	0.94
Whooping Cough	-	-	-	-	-	-
Strep Throat	-	-	-	-	-	-
Meningococcal Inf	-	-	-	1.00	1.00	1.00
Septicemia	0.93	0.93	0.98	1.00	0.97	0.97
Polio	-	-	-	-	-	-
Measles	-	-	-	-	-	-
Viral Hepatitis	1.00	1.00	1.00	1.00	1.00	1.00
Syphilis	1.00	-	-	-	-	1.00
All Other Inf	1.00	0.94	0.91	0.94	0.97	0.95
Ca Lip,Or/Pharynx	0.77	0.88	0.79	0.78	0.85	0.82
Ca Digestive	0.74	0.78	0.81	0.84	0.84	0.80
Ca Respiratory	0.75	0.75	0.84	0.82	0.82	0.78
Ca Breast	0.72	0.78	0.79	0.80	0.87	0.78
Ca Genital	0.72	0.77	0.77	0.87	0.86	0.79
Ca Urinary	0.76	0.76	0.88	0.85	0.83	0.82
Ca Other,Unspec	0.76	0.75	0.80	0.78	0.82	0.78
Leukemia	0.72	0.77	0.75	0.80	0.75	0.76
Ca Other Lymphatic	0.75	0.71	0.65	0.76	0.79	0.73
Benign Ca,in situ	0.90	0.75	0.87	0.88	0.94	0.87
Diabetes	0.99	0.99	0.99	1.00	0.99	0.99
Nutrit Deficiency	1.00	0.90	1.00	1.00	0.98	0.98
Anemia	1.00	1.00	0.93	0.87	0.95	0.94
Meningitis	1.00	0.50	0.50	1.00	0.50	0.69
Rheum Heart Dis	0.98	0.99	0.98	0.96	0.96	0.97
Hyp Heart Dis	0.64	0.76	0.75	0.79	0.83	0.78
Hyp Heart/Renal Dis	0.92	0.93	0.92	0.91	0.80	0.87
IHD	0.94	0.95	0.95	0.96	0.96	0.96
Other Dis Endocard	1.00	0.95	1.00	0.93	0.98	0.97
All Other Heart Dis	0.66	0.62	0.67	0.71	0.76	0.71
Hypertension	0.92	0.90	0.91	0.90	0.95	0.92
CVD	0.90	0.90	0.92	0.92	0.92	0.92
Atherosclerosis	0.92	0.91	0.94	0.90	0.90	0.90
Other Dis Arteries	0.91	0.89	0.88	0.84	0.79	0.85
Bronchitis	1.00	1.00	1.00	0.91	0.93	0.94

TABLE 5

Pneumonia	0.90	0.85	0.91	0.90	0.89	0.89
Influenza	1.00	1.00	0.93	1.00	0.94	0.96
COPD	0.94	0.95	0.96	0.95	0.96	0.95
Ulcer	0.95	0.88	0.90	1.00	0.93	0.93
Appendicitis	-	1.00	0.67	1.00	0.89	0.88
Hernia,Intest Obstr	0.96	0.98	0.97	0.93	0.96	0.96
Chron Liver Dis	0.94	0.96	0.91	0.98	0.96	0.95
Cholelithiasis	1.00	0.92	1.00	1.00	0.98	0.98
Nephritis	0.94	0.97	0.96	0.95	0.92	0.94
Kidney Infection	1.00	1.00	0.96	0.96	0.99	0.98
Sign,Sym Ill Def	0.11	0.11	0.13	0.31	0.26	0.21
MVA	1.00	1.00	1.00	1.00	1.00	1.00
All Other Accidents	1.00	1.00	1.00	1.00	1.00	1.00
Suicide	1.00	1.00	1.00	1.00	1.00	1.00
Homicide	1.00	1.00	1.00	1.00	1.00	1.00
All Other External	1.00	1.00	1.00	1.00	1.00	1.00
All Other	0.94	0.94	0.95	0.97	0.96	0.96

- There were no deaths in this cause category.

TABLE 6.1

Underlying Cause of Death
Rates and Ranks of Causes
Among White Males Aged 65-69
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	1360.46	1	1166.34	1	938.62
Ca Respiratory	2	316.29	2	356.48	2	355.97
CVD	3	290.23	4	217.72	6	160.00
COPD	4	286.82	5	192.00	5	175.79
Ca Digestive	5	228.79	3	245.21	4	234.87
All Other	6	160.32	6	171.07	7	149.76
Chron Liver Dis	7	128.29	7	110.55	9	90.67
All Other Heart Dis	8	85.75	8	92.67	3	260.91
Ca Other, Unspec	9	80.35	9	90.22	8	99.74
All Other Accidents	10	75.84	11	59.49	13	41.83
Other Dis Arteries	11	68.35	13	50.82	12	50.60
Ca Genital	12	66.12	10	61.12	10	71.66
Pneumonia	13	59.08	12	54.67	11	53.82
Ca Urinary	14	53.69	14	49.54	14	41.53
Diabetes	15	50.94	17	42.41	17	34.52
Suicide	16	47.25	16	44.97	18	33.64
Other Ca Lymphatic	17	46.76	15	45.89	16	35.98
Hyp Heart Dis	18	43.70	18	35.88	15	38.02
MVA	19	43.32	19	31.26	20	26.62
Ulcer	20	32.24	21	24.70	26	14.04
Atherosclerosis	21	30.67	23	18.44	22	21.06
Rheum Heart Dis	22	29.76	25	17.61	24	16.09
Ca Lip,Or/Pharynx	23	27.17	20	28.17	19	28.08
Leukemia	24	26.65	22	24.28	21	25.45
Nephritis	25	25.73	24	18.31	23	16.67
Hypertension	26	16.81	26	11.22	30	6.44
Benign Ca,in situ	27	14.58	27	11.08	27	11.41
Kidney Infection	28	11.53	37	3.02	41	1.76
Other Dis Endocard	29	9.56	29	5.84	25	16.09
Hernia, Intest Obstr	30	8.81	30	5.77	35	3.51
TB	31	6.86	33	4.69	32	5.27
Homicide	32	6.65	28	10.93	28	10.24
Hyp Heart/Renal Dis	33	6.13	34	4.53	38	2.34
Cholelithiasis	34	6.13	36	4.28	34	4.10
Sign,Sym Ill Def	35	5.31	32	5.25	31	5.56
All Other Inf	36	4.82	31	5.26	33	4.68

TABLE 6.1

All Other External	37	4.52	42	1.64	36	3.22
Hyper Prostate	38	4.38	41	1.74	42	1.76
Septicemia	39	3.97	40	2.02	29	7.02
Anemia	40	3.26	35	4.42	39	2.05
Nutrit Deficiency	41	3.07	45	0.97	37	2.63
Appendicitis	42	1.96	44	1.37	45	0.59
Ca Breast	43	1.57	47	0.34	44	1.17
Influenza	44	1.13	38	3.96	40	2.05
Viral Hepatitis	45	1.09	39	2.37	47	0.29
Bronchitis	46	1.04	46	0.60	43	1.46
Meningitis	47	0.74	43	1.61	46	0.59
Other Intest Inf	48	0.14	48	0.19	48	0.29
Meningococcal Inf	-	0.00	-	0.00	49	0.29
Syphilis	-	0.00	-	0.00	50	0.29
Shig,Amebiasis	-	0.00	-	0.00	-	0.00
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00

TABLE 6.2

Underlying Cause of Death
Rates and Ranks of Causes
Among White Males Aged 70-74
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	2007.08	1	1798.37	1	1460.88
CVD	2	528.73	2	468.49	5	327.93
COPD	3	425.25	5	322.43	6	289.30
Ca Respiratory	4	383.02	3	436.57	2	442.17
Ca Digestive	5	339.29	4	349.54	4	332.04
All Other	6	178.97	6	271.60	7	239.58
Ca Genital	7	134.86	7	143.19	9	126.16
All Other Heart Dis	8	121.43	8	121.36	3	353.41
Pneumonia	9	100.88	10	106.23	10	111.36
Other Dis Arteries	10	99.21	11	96.48	11	93.69
All Other Accidents	11	95.98	13	76.23	16	53.83
Chron Liver Dis	12	91.14	12	92.73	12	80.13
Ca Other,Unspec	13	90.19	9	106.28	8	129.03
Diabetes	14	80.59	15	65.52	14	73.56
Ca Urinary	15	75.86	14	68.86	13	77.26
Atherosclerosis	16	62.88	19	44.03	20	40.27
Other Ca Lymphatic	17	60.36	16	56.64	15	58.35
MVA	18	57.60	23	32.21	21	32.88
Suicide	19	57.12	18	50.06	19	42.33
Hyp Heart Dis	20	47.01	17	53.36	18	51.37
Ulcer	21	44.84	21	37.76	23	30.00
Leukemia	22	43.00	20	41.64	17	53.01
Rheum Heart Dis	23	35.40	24	31.59	27	13.15
Ca Lip,Or/Pharynx	24	29.34	22	34.14	25	27.94
Nephritis	25	25.68	25	23.98	22	30.82
Benign Ca,in situ	26	19.11	27	12.64	28	13.15
Hypertension	27	17.41	26	16.90	31	11.10
Kidney Infection	28	15.62	29	9.39	36	4.52
Hernia,Intest Obstr	29	13.92	31	8.07	32	9.45
Hyper Prostate	30	10.79	37	5.35	39	3.29
Cholelithiasis	31	10.51	34	6.48	33	6.58
Hyp Heart/Renal Dis	32	10.22	28	9.79	34	6.16
TB	33	10.11	36	5.83	40	2.88
Other Dis Endocard	34	9.72	27	9.93	24	28.77
Sign,Sym Ill Def	35	8.16	33	6.49	37	4.52
All Other Inf	36	5.99	39	4.90	30	11.92

TABLE 6.2

Anemia	37	4.90	35	6.18	38	3.70
Homicide	38	4.77	30	9.08	29	13.15
All Other External	39	4.59	-	0.00	35	4.93
Appendicitis	40	4.25	43	1.92	43	1.23
Nutrit Deficiency	41	4.16 ·	41	2.38	41	2.47
Septicemia	42	4.03	32	6.87	26	13.56
Influenza	43	3.07	38	5.08	42	2.47
Bronchitis	44	1.41	40	3.80	44	1.23
Ca Breast	45	1.06	44	1.44	46	0.82
Meningitis	46	1.00	-	0.00	47	0.41
Viral Hepatitis	47	0.74	44	1.99	45	1.23
Other Intest Inf	48	0.58	45	0.26	-	0.00
Shig,Amebiasis	49	0.52	-	0.00	-	0.00
Meningococcal Inf	50	0.52	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	48	0.82
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00

TABLE 6.3

Underlying Cause of Death
Rates and Ranks of Causes
Among White Males Aged 75-79
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	3050.77	1	2673.63	1	2227.96
CVD	2	1058.68	2	882.85	2	638.54
COPD	3	574.24	5	435.79	5	447.48
Ca Digestive	4	476.58	3	486.72	6	431.14
Ca Respiratory	5	392.70	4	474.40	4	526.67
All Other	6	309.20	6	398.46	7	379.60
Ca Genital	7	220.17	8	230.14	8	240.08
Pneumonia	8	192.39	9	210.05	9	234.42
Atherosclerosis	9	159.32	12	115.02	13	87.99
Other Dis Arteries	10	152.63	10	139.10	11	151.46
All Other Accidents	11	146.46	13	107.72	16	79.19
All Other Heart Dis	12	143.15	7	232.28	3	545.52
Diabetes	13	122.87	15	87.63	12	91.13
Hyp Heart Dis	14	103.46	17	71.81	17	76.67
Ca Other,Unspec	15	101.81	11	134.40	10	171.58
Ca Urinary	16	100.28	14	102.15	15	84.22
MVA	17	70.53	21	38.13	21	50.28
Chron Liver Dis	18	70.48	20	65.22	18	70.39
Other Ca Lymphatic	19	69.84	16	76.19	14	86.73
Leukemia	20	62.31	19	67.89	19	65.99
Suicide	21	52.65	18	70.54	20	54.68
Nephritis	22	51.78	25	27.74	22	50.28
Ulcer	23	48.22	23	30.83	25	29.54
Rheum Heart Dis	24	43.74	24	28.43	29	19.48
Ca Lip,Or/Pharynx	25	35.66	22	31.53	24	32.05
Hypertension	26	29.85	26	25.78	26	27.65
Kidney Infection	27	29.40	34	12.17	34	9.43
Cholelithiasis	28	25.48	29	15.21	32	13.20
Other Dis Endocard	29	25.02	33	12.47	23	49.02
TB	30	22.22	37	7.23	38	5.66
Hyper Prostate	31	20.84	32	13.35	39	5.66
Hernia,Intest Obstr	32	20.69	27	22.56	30	16.34
Hyp Heart/Renal Dis	33	18.04	39	6.15	37	6.28
Benign Ca,in situ	34	17.99	28	19.27	27	27.02
Anemia	35	11.65	40	5.39	40	5.66
All Other Inf	36	9.70	35	11.97	31	13.83

TABLE 6.3

Nutrit Deficiency	37	8.98	41	4.68	36	8.17
Influenza	38	8.37	36	10.56	41	5.66
Sign,Sym Ill Def	39	7.84	30	14.52	35	8.17
Appendicitis	40	6.32	42	4.38	44	2.51
Homicide	41	6.30	38	6.56	33	12.57
Ca Breast	42	4.74	45	1.46	43	3.14
Septicemia	43	4.66	31	14.17	28	20.11
All Other External	44	2.27	46	1.40	42	3.77
Meningitis	45	2.22	44	2.06	45	1.89
Bronchitis	46	1.39	49	0.64	48	0.63
Other Intest Inf	47	1.28	48	0.66	46	1.26
Viral Hepatitis	48	1.10	43	4.06	47	1.26
Shig,Amebiasis	-	0.00	47	0.71	49	0.63
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	-	0.00

TABLE 6.4

Underlying Cause of Death
Rates and Ranks of Causes
Among White Males Aged 80-84
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	4557.29	1	4018.19	1	3514.13
CVD	2	1875.91	2	1648.93	2	1192.50
COPD	3	617.21	6	478.94	5	547.60
Ca Digestive	4	599.09	4	546.50	6	544.20
All Other	5	389.93	3	565.07	4	627.93
Ca Genital	6	372.53	8	359.49	9	407.30
Ca Respiratory	7	360.50	5	490.29	7	522.71
Atherosclerosis	8	360.38	10	253.71	10	234.20
Pneumonia	9	350.23	7	436.09	8	501.21
All Other Heart Dis	10	252.80	9	354.82	3	936.80
All Other Accidents	11	217.55	12	157.51	14	126.72
Other Dis Arteries	12	175.92	11	168.37	12	177.63
Ca Urinary	13	159.80	15	126.10	13	162.92
Diabetes	14	141.79	14	142.82	15	110.88
Ca Other,Unspec	15	139.54	13	150.63	11	182.16
Hyp Heart Dis	16	135.18	16	125.07	17	85.99
Ulcer	17	96.22	24	46.49	24	40.73
Leukemia	18	90.69	17	105.81	16	98.43
Suicide	19	90.35	19	61.29	23	53.18
Hypertension	20	76.27	20	60.53	21	59.96
Other Ca Lymphatic	21	65.31	18	104.35	19	80.33
MVA	22	60.74	21	50.68	25	38.47
Nephritis	23	59.35	22	48.89	18	83.72
Hyper Prostate	24	55.85	32	21.25	31	22.63
Chron Liver Dis	25	52.42	25	40.76	22	59.96
Kidney Infection	26	48.53	30	31.38	33	20.37
Hyp Heart/Renal Dis	27	43.00	23	48.86	36	15.84
Hernia,Intest Obstr	28	41.19	29	35.72	30	23.76
Rheum Heart Dis	29	40.82	27	38.18	28	28.29
Other Dis Endocard	30	35.21	31	27.02	20	69.02
Ca Lip,Or/Pharynx	31	34.51	26	39.56	27	35.07
Cholelithiasis	32	30.07	36	15.39	29	28.29
Anemia	33	29.18	38	14.77	35	16.97
TB	34	25.11	39	10.31	41	7.92
Benign Ca,in situ	35	19.79	33	19.20	34	20.37
Nutrit Deficiency	36	18.58	37	14.89	39	10.18

TABLE 6.4

Sign,Sym Ill Def	37	17.39	35	15.57	38	12.45
All Other Inf	38	16.90	40	6.31	37	14.71
Influenza	39	13.26	28	37.98	32	21.50
Appendicitis	40	9.63	44	3.69	•	0.00
Septicemia	41	9.28	34	17.66	26	37.34
All Other External	42	6.60	46	2.38	42	4.53
Ca Breast	43	4.13	43	3.70	•	0.00
Meningitis	44	2.58	47	2.31	44	3.39
Bronchitis	45	2.43	42	5.43	45	3.39
Viral Hepatitis	46	1.91	45	3.42	43	4.53
Homicide	47	1.37	41	6.14	40	10.18
Other Intest Inf	48	1.24	48	2.00	46	2.26
Syphilis	•	0.00	•	0.00	47	2.26
Meningococcal Inf	•	0.00	•	0.00	48	1.13
Shig,Amebiasis	•	0.00	•	0.00	•	0.00
Whooping Cough	•	0.00	•	0.00	•	0.00
Strep Throat	•	0.00	•	0.00	•	0.00
Polio	•	0.00	•	0.00	•	0.00
Measles	•	0.00	•	0.00	•	0.00

TABLE 6.5

Underlying Cause of Death
Rates and Ranks of Causes
Among White Males Aged 85 and Older
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	7634.07	1	7080.87	1	6473.39
CVD	2	3293.75	2	3189.34	2	2447.32
Atherosclerosis	3	938.23	4	785.94	9	598.49
Pneumonia	4	819.46	3	813.62	4	1168.64
Ca Digestive	5	756.33	7	664.29	6	700.19
COPD	6	712.92	8	589.18	7	696.85
All Other Heart Dis	7	543.79	6	688.55	3	1968.86
All Other	8	539.66	5	694.81	5	1078.62
Ca Genital	9	530.55	9	548.17	8	625.17
All Other Accidents	10	405.90	11	301.82	11	278.41
Ca Respiratory	11	280.86	10	344.53	10	411.78
Diabetes	12	202.39	15	175.94	16	163.38
Hyp Heart Dis	13	201.48	14	176.42	19	130.03
Other Dis Arteries	14	179.01	12	208.17	12	220.06
Ca Urinary	15	167.12	13	206.18	15	185.05
Ca Other,Unspec	16	158.61	16	168.30	13	201.72
Hyper Prostate	17	134.85	22	76.93	34	33.34
Ulcer	18	122.92	19	106.30	21	106.70
Leukemia	19	108.14	18	109.59	17	145.04
Hypertension	20	105.41	17	128.19	18	138.37
Nephritis	21	101.90	20	99.83	14	196.72
Kidney Infection	22	98.84	24	64.50	28	56.68
MVA	23	86.42	27	52.05	24	76.69
Suicide	24	78.35	21	83.37	23	78.35
Other Dis Endocard	25	77.96	31	46.19	22	98.36
Other Ca Lymphatic	26	68.71	23	76.14	20	115.03
Hernia,Intest Obstr	27	64.45	25	59.72	26	61.68
Hyp Heart/Renal Dis	28	50.28	26	57.55	33	35.01
Rheum Heart Dis	29	48.67	36	39.46	35	33.34
Cholelithiasis	30	48.66	28	51.91	27	61.68
Influenza	31	40.30	29	51.90	29	45.01
TB	32	39.30	39	13.66	39	23.34
Ca Lip,Or/Pharynx	33	37.04	32	44.04	31	36.68
Chron Liver Dis	34	37.01	33	42.01	38	30.01
Benign Ca,in situ	35	35.39	30	50.22	30	43.34
Nutrit Deficiency	36	33.23	34	39.71	32	36.68

TABLE 6.5

Anemia	37	29.49	37	34.95	37	31.68
Septicemia	38	22.82	38	28.59	25	63.35
Sign,Sym Ill Def	39	22.21	35	39.62	36	33.34
Appendicitis	40	22.14	42	7.98	44	3.33
Bronchitis	41	17.35	41	8.79	45	3.33
Homicide	42	17.18	45	1.99	41	18.34
All Other Inf	43	15.11	40	10.21	40	20.01
Meningitis	44	4.62	46	1.87	-	0.00
Other Intest Inf	45	4.00	47	1.44	46	1.67
All Other External	46	2.36	43	5.74	42	6.67
Viral Hepatitis	-	0.00	-	0.00	43	5.00
Syphilis	-	0.00	-	0.00	47	1.67
Ca Breast	-	0.00	44	2.00	48	1.67
Shig,Amebiasis	-	0.00	-	0.00	-	0.00
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00

TABLE 7.1

Underlying Cause of Death
Rates and Ranks of Causes
Among White Females Aged 65-69
California, 1970, 1975 and 1980

| | 1970 | | 1975 | | 1980 | |
Cause	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	540.36	1	460.37	1	370.61
CVD	2	193.96	2	155.30	4	116.46
Ca Digestive	3	163.05	3	153.21	2	136.74
Ca Genital	4	86.25	6	78.68	9	68.01
All Other	5	80.47	5	101.33	7	108.82
COPD	6	63.95	9	57.23	8	84.96
Ca Respiratory	7	57.32	7	80.31	3	132.92
Ca Other,Unspec	8	55.34	8	57.53	10	62.05
Diabetes	9	44.79	12	32.78	12	34.60
Chron Liver Dis	10	39.03	11	39.20	11	45.10
All Other Accidents	11	34.62	15	24.82	16	21.24
All Other Heart Dis	12	31.96	10	52.95	5	114.55
Other Ca Lymphatic	13	31.56	13	30.79	14	28.64
Rheum Heart Dis	14	22.77	18	18.57	17	21.00
Suicide	15	21.24	17	19.86	22	10.74
Other Dis Arteries	16	21.22	19	17.88	18	18.38
Pneumonia	17	21.19	14	27.44	13	29.83
MVA	18	19.84	20	14.26	21	10.98
Hyp Heart Dis	19	19.53	16	23.28	15	21.72
Ca Urinary	20	18.85	21	13.45	20	13.84
Leukemia	21	17.87	22	13.38	19	15.51
Atherosclerosis	22	14.26	23	10.97	24	9.07
Ulcer	23	9.41	26	8.19	30	4.53
Kidney Infection	24	8.61	30	4.55	31	4.53
Hypertension	25	8.31	33	4.13	28	5.73
Other Dis Endocard	26	7.65	28	6.00	26	5.97
Hernia,Intest Obstr	27	7.64	29	5.88	27	5.97
Ca Lip,Or/Pharynx	28	7.24	24	10.97	23	10.26
Benign Ca,in situ	29	6.77	25	8.85	29	4.77
Nephritis	30	6.50	27	7.08	25	7.88
Ca Breast	31	4.71	4	108.33	6	113.59
Hyp Heart/Renal Dis	32	4.53	39	1.64	35	2.86
All Other Inf	33	4.18	31	4.48	32	4.30
TB	34	3.58	36	1.87	39	1.67
Homicide	35	3.44	34	3.82	34	3.10
Nutrit Deficiency	36	2.45	44	1.17	40	1.67

TABLE 7.1

Anemia	37	2.32	42	1.26	37	2.15
Cholelithiasis	38	2.29	38	1.71	36	2.39
All Other External	39	2.11	40	1.57	41	0.96
Sign,Sym Ill Def	40	1.99	32	4.44	38	2.15
Appendicitis	41	1.57	45	1.09	-	0.00
Septicemia	42	1.32	35	2.31	33	3.34
Viral Hepatitis	43	1.31	41	1.52	42	0.72
Influenza	44	0.91	37	1.84	43	0.72
Bronchitis	45	0.55	43	1.21	44	0.48
Other Intest Inf	46	0.34	46	0.40	-	0.00
Shig,Amebiasis	47	0.31	o	0.00	o	0.00
Meningitis	o	0.00	47	0.26	45	0.48
Syphilis	o	0.00	o	0.00	46	0.24
Whooping Cough	o	0.00	o	0.00	o	0.00
Strep Throat	o	0.00	o	0.00	o	0.00
Meningococcal Inf	-	0.00	o	0.00	-	0.00
Polio	-	0.00	-	0.00	o	0.00
Measles	-	0.00	-	0.00	-	0.00

TABLE 7.2

Underlying Cause of Death
Rates and Ranks of Causes
Among White Females Aged 70-74
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	957.89	1	852.75	1	673.60
CVD	2	410.56	2	332.83	2	250.05
Ca Digestive	3	200.22	3	202.54	4	201.72
All Other	4	120.38	4	143.38	5	163.00
Ca Breast	5	99.85	5	98.22	8	117.07
Ca Genital	6	93.65	7	80.19	10	75.95
Diabetes	7	76.12	11	57.48	11	59.74
COPD	8	76.01	9	77.62	7	120.37
Ca Other	9	71.03	8	78.08	9	84.95
All Other Heart Dis	10	64.51	6	80.96	3	209.22
All Other Accidents	11	52.19	15	34.84	17	31.52
Ca Respiratory	12	47.09	10	77.32	6	146.49
Pneumonia	13	45.00	12	45.40	12	54.93
Hyp Heart Dis	14	43.16	14	39.34	15	39.02
Other Ca Lymphatic	15	42.76	13	39.29	13	45.03
Atherosclerosis	16	40.96	18	27.19	21	24.01
Other Dis Arteries	17	34.31	17	27.74	16	35.72
Chron Liver Dis	18	29.45	16	32.35	14	39.92
Rheum Heart Dis	19	28.55	19	27.16	20	24.31
MVA	20	27.96	25	11.71	22	20.11
Ca Urinary	21	24.83	21	23.98	19	25.52
Suicide	22	23.23	22	20.15	28	11.71
Leukemia	23	22.19	20	25.37	18	27.62
Nephritis	24	15.59	23	14.21	23	20.11
Kidney Infection	25	14.02	29	8.41	33	5.10
Ulcer	26	12.96	28	10.29	30	9.61
Benign Ca,in situ	27	10.38	24	12.34	29	10.81
Hernia,Intest Obstr	28	9.51	31	6.10	26	12.01
Hypertension	29	9.49	26	11.68	27	12.61
Other Dis Endocard	30	8.26	35	3.76	24	17.41
Cholelithiasis	31	8.23	30	6.79	37	3.90
Ca Lip,Or/Pharynx	32	7.18	27	10.68	25	14.41
Hyp Heart/Renal Dis	33	5.43	33	4.95	36	4.50
Nutrit Deficiency	34	4.82	39	2.68	38	3.00
TB	35	4.30	41	1.83	42	1.20
Anemia	36	3.47	38	2.85	43	1.20

TABLE 7.2

Influenza	37	3.27	32	4.96	39	2.70
Septicemia	38	3.17	40	2.60	31	9.01
Sign,Sym Ill Def	39	2.72	36	3.72	32	5.40
Bronchitis	40	2.32	45	0.61	44	0.90
All Other Inf	41	2.31	34	4.57	34	5.10
Viral Hepatitis	42	1.57	42	1.43	41	1.80
Homicide	43	1.50	37	3.08	35	4.80
Appendicitis	44	1.13	44	0.67	47	0.30
All Other External	45	0.72	47	0.33	40	2.10
Other Intest Inf	46	0.68	48	0.31	45	0.90
Strep Throat	47	0.53	-	0.00	-	0.00
Shig,Amebiasis	48	0.37	46	0.33	-	0.00
Meningitis	-	0.00	43	0.97	46	0.60
Whooping Cough	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Syph	-	0.00	-	0.00	-	0.00

TABLE 7.3

Underlying Cause of Death
Rates and Ranks of Causes
Among White Females Aged 75-79
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	1809.27	1	1536.04	1	1211.79
CVD	2	877.92	2	711.77	2	544.54
Ca Digestive	3	290.64	3	284.64	4	292.00
All Other	4	195.24	4	204.57	5	253.33
Diabetes	5	120.76	13	75.88	12	73.39
Ca Breast	6	120.42	5	117.62	8	119.56
All Other Heart Dis	7	111.74	6	113.87	3	348.03
Atherosclerosis	8	1C7.35	11	89.35	13	73.00
Hyp Heart Dis	9	102.68	14	75.83	14	61.56
Ca Genital	10	101.42	9	95.10	11	97.46
Pneumonia	11	93.65	12	85.71	9	113.25
Ca Other,Unspec	12	86.27	8	97.07	10	102.99
COPD	13	86.01	7	103.19	6	133.37
All Other Accidents	14	80.94	15	63.45	16	47.75
Ca Respiratory	15	62.73	10	94.12	7	129.03
Other Ca Lymphatic	16	53.19	16	53.46	15	49.32
Other Dis Arteries	17	50.91	17	44.50	17	45.77
Ca Urinary	18	38.82	19	30.24	21	26.83
Rheum Heart Dis	19	38.68	18	34.35	18	35.12
Leukemia	20	36.36	20	29.79	20	27.23
Kidney Infection	21	32.20	25	18.76	33	9.86
Chron Liver Dis	22	28.39	21	25.45	22	26.83
MVA	23	27.40	22	23.68	23	24.07
Ulcer	24	23.57	26	18.29	28	15.78
Nephritis	25	23.56	23	20.74	24	21.70
Hypertension	26	21.66	24	19.07	26	16.97
Hernia,Intest Obstr	27	19.87	31	12.50	29	13.81
Cholelithiasis	28	17.89	30	12.51	31	11.44
Other Dis Endocard	29	14.79	33	9.77	19	28.02
Suicide	30	14.59	27	16.83	32	11.44
Hyp Heart/Renal Dis	31	12.16	34	9.10	40	4.74
Benign Ca,in situ	32	12.12	32	10.14	25	18.55
Anemia	33	10.72	36	6.98	37	5.92
Ca Lip,Or/Pharynx	34	10.15	29	12.96	30	13.02
All Other Inf	35	6.73	35	7.75	34	9.08
Influenza	36	5.85	28	15.01	38	5.52

TABLE 7.3

Sign,Sym Ill Def	37	4.56	37	6.83	36	6.31
Nutrit Deficiency	38	4.31	39	6.01	39	5.13
TB	39	4.23	41	3.05	41	4.34
Viral Hepatitis	40	4.21	45	1.24	42	2.37
Homicide	41	4.04	40	5.77	35	6.71
Appendicitis	42	3.54	43	2.23	44	1.18
Septicemia	43	3.41	38	6.76	27	16.18
Bronchitis	44	1.78	48	0.39	45	0.79
All Other External	45	1.46	42	2.56	46	0.79
Meningitis	46	1.42	44	2.09	43	1.58
Meningococcal Inf	47	0.49	46	0.43	-	0.00
Other Intest Inf	48	0.46	49	0.08	47	0.79
Shig,Amebiasis	-	0.00	47	0.43	-	0.00
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	-	0.00

TABLE 7.4

Underlying Cause of Death
Rates and Ranks of Causes
Among White Females Aged 80-84
California, 1970, 1975 and 1980

	1970		1975		1980	
Cause	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	3150.87	1	2629.49	1	2298.66
CVD	2	1681.11	2	1422.12	2	1160.46
Ca Digestive	3	405.04	3	396.24	5	362.02
Atherosclerosis	4	300.40	5	233.42	7	182.77
All Other	5	247.78	4	271.87	4	409.47
Hyp Heart Dis	6	217.96	9	132.56	10	130.05
All Other Heart Dis	7	204.59	7	178.66	3	683.62
Pneumonia	8	179.99	6	205.74	6	278.84
Diabetes	9	171.93	11	109.50	14	105.44
All Other Accidents	10	167.03	12	105.35	15	77.33
Ca Breast	11	137.94	8	140.14	9	138.83
Ca Other,Unspec	12	116.40	10	111.44	11	121.26
Ca Genital	13	110.44	13	102.44	12	110.72
COPD	14	94.78	14	98.47	8	164.02
Other Dis Arteries	15	94.31	16	72.23	17	65.02
Other Ca Lymphatic	16	65.63	17	56.21	16	76.74
Ca Respiratory	17	57.40	15	86.72	13	110.13
Ca Urinary	18	53.81	19	44.90	23	39.25
Hypertension	19	48.91	22	32.38	19	47.45
Leukemia	20	48.27	18	47.48	22	43.93
Ulcer	21	46.61	23	30.66	26	24.60
Kidney Infection	22	41.14	21	32.73	31	16.40
Nephritis	23	41.01	20	35.47	20	46.86
Other Dis Endocard	24	37.65	27	22.70	18	50.38
MVA	25	36.57	29	21.27	29	18.75
Rheum Heart Dis	26	34.48	24	29.65	21	45.69
Hernia,Intest Obstr	27	32.61	26	24.64	24	35.15
Cholelithiasis	28	24.74	31	16.72	32	15.82
Chron Liver Dis	29	23.83	30	19.97	27	23.43
Hyp Heart/Renal Dis	30	21.90	28	21.62	34	12.89
Benign Ca,in situ	31	20.89	34	13.09	25	28.70
Suicide	32	18.13	32	16.62	39	7.03
Ca Lip,Or/Pharynx	33	17.49	33	15.47	33	13.47
Anemia	34	16.07	36	11.25	37	8.79
Influenza	35	12.98	25	26.62	30	16.99
Septicemia	36	9.35	38	9.21	28	23.43

TABLE 7.4

Sign.Sym Ill Def	37	9.30	40	5.22	38	7.62
Appendicitis	38	7.92	47	0.64	43	1.76
Nutrit Deficiency	39	7.32	35	12.33	35	11.72
All Other Inf	40	7.30	37	11.18	36	10.54
Homicide	41	7.11	39	5.77	42	2.34
Bronchitis	42	3.49	42	3.96	40	6.44
TB	43	2.41	41	4.89	41	4.69
All Other External	44	1.52	45	1.23	46	1.17
Meningitis	45	1.49	46	1.21	44	1.76
Other Intest Inf	46	1.43	44	1.28	-	0.00
Strep Throat	47	1.12	-	0.00	-	0.00
Viral Hepatitis	48	1.10	43	1.78	45	1.76
Shig.Amebiasis	49	0.77	-	0.00	48	0.59
Meningococcal Inf	-	0.00	48	0.62	47	1.17
Whooping Cough	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	-	0.00

TABLE 7.5

Underlying Cause of Death
Rates and Ranks of Causes
Among White Females Aged 85 and Older
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
IHD	1	6490.94	1	5861.62	1	5124.83
CVD	2	3696.75	2	3079.79	2	2625.40
Atherosclerosis	3	909.19	3	769.24	6	673.64
Pneumonia	4	536.34	4	560.97	5	807.13
Ca Digestive	5	501.69	6	474.93	7	501.80
Hyp Heart Dis	6	388.20	8	244.87	8	223.86
All Other Accidents	7	383.29	9	223.22	10	182.10
All Other	8	377.22	7	424.54	4	837.94
All Other Heart Dis	9	347.82	5	487.05	3	1616.32
Ca Breast	10	188.09	11	164.59	11	176.62
Diabetes	11	187.45	10	168.22	12	160.19
Other Dis Arteries	12	158.36	13	142.20	15	121.86
COPD	13	154.41	12	149.62	9	184.84
Ca Other,Unspec	14	136.18	14	140.07	13	147.19
Ca Genital	15	123.67	15	112.03	14	126.65
Hypertension	16	104.08	16	87.55	18	90.37
Ca Respiratory	17	83.18	18	73.33	16	99.27
Kidney Infection	18	76.24	28	43.09	25	52.71
Hernia,Intest Obstr	19	73.92	21	61.71	22	69.83
Hyp Heart/Renal Dis	20	71.95	24	52.86	32	30.81
Ulcer	21	63.79	17	77.14	24	54.77
Other Dis Endocard	22	59.81	27	43.95	19	86.26
Ca Urinary	23	57.74	22	60.60	23	68.46
Rheum Heart Dis	24	52.89	26	46.40	26	52.71
Leukemia	25	50.22	23	57.10	21	73.94
Other Ca Lymphatic	26	49.03	19	65.50	20	75.99
Cholelithiasis	27	48.60	30	32.04	34	28.07
Nephritis	28	45.45	25	47.05	17	95.84
Influenza	29	43.83	20	62.71	27	49.29
Nutrit Deficiency	30	40.85	29	35.01	30	35.60
Sign,Sym Ill Def	31	34.59	31	30.97	31	31.49
Benign Ca,in situ	32	34.44	32	29.52	29	36.28
Anemia	33	30.91	33	21.90	33	28.75
MVA	34	27.63	35	12.36	37	15.75
Suicide	35	21.44	39	9.63	39	14.38
Septicemia	36	17.16	34	17.06	28	44.50

TABLE 7.5

Chron Liver Dis	37	14.41	37	11.47	38	15.75
Ca Lip,Or/Pharynx	38	13.21	38	11.47	36	18.48
All Other Inf	39	11.03	36	11.71	35	19.85
TB	40	8.19	40	6.69	43	3.42
Appendicitis	41	5.98	41	6.16	42	6.16
Other Intest Inf	42	3.24	45	2.70	44	3.42
Bronchitis	43	3.17	44	3.10	40	9.58
Viral Hepatitis	44	1.66	46	1.22	45	3.42
Homicide	45	1.19	42	4.39	41	6.85
Meningitis	46	1.12	43	4.13	46	1.37
All Other External	-	0.00	47	0.84	47	1.37
Meningococcal Inf	-	0.00	-	0.00	48	0.68
Shig,Amebiasis	-	0.00	-	0.00	-	0.00
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	-	0.00

TABLE 8.1

Contributing Cause of Death
Rates and Ranks of Causes
Among White Males Aged 65-69
California, 1970, 1975 and 1980

	1970		1975		1980	
Cause	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	1712.14	1	1817.65	1	1031.63
Sign,Sym Ill Def	2	675.63	2	673.52	3	571.24
Atherosclerosis	3	463.42	4	329.81	7	188.66
COPD	4	437.94	5	286.72	5	256.23
Ca Other,Unspec	5	386.14	3	368.68	4	306.83
Pneumonia	6	339.45	6	277.40	6	210.30
IHD	7	263.27	7	202.24	9	171.99
Diabetes	8	206.89	8	173.71	8	172.87
CVD	9	191.66	9	169.26	10	140.69
Fracture,Trauma,Burn*	10	162.70	10	125.31	13	124.31
All Other	11	155.47	11	120.04	2	603.42
Other Dis Endocard	12	150.16	15	54.66	23	26.62
All Other Accidents	13	122.19	12	94.24	14	90.97
Chron Liver Dis	14	84.21	13	76.90	16	64.64
Compl Medical Care*	15	80.57	14	63.84	17	52.06
Nutrit Deficiency	16	51.61	17	52.57	20	37.15
Other External NI*	17	50.60	19	45.85	28	13.75
Ulcer	18	50.53	20	40.67	25	23.11
Septicemia	19	49.63	16	53.11	15	87.16
Other Dis Arteries	20	48.45	21	38.50	19	38.90
Poisoning*	21	41.26	23	34.98	34	10.24
Ca Respiratory	22	37.39	22	36.36	21	36.27
Nephritis	23	35.89	18	49.04	11	132.21
Anemia	24	35.46	24	29.99	22	31.88
Ca Digestive	25	26.14	26	26.31	24	25.74
Kidney Infection	26	25.76	32	13.42	41	3.51
Rheum Heart Dis	27	25.10	27	21.67	29	13.75
Hernia,Intest Obstr	28	22.76	30	19.54	27	14.33
Hypertension	29	21.76	28	21.57	12	129.87
Hyp Heart Dis	30	20.57	25	28.03	18	39.49
Ca Genital	31	19.68	29	21.29	26	14.92
TB	32	19.40	36	9.63	39	4.97
Ca Urinary	33	14.68	37	8.09	32	10.82
All Other Inf	34	13.26	31	18.58	30	12.58
Hyper Prostate	35	11.15	40	6.25	38	5.85
Benign Ca,in situ	36	10.82	35	10.67	35	8.77

TABLE 8.1

Cholelithiasis	37	10.21	41	4.63	36	8.19
Other Ca Lymphatic	38	9.50	33	12.43	31	11.70
Bronchitis	39	5.88	39	6.64	42	3.51
Ca Lip,Or/Pharynx	40	5.51	38	6.53	33	10.53
Leukemia	41	5.49	34	10.94	37	6.14
Meningitis	42	2.58	43	1.61	40	4.39
MVA	43	2.36	46	0.69	44	1.75
Appendicitis	44	2.35	48	0.68	45	1.17
Influenza	45	1.13	49	0.66	48	0.29
Homicide	46	0.78	o	0.00	o	0.00
Other Intest Inf	47	0.64	50	0.43	o	0.00
Viral Hepatitis	48	0.54	45	0.95	o	0.00
Hyp Heart/Ren Dis	49	0.47	42	2.06	43	2.34
Polio	50	0.39	o	0.00	49	0.29
Suicide	51	0.39	44	1.02	46	0.88
Ca Breast	o	0.00	47	0.69	o	0.00
All Other External	o	0.00	51	0.33	47	0.58
Syphilis	o	0.00	o	0.00	50	0.29
Shig,Amebiasis	o	0.00	o	0.00	o	0.00
Whooping Cough	o	0.00	o	0.00	o	0.00
Strep Throat	o	0.00	o	0.00	o	0.00
Meningococcal Inf	o	0.00	o	0.00	o	0.00
Measles	o	0.00	o	0.00	o	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 8.2

Contributing Cause of Death
Rates and Ranks of Causes
Among White Males Aged 70-74
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	2506.43	1	2956.55	1	1628.13
Sign,Sym Ill Def	2	1006.28	2	1090.49	3	916.80
Atherosclerosis	3	846.63	3	666.51	7	361.21
COPD	4	747.17	4	523.95	5	410.94
Pneumonia	5	530.08	6	464.28	6	362.45
Ca Other,Unspec	6	507.88	5	511.41	4	436.00
IHD	7	426.98	7	404.51	8	340.67
CVD	8	351.25	8	348.15	9	265.88
Diabetes	9	329.74	9	289.16	10	265.47
All Other	10	212.63	10	186.86	2	960.77
Fracture,Trauma,Burn*	11	211.94	11	163.48	13	167.66
Other Dis Endocard	12	172.94	14	91.08	24	45.20
All Other Accidents	13	155.65	12	150.13	14	140.95
Compl Medical Care*	14	103.33	13	98.85	16	83.83
Other Dis Arteries	15	76.56	19	66.55	19	67.80
Nutrit Deficiency	16	72.93	16	80.38	18	68.22
Septicemia	17	70.80	17	79.58	15	138.90
Chron Liver Dis	18	69.82	18	70.63	20	67.39
Other External NI*	19	69.06	21	57.50	32	15.20
Ulcer	20	68.45	22	54.25	26	34.93
Anemia	21	61.75	23	50.80	22	55.07
Nephritis	22	58.70	15	83.50	11	219.03
Ca Genital	23	58.64	24	40.84	23	51.37
Ca Respiratory	24	58.56	20	59.92	17	68.63
Hyp Heart Dis	25	57.45	25	40.80	21	57.12
Kidney Infection	26	52.60	35	20.19	37	11.10
Ca Digestive	27	44.11	26	38.78	25	43.56
Poisoning*	28	42.18	27	35.64	35	13.97
Hernia,Intest Obstr	29	41.77	30	29.58	27	28.35
Hyper Prostate	30	36.68	32	26.26	36	13.56
Rheum Heart Dis	31	36.10	28	32.86	33	15.20
Ca Urinary	32	26.68	33	23.11	28	24.25
TB	33	25.06	34	21.86	39	9.45
Hypertension	34	24.11	29	31.39	12	202.59
All Other Inf	35	20.68	31	26.49	34	15.20
Cholelithiasis	36	17.70	37	17.95	31	16.85

TABLE 8.2

Leukemia	37	14.87	38	17.23	38	10.68
Other Ca Lymphatic	38	14.35	36	19.62	29	19.31
Benign Ca,in situ	39	12.74	39	12.64	30	18.90
Ca Lip,Or/Pharynx	40	7.47	41	8.17	40	7.81
Bronchitis	41	5.62	40	9.71	41	7.40
MVA	42	4.80	42	5.29	43	2.88
Influenza	43	2.56	43	5.08	48	0.82
Hyp Heart/Renal Dis	44	1.92	44	4.61	42	3.70
Appendicitis	45	1.59	49	0.48	45	1.23
Meningitis	46	1.50	45	2.70	44	2.47
Viral Hepatitis	47	1.47	47	0.66	49	0.82
Homicide	48	1.06	46	1.43	46	1.23
All Other External	49	1.02	○	0.00	51	0.41
Other Intest Inf	50	0.58	48	0.61	52	0.41
Ca Breast	51	0.53	50	0.48	○	0.00
Shig,Amebiasis	○	0.00	51	0.47	○	0.00
Polio	○	0	52	0.24	53	0.41
Syphilis	○	0	○	0.00	47	1.23
Suicide	○	0	○	0.00	50	0.82
Whooping Cough	○	0.00	○	0.00	○	0.00
Strep Throat	○	0.00	○	0.00	○	0.00
Meningococcal Inf	○	0.00	○	0.00	○	0.00
Measles	○	0	○	0.00	○	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 8.3

Contributing Cause of Death
Rates and Ranks of Causes
Among White Males Aged 75-79
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	4308.23	1	4625.73	1	2549.12
Sign,Sym Ill Def	2	1624.10	2	1627.02	3	1405.28
Atherosclerosis	3	1614.86	3	1187.98	4	637.91
COPD	4	1067.28	5	687.15	5	630.37
Pneumonia	5	905.73	4	792.84	6	612.77
IHD	6	722.44	7	599.16	8	536.72
Ca Other,Unspec	7	690.20	6	650.50	7	566.26
CVD	8	673.78	8	583.47	9	514.73
Diabetes	9	485.20	9	393.98	10	406.00
All Other	10	342.75	10	322.27	2	1503.32
Fracture,Trauma,Burn*	11	304.70	11	238.48	13	257.68
Other Dis Endocard	12	244.44	20	94.40	22	71.65
All Other Accidents	13	228.17	12	214.72	15	194.83
Compl Medical Care*	14	156.66	14	124.68	20	94.90
Ca Genital	15	128.30	15	119.47	16	111.87
Nutrit Deficiency	16	128.00	17	108.58	18	105.58
Other Dis Arteries	17	117.81	19	100.97	17	110.61
Anemia	18	111.41	18	103.77	19	96.79
Ulcer	19	110.46	23	79.51	26	57.19
Nephritis	20	107.65	13	134.93	11	358.86
Kidney Infection	21	103.68	28	50.12	34	21.37
Ca Digestive	22	101.95	21	85.36	21	84.22
·Septicemia	23	101.20	16	113.99	14	209.91
Other External NI*	24	78.33	22	81.19	38	16.34
Hernia,Intest Obstr	25	77.57	29	46.49	27	47.76
Hyper Prostate	26	75.34	27	50.43	29	33.31
Chron Liver Dis	27	71.27	25	63.76	25	62.85
Hyp Heart Dis	28	64.66	26	57.45	23	71.65
Ca Respiratory	29	61.14	24	76.17	24	71.65
Ca Urinary	30	45.09	32	38.85	28	31.42
Rheum Heart Dis	31	44.26	30	41.44	37	18.23
Cholelithiasis	32	43.57	39	22.06	33	22.63
All Other Inf	33	35.57	36	30.67	31	23.88
Hypertension	34	30.85	34	32.23	12	301.04
TB	35	30.03	35	31.13	40	11.31
Benign Ca,in situ	36	26.50	38	23.65	35	20.74

TABLE 8.3

Leukemia	37	24.45	33	32.85	30	25.77
Poisoning*	38	21.93	31	40.59	36	20.74
Other Ca Lymphatic	39	16.17	37	29.25	32	23.88
Bronchitis	40	15.32	40	14.17	41	10.68
MVA	41	11.89	43	6.60	43	5.66
Ca Lip,Or/Pharynx	42	11.09	41	11.73	39	15.08
Appendicitis	43	7.11	48	1.46	45	5.03
Influenza	44	6.09	42	7.04	46	2.51
Hyp Heart/Renal Dis	45	4.75	44	6.15	42	7.54
Other Intest Inf	46	1.71	49	0.79	50	0.63
Ca Breast	47	1.58	46	2.93	48	1.26
Meningitis	48	1.48	45	3.43	44	5.66
Strep Throat	49	1.12	∘	0.00	∘	0.00
Viral Hepatitis	50	1.10	47	2.03	51	0.63
Suicide	51	0.79	∘	0.00	52	0.63
All Other External	52	0.76	-	0.00	49	1.26
Homicide	∘	0.00	50	0.73	53	0.63
Syphilis	∘	0.00	∘	0.00	47	1.89
Shig,Amebiasis	-	0.00	∘	0.00	54	0.63
Whooping Cough	∘	0.00	∘	0.00	•	0.00
Meningococcal Inf	-	0.00	∘	0.00	∘	0.00
Polio	∘	0.00	∘	0.00	∘	0.00
Measles	-	0.00	-	0.00	•	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 8.4

Contributing Cause of Death
Rates and Ranks of Causes
Among White Males Aged 80-84
California, 1970, 1975 and 1980

	1970		1975		1980	
Cause	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	6333.74	1	7136.16	1	4084.36
Atherosclerosis	2	2814.76	3	2053.14	5	1134.80
Sign,Sym Ill Def	3	2623.21	2	2585.61	3	2173.42
Pneumonia	4	1486.26	4	1325.13	4	1138.19
COPD	5	1252.42	7	898.02	8	880.23
CVD	6	1080.57	6	962.59	6	909.65
IHD	7	1010.47	5	1064.65	7	909.65
Ca Other,Unspec	8	841.17	8	792.86	9	724.10
Diabetes	9	633.96	9	581.06	11	528.36
All Other	10	563.11	10	519.41	2	2267.33
Fracture,Trauma,Burn*	11	499.44	11	351.88	13	334.89
All Other Accidents	12	330.35	12	271.74	15	304.35
Other Dis Endocard	13	316.87	19	153.11	22	122.19
Ca Genital	14	292.50	13	269.31	16	251.17
Nutrit Deficiency	15	223.96	14	201.40	18	178.76
Other Dis Arteries	16	186.03	18	169.28	19	143.69
Anemia	17	185.20	15	201.04	17	195.73
Hyper Prostate	18	174.53	24	93.76	29	63.36
Kidney Infection	19	164.45	25	92.93	33	31.68
Compl Medical Care*	20	143.28	20	128.29	20	138.03
Septicemia	21	135.71	17	182.78	14	308.87
Ca Digestive	22	132.50	21	113.59	21	131.24
Ulcer	23	125.23	22	108.03	25	87.12
Nephritis	24	118.70	16	195.55	10	610.96
Hernia,Intest Obstr	25	115.84	26	89.89	24	90.51
Hyp Heart Dis	26	85.62	27	88.76	23	114.27
Other External NI*	27	83.24	23	97.75	32	32.81
Chron Liver Dis	28	73.12	32	50.65	26	73.54
Ca Respiratory	29	71.01	29	59.91	27	71.28
Ca Urinary	30	58.23	28	60.63	28	67.88
Rheum Heart Dis	31	56.25	31	57.67	36	27.15
Poisoning*	32	53.22	36	37.88	38	19.23
Cholelithiasis	33	47.26	34	42.31	34	30.55
Leukemia	34	43.97	37	34.45	31	37.34
TB	35	42.90	33	44.97	39	19.23
Benign Ca,in situ	36	42.88	39	28.05	30	44.12

TABLE 8.4

All Other Inf	37	42.25	30	58.01	37	27.15
Hypertension	38	38.14	35	38.80	12	386.94
Other Ca Lymphatic	39	34.58	38	33.25	35	30.55
Bronchitis	40	19.41	41	16.29	40	18.10
Ca Lip,Or/Pharynx	41	9.66	42	14.83	41	11.31
MVA	42	9.66	43	4.94	44	6.79
Hyp Heart/Renal Dis	43	8.27	48	1.48	43	7.92
Influenza	44	5.30	40	20.18	42	10.18
Ca Breast	45	4.13	-	0.00	47	1.13
Meningitis	46	3.87	45	3.47	48	1.13
Viral Hepatitis	47	3.82	46	3.42	-	0.00
Appendicitis	48	2.75	44	3.69	45	4.53
All Other External	49	2.64	49	1.18	49	1.13
Other Intest Inf	50	1.74	47	3.11	50	1.13
Shig,Amebiasis	51	1.34	-	0.00	-	0.00
Syphilis	-	0.00	-	0.00	46	2.26
Strep Throat	-	0.00	-	0.00	51	1.13
Homicide	-	0.00	-	0.00	52	1.13
Whooping Cough	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Suicide	-	0.00	-	0.00	-	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes
but never as an underlying cause.

TABLE 8.5

Contributing Cause of Death
Rates and Ranks of Causes
Among White Males Aged 85 and Older
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	10851.30	1	12289.90	1	7340.29
Atherosclerosis	2	5138.20	3	3997.10	4	2520.67
Sign,Sym Ill Def	3	4844.90	2	4736.60	3	3829.35
Pneumonia	4	2633.50	4	2362.60	5	2137.24
CVD	5	1773.20	6	1662.30	6	1653.77
IHD	6	1655.00	5	1692.90	7	1495.40
COPD	7	1568.40	7	1133.60	8	1103.63
Fracture,Trauma,Burn*	8	927.42	11	654.94	11	790.21
All Other	9	923.51	9	798.03	2	4322.82
Ca,Other,Unspec	10	877.00	8	994.70	10	911.91
Diabetes	11	790.00	10	763.10	12	745.20
All Other Accidents	12	600.40	12	484.90	14	588.49*
Other Dis Endocard	13	497.70	20	213.90	22	176.71
Ca Genital	14	439.20	13	464.10	16	461.79
Hyper Prostate	15	407.00	18	261.20	24	155.04
Nutrit Deficiency	16	397.10	15	330.40	18	328.42
Anemia	17	299.50	14	356.80	17	403.44
Kidney Infection	18	298.90	27	129.00	30	65.02
Other Dis Arteries	19	235.10	19	237.50	19	246.73
Ca Digestive	20	211.80	23	155.30	20	243.40
Compl Medical Care*	21	205.01	21	193.91	21	190.05
Septicemia	22	199.20	17	287.60	13	608.50
Hernia,Intest Obstr	23	195.70	22	175.40	25	135.04
Ulcer	24	191.20	24	152.80	23	161.71
Nephritis	25	186.80	16	289.20	9	1053.61
Hyp Heart Dis	26	145.10	28	104.50	26	121.70
Other External NI*	27	134.23	25	148.40	38	23.34
Ca Urinary	28	87.20	26	143.30	27	121.70
Cholelithiasis	29	84.50	35	62.30	29	68.35
TB	30	73.00	36	51.60	39	23.34
Rheum Heart Dis	31	69.80	30	84.20	36	33.34
All Other Infections	32	63.00	29	89.90	33	53.35
Ca Respiratory	33	58.60	33	65.30	28	101.69
Chron Liver Dis	34	56.80	37	42.00	35	36.68
Benign Ca,in situ	35	56.00	34	64.60	31	65.02
Hypertension	36	55.80	32	65.40	15	533.48

TABLE 8.5

Other Ca Lymphatic	37	48.10	39	39.00	34	46.68
Leukemia	38	46.70	31	73.70	32	58.35
Poisoning*	39	39.05	38	41.55	40	20.01
Ca Lip,Or/Pharynx	40	27.20	40	24.00	42	15.00
Bronchitis	41	19.50	41	22.90	37	33.34
Influenza	42	16.60	42	17.30	43	10.00
Hyp Heart/Renal Dis	43	14.80	47	2.40	41	16.67
MVA	44	9.90	44	4.00	44	6.67
Other Intest Inf	45	5.80	43	6.10	46	3.33
Meningitis	46	4.60	48	1.90	47	1.67
Ca Breast	47	2.50	45	4.00	-	0.00
Appendicitis	-	0.00	46	4.00	45	6.67
Syphilis	-	0.00	-	0.00	48	1.67
Homicide	-	0.00	-	0.00	49	1.67
All Other External	-	0.00	-	0.00	50	1.67
Shig,Amebiasis	-	0.00	-	0.00	-	0.00
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00
Viral Hepatitis	-	0.00	-	0.00	-	0.00
Suicide	-	0.00	-	0.00	-	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes
but never as an underlying cause.

TABLE 9.1

Contributing Cause of Death
Rates and Ranks of Causes
Among White Females Aged 65-69
California, 1970, 1975 and 1980

	1970		1975		1980	
Cause	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	777.05	1	822.69	1	482.06
Sign,Sym Ill Def	2	320.20	2	338.59	3	351.28
Ca Other,Unspec	3	273.13	3	255.75	4	215.26
Atherosclerosis	4	232.40	4	147.25	6	98.32
Diabetes	5	164.54	5	120.27	5	120.51
CVD	6	125.76	7	96.45	10	83.76
Pneumonia	7	124.29	6	111.74	7	97.84
IHD	8	121.42	8	92.41	11	81.14
COPD	9	80.38	9	69.49	8	91.64
All Other	10	69.57	10	67.76	2	365.60
Fracture,Trauma,Burn*	11	61.64	12	45.28	15	46.54
All Other Accidents	12	53.61	11	50.70	14	51.31
Other Dis Endocard	13	53.17	18	25.98	26	10.50
Nutrit Deficiency	14	40.39	16	28.18	17	28.88
Compl Medical Care*	15	32.07	13	33.35	16	32.22
Poisoning*	16	31.13	19	25.22	27	10.50
Hyp Heart Dis	17	27.76	20	24.17	20	17.90
Anemia	18	26.34	21	22.68	18	25.53
Hernia,Intest Obstr	19	25.55	23	19.95	21	17.18
Septicemia	20	24.35	14	32.96	13	55.84
Chron Liver Dis	21	23.92	17	26.59	19	21.96
Other External NI*	22	23.04	22	22.23	34	4.53
Nephritis	23	22.75	15	29.72	12	79.23
Other Dis Arteries	24	21.68	24	19.08	22	15.75
Ca Breast	25	15.08	27	14.50	23	14.08
Rheum Heart Dis	26	14.90	28	14.06	29	9.78
Ulcer	27	13.94	29	13.05	28	10.50
Kidney Infection	28	13.84	32	7.77	35	4.53
Ca Digestive	29	13.51	25	17.36	24	13.13
Ca Genital	30	9.13	34	5.76	30	7.16
Hypertension	31	9.10	26	16.19	9	86.63
Cholelithiasis	32	8.17	33	6.83	32	6.21
All Other Infections	33	7.71	30	10.91	31	7.16
Benign Ca,in situ	34	7.15	37	5.24	33	5.01
TB	35	6.68	35	5.61	42	1.19
Other Ca Lymphatic	36	6.43	36	5.60	36	4.06

TABLE 9.1

Leukemia	37	5.96	38	4.10	40	1.91
Ca Respiratory	38	3.43	31	9.50	25	12.17
Bronchitis	39	2.77	40	2.89	43	0.95
Hyp Heart/Renal Dis	40	2.64	44	0.66	44	0.95
Ca Lip.Or/Pharynx	41	1.58	42	1.37	37	3.58
Ca Urinary	42	1.55	39	3.23	38	3.10
Meningitis	43	1.18	41	2.31	39	2.39
MVA	44	0.95	•	0.00	•	0.00
Influenza	45	0.61	43	1.05	41	1.67
Other Intest Inf	46	0.45	47	0.20	47	0.24
Viral Hepatitis	47	0.44	46	0.38	48	0.24
Homicide	48	0.31	•	0.00	49	0.24
All Other External	49	0.30	•	0.00	50	0.24
Polio	•	0.00	45	0.41	51	0.24
Syphilis	•	0.00	•	0.00	45	0.48
Appendicitis	•	0.00	•	0.00	46	0.48
Shig,Amebiasis	•	0.00	•	0.00	•	0.00
Whooping Cough	•	0.00	•	0.00	•	0.00
Strep Throat	•	0.00	•	0.00	•	0.00
Meningococcal Inf	•	0.00	•	0.00	•	0.00
Measles	•	0.00	•	0.00	•	0.00
Suicide	•	0.00	•	0.00	•	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 9.2

Contributing Cause of Death
Rates and Ranks of Causes
Among White Females Aged 70-74
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100.000	Rank	Rate per 100.000	Rank	Rate per 100.000
All Other Ht Dis	1	1354.73	1	1457.22	1	871.41
Sign,Sym Ill Def	2	528.91	2	541.27	3	523.51
Atherosclerosis	3	483.59	3	350.16	5	210.12
Ca Other,Unspec	4	291.60	4	285.30	4	269.56
Diabetes	5	254.47	5	230.58	6	201.12
CVD	6	233.05	6	209.00	7	187.91
Pneumonia	7	215.74	7	201.03	9	166.30
IHD	8	207.98	8	177.61	8	167.80
COPD	9	132.32	9	123.81	11	132.38
All Other	10	120.09	10	114.49	2	570.64
Fracture,Trauma,Burn*	11	97.47	11	66.72	14	87.95
Other Dis Endocardium	12	80.75	20	35.55	23	24.92
All Other Accidents	13	74.97	12	63.98	13	88.55
Nutrit Deficiency	14	55.94	13	48.79	17	45.33
Compl Medical Care*	15	47.06	17	38.12	16	45.63
Hernia,Intest Obstr	16	44.03	21	27.29	22	26.42
Anemia	17	41.66	19	35.76	18	37.22
Septicemia	18	35.87	16	41.95	15	83.45
Other Dis Arteries	19	34.86	18	36.82	20	27.02
Kidney Infection	20	29.88	29	17.15	35	8.11
Other External NI*	21	29.50	23	22.47	33	8.70
Poisoning*	22	28.76	24	21.45	29	13.21
Hyp Heart Dis	23	28.36	14	46.09	19	35.42
Ca Digestive	24	25.85	22	25.32	26	21.31
Nephritis	25	25.34	15	42.64	12	108.06
Rheum Heart Dis	26	23.09	26	21.05	27	18.31
Chron Liver Dis	27	22.65	30	16.86	24	24.01
Ulcer	28	21.32	25	21.33	25	21.91
Hypertension	29	19.92	28	17.73	10	150.69
Ca Breast	30	16.20	27	20.61	21	27.02
Cholelithiasis	31	16.07	31	13.22	32	10.51
Ca Genital	32	11.71	36	8.26	28	13.81
Benign Ca,in situ	33	9.93	37	7.40	30	11.71
TB	34	8.88	34	9.66	42	1.80
Leukemia	35	8.27	38	5.83	38	5.40
All Other Infections	36	8.09	33	11.24	36	7.20

TABLE 9.2

Other Ca Lymphatic	37	6.31	35	8.31	34	8.70
Ca Respiratory	38	4.86	32	12.60	31	11.41
Bronchitis	39	2.99	41	2.42	40	3.30
Influenza	40	2.54	40	2.65	44	0.90
Hyp Heart/Renal Dis	41	2.26	43	1.65	41	2.40
Ca Urinary	42	2.22	39	4.05	37	6.30
Appendicitis	43	1.88	44	1.37	47	0.60
Ca Lip,Or/Pharynx	44	1.51	42	1.72	39	3.90
MVA	45	1.51	46	1.03	45	0.90
Meningitis	46	1.06	45	1.29	43	1.20
Viral Hepatitis	47	1.04	48	0.95	48	0.60
Suicide	48	0.75	49	0.34	○	0.00
Other Intest Inf	49	0.61	47	0.99	●	0.00
All Other External	50	0.36	○	0.00	○	0.00
Polio	○	0.00	50	0.17	50	0.30
Syphilis	○	0.00	●	0.00	49	0.60
Homicide	●	0.00	○	0.00	46	0.90
Shig,Amebiasis	●	0.00	●	0.00	○	0.00
Whooping Cough	○	0.00	○	0.00	○	0.00
Strep Throat	○	0.00	○	0.00	○	0.00
Meningococcal Inf	○	0.00	●	0.00	●	0.00
Measles	●	0.00	●	0.00	○	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 9.3

Contributing Cause of Death
Rates and Ranks of Causes
Among White Females Aged 75-79
California, 1970, 1975 and 1980

Cause	1970 Rank	1970 Rate per 100,000	1975 Rank	1975 Rate per 100,000	1980 Rank	1980 Rate per 100,000
All Other Heart Dis	1	2491.01	1	2506.19	1	1431.97
Atherosclerosis	2	1060.65	3	730.76	4	405.24
Sign,Sym Ill Dis	3	984.63	2	928.46	3	780.90
CVD	4	475.75	4	415.79	5	331.06
IHD	5	442.74	8	344.44	9	261.22
Pneumonia	6	414.29	6	346.50	8	283.71
Diabetes	7	413.38	7	346.33	7	313.31
Ca Other,Unspec	8	394.94	5	366.32	6	320.41
All Other	9	243.66	9	215.57	2	916.24
COPD	10	201.32	10	173.93	11	194.53
Fracture,Trauma,Burn*	11	162.99	11	129.38	14	128.24
Other Dis Endocard	12	144.18	20	51.00	22	37.49
All Other Accidents	13	138.19	12	107.34	15	125.48
Nutrit Deficiency	14	92.02	13	81.34	16	76.55
Anemia	15	75.99	16	60.75	17	64.71
Compl Medical Care*	16	69.21	17	54.32	19	55.64
Other Dis Arteries	17	65.03	21	41.22	20	45.77
Septicemia	18	58.40	15	72.44	13	129.03
Nephritis	19	57.58	19	51.47	12	163.36
Hyp Heart Dis	20	56.31	14	77.28	18	61.16
Kidney Infection	21	55.48	28	25.74	35	11.05
Hernia,Intest Obstr	22	53.93	18	51.65	21	44.59
Ca Digestive	23	50.77	24	35.58	23	34.33
Other External NI*	24	38.11	23	35.77	36	9.47
Ulcer	25	37.61	26	31.63	24	32.75
Rheum Heart Dis	26	35.67	22	39.63	26	28.41
Hypertension	27	35.04	27	29.17	10	253.33
Cholelithiasis	28	33.68	32	16.68	29	19.73
Ca Breast	29	31.37	25	34.75	25	31.96
Chron Liver Dis	30	29.41	33	16.52	27	21.70
Poisoning*	31	22.57	29	22.96	31	16.57
Benign Ca,in situ	32	21.82	36	12.81	28	21.70
Ca Genital	33	18.26	34	16.52	30	17.76
Other Ca Lymphatic	34	14.12	30	21.14	33	15.78
TB	35	13.84	35	12.87	40	4.74
All Other Infections	36	11.91	31	18.69	34	12.63

TABLE 9.3

Leukemia	37	10.10	37	11.56	38	6.71
Ca Respiratory	38	9.03	38	11.49	32	16.57
Ca Urinary	39	7.47	39	5.70	37	7.89
Meningitis	40	2.37	46	0.84	43	3.16
Bronchitis	41	2.23	40	5.10	42	3.95
MVA	42	2.03	43	2.23	45	1.58
Influenza	43	1.95	41	4.72	39	5.92
Hyp Heart/Renal Dis	44	1.82	45	1.07	41	4.34
Ca Lip,Or/Pharynx	45	1.52	42	3.13	44	2.76
Other Intest Inf	46	1.28	47	0.80	47	1.18
Appendicitis	47	1.01	44	2.23	46	1.58
Suicide	48	0.50	48	0.44	-	0.00
Syphilis	-	0.00	-	0.00	48	1.18
Homicide	-	0.00	-	0.00	49	0.39
Shig,Amebiasis	-	0.00	-	0.00	50	0.39
Viral Hepatitis	-	0.00	-	0.00	51	0.39
All Other External	-	0.00	-	0.00	52	0.39
Whooping Cough	-	0.00	-	0.00	-	0.00
Strep Throat	-	0.00	-	0.00	-	0.00
Meningococcal Inf	-	0.00	-	0.00	-	0.00
Polio	-	0.00	-	0.00	-	0.00
Measles	-	0.00	-	0.00	-	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 9.4

Contributing Cause of Death
Rates and Ranks of Causes
Among White Females Aged 80-84
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	4355.35	1	4193.77	1	2637.25
Atherosclerosis	2	2220.79	3	1501.61	4	899.20
Sign,Sym Ill Def	3	1815.92	2	1587.37	3	1371.93
CVD	4	874.11	4	771.57	5	729.32
Pneumonia	5	806.68	5	649.45	6	583.45
IHD	6	706.10	6	633.03	7	520.77
Diabetes	7	566.03	7	466.64	8	462.19
Ca Other,Unspec	8	497.89	8	440.28	10	389.55
All Other	9	444.78	9	371.09	2	1597.46
Fracture,Trauma,Burn*	10	352.81	10	226.84	13	235.49
COPD	11	290.25	11	188.53	12	246.03
All Other Accidents	12	232.76	12	177.46	14	219.67
Other Dis Endocard	13	174.74	20	73.59	19	83.77
Nutrit Deficiency	14	163.32	13	151.61	17	132.98
Anemia	15	132.94	14	104.84	16	133.56
Kidney Infection	16	107.89	25	49.09	29	26.95
Hernia,Intest Obstr	17	97.83	18	78.13	20	79.08
Other Dis Arteries	18	93.73	19	77.90	21	78.50
Hyp Heart Dis	19	88.22	16	96.79	18	111.30
Septicemia	20	84.82	15	103.99	15	216.74
Compl Medical Care*	21	82.51	22	67.54	23	67.37
Ca Digestive	22	79.55	21	71.09	22	70.30
Cholelithiasis	23	71.74	28	40.12	26	40.42
Nephritis	24	66.98	17	95.33	11	247.79
Ulcer	25	62.44	26	44.93	25	50.96
Ca Breast	26	55.49	24	53.36	24	51.55
Rheum Heart Dis	27	54.33	27	44.48	27	34.56
Other External NI*	28	52.65	23	53.52	41	5.86
Hypertension	29	35.93	29	38.04	9	438.76
Chron Liver Dis	30	31.78	32	23.84	32	23.43
Benign Ca,in situ	31	24.69	30	27.72	28	28.12
Ca Genital	32	23.04	36	16.11	30	24.02
All Other Infections	33	19.46	31	26.31	35	15.23
Other Ca Lymphatic	34	18.44	33	23.32	34	16.99
TB	35	17.47	38	14.66	42	2.93
Ca Respiratory	36	17.30	37	15.30	31	24.02

TABLE 9.4

Leukemia	37	16.62	35	18.61	33	19.92
Poisoning*	38	16.50	34	22.30	36	14.64
Ca Urinary	39	7.80	39	12.01	37	11.13
Hyp Heart/Renal Dis	40	5.71	42	5.41	39	7.62
Influenza	41	4.58	40	6.19	40	7.62
Bronchitis	42	4.19	41	5.66	38	8.20
MVA	43	2.38	46	1.93	46	1.76
Meningitis	44	2.23	47	1.21	43	2.93
Other Intest Inf	45	1.72	45	2.20	47	1.17
All Other External	46	1.52	•	0.00	49	0.59
Appendicitis	47	0.79	43	4.50	44	2.34
Homicide	48	0.79	•	0.00	•	0.00
Ca Lip,Or/Pharynx	•	0.00	44	3.87	45	2.34
Viral Hepatitis	•	0.00	48	0.89	•	0.00
Polio	•	0.00	•	0.00	48	1.17
Syphilis	•	0.00	•	0.00	50	0.59
Suicide	•	0.00	•	0.00	51	0.59
Shig,Amebiasis	•	0.00	•	0.00	•	0.00
Whooping Cough	•	0.00	•	0.00	•	0.00
Strep Throat	•	0.00	•	0.00	•	0.00
Meningococcal Inf	•	0.00	•	0.00	•	0.00
Measles	•	0.00	•	0.00	•	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes
but never as an underlying cause.

TABLE 9.5

Contributing Cause of Death
Rates and Ranks of Causes
Among White Females Aged 85 and Older
California, 1970, 1975 and 1980

Cause	1970		1975		1980	
	Rank	Rate per 100,000	Rank	Rate per 100,000	Rank	Rate per 100,000
All Other Heart Dis	1	8478.38	1	9074.85	1	5580.09
Atherosclerosis	2	4910.12	2	3778.36	4	2363.89
Sign,Sym Ill Def	3	4268.15	3	3701.94	3	3109.40
Pneumonia	4	1763.03	5	1433.32	6	1362.33
CVD	5	1683.70	4	1522.80	5	1569.76
IHD	6	1322.60	6	1213.09	7	1105.61
All Other	7	876.47	7	785.90	2	3511.26
Fracture,Trauma,Burn*	8	840.71	9	567.07	10	544.93
Diabetes	9	756.91	8	660.69	8	668.16
Ca Other,Unspec	10	581.04	10	495.25	11	482.64
All Other Accidents	11	531.70	11	451.59	13	475.10
COPD ·	12	447.57	12	304.17	15	355.99
Other Dis Endocard	13	423.08	15	199.36	21	139.66
Nutrit Deficiency	14	383.82	13	303.25	16	343.66
Anemia	15	239.54	14	248.97	17	306.01
Hernia,Intest Obstr	16	190.40	19	135.77	19	151.29
Kidney Infection	17	186.50	25	74.11	28	47.24
Other Dis Arteries	18	167.16	16	163.53 ·	20	144.45
Hyp Heart Dis	19	164.69	18	141.16	18	200.58
Ca Digestive	20 ·	139.84	21	118.06	22	132.81
Ca Breast	21	134.18	23	97.70	24	103.37
Septicemia	22	122.13	17	163.14	14	390.22
Nephritis	23	117.75	20	121.42	12	482.64
Compl Medical Care*	24	110.43	22	101.20	· 23	104.06
Cholelithiasis	25	107.17	27	65.92	26	58.87
Ulcer	26	97.02	26	69.32	25	74.62
Rheum Heart Dis	27	79.73	24	85.26	27	47.92
Hypertension	28	52.79	29	55.41	9	627.08
Benign Ca,in situ	29	50.23	30	49.55	29	45.18
Other External NI*	30	49.87	28	63.69	39	15.75
Ca Genital	31	45.62	32	39.69	30	36.97
TB	32	38.24	35	27.43	42	5.48
Poisoning*	33	35.62	37	23.56	37	21.91
All Other Infections	34	34.32	31	47.72	32	34.23
Ca Urinary	35	28.28	36	23.38	33	24.65
Chron Liver Dis ·	36	25.21	40	18.52	41	15.06

TABLE 9.5

Leukemia	37	22.72	33	36.02	31	36.28
Ca Respiratory	38	21.39	41	12.22	35	22.59
Influenza	39	17.30	38	22.03	38	17.11
Bronchitis	40	13.72	39	21.71	36	22.59
Other Ca Lymphatic	41	13.37	34	27.84	34	23.96
Hyp Heart/Renal Dis	42	11.51	42	6.34	40	15.75
Ca Lip,Or/Pharynx	43	9.61	43	6.18	43	4.11
Other Intest Inf	44	5.19	44	6.04	44	4.11
MVA	45	2.40	45	2.65	45	2.74
Appendicitis	46	2.39	46	2.64	47	1.37
Meningitis	47	2.25	48	1.65	46	2.05
Suicide	48	1.19	50	0.88	49	0.68
Homicide	49	1.19	47	1.75	50	0.68
Strep Throat	∘	0.00	49	1.25	∘	0.00
Polio	∘	0.00	∘	0.00	48	1.37
Shig,Amebiasis	∘	0.00	∘	0.00	51	0.68
Syphilis	∘	0.00	∘	0.00	52	0.68
All Other External	∘	0.00	∘	0.00	53	0.68
Whooping Cough	∘	0.00	∘	0.00	∘	0.00
Meningococcal Inf	∘	0.00	∘	0.00	∘	0.00
Measles	∘	0.00	∘	0.00	∘	0.00
Viral Hepatitis	∘	0.00	∘	0.00	∘	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 10

Mortality Rates per 100,000
by Any Mention of a Cause
Among White Males
California, 1980

Cause	Age Group				
	65-69	70-74	75-79	80-84	85 and older
All Other Heart Dis	1292.54	1981.54	3094.64	5021.16	9309.15
IHD	1110.61	1801.55	2764.68	4423.78	7968.79
Sign,Sym Ill Def	576.80	921.32	1413.45	2185.87	3862.70
COPD	432.02	700.24	1077.84	1427.83	1798.81
Ca Other,Unspec	406.57	565.04	737.84	906.25	1113.63
Ca Respiratory	392.24	510.80	598.31	593.99	513.47
CVD	300.69	593.80	1152.00	2102.14	4101.09
Pneumonia	264.12	473.81	847.19	1639.40	3305.88
Ca Digestive	260.61	375.60	515.35	675.45	943.58
All Other	226.68	354.23	621.57	1034.10	2055.55
Atherosclerosis	209.72	401.49	725.89	1369.00	3119.17
Diabetes	207.38	339.02	497.13	639.24	908.58
Chron Liver Dis	155.32	147.53	133.24	133.51	66.68
Nephritis	148.88	249.44	409.14	694.68	1250.33
Hypertension	136.30	213.69	328.70	444.64	670.18
All Other Accidents	132.79	194.78	274.02	431.06	866.90
Fracture,Trauma,Burn*	124.31	167.66	257.68	334.89	790.21
Septicemia	94.18	152.46	230.02	346.21	671.85
Other Dis Arteries	89.50	160.68	262.08	321.32	465.12
Ca Genital	86.58	177.53	351.95	658.48	1086.96
Hyp Heart Dis	77.22	107.67	147.06	198.00	251.73
Ca Urinary	52.36	101.50	115.64	230.81	306.75
Compl Med Care*	52.06	83.83	94.90	138.03	190.05
Other Ca Lymphatic	47.68	77.67	110.61	110.88	161.71
Other Dis Endocard	42.70	73.97	120.67	191.21	275.07
Nutrit Deficiency	39.78	70.68	113.75	188.94	365.10
Ca Lip,Or/Pharynx	38.61	35.75	47.14	46.39	51.68
Ulcer	37.15	64.93	86.73	127.85	268.40
Suicide	34.51	43.15	55.31	53.18	78.35
Anemia	33.93	58.76	102.44	212.70	435.12
Leukemia	31.59	63.70	91.76	135.77	203.39
Rheum Heart Dis	29.83	28.35	37.71	55.44	66.68
MVA	28.37	35.75	55.93	45.26	83.36
Benign Ca,in situ	20.18	32.05	47.76	64.49	108.36
Hernia,Intest Obstr	17.84	37.81	64.10	114.27	196.72
All Other Inf	17.26	27.12	37.71	41.86	73.35

TABLE 10

All Other External NI*	13.75	15.20	16.34	32.81	23.34
Cholelithiasis	12.28	23.42	35.82	58.83	130.03
TB	10.24	12.33	16.97	27.15	46.68
Homicide	10.24	14.38	13.20	11.31	20.01
Poisoning*	10.24	13.97	20.74	19.23	20.01
Hyper Prostate	7.60	16.85	38.97	85.99	188.38
Kidney Infection	5.26	15.20	30.17	52.04	121.70
Meningitis	4.97	2.88	7.54	4.53	1.67
Bronchitis	4.97	8.63	11.31	21.50	36.68
Hyp Heart/Ren Dis	4.68	9.45	11.94	19.23	46.68
All Other External	3.80	5.34	5.03	5.66	8.34
Influenza	2.34	3.29	8.17	31.68	55.01
Appendicitis	1.75	2.47	7.54	4.53	10.00
Ca Breast	1.17	0.82	4.40	1.13	1.67
Syphilis	0.58	2.05	1.89	4.53	3.33
Other Intest Inf	0.29	0.41	1.89	3.39	5.00
Meningococcal Inf	0.29	0.00	0.00	1.13	0.00
Polio	0.29	0.41	0.00	0.00	0.00
Viral Hepatitis	0.29	2.05	1.89	4.53	5.00
Shig,Amebiasis	0.00	0.00	1.26	0.00	0.00
Whooping Cough	0.00	0.00	0.00	0.00	0.00
Strep Throat	0.00	0.00	0.00	1.13	0.00
Measles	0.00	0.00	0.00	0.00	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 11

Mortality Rates per 100,000
by Any Mention of a Cause
Among White Females
California, 1980

Cause	Age Group				
	65-69	70-74	75-79	80-84	85 and older
All Other Heart Dis	596.61	1080.64	1780.00	3320.88	7196.40
IHD	451.75	841.40	1473.01	2819.43	6230.45
Sign,Sym Ill Def	353.43	528.91	787.21	1379.55	3140.90
Ca Other,Unspec	277.30	354.51	423.40	510.81	629.82
CVD	200.22	437.96	875.60	1889.78	4194.48
COPD	176.60	252.75	327.91	410.06	540.83
Diabetes	155.12	260.85	386.70	567.64	828.35
Ca Digestive	149.87	223.03	326.33	432.32	634.61
All Other	147.96	238.64	411.56	798.44	1873.72
Ca Respiratory	145.10	157.89	145.60	134.15	121.86
Ca Breast	127.67	144.08	151.52	190.38	280.00
Pneumonia	127.67	221.23	396.96	862.29	2169.46
Atherosclerosis	107.39	234.14	478.24	1081.96	3037.52
Hypertension	92.12	163.30	270.29	486.21	716.08
Nephritis	87.11	128.18	185.06	294.66	578.48
Ca Genital	75.17	89.75	115.22	134.73	163.62
All Other Accidents	72.55	120.07	173.23	297.00	657.21
Chron Liver Dis	66.82	63.94	48.14	46.86	30.81
Septicemia	59.18	92.45	145.21	240.18	434.71
Fracture,Trauma,Burn*	46.54	87.95	128.24	235.49	544.93
Hyp Heart Dis	39.62	73.84	122.72	239.59	421.02
Other Dis Arteries	34.13	62.74	91.15	141.18	265.62
Other Ca Lymphatic	32.69	53.73	65.11	93.73	99.95
Compl Med Care*	32.22	45.63	55.64	67.37	104.06
Rheum Heart Dis	30.79	42.63	63.53	79.67	100.63
Nutrit Deficiency	30.55	48.33	81.68	144.69	379.26
Anemia	27.68	38.42	70.63	142.35	334.76
Hernia,Intest Obstr	23.15	38.42	58.40	114.23	221.12
Leukemia	17.42	33.02	33.93	63.85	110.22
Ca Urinary	16.94	31.82	34.72	50.38	93.10
Other Dis Endocard	16.47	42.32	65.50	134.15	225.91
Ulcer	15.04	31.52	48.53	75.57	129.39
Ca Lip,Or/Pharynx	13.84	18.31	15.78	15.82	22.59
All Other Inf	11.46	12.31	21.70	25.78	54.08
MVA	10.98	21.01	25.65	20.50	18.48
Suicide	10.74	11.71	11.44	7.62	15.06

TABLE 11

Poisoning*	10.50	13.21	16.57	14.65	21.91
Benign Ca,in situ	9.78	22.51	40.25	56.82	81.47
Kidney Infection	8.83	13.21	20.52	42.76	99.95
Cholelithiasis	8.59	14.41	31.17	56.24	86.94
Other External NI*	4.53	8.70	9.47	5.86	15.75
Hyp Heart/Renal Dis	3.58	6.90	8.29	18.75	44.50
Homicide	3.34	5.70	7.10	2.34	7.53
TB	2.86	3.00	9.08	7.62	8.90
Meningitis	2.86	1.80	4.74	4.69	3.42
Influenza	2.37	3.60	11.44	24.60	66.41
Bronchitis	1.43	4.20	4.74	14.64	32.18
All Other External	1.19	2.10	1.18	1.76	2.05
Viral Hepatitis	0.96	2.40	2.76	1.76	3.42
Syphilis	0.72	0.60	1.18	0.59	0.68
Appendicitis	0.48	0.90	2.76	4.10	7.53
Other Intest Inf	0.24	0.90	1.97	1.17	7.53
Polio	0.24	0.30	0.00	1.17	1.37
Shig,Amebiasis	0.00	0.00	0.39	0.59	0.68
Whooping Cough	0.00	0.00	0.00	0.00	0.00
Strep Throat	0.00	0.00	0.00	0.00	0.00
Meningococcal Inf	0.00	0.00	0.00	1.17	0.68
Measles	0.00	0.00	0.00	0.00	0.00

* NI codes are the Nature of Injury codes, N800-N999, which appear in the contributing causes but never as an underlying cause.

TABLE 12

Mortality due to Ischemic Heart Disease
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	1360.46	1166.34	938.62	263.27	202.24	171.99
70-74	2007.08	1798.37	1460.88	426.98	404.51	340.67
75-79	3050.77	2673.63	2227.96	722.44	599.16	536.72
80-84	4557.29	4018.19	3514.13	1010.47	1064.65	909.65
85 and older	7634.07	7080.87	6473.39	1655.00	1692.90	1495.40

Females Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	540.36	460.37	370.61	121.42	92.41	81.14
70-74	957.89	852.75	673.60	207.98	177.61	167.80
75-79	1809.27	1536.04	1211.79	442.74	344.44	261.22
80-84	3150.87	2629.49	2298.66	706.10	633.03	520.77
85 and older	6490.94	5861.62	5124.83	1322.60	1213.09	1105.61

TABLE 13

Mortality due to All Other Heart Disease
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	85.75	92.67	260.91	1712.14	1817.65	1031.63
70-74	121.43	121.36	353.41	2506.43	2956.55	1628.13
75-79	143.15	232.28	545.52	4308.23	4625.73	2549.12
80-84	252.80	354.82	936.80	6333.74	7136.16	4084.36
85 and older	543.79	688.55	1968.86	10851.30	12289.90	7340.29

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	31.95	52.94	114.55	777.05	822.69	482.06
70-74	64.51	80.96	209.22	1354.73	1457.22	871.41
75-79	111.74	113.87	348.03	2491.01	2506.19	1431.97
80-84	204.59	178.66	683.62	4355.35	4193.77	2637.25
85 and older	347.82	487.05	1616.32	8478.38	9074.85	5580.09

TABLE 14

Mortality due to Malignant Neoplasms of Respiratory and Intrathoracic Organs
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	316.29	356.48	355.97	37.39	36.36	36.27
70-74	383.02	436.57	442.17	58.56	59.92	68.63
75-79	392.70	474.40	526.67	61.14	76.17	71.65
80-84	360.50	490.29	522.71	71.01	59.91	71.28
85 and older	280.86	344.53	411.78	58.60	65.30	101.69

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	57.32	80.31	132.92	3.43	9.50	12.17
70-74	47.09	77.32	146.49	4.86	12.60	11.41
75-79	62.73	94.12	129.03	9.03	11.49	16.57
80-84	57.40	86.72	110.13	17.30	15.30	24.02
85 and older	83.18	73.33	99.27	21.39	12.22	22.59

TABLE 15

Mortality due to Chronic Obstructive Pulmonary Diseases
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	286.82	192.00	175.79	437.94	286.72	256.23
70-74	425.25	322.43	289.30	747.17	523.95	410.94
75-79	574.24	435.79	447.48	1067.28	687.15	630.37
80-84	617.21	478.94	547.60	1252.42	898.02	880.23
85 and older	712.92	589.18	696.85	1568.40	1133.60	1103.63

Females Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	63.95	57.23	84.96	80.38	69.49	91.64
70-74	76.01	77.62	120.37	132.32	123.81	132.38
75-79	86.01	103.19	133.37	201.32	173.93	194.53
80-84	94.78	98.47	164.02	290.25	188.53	246.03
85 and older	154.41	149.62	184.84	447.57	304.17	355.99

TABLE 16

Mortality due to Cerebrovascular Disease
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	290.23	217.72	159.99	191.66	169.26	140.69
70-74	528.73	468.49	327.93	351.25	348.15	265.88
75-79	1058.68	882.85	638.54	673.78	583.47	514.73
80-84	1875.91	1648.93	1192.50	1080.57	962.59	909.65
85 and older	3293.75	3189.34	2447.32	1773.20	1662.30	1653.77

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	193.96	155.30	116.46	125.76	96.45	83.76
70-74	410.56	332.83	250.05	233.05	209.00	187.91
75-79	877.92	711.77	544.54	475.75	415.79	331.06
80-84	1681.11	1422.12	1160.46	874.11	771.57	729.32
85 and older	3696.75	3079.79	2625.40	1683.70	1522.80	1569.76

TABLE 17

Mortality due to Malignant Neoplasms of Digestive Organs and Peritoneum
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	228.79	245.21	234.87	26.14	26.31	25.74
70-74	339.29	349.54	332.04	44.11	38.78	43.56
75-79	476.58	486.72	431.14	101.95	85.36	84.22
80-84	599.09	546.50	544.20	132.50	113.59	131.24
85 and older	756.33	664.29.	700.19	211.80	155.30	243.40

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	163.05	153.20	136.74	13.51	17.36	13.13
70-74	200.22	202.54	201.72	25.85	25.32	21.31
75-79	290.64	284.64	292.00	50.77	35.58	34.33
80-84	405.04	396.24	362.02	79.55	71.09	70.30
85 and older	501.69	474.93	501.80	139.84	118.06	132.81

TABLE 18

Mortality due to Malignant Neoplasms of Breast
Underlying and Contributing Rates per 100,000
By Age among White Females
California, 1970, 1975 and 1980

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	4.71	108.33	113.59	15.08	14.50	14.08
70-74	99.85	98.22	117.07	16.20	20.61	27.02
75-79	120.42	117.62	119.56	31.37	34.75	31.96
80-84	137.94	140.14	138.83	55.49	53.36	51.55
85 and older	188.09	164.59	176.62	134.18	97.70	103.37

TABLE 19

Mortality due to Malignant Neoplasms of Genital Organs
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	66.12	61.12	71.66	19.68	21.29	14.92
70-74	134.86	143.19	126.16	58.64	40.84	51.37
75-79	220.17	230.14	240.08	128.30	119.47	111.87
80-84	372.53	359.49	407.30	292.50	269.31	251.17
85 and older	530.55	548.17	625.17	439.20	464.10	461.79

Females Age	Underlying			Contributing		
	1970	1975	1980	1970	1975	1980
65-69	86.25	78.68	68.01	9.13	5.76	7.16
70-74	93.65	80.19	75.95	11.71	8.26	13.81
75-79	101.42	95.10	97.46	18.26	16.52	17.76
80-84	110.44	102.44	110.72	23.04	16.11	24.02
85 and older	123.67	112.03	126.65	45.62	39.69	36.97

TABLE 20

Mortality due to Atherosclerosis
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	30.67	18.44	21.06	463.42	329.81	188.66
70-74	62.88	44.03	40.27	846.63	666.51	361.21
75-79	159.32	115.02	87.99	1614.86	1187.98	637.91
80-84	360.38	253.71	234.20	2814.76	2053.14	1134.80
85 and older	938.23	785.94	598.49	5138.20	3997.10	2520.67

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	14.26	10.97	9.07	232.40	147.25	98.32
70-74	40.96	27.19	24.01	483.59	350.16	210.12
75-79	107.35	89.35	73.00	1060.65	730.76	405.24
80-84	300.40	233.42	182.77	2220.79	1501.61	899.20
85 and older	909.19	769.24	673.64	4910.12	3778.36	2363.89

TABLE 21

Mortality due to Diabetes
Underlying and Contributing Rates per 100,000
By Age and Sex among Whites
California, 1970, 1975 and 1980

Males	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	50.94	42.41	34.51	206.89	173.71	172.87
70-74	80.59	65.52	73.56	329.74	289.16	265.47
75-79	122.87	87.63	91.13	485.20	393.98	406.00
80-84	141.79	142.82	110.88	633.96	581.06	528.36
85 and older	202.39	175.94	163.38	790.00	763.10	745.20

Females	Underlying			Contributing		
Age	1970	1975	1980	1970	1975	1980
65-69	44.79	32.78	34.60	164.54	120.27	120.51
70-74	76.12	57.48	59.74	254.47	230.58	201.12
75-79	120.76	75.88	73.39	413.38	346.33	313.31
80-84	171.93	109.50	105.44	566.03	466.64	462.19
85 and older	187.45	168.22	160.19	756.91	660.69	668.16

TABLE 22

Z-Scores Evaluating Whether the Difference
between Underlying and Contributing Mortality Rates
Was the Same in 1970 as It Was in 1980
Among White Males Aged 65 and Older, California

	Z-Score				
Cause of Death	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
All Other	9.828	9.770	13.098	11.479	13.300
Hypertension	5.300	5.855	7.253	10.566	10.392
Nephritis	4.743	3.720	5.447	6.567	7.364
Hyp Heart Dis	2.255	-0.343	1.762	3.730	1.573
CVD	1.930	1.854	3.067	4.819	5.241
Hyp Heart/Renal Dis	1.448	1.134	2.032	1.654	1.146
All Other Accidents	1.265	2.324	2.685	3.344	3.678
Ca Lip,Or/Pharynx	1.041	0.162	0.891	0.284	-1.474
Other Ca Lymphatic	0.960	0.840	0.481	-1.107	-2.131
Diabetes	0.861	-0.693	0.785	0.456	1.332
Hernia,Intest Obstr	0.639	0.000	-0.658	1.034	-1.555
Suicide	0.596	-	-0.155	-	-
Meningitis	0.400	0.655	1.110	-1.113	-
Anemia	0.388	0.233	1.095	1.855	0.847
Chron Liver Dis	0.384	0.407	-0.515	-0.512	-0.702
Other Dis Arteries	0.285	-0.292	-0.316	-1.742	-1.165
Appendicitis	0.274	0.623	0.610	-	-
Hyper Prostate	0.262	0.273	0.941	-0.380	2.009
Leukemia	0.243	-1.199	-0.014	-0.923	-0.303
Cholelithiasis	0.231	0.696	0.006	-1.072	-1.786
MVA	0.183	0.064	-0.744	0.192	-0.525
Ulcer	0.121	-0.861	-0.591	2.130	-0.153
Benign Ca,in situ	0.059	1.507	-1.543	-0.001	-0.183
Rheum Heart Dis	0.029	0.282	-0.201	-1.069	-1.171
Septicemia	-0.010	-0.921	-1.387	-1.496	0.372
All Other Infections	-0.031	-1.649	-1.520	-0.700	-1.152
Ca Urinary	-0.107	-0.351	-0.678	0.637	1.313
Kidney Infection	-0.112	-0.503	-0.998	-2.377	-4.496
Ca Digestive	-0.142	0.040	-0.562	0.633	2.009
Nutrit Deficiency	-0.202	0.554	-0.196	0.934	-1.151
Sign,Sym Ill Def	-0.350	0.846	-0.371	0.392	-2.335
COPD	-0.375	-2.172	-3.438	-3.176	-4.965
IHD	-0.511	1.142	0.270	3.040	1.609
Bronchitis	-0.591	0.304	0.274	-0.447	3.300
Ca Respiratory	-0.605	0.079	-0.724	-2.031	0.929
Influenza	-0.818	-0.602	-0.534	0.265	-1.356
Ca Genital	-0.932	-0.288	-1.402	-2.157	-1.280
TB	-1.430	0.365	0.667	0.715	-1.753
Atherosclerosis	-1.767	-1.921	-2.380	-5.247	-4.552
Pneumonia	-1.855	-3.122	-5.327	-7.815	-10.430
Ca Other,Unspec	-2.651	-3.360	-5.241	-3.375	-1.733

TABLE 22

Other Dis Endocard	-4.899	-5.965	-6.784	-6.982	-7.241
All Other Heart Dis	-12.402	-13.646	-19.168	-23.739	-33.057
Shig,Amebiasis	-	-	-	-	-
Other Intest Inf	-	-	-0.508	-0.627	0.277
Whooping Cough	-	-	-	-	-
Strep Throat	-	-	-	-	-
Meningococcal Inf	-	-	-	-	-
Polio	-	-	-	-	-
Measles	-	-	-	-	-
Viral Hepatitis	-	-0.542	-0.338	-	-
Syphilis	-	-	-	-	-
Ca Breast	-	-	0.133	-	-
Homicide	-	-0.606	-	-	-
All Other External	-	-0.502	-0.001	-0.369	-

TABLE 23

Z-Scores Evaluating Whether the Difference
between Underlying and Contributing Mortality Rates
Was the Same in 1970 as It Was in 1980
Among White Females Aged 65 and Older, California

	Z-Score				
Cause of Death	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
All Other	6.898	8.017	8.909	8.027	8.123
Hypertension	4.068	3.539	5.991	9.463	12.886
Nephritis	1.818	2.966	3.361	4.619	3.205
All Other Accidents	1.316	2.441	1.958	4.274	5.746
Ca Urinary	0.961	1.225	0.746	1.311	-0.937
Ca Respiratory	0.675	-0.497	-0.259	-0.911	-0.363
Ulcer	0.636	0.624	0.651	1.394	-0.458
Influenza	0.575	-0.574	1.149	0.344	-0.322
CVD	0.566	2.215	1.278	3.008	6.273
Ca Lip,Or/Pharynx	0.441	0.238	0.318	-	-1.716
Ca Digestive	0.364	-0.648	-1.678	-0.063	-0.379
All Other External	0.187	-	-	-0.348	-
Nutrit Deficiency	0.047	0.345	-0.533	-1.393	0.112
Anemia	0.045	0.877	0.803	1.391	1.162
Sign,Sym Ill Def	0.013	-0.934	-0.903	-0.166	-0.901
Viral Hepatitis	0.001	-0.353	-	-	-
Benign Ca,in situ	-0.006	0.203	-0.902	-0.471	-0.503
Ca Genital	-0.010	0.878	0.033	0.122	-0.918
Homicide	-0.058	-	-	-	-1.272
Septicemia	-0.091	-0.291	-1.240	0.048	0.690
All Other Infections	-0.119	-0.961	-0.371	-1.037	-1.322
IHD	-0.164	1.192	-1.468	0.171	1.274
Diabetes	-0.208	0.036	1.331	2.064	0.270
Hernia,Intest Obstr	-0.238	-1.491	0.429	-1.005	-0.868
Cholelithiasis	-0.297	0.439	-0.185	-0.336	-0.175
Other Dis Arteries	-0.383	-0.842	-0.872	0.876	0.700
Hyp Heart/Renal Dis	-0.396	0.220	1.748	1.249	2.619
Bronchitis	-0.397	0.709	0.870	0.066	-0.829
Other Ca Lymphatic	-0.531	0.478	0.449	-0.634	0.375
Kidney Infection	-0.598	-0.452	-0.876	-1.288	-4.147
Chron Liver Dis	-0.627	-0.646	-0.634	-0.722	-1.236
Rheum Heart Dis	-0.666	-0.171	-0.382	-2.342	-1.894
COPD	-0.679	-2.401	-2.766	-4.592	-3.142
TB	-0.704	-0.244	-1.267	-2.419	-1.355
Atherosclerosis	-0.924	-1.110	-3.547	-4.000	-7.608
Leukemia	-1.106	-1.036	-0.214	0.702	0.251
Hyp Heart Dis	-1.253	0.964	2.424	4.147	5.557
Ca Other,Unspec	-1.710	-1.418	-2.353	-1.956	-1.966
Pneumonia	-1.847	-2.034	-3.565	-6.926	-10.040
Other Dis Endocard	-2.139	-3.998	-5.367	-4.055	-7.581
Ca Breast	-5.430	1.029	0.091	-0.352	-1.181

TABLE 23

All Other Heart Dis	-8.421	-10.866	-14.865	-20.475	-31.745
Shig,Amebiasis	-	-	-	-	-
Other Intest Inf	-	-	-0.276	-	-0.282
Whooping Cough	-	-	-	-	-
Strep Throat	-	-	-	-	-
Meningococcal Inf	-	-	-	-	-
Polio	-	-	-	-	-
Measles	-	-	-	-	-
Syphilis	-	-	-	-	-
Meningitis	-	-	0.126	0.075	-0.184
Appendicitis	-	0.072	0.932	1.676	-0.482
MVA	-	-0.137	-0.110	0.354	0.740
Suicide	-	-	-	-	-0.103

TABLE 24

Mortality Rates for All Pairs of Causes of Death
By Age Group Among White Males
California, 1980

Cause Pair	Rate per 100,000				
	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD All Other Heart Dis	616.58	978.44	1548.58	2526.42	4669.58
All Other Heart Dis COPD	204.75	336.56	509.70	698.07	908.58
All Other Heart Dis Sign,Sym Ill Def	184.27	301.63	484.56	797.64	1492.06
COPD Sign,Sym Ill Def	147.71	239.58	377.72	458.22	521.81
IHD Sign,Sym Ill Def	147.13	251.49	402.23	657.34	1270.34
IHD COPD	140.98	235.47	384.63	543.07	713.52
Ca Respiratory Ca Other,Unspec	128.70	154.10	164.03	131.24	96.69
IHD Atherosclerosis	116.12	205.88	336.87	601.91	1330.35
Diabetes IHD	113.49	185.74	248.88	317.92	423.45
Diabetes All Other Heart Dis	104.71	158.21	233.79	316.79	451.79
All Other Heart Dis CVD	100.33	190.68	377.09	707.13	1383.70
Ca Respiratory Sign,Sym Ill Def	100.03	142.18	159.63	157.26	130.03
Ca Digestive Ca Other,Unspec	99.16	151.64	204.88	246.65	298.41
All Other Heart Dis Atherosclerosis	84.53	154.51	294.13	544.20	1223.66
All Other Heart Dis All Other	84.53	132.32	238.19	406.17	943.58
IHD CVD	83.36	160.68	326.81	632.45	1257.00
Ca Other,Unspec Sign,Sym Ill Def	81.02	113.42	145.81	191.21	243.40
Ca Respiratory All Other Heart Dis	78.10	109.72	135.75	147.08	131.70
All Other Heart Dis Pneumonia	74.00	139.31	268.36	565.70	1288.68
All Other Heart Dis					

TABLE 24

Nephritis	73.12	113.42	192.94	345.08	616.83
Ca Other,Unspec					
All Other Heart Dis	72.25	113.01	147.06	208.18	296.75
IHD					
Hypertension	69.91	106.43	153.98	194.60	306.75
Pneumonia					
Sign,Sym Ill Def	66.40	115.06	229.40	429.93	806.88
All Other Heart Dis					
Hypertension	60.84	94.93	134.49	174.24	268.40
IHD					
All Other	59.67	98.21	192.94	329.24	763.54
All Other Accidents					
Fracture,Trauma,Burn	59.38	82.60	146.44	244.38	621.83
Sign,Sym Ill Def					
All Other	56.74	96.98	175.35	287.38	550.15
Pneumonia					
COPD	56.16	94.93	171.58	260.22	415.11
Ca Respiratory					
COPD	52.94	85.48	111.24	97.30	90.02
CVD					
Sign,Sym Ill Def	52.06	115.47	210.54	411.83	841.89
All Other Accidents					
Compl Medical Care	52.06	83.83	94.90	138.03	190.05
Ca Digestive					
All Other Heart Dis	50.60	76.43	103.70	186.68	280.07
CVD					
Atherosclerosis	50.60	113.01	219.97	409.57	900.24
All Other Heart Dis					
All Other Accidents	45.92	66.98	100.56	161.79	400.11
IHD					
Pneumonia	43.58	88.35	196.71	390.33	928.58
IHD					
Nephritis	41.53	78.49	127.58	234.20	438.45
CVD					
All Other	40.07	75.61	150.21	287.38	540.14
CVD					
Pneumonia	39.49	91.64	197.97	377.89	728.53
Hypertension					
CVD	38.90	66.98	112.50	181.02	211.72
Ca Genital					
Ca Other,Unspec	38.02	73.97	123.81	227.41	323.42
Ca Other,Unspec					
Pneumonia	38.02	50.13	54.05	95.04	111.70
Ca Digestive					
Sign,Sym Ill Def	37.15	60.41	91.13	130.11	166.71
Diabetes					

TABLE 24

CVD	36.85	65.34	130.72	167.45	246.73
Ca Respiratory IHD	36.27	62.05	76.05	114.27	86.69
All Other Heart Dis Other Dis Arteries	35.10	68.22	104.33	128.98	200.05
COPD All Other	35.10	49.72	71.65	117.67	151.71
Hyp Heart Dis All Other Heart Dis	34.81	44.79	68.50	96.17	140.04
Atherosclerosis Sign,Sym Ill Def	34.22	76.43	136.38	279.46	663.51
Septicemia All Other Heart Dis	31.30	50.13	89.24	126.72	238.40
Nephritis Sign,Sym Ill Def	30.13	54.24	97.41	152.74	270.07
Pneumonia All Other	29.83	62.05	145.81	251.17	475.13
Diabetes Sign,Sym Ill Def	28.37	57.12	75.42	117.67	155.04
Other Dis Endocard All Other Heart Dis	28.37	52.19	82.33	133.51	186.72
Ca Other,Unspec IHD	28.08	63.28	94.90	159.53	221.73
Diabetes Atherosclerosis	26.91	49.72	76.05	101.83	160.04
Sign,Sym Ill Def All Other Accidents	26.62	40.68	59.08	101.83	180.05
Atherosclerosis COPD	26.03	50.55	71.65	135.77	236.73
IHD Other Dis Arteries	24.57	41.50	77.30	104.09	165.04
IHD All Other Accidents	22.52	39.04	55.93	93.91	186.72
Septicemia Sign,Sym Ill Def	22.23	41.92	50.91	100.69	181.72
All Other Heart Dis Fracture,Trauma,Burn	20.18	33.29	60.33	106.35	315.08
CVD COPD	20.18	52.60	81.07	128.98	193.38
Ca Digestive IHD	19.01	38.22	73.53	112.01	181.72
IHD Other Dis Endocard	19.01	32.88	55.31	100.69	130.03
Septicemia Pneumonia	18.43	30.00	46.51	91.64	195.05
Other Dis Arteries					

TABLE 24

Sign,Sym Ill Def	18.43	36.57	46.51	78.07	120.03
All Other Accidents All Other	18.13	24.25	36.45	56.57	113.36
Ca Genital All Other Heart Dis	17.84	48.49	91.13	216.10	395.11
Pneumonia Nephritis	17.84	32.88	53.42	112.01	220.06
Hypertension Atherosclerosis	16.96	33.70	60.96	92.77	175.05
Atherosclerosis All Other	16.38	36.57	75.42	164.05	306.75
Diabetes Pneumonia	15.50	31.23	51.54	81.46	131.70
Ca Genital Sign,Sym Ill Def	15.21	32.05	50.91	118.80	190.05
Nutrit Deficiency Sign,Sym Ill Def	15.21	27.53	42.74	78.07	166.71
Sign,Sym Ill Def Fracture,Trauma,Burn	15.21	17.67	34.57	49.78	128.37
Nephritis All Other	14.62	21.37	48.39	67.88	145.04
Anemia All Other Heart Dis	13.16	22.19	43.37	97.30	228.39
Atherosclerosis Pneumonia	12.58	31.64	72.90	193.47	433.45
Atherosclerosis Nephritis	11.70	23.01	43.37	88.25	216.72
Ca Urinary All Other Heart Dis	11.11	23.42	25.14	72.41	120.03
All Other Heart Dis Ulcer	11.11	18.90	34.57	46.39	108.36
Ca Genital IHD	10.82	35.75	74.16	162.92	336.76
CVD Nephritis	10.82	23.83	46.51	57.70	145.04
Nutrit Deficiency All Other Heart Dis	10.24	19.73	25.77	59.96	120.03

TABLE 25

Mortality Rates for All Pairs of Causes of Death
By Age Group Among White Females
California, 1980

	Rate per 100,000				
Cause Pair	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD All Other Heart Dis	244.61	475.78	823.51	1624.41	3522.21
All Other Heart Dis Sign,Sym Ill Def	96.65	178.31	297.52	534.25	1329.47
All Other Heart Dis COPD	83.29	117.97	175.20	212.64	290.95
Diabetes IHD	77.56	144.39	196.51	278.25	375.15
Diabetes All Other Heart Dis	76.13	129.38	181.12	270.05	377.89
COPD Sign,Sym Ill Def	68.73	100.26	116.40	134.15	169.78
IHD Sign,Sym Ill Def	63.48	132.98	229.65	456.33	1087.13
Ca Digestive Ca Other,Unspec	63.00	93.66	128.64	158.16	190.32
Ca Breast Ca Other,Unspec	61.57	67.24	69.45	84.94	116.38
All Other Heart Dis CVD	61.57	136.28	272.66	611.57	1374.66
Ca Other,Unspec Sign,Sym Ill Def	61.09	68.74	84.44	103.69	130.76
IHD Atherosclerosis	54.65	111.37	191.77	432.90	1196.66
Ca Respiratory Ca Other,Unspec	51.07	45.63	47.35	40.42	23.28
All Other Heart Dis All Other	49.40	94.26	175.20	339.18	842.73
Sign,Sym Ill Def All Other	47.97	70.24	100.62	206.20	455.25
IHD COPD	43.43	68.14	111.67	162.27	243.71
Ca Other,Unspec All Other Heart Dis	42.96	62.44	78.13	108.96	179.36
CVD Sign,Sym Ill Def	42.96	78.95	152.31	353.82	831.09
IHD Hypertension	41.76	64.54	126.27	206.79	300.53
All Other Heart Dis					

TABLE 25

Nephritis	41.76	61.84	86.42	148.79	303.96
IHD CVD	40.33	101.76	219.00	516.67	1240.48
All Other Heart Dis Pneumonia	36.04	69.94	134.95	331.56	821.51
Pneumonia Sign,Sym Ill Def	35.56	63.94	97.86	209.13	559.31
All Other Heart Dis Atherosclerosis	35.32	91.25	172.83	405.37	1169.28
Ca Respiratory Sign,Sym Ill Def	34.84	40.82	35.51	34.56	33.54
CVD Atherosclerosis	34.60	73.54	177.57	383.70	886.54
IHD All Other	34.36	66.94	134.16	295.24	719.50
All Other Heart Dis Hypertension	34.36	62.44	106.93	196.24	292.32
Hypertension CVD	32.46	68.74	120.35	204.44	307.38
All Other Accidents Compl Medical Care	32.22	45.63	55.64	67.37	104.06
Diabetes CVD	31.02	60.04	103.38	176.91	279.31
All Other Accidents Fracture,Trauma,Burn	27.68	58.83	93.91	212.64	516.86
Diabetes Sign,Sym Ill Def	27.21	40.52	67.48	93.73	164.30
Ca Digestive Sign,Sym Ill Def	26.01	36.92	51.69	73.81	107.48
CVD All Other	22.67	58.23	134.16	253.65	535.35
Ca Digestive All Other Heart Dis	21.24	40.82	67.08	120.09	186.89
Pneumonia COPD	21.00	28.22	41.43	69.71	110.22
IHD Nephritis	20.76	32.42	51.69	104.27	199.22
Nephritis Sign,Sym Ill Def	20.52	31.52	43.41	60.34	135.55
All Other Heart Dis All Other Accidents	20.28	45.93	75.37	145.28	355.99
Atherosclerosis Sign,Sym Ill Def	19.33	46.23	103.38	233.73	724.30
Sign,Sym Ill Def All Other Accidents	19.09	26.12	29.99	59.75	126.65
Diabetes					

TABLE 25

Atherosclerosis	17.90	38.72	63.53	110.13	178.68
CVD Pneumonia	17.90	47.13	111.67	254.24	581.22
Hypertension Sign,Sym Ill Def	17.66	23.71	39.06	78.50	138.97
Pneumonia All Other	16.23	31.52	62.35	148.79	380.63
IHD Pneumonia	15.99	37.22	85.23	224.95	587.38
Septicemia All Other Heart Dis	15.75	30.32	43.41	88.46	160.88
All Other Heart Dis Other Dis Arteries	15.51	27.32	40.25	69.71	105.43
Nutrit Deficiency Sign,Sym Ill Def	15.03	22.81	33.15	53.89	162.25
Hyp Heart Dis All Other Heart Dis	15.03	32.42	56.82	108.96	209.48
Septicemia Sign,Sym Ill Def	14.56	19.51	46.56	67.37	126.65
Hypertension Atherosclerosis	14.56	30.32	41.04	94.31	177.99
Ca Other,Unspec IHD	12.41	25.82	41.04	80.84	100.63
Hyp Heart Dis IHD	11.93	23.11	42.22	76.74	126.65
Other Dis Endocard All Other Heart Dis	11.93	26.42	45.77	94.31	156.09
Atherosclerosis All Other	10.74	24.01	61.95	136.49	393.64
Anemia All Other Heart Dis	10.50	12.91	35.51	69.12	165.67
IHD All Other Accidents	10.02	19.21	33.93	54.48	136.23

TABLE 26

Mortality Rates for Pairs of Causes of Death
Excluding the Underlying Cause of Death
By Age Group Among White Males
California, 1980

	Rate per 100,000				
Cause Pair	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD All Other Heart Dis	219.37	343.54	532.32	771.62	1098.63
All Other Heart Dis Sign,Sym Ill Def	168.77	279.85	445.59	742.20	1307.02
All Other Heart Dis COPD	126.36	200.13	323.67	460.48	601.83
IHD Sign,Sym Ill Def	85.70	139.31	224.37	342.81	528.47
Diabetes All Other Heart Dis	82.78	127.39	191.06	245.51	358.43
All Other Heart Dis Atherosclerosis	71.08	127.80	240.71	403.91	960.26
Ca Other,Unspec Sign,Sym Ill Def	69.91	95.75	130.72	173.10	220.06
COPD Sign,Sym Ill Def	68.74	110.13	179.75	217.23	268.40
All Other Heart Dis Nephritis	63.76	99.04	162.15	290.77	478.46
All Other Heart Dis CVD	63.47	119.17	238.19	452.56	860.23
All Other Heart Dis All Other	63.18	99.04	187.92	322.45	748.53
All Other Heart Dis Pneumonia	58.21	102.32	187.92	394.86	818.55
Ca Other,Unspec All Other Heart Dis	55.87	92.46	121.93	179.89	246.73
All Other Heart Dis Hypertension	55.28	84.24	121.30	149.34	220.06
Diabetes IHD	52.65	73.97	105.58	127.85	156.71
IHD COPD	52.65	88.76	140.78	187.81	211.72
Pneumonia Sign,Sym Ill Def	48.85	85.89	147.06	278.32	503.47
All Other Accidents Compl Medical Care	47.38	78.49	89.87	123.32	171.71
IHD Atherosclerosis	43.00	69.04	111.87	181.02	361.76

TABLE 26

Sign,Sym Ill Def					
All Other	37.73	73.56	127.58	218.36	413.44
IHD					
CVD	36.85	62.05	131.98	225.15	403.44
IHD					
Hypertension	34.81	57.94	80.45	88.25	123.37
All Other Heart Dis					
All Other Accidents	33.34	47.67	68.50	88.25	200.05
CVD					
Sign,Sym Ill Def	32.17	68.63	142.67	229.67	470.13
All Other Accidents					
Fracture,Trauma,Burn	31.88	47.67	89.87	155.00	398.44
Atherosclerosis					
Sign,Sym Ill Def	30.13	66.98	115.64	217.23	515.14
Septicemia					
All Other Heart Dis	27.79	43.97	74.16	109.75	201.72
Nephritis					
Sign,Sym Ill Def	26.91	46.44	85.47	124.45	235.06
Diabetes					
Sign,Sym Ill Def	26.32	48.90	66.62	102.96	135.04
IHD					
All Other	25.45	40.68	69.76	102.96	218.39
All Other Heart Dis					
Other Dis Arteries	22.52	44.38	60.33	78.07	135.04
CVD					
All Other	21.94	34.52	85.47	150.48	308.42
Pneumonia					
COPD	21.06	37.40	63.48	83.72	141.70
Septicemia					
Sign,Sym Ill Def	20.18	37.81	47.14	87.12	165.04
Diabetes					
Atherosclerosis	19.89	34.93	59.71	72.41	120.03
IHD					
Nephritis	19.89	31.23	54.68	102.96	138.37
Diabetes					
CVD	19.30	32.05	73.53	99.56	130.03
IHD					
Pneumonia	19.30	41.92	87.36	127.85	233.40
Sign,Sym Ill Def					
All Other Accidents	19.30	34.11	47.76	80.33	135.04
Ca Other,Unspec					
IHD	19.01	45.20	71.02	112.01	145.04
Atherosclerosis					
COPD	18.72	36.57	49.02	87.12	155.04
CVD					
Pneumonia	17.84	35.34	79.19	160.66	276.74

TABLE 26

All Other Heart Dis Fracture,Trauma,Burn	17.55	28.35	48.39	67.88	196.72
Pneumonia All Other	15.79	27.94	73.53	127.85	256.74
Hypertension Atherosclerosis	15.50	28.77	52.79	66.75	115.03
Sign,Sym Ill Def Fracture,Trauma,Burn	15.21	17.67	34.57	49.78	128.37
Nutrit Deficiency Sign,Sym Ill Def	14.62	26.30	41.48	74.67	153.37
CVD Atherosclerosis	14.62	29.18	54.68	90.51	196.72
Pneumonia Nephritis	13.75	20.14	40.22	63.36	130.03
Atherosclerosis All Other	13.16	27.94	59.71	116.53	230.06
Septicemia Pneumonia	12.87	19.73	28.28	46.39	100.03
Ca Digestive All Other Heart Dis	12.87	20.14	36.45	74.67	133.37
Anemia All Other Heart Dis	12.87	20.55	39.59	84.86	208.39
Atherosclerosis Pneumonia	11.11	21.78	47.14	114.27	268.40

TABLE 27

Mortality Rates for Pairs of Causes of Death
Excluding the Underlying Cause of Death
By Age Group Among White Females
California, 1980

	Rate per 100,000				
Cause Pair	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD All Other Heart Dis	89.49	165.70	249.38	422.36	728.40
All Other Heart Dis Sign,Sym Ill Def	88.54	163.00	264.38	474.49	1145.32
Diabetes All Other Heart Dis	57.99	99.36	148.76	210.30	299.85
Ca Other,Unspec Sign,Sym Ill Def	54.17	59.13	74.97	91.38	112.27
All Other Heart Dis COPD	42.48	65.44	108.12	134.15	197.85
All Other Heart Dis All Other	37.71	71.74	138.11	285.28	680.48
All Other Heart Dis CVD	35.56	84.35	155.47	374.32	822.19
All Other Heart Dis Nephritis	35.56	46.53	70.63	120.09	252.61
Ca Other,Unspec All Other Heart Dis	34.60	49.53	63.13	93.14	144.45
Sign,Sym Ill Def All Other	34.60	48.03	77.34	164.61	364.89
IHD Sign,Sym Ill Def	34.13	73.24	112.85	192.73	401.85
All Other Heart Dis Hypertension	30.07	54.33	94.70	168.71	243.03
All Other Heart Dis Atherosclerosis	29.83	77.45	134.95	313.40	844.78
Diabetes IHD	29.11	59.74	76.95	105.44	147.19
Pneumonia Sign,Sym Ill Def	26.49	48.33	67.87	134.15	338.87
All Other Heart Dis Pneumonia	25.30	50.73	91.15	217.92	508.65
CVD Sign,Sym Ill Def	24.82	47.43	83.65	202.69	457.99
Diabetes Sign,Sym Ill Def	24.58	34.52	58.79	82.01	141.71
IHD Hypertension	19.57	31.82	59.98	93.14	111.59

TABLE 27

Nephritis Sign,Sym Ill Def	19.33	28.22	38.67	56.24	115.70
IHD CVD	17.66	39.92	72.21	175.74	348.46
Hypertension Sign,Sym Ill Def	16.71	21.61	35.12	69.71	119.12
Atherosclerosis Sign,Sym Ill Def	16.71	38.42	86.81	178.67	522.34
All Other Heart Dis All Other Accidents	15.75	29.12	46.17	74.98	163.62
Diabetes CVD	15.03	29.72	52.09	89.04	135.55
All Other Accidents Fracture,Trauma,Burn	14.80	38.42	61.95	155.82	374.47
IHD Atherosclerosis	14.56	35.72	61.16	115.99	300.53
Septicemia All Other Heart Dis	14.08	27.02	35.12	77.33	133.49
Septicemia Sign,Sym Ill Def	14.08	18.31	40.64	62.09	110.22
Hypertension CVD	14.08	27.62	59.19	91.38	136.23
Hypertension Atherosclerosis	14.08	24.91	36.30	79.08	134.18
Nutrit Deficiency Sign,Sym Ill Def	13.84	22.21	31.17	50.38	150.61
Diabetes Atherosclerosis	13.13	28.82	47.75	80.84	131.44
CVD All Other	12.17	30.62	74.58	139.42	311.49
IHD All Other	10.50	20.71	43.41	84.94	208.12

TABLE 28

Z-Scores Evaluating the Occurrence of Pairs of Causes of Death
Compared to the Frequency of Each Cause
Among White Males Aged 65 and Older, California, 1980

	Z-Score				
Cause Pair	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
All Other Heart Dis COPD	155.839	135.134	104.038	69.549	44.357
Diabetes IHD	135.464	113.388	80.004	51.207	31.952
Diabetes All Other Heart Dis	115.233	91.178	70.241	47.243	30.924
IHD COPD	114.958	97.878	81.993	56.770	36.884
Diabetes Hypertension	100.741	52.899	44.901	31.223	20.588
All Other Heart Dis Nephritis	94.902	76.114	63.910	49.378	35.925
Diabetes CVD	84.836	69.624	65.886	39.498	26.577
CVD Pneumonia	80.280	82.609	75.995	54.998	39.441
Diabetes Atherosclerosis	74.228	64.665	48.100	29.580	19.161
Ca Respiratory COPD	72.792	67.552	52.052	28.673	20.588
All Other Heart Dis Pneumonia	70.639	66.143	59.653	50.089	43.307
Ca Respiratory Pneumonia	69.319	57.734	37.654	17.859	9.971
All Other Heart Dis All Other Accidents	62.389	50.121	39.885	28.320	27.537
Other Dis Arteries Compl Medical Care	62.235	62.307	34.343	26.526	18.498
All Other Heart Dis Chron Liver Dis	61.507	37.825	20.473	13.999	4.289
Ca Other,Unspec Nutrit Deficiency	61.118	33.503	40.380	29.659	18.289
Septicemia Compl Medical Care	60.648	29.925	26.559	22.430	9.409
Ca Respiratory All Other Heart Dis	59.969	48.836	34.367	20.186	9.399
IHD Nephritis	57.346	54.452	43.608	34.506	26.289

Septicemia

TABLE 28

All Other Accidents	55.929	35.617	25.959	17.136	12.576
Ca Digestive Nutrit Deficiency	54.835	45.230	38.379	24.360	12.475
Ca Other,Unspec All Other Heart Dis	54.034	47.464	32.794	22.672	14.687
Kidney Infection Hyper Prostate	54.019	25.252	-0.137	9.857	7.719
Septicemia Leukemia	52.984	34.485	25.304	14.870	10.140
Pneumonia Nephritis	51.450	45.477	33.846	28.031	21.530
All Other Heart Dis Compl Medical Care	50.566	40.266	24.669	15.302	13.626
Septicemia All Other Heart Dis	50.409	42.284	38.828	24.653	17.222

TABLE 29

Z-Scores Evaluating the Occurrence of Pairs of Causes of Death
Compared to the Frequency of Each Cause
Among White Females Aged 65 and Older, California, 1980

	Z-Score				
Cause Pair	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
Diabetes IHD	187.947	175.179	127.274	85.649	54.432
All Other Heart Dis COPD	163.997	127.269	111.598	70.468	48.826
Diabetes All Other Heart Dis	160.021	137.582	105.721	75.594	49.823
All Other Heart Dis Nephritis	117.114	93.751	72.907	58.060	49.139
Diabetes Hypertension	112.952	100.384	82.549	45.743	36.125
Diabetes CVD	112.814	100.568	86.512	66.294	50.146
IHD COPD	97.713	82.623	77.389	57.909	43.727
Diabetes Nephritis	92.277	72.851	47.662	32.635	25.325
Diabetes Atherosclerosis	88.933	89.010	72.203	54.824	36.989
Ca Genital Hernia,Intest Obstr	84.905	52.767	45.598	11.193	7.526
Rheum Heart Dis Compl Medical Care	83.186	42.961	9.724	6.305	4.723
All Other Heart Dis Pneumonia	82.733	79.740	76.588	73.962	64.361
Ca Other,Unspec Nutrit Deficiency	74.936	50.867	53.541	24.694	25.970
Ca Respiratory COPD	72.309	62.159	38.901	14.510	5.134
CVD Pneumonia	71.430	85.591	92.385	77.013	62.110
IHD Nephritis	66.468	55.083	47.212	43.501	32.850
Ca Other,Unspec All Other Heart Dis	65.731	54.651	40.936	29.183	24.063
Septicemia Leukemia	62.336	49.853	19.455	28.805	9.921
Rheum Heart Dis All Other Accidents	61.802	35.914	12.727	8.805	6.139
All Other Heart Dis					

TABLE 29

All Other Accidents	61.769	71.511	65.531	56.336	54.250
Ca Other,Unspec Pneumonia	58.715	48.495	25.070	16.951	10.529
Septicemia Hernia,Intest Obstr	58.191	63.608	18.950	24.157	15.693
Ca Respiratory Pneumonia	58.139	41.564	24.404	17.809	12.283
Other Dis Arteries Compl Medical Care	55.693	61.219	52.640	21.933	5.660
Cholelithiasis Compl Medical Care	55.606	20.124	28.409	43.001	27.145
Septicemia All Other Heart Dis	53.043	53.537	40.420	37.232	28.004
Ca Other Lymphatic Pneumonia	52.185	37.509	15.254	14.150	7.772
All Other Heart Dis Chron Liver Dis	52.093	38.031	29.742	18.003	6.536
Ca Digestive Nutrit Deficiency	52.075	49.465	55.147	34.772	25.858
Anemia All Other Heart Dis	52.059	35.385	48.635	38.698	34.863
Ca Other,Unspec Hernia,Intest Obstr	51.541	21.594	38.370	14.031	11.895
All Other Heart Dis Compl Medical Care	50.359	48.655	40.076	25.166	13.625

TABLE 30

Z-Scores Evaluating the Occurrence of a Cause of Death With Diabetes
Compared to the Frequency of the Cause and the Frequency of Diabetes
Among White Males Aged 65 and Older, California, 1980

	Z-Score				
Cause with Diabetes	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD	135.464	113.388	80.004	51.207	31.952
All Other Heart Dis	115.233	91.178	70.241	47.243	30.924
Hypertension	100.741	52.899	44.901	31.223	20.588
CVD	84.836	69.624	65.886	39.498	26.577
Atherosclerosis	74.228	64.665	48.100	29.580	19.161
Sign,Sym Ill Def	45.944	47.661	32.545	26.079	15.681
Nephritis	45.692	52.939	32.109	21.742	8.116
Pneumonia	37.362	36.463	29.088	20.614	14.367
Hyp Heart Dis	35.750	30.889	20.246	17.852	5.659
COPD	31.390	24.640	18.314	11.947	6.770
Septicemia	29.776	32.761	23.857	13.616	13.764
Ca Other,Unspec	23.629	14.515	16.211	10.111	6.872
Other Dis Endocard	23.075	22.261	8.235	7.620	3.676
All Other Accidents	22.733	8.199	5.320	4.847	1.507
Ca Digestive	22.182	16.986	15.811	7.772	5.670
All Other Infections	16.803	3.755	14.102	1.570	2.531
Cholelithiasis	16.647	4.110	5.103	2.892	2.722
Ca Respiratory	16.322	11.587	7.937	7.448	3.707
Hyp Heart/Renal Dis	16.287	14.045	15.962	8.771	3.461
Compl Medical Care	15.852	11.193	3.750	3.646	1.930
Chron Liver Dis	15.151	17.026	5.792	9.494	4.373
Anemia	13.782	7.921	9.098	2.553	4.304
Ca Other Lymphatic	13.178	6.695	5.479	2.999	1.192
Benign Ca,in situ	12.840	3.375	2.639	2.710	4.437
Fracture,Trauma,Burn	11.843	0.524	2.075	2.259	-0.148
Ulcer	11.178	14.298	8.830	7.386	3.751
Tuberculosis	10.866	12.224	-0.366	2.161	1.478
Other Dis Arteries	10.501	13.614	8.284	3.848	2.804
Ca Lip,Or/Pharynx	9.033	6.822	2.665	5.348	-0.531
Appendicitis	8.853	6.869	7.944	-0.160	-0.233
Hyper Prostate	8.381	4.992	4.849	0.738	0.961
Rheum Heart Dis	8.237	5.719	6.778	1.227	-0.603
Ca Genital	8.151	11.184	7.921	8.440	7.427
Influenza	7.635	5.907	-0.254	4.304	1.279
Ca Urinary	7.597	10.013	4.271	2.361	4.894
Leukemia	5.866	6.173	9.712	3.691	1.797
Meningitis	5.138	-0.154	-0.244	-0.160	-0.095
Bronchitis	5.138	3.481	9.730	2.521	-0.447
Nutrit Deficiency	5.118	9.713	7.485	5.742	1.425
Kidney Infection	4.983	13.763	3.606	12.367	2.869
Hernia,Intest Obstr	2.456	1.232	2.097	1.686	1.862
MVA	1.781	-0.543	-0.665	-0.506	-0.674

TABLE 30

All Other	1.099	-1.125	-0.413	-2.003	-3.347
Other Intest Inf	-0.046	-0.058	-0.122	7.083	-0.165
Meningococcal Inf	-0.046	.	.	-0.080	.
Polio	-0.046	17.116	.	.	.
Viral Hepatitis	-0.046	-0.130	-0.122	-0.160	-0.165
Syphilis	-0.064	-0.130	-0.122	-0.160	-0.135
Ca Breast	-0.091	-0.082	5.174	-0.080	-0.095
All Other External	-0.164	-0.210	-0.199	-0.179	-0.213
Homicide	-0.269	-0.344	-0.323	-0.253	-0.330
Poisoning	-0.269	-0.340	2.064	-0.330	-0.330
Other External NI	-0.312	-0.354	-0.360	-0.431	-0.357
Suicide	-0.495	-0.597	0.850	-0.548	-0.653
Shigellosis,Amebiasis	.	.	-0.100	.	.
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	-0.080	.
Measles	.	.	.	.	.

TABLE 31

Z-Scores Evaluating the Occurrence of a Cause of Death With Diabetes
Compared to the Frequency of the Cause and the Frequency of Diabetes
Among White Females Aged 65 and Older, California, 1980

	Z-Score				
Cause with Diabetes	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD	187.947	175.179	127.274	85.649	54.432
All Other Heart Dis	160.021	137.582	105.721	75.594	49.823
Hypertension	112.952	100.384	82.549	45.743	36.125
CVD	112.814	100.568	86.512	66.294	50.146
Nephritis	92.277	72.851	47.662	32.635	25.325
Atherosclerosis	88.933	89.010	72.203	54.824	36.989
Sign,Sym Ill Def	73.698	60.826	58.788	40.105	32.766
Pneumonia	47.389	37.559	50.249	27.899	21.226
Hyp Heart Dis	46.789	49.133	35.378	23.416	20.339
Anemia	37.295	9.806	6.380	10.746	7.428
Septicemia	34.850	35.920	28.147	27.316	19.507
Kidney Infection	33.154	5.565	15.162	10.231	17.087
Ca Digestive	30.422	20.157	18.343	16.519	10.220
Cholelithiasis	29.386	16.602	10.303	10.099	2.874
COPD	27.863	22.134	22.753	9.043	6.824
Ca Other,Unspec	21.748	20.465	20.055	12.608	5.933
Ca Breast	21.043	18.542	11.912	11.894	7.395
Chron Liver Dis	20.584	22.061	5.137	11.198	1.027
Hernia,Intest Obstr	17.658	14.998	5.853	4.651	3.255
Compl Medical Care	17.024	12.075	11.450	5.381	2.443
All Other Accidents	16.788	19.537	14.815	3.609	5.691
Ulcer	15.682	14.763	9.460	7.325	1.146
Rheum Heart Dis	15.201	5.964	9.350	2.536	5.240
Other Dis Endocard	14.956	19.180	11.680	8.508	4.395
Tuberculosis	14.523	6.030	9.761	-0.272	8.814
Meningitis	14.523	7.868	4.427	13.865	-0.204
Nutrit Deficiency	13.020	8.610	6.929	7.261	8.128
Hyp Heart/Renal Dis	12.959	20.168	13.752	11.305	8.806
Viral Hepatitis	12.616	-0.144	5.914	-0.130	4.710
Ca Urinary	11.721	5.179	9.702	3.595	6.476
Leukemia	11.550	3.198	2.891	6.841	9.236
Ca Respiratory	11.385	6.512	11.363	3.245	2.080
All Other Infections	10.721	8.846	12.549	3.502	5.372
Ca Genital	6.454	5.911	11.171	8.484	4.989
Ca Other Lymphatic	6.047	6.634	9.216	11.639	1.628
Other Dis Arteries	5.899	14.159	9.635	7.380	3.785
Fracture,Trauma,Burn	4.905	13.996	9.583	0.475	4.442
All Other	4.118	2.726	2.971	-1.343	-3.291
Benign Ca,in situ	3.713	8.601	2.556	7.344	5.050
Ca Lip,Or/Pharynx	3.034	2.108	-0.393	4.717	1.390
Other Intest Inf	-0.039	11.216	-0.139	-0.107	6.324
Polio	-0.039	-0.051	.	-0.107	-0.129

TABLE 31

Appendicitis	-0.056	-0.088	11.992	4.817	-0.302
Syphilis	-0.068	-0.072	-0.108	-0.075	-0.091
All Other External	-0.088	-0.135	9.177	-0.130	-0.158
Bronchitis	-0.096	-0.191	4.427	7.587	0.979
Influenza	-0.125	5.475	5.637	5.656	5.797
Homicide	-0.147	-0.223	-0.264	-0.151	-0.302
Other External NI	-0.172	3.361	-0.305	3.959	-0.436
Poisoning	-0.261	-0.339	2.078	-0.377	1.427
Suicide	-0.264	-0.319	-0.335	-0.272	-0.427
MVA	-0.267	1.913	-0.501	-0.446	-0.473
Shigellosis,Amebiasis	.	.	-0.062	13.198	-0.091
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	.	.
Meningococcal Inf	.	.	.	-0.107	10.896
Measles	.	.	.	.	.
Hyper Prostate	na	na	na	na	na

TABLE 32

Z-Scores Evaluating the Occurrence of a Cause of Death With Atherosclerosis
Compared to the Frequency of the Cause and the Frequency of Atherosclerosis
Among White Males Aged 65 and Older, California, 1980

	Z-Score				
Cause with Atherosclerosis	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD	137.864	115.222	89.202	65.398	53.143
CVD	116.355	111.764	92.303	66.734	52.887
All Other Heart Dis	91.889	81.055	72.301	53.915	42.419
Diabetes	74.228	64.665	48.100	29.580	19.161
Hypertension	57.681	55.307	47.835	33.033	26.111
Sign,Sym Ill Def	55.499	58.995	49.666	42.885	38.315
COPD	48.809	44.410	28.782	24.714	18.676
Other Dis Arteries	47.883	41.048	28.148	17.300	11.965
All Other	42.651	45.981	42.107	37.454	23.468
Nephritis	37.682	34.311	29.567	24.004	22.041
Pneumonia	29.871	33.637	33.955	33.940	25.195
Septicemia	24.733	22.541	14.935	7.725	6.890
Influenza	23.031	-0.179	9.459	4.226	3.914
Other Dis Endocard	21.133	13.266	8.984	5.711	3.462
Hyp Heart Dis	19.415	17.500	8.671	4.913	7.967
Compl Medical Care	19.029	17.879	14.236	4.898	3.948
Appendicitis	17.717	6.288	-0.295	-0.234	4.191
Cholelithiasis	16.550	9.974	7.130	3.897	1.646
All Other Accidents	16.446	17.468	14.522	8.663	5.408
Chron Liver Dis	16.002	10.461	6.821	4.237	-0.222
Ulcer	14.985	13.015	11.988	2.776	6.684
Anemia	13.699	13.760	9.944	6.499	7.661
Ca Respiratory	11.442	8.957	8.783	5.525	2.708
Ca Breast	10.827	-0.090	-0.225	-0.117	-0.177
Hernia,Intest Obstr	10.826	7.619	13.085	3.076	7.464
Hyp Heart/Renal Dis	10.735	-0.304	-0.371	5.736	5.486
Benign Ca,in situ	10.135	13.736	5.989	9.305	4.195
Ca Genital	9.366	18.425	13.855	11.348	11.456
Ca Other,Unspec	8.835	11.270	11.811	6.654	5.075
Nutrit Deficiency	8.828	13.609	12.812	10.393	12.691
Leukemia	7.929	5.549	0.913	4.960	2.150
Tuberculosis	7.111	5.416	1.816	2.916	2.276
Rheum Heart Dis	6.024	7.073	2.371	-0.819	5.150
Ca Other Lymphatic	4.546	8.313	3.293	2.295	-1.165
Ca Digestive	4.485	9.047	8.217	10.084	6.984
Fracture,Trauma,Burn	4.352	7.315	5.231	5.935	2.397
Hyper Prostate	4.049	9.453	9.763	10.744	9.308
Ca Lip,Or/Pharynx	3.275	1.101	10.104	1.920	2.068
Other External NI	2.871	-0.385	-0.434	-0.630	2.366
Ca Urinary	2.652	5.029	4.901	2.518	3.448
All Other Infections	2.491	5.313	3.886	3.504	3.096
MVA	1.766	2.793	-0.804	0.611	-1.249

TABLE 32

Other Intest Inf	-0.046	-0.063	-0.148	-0.203	2.963
Meningococcal Inf	-0.046	.	.	-0.117	.
Polio	-0.046	-0.063	.	.	.
Viral Hepatitis	-0.046	-0.142	-0.148	-0.234	-0.306
Syphilis	-0.065	6.916	-0.148	-0.234	-0.250
All Other External	-0.165	-0.228	-0.241	-0.262	-0.395
Meningitis	-0.189	-0.168	-0.295	-0.234	-0.177
Bronchitis	-0.189	6.598	10.704	3.411	1.586
Kidney Infection	-0.194	4.804	12.963	1.727	4.455
Homicide	-0.271	-0.375	-0.390	-0.370	-0.612
Poisoning	-0.271	2.337	-0.489	-0.482	-0.612
Suicide	-0.497	0.891	-0.799	-0.802	-1.211
Shigellosis,Amebiasis	.	.	-0.120	.	.
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	-0.117	.
Measles	.	.	.	.	.

TABLE 33

Z-Scores Evaluating the Occurrence of a Cause of Death With Atherosclerosis
Compared to the Frequency of the Cause and the Frequency of Atherosclerosis
Among White Females Aged 65 and Older, California, 1980

	Z-Score				
Cause with Atherosclerosis	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
IHD	159.187	142.258	110.797	95.191	88.506
CVD	151.809	130.709	134.879	104.959	81.284
Hypertension	94.101	88.364	55.650	50.729	40.490
Diabetes	88.933	89.010	72.203	54.824	36.989
All Other Heart Dis	88.687	101.806	89.656	80.526	77.715
Sign,Sym Ill Def	62.967	73.789	81.732	73.997	77.817
Other Dis Arteries	58.300	39.327	39.860	25.014	21.035
All Other	54.333	57.273	68.063	56.834	53.944
Nephritis	47.291	34.004	31.888	31.531	28.292
COPD ·	38.370	44.890	33.621	21.957	18.169
All Other Accidents	27.431	21.765	10.974	15.590	11.452
Compl Medical Care	25.883	19.519	7.703	10.539	6.694
Pneumonia	20.351	31.420	44.765	40.612	44.107
Cholelithiasis	20.147	17.562	7.520	13.699	9.237
Hyp Heart Dis	16.157	15.053	16.820	11.207	14.419
Hyp Heart/Renal Dis	15.631	8.386	5.994	2.811	8.558
Viral Hepatitis	15.192	-0.137	-0.183	-0.180	-0.390
Benign Ca,in situ	14.087	16.285	15.051	8.737	4.411
Anemia	13.813	8.586	8.802	15.030	15.347
Nutrit Deficiency	13.115	15.673	28.152	28.339	28.076
Septicemia	13.048	23.880	16.011	19.734	12.913
Fracture,Trauma,Burn	12.654	12.452	6.774	12.299	8.302
Ca Digestive	11.356	11.570	5.554	13.453	8.451
Ca Other,Unspec	10.520	10.966	10.095	10.602	9.280
Ca Genital	9.734	5.139	3.896	5.396	6.213
Hernia,Intest Obstr	8.972	10.413	14.611	12.317	11.873
All Other Infections	8.582	2.918	3.387	5.107	6.843
Ca Breast	8.477	4.600	9.714	7.190	8.675
Rheum Heart Dis	7.688	8.095	13.938	6.206	4.512
Ulcer	7.429	23.706	13.575	17.440	10.125
Ca Urinary	6.967	5.524	2.434	9.402	3.872
Chron Liver Dis	6.746	13.454	3.164	4.444	1.397
Ca Respiratory	5.380	10.604	9.210	6.685	2.835
Ca Other Lymphatic	4.831	-0.647	4.740	4.005	1.218
Kidney Infection	4.817	9.026	15.543	9.238	9.291
Poisoning	4.383	-0.321	-0.448	-0.520	1.043
Ca Lip,Or/Pharynx	3.757	7.560	-0.437	3.160	1.995
Other Dis Endocard	3.401	6.387	13.699	7.320	9.152
Leukemia	3.292	1.463	0.918	6.281	3.215
Other Intest Inf	-0.033	11.848	6.312	6.651	2.882
Polio	-0.033	-0.048	.	-0.147	3.811
Appendicitis	-0.046	11.848	5.282	-0.275	1.152

TABLE 33

Syphilis	-0.057	-0.068	-0.120	9.510	-0.174
All Other External	-0.073	-0.128	-0.120	-0.180	-0.302
Bronchitis	-0.080	5.342	12.283	5.248	4.664
Influenza	-0.104	5.798	15.739	3.776	6.440
Tuberculosis	-0.114	-0.153	2.684	-0.375	0.963
Meningitis	-0.114	-0.119	-0.240	-0.294	2.176
Homicide	-0.123	-0.211	-0.293	-0.208	-0.578
Other External NI	-0.143	-0.261	-0.339	-0.329	1.557
Suicide	-0.220	-0.302	-0.372	-0.375	-0.817
MVA	-0.222	-0.405	-0.558	-0.615	0.199
Shigellosis,Amebiasis	.	.	-0.069	-0.104	-0.174
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	.	.
Meningococcal Inf	.	.	.	-0.147	-0.174
Measles	.	.	.	.	.
Hyper Prostate	na	na	na	na	na

TABLE 34

Z-Scores Evaluating the Occurrence of a Cause of Death With Pneumonia
Compared to the Frequency of the Cause and the Frequency of Pneumonia
Among White Males Aged 65 and Older, California, 1980

	Z-Score				
Cause with Pneumonia	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
Sign,Sym Ill Def	97.182	82.650	79.254	61.893	46.550
COPD	95.234	78.456	67.809	46.017	35.719
CVD	80.280	82.609	75.995	54.998	39.441
All Other Heart Dis	70.639	66.143	59.653	50.089	43.307
All Other	69.862	72.696	77.255	53.480	38.255
Ca Respiratory	69.319	57.734	37.654	17.859	9.971
Septicemia	67.392	53.734	40.263	33.925	28.405
Ca Other,Unspec	65.931	45.245	24.116	19.557	9.558
Nephritis	51.450	45.477	33.846	28.031	21.530
Chron Liver Dis	47.791	21.698	13.583	7.237	3.198
IHD	43.883	42.616	45.167	35.085	31.739
Ca Other Lymphatic	43.542	24.415	21.709	8.989	7.703
Leukemia	42.530	24.815	21.367	17.134	5.461
Nutrit Deficiency	41.113	31.221	22.988	21.916	12.547
Diabetes	37.362	36.463	29.088	20.614	14.367
Ca Digestive	33.667	30.595	18.990	15.731	5.384
Atherosclerosis	29.871	33.637	33.955	33.940	25.195
Ca Genital	29.652	23.033	23.073	20.544	13.450
All Other Accidents	29.041	23.858	20.972	9.505	9.119
Benign Ca,in situ	27.683	22.421	17.891	11.447	6.038
Ca Lip,Or/Pharynx	23.120	22.721	10.494	6.499	3.927
Fracture,Trauma,Burn	22.537	22.344	15.843	8.238	7.409
Hypertension	21.425	18.180	11.672	14.008	9.796
Ca Urinary	21.128	13.708	8.363	12.388	3.210
Anemia	21.126	29.549	20.099	11.915	8.978
Ulcer	20.140	14.160	11.867	9.660	5.929
Polio	19.407	-0.069	.	.	.
Meningitis	18.665	5.309	9.090	-0.256	-0.182
Bronchitis	18.665	9.195	4.731	4.817	3.838
Other Dis Endocard	17.093	6.656	8.134	6.746	5.800
Other Dis Arteries	15.786	13.333	10.889	7.111	3.878
Rheum Heart Dis	14.894	9.922	9.105	2.451	3.198
All Other Infections	12.271	15.535	11.910	4.357	4.598
Hernia,Intest Obstr	12.055	22.059	11.979	9.593	3.088
Compl Medical Care	10.982	3.085	7.710	4.950	2.695
Tuberculosis	9.563	7.580	3.703	2.561	4.235
Kidney Infection	8.955	4.358	11.908	7.192	4.884
Cholelithiasis	8.674	5.253	7.939	5.575	5.867
MVA	5.421	2.473	1.435	2.895	-1.286
Other External NI	5.324	1.970	-0.469	-0.690	-0.680
All Other External	5.211	-0.248	-0.260	3.206	2.053
Hyp Heart Dis	5.153	14.144	8.535	11.295	5.375

TABLE 34

Hyp Heart/Renal Dis	4.659	8.758	4.584	7.049	-0.962
Hyper Prostate	3.554	13.172	14.453	6.947	7.898
Homicide	2.985	4.504	1.949	2.065	-0.630
Poisoning	2.985	-0.401	3.254	1.366	0.958
Suicide	1.233	-0.705	-0.863	-0.878	-1.247
Other Intest Inf	-0.051	14.459	-0.159	4.287	-0.315
Meningococcal Inf	-0.051	.	.	-0.128	.
Viral Hepatitis	-0.051	-0.154	-0.159	-0.256	-0.315
Syphilis	-0.073	6.343	-0.159	-0.256	-0.257
Ca Breast	-0.103	-0.097	-0.244	7.682	5.318
Appendicitis	-0.126	5.762	2.817	-0.256	1.800
Influenza	-0.145	-0.195	-0.332	-0.678	-1.044
Shigellosis,Amebiasis	.	.	-0.130	.	.
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	-0.128	.
Measles	.	.	.	.	.

TABLE 35

Z-Scores Evaluating the Occurrence of a Cause of Death With Pneumonia
Compared to the Frequency of the Cause and the Frequency of Pneumonia
Among White Females Aged 65 and Older, California, 1980

	Z-Score				
Cause with Pneumonia	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
Sign,Sym Ill Def	106.982	105.909	85.313	74.716	71.914
COPD	89.563	67.508	55.996	45.979	34.750
Septicemia	82.963	63.381	50.089	43.858	33.738
All Other Heart Dis	82.733	79.740	76.588	73.962	64.361
All Other	75.540	77.848	75.615	70.662	64.448
CVD	71.430	85.591	92.385	77.013	62.110
Nephritis	66.702	39.154	35.280	22.406	19.775
Ca Other,Unspec	58.715	48.495	25.070	16.951	10.529
Ca Respiratory	58.139	41.564	24.404	17.809	12.283
Ca Other Lymphatic	52.185	37.509	15.254	14.150	7.772
Diabetes	47.389	37.559	50.249	27.899	21.226
IHD	41.542	47.305	52.262	53.165	47.010
Nutrit Deficiency	36.701	32.915	28.879	28.005	23.647
All Other Infections	36.108	12.980	18.794	4.254	8.621
Chron Liver Dis	34.525	24.078	10.800	7.597	2.048
Syphilis	32.254	-0.067	-0.109	-0.093	-0.147
Ca Breast	31.842	31.964	19.824	13.857	10.450
Ca Genital	30.903	15.171	14.713	12.083	4.310
Ca Digestive	30.374	24.457	16.401	10.162	8.226
Other Intest Inf	27.951	12.193	-0.141	-0.131	1.559
Polio	27.951	-0.047	.	7.483	4.592
Hernia,Intest Obstr	25.222	20.139	14.889	17.212	8.686
Hypertension	24.939	16.222	17.150	17.883	10.771
Rheum Heart Dis	24.235	15.497	16.713	9.998	6.614
Bronchitis	22.763	11.188	13.527	10.305	4.932
All Other Accidents	21.849	15.005	18.375	14.170	11.432
Benign Ca,in situ	21.625	24.142	16.651	15.487	6.484
Ulcer	20.872	22.341	12.181	9.375	5.877
Atherosclerosis	20.351	31.420	44.765	40.612	44.107
Appendicitis	19.739	-0.081	5.832	7.895	5.653
Cholelithiasis	18.443	18.086	6.583	7.883	5.570
Kidney Infection	18.186	22.124	17.154	8.029	9.458
Anemia	17.805	18.260	19.324	19.968	13.629
Meningitis	16.034	17.244	18.109	7.352	2.707
Other Dis Arteries	15.955	12.556	9.485	11.045	5.026
Ca Lip,Or/Pharynx	14.427	24.132	14.659	3.662	8.609
Ca Urinary	12.984	3.646	9.561	7.268	4.104
Leukemia	12.797	21.805	13.108	18.629	8.832
Fracture,Trauma,Burn	11.526	10.373	14.712	12.640	10.523
Compl Medical Care	9.220	6.318	9.945	2.017	2.590
Tuberculosis	7.955	-0.149	3.007	2.652	1.352
Homicide	7.346	-0.205	-0.267	-0.186	-0.489

TABLE 35

Hyp Heart/Renal Dis	7.088	8.641	6.638	3.282	0.497
Other Dis Endocard	6.442	20.927	11.507	4.288	7.415
Hyp Heart Dis	3.884	10.107	8.789	12.499	8.119
Viral Hepatitis	-0.071	-0.133	-0.167	-0.161	-0.329
All Other External	-0.080	7.911	9.054	-0.161	-0.255
Influenza	-0.113	-0.163	-0.339	-0.602	-1.451
Other External NI	-0.156	3.695	-0.309	-0.294	2.125
Poisoning	-0.237	2.893	2.041	5.997	0.367
Suicide	-0.240	-0.294	-0.339	5.639	0.757
MVA	-0.242	2.148	3.429	1.271	-0.765
Shigellosis,Amebiasis	.	.	-0.063	-0.093	-0.147
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	.	.
Meningococcal Inf	.	.	.	7.483	-0.147
Measles	.	.	.	.	.
Hyper Prostate	na	na	na	na	na

TABLE 36

Z-Scores Evaluating the Occurrence of a Cause of Death With Septicemia
Compared to the Frequency of the Cause and the Frequency of Septicemia
Among White Males Aged 65 and Older, California, 1980

	Z-Score				
Cause with Septicemia	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
Nephritis	85.965	71.804	45.356	28.721	18.248
Pneumonia	67.392	53.734	40.263	33.925	28.405
Compl Medical Care	60.648	29.925	26.559	22.430	9.409
All Other Accidents	55.929	35.617	25.959	17.136	12.576
Sign,Sym Ill Def	54.404	53.322	33.338	31.826	23.681
Leukemia	52.984	34.485	25.304	14.870	10.140
All Other Heart Dis	50.409	42.284	38.828	24.653	17.222
Meningitis	47.291	9.577	23.910	-0.118	-0.082
Cholelithiasis	40.024	23.451	7.923	20.787	22.760
Kidney Infection	38.271	16.604	14.715	32.177	15.007
Anemia	35.974	23.092	22.251	11.588	8.493
CVD	35.602	30.181	25.219	14.024	10.447
Ca Digestive	35.108	24.234	12.461	9.692	6.255
Ca Other Lymphatic	32.787	23.681	26.082	9.718	7.864
Other Intest Inf	32.554	-0.039	11.955	9.710	-0.142
Ulcer	31.460	25.997	10.086	16.961	4.729
Other Dis Arteries	31.130	19.951	16.378	9.093	3.013
Diabetes	29.776	32.761	23.857	13.616	13.764
Chron Liver Dis	28.988	18.184	2.166	4.054	3.340
Appendicitis	26.530	10.360	11.872	-0.118	4.780
Ca Other,Unspec	25.075	12.366	9.919	5.541	1.186
Atherosclerosis	24.733	22.541	14.935	7.725	6.890
Influenza	22.954	17.999	-0.173	2.900	-0.471
COPD	20.865	18.862	13.118	7.956	5.107
Hernia,Intest Obstr	20.620	20.986	11.903	9.555	14.833
Fracture,Trauma,Burn	18.334	11.891	7.267	1.951	7.742
Ca Respiratory	17.562	10.246	5.954	4.586	0.647
All Other Infections	16.733	12.293	7.704	10.818	1.296
Ca Urinary	16.638	5.905	7.035	3.919	3.385
Tuberculosis	16.342	-0.214	7.776	-0.288	-0.434
IHD	15.559	21.396	17.567	9.639	5.274
Benign Ca,in situ	15.436	19.954	9.149	6.309	9.932
Hyper Prostate	12.624	11.749	12.862	20.932	4.867
Rheum Heart Dis	12.595	8.925	7.704	4.444	5.269
Hypertension	11.413	11.464	3.462	3.120	0.791
Nutrit Deficiency	10.819	15.110	11.753	12.391	4.558
Other Dis Endocard	10.416	9.021	12.878	0.542	3.696
Ca Genital	8.942	6.582	12.962	9.148	5.552
MVA	6.315	5.127	1.758	-0.372	-0.580
Poisoning	5.326	-0.228	-0.276	3.879	-0.284
Ca Lip,Or/Pharynx	5.320	7.873	1.992	-0.377	-0.456
Hyp Heart Dis	3.512	0.950	1.992	-0.778	-0.014

TABLE 36

Suicide	2.666	-0.400	-0.450	-0.403	-0.562
Meningococcal Inf	-0.031	.	.	-0.059	.
Polio	-0.031	-0.039	.	.	.
Viral Hepatitis	-0.031	11.366	-0.083	-0.118	-0.142
Syphilis	-0.043	-0.087	-0.083	-0.118	-0.116
Ca Breast	-0.061	-0.055	-0.127	-0.059	-0.082
All Other External	-0.111	-0.141	-0.136	-0.132	-0.183
Hyp Heart/Renal Dis	-0.123	-0.187	-0.209	3.879	-0.434
Bronchitis	-0.127	-0.179	-0.203	-0.256	-0.384
Homicide	-0.182	-0.231	4.330	-0.186	-0.284
Other External NI	-0.210	-0.238	3.845	-0.317	-0.307
All Other	-0.854	-1.146	-1.508	-1.779	-2.878
Shigellosis,Amebiasis	.	.	14.676	.	.
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	-0.059	.
Measles	.	.	.	.	.

TABLE 37

Z-Scores Evaluating the Occurrence of a Cause of Death With Septicemia
Compared to the Frequency of the Cause and the Frequency of Septicemia
Among White Females Aged 65 and Older, California, 1980

	Z-Score				
Cause with Septicemia	Age 65-69	Age 70-74	Age 75-79	Age 80-84	Age 85 and Older
Pneumonia	82.963	63.381	50.089	43.858	33.738
Nephritis	72.688	67.809	48.857	35.293	25.737
Sign,Sym Ill Def	64.219	49.650	67.627	45.976	36.959
Leukemia	62.336	49.853	19.455	28.805	9.921
Kidney Infection	60.671	49.379	50.673	23.463	46.902
Hernia,Intest Obstr	58.191	63.608	18.950	24.157	15.693
All Other Heart Dis	53.043	53.537	40.420	37.232	28.004
Anemia	45.537	25.818	32.835	16.253	8.830
Cholelithiasis	40.959	18.777	61.664	22.428	22.136
Compl Medical Care	38.633	50.309	41.538	22.308	18.870
Ca Other Lymphatic	38.346	34.007	21.983	26.804	1.714
Meningitis	35.514	-0.074	15.019	21.504	6.635
Diabetes	34.850	35.920	28.147	27.316	19.507
CVD	34.773	35.001	39.987	27.035	14.409
Ulcer	30.880	28.574	18.507	17.409	7.919
Ca Digestive	30.556	30.541	24.455	11.438	5.963
Ca Other,Unspec	30.523	19.052	9.166	8.918	2.000
All Other Accidents	30.224	43.791	39.281	20.646	14.111
Ca Breast	29.649	12.844	9.967	9.303	3.166
Chron Liver Dis	29.071	19.837	6.707	8.687	-0.442
Other Dis Endocard	24.540	10.718	5.619	11.394	2.142
IHD	22.561	20.132	17.429	15.718	12.311
Other Dis Arteries	20.334	29.134	14.960	11.069	8.711
COPD	18.982	18.385	18.019	9.501	7.860
Nutrit Deficiency	17.891	25.533	15.867	14.810	14.558
All Other Infections	17.631	10.078	3.256	2.751	1.120
Ca Genital	15.780	12.788	13.170	4.639	4.867
Hypertension	14.168	13.391	10.032	7.796	6.778
Atherosclerosis	13.048	23.880	16.011	19.734	12.913
Ca Respiratory	11.069	12.208	7.465	1.955	2.531
Rheum Heart Dis	10.581	7.917	5.721	2.928	-0.799
Ca Urinary	9.552	-0.313	2.440	8.347	7.034
Benign Ca,in situ	6.264	-0.263	12.607	7.805	6.233
Ca Lip,Or/Pharynx	5.212	-0.237	-0.241	-0.255	2.261
Hyp Heart Dis	2.877	3.717	5.280	-0.991	0.811
Other Intest Inf	-0.024	-0.053	11.651	-0.069	-0.219
Polio	-0.024	-0.030	.	-0.069	-0.093
Appendicitis	-0.034	-0.053	19.737	15.295	4.354
Syphilis	-0.042	-0.043	-0.066	-0.049	-0.066
Viral Hepatitis	-0.049	-0.086	9.818	-0.085	-0.147
All Other External	-0.054	-0.080	-0.066	-0.085	-0.114
Bronchitis	-0.060	-0.114	-0.132	3.836	-0.452

TABLE 37

Influenza	-0.077	9.389	9.541	2.831	5.511
Tuberculosis	-0.084	-0.096	-0.183	-0.177	-0.238
Homicide	-0.091	-0.133	-0.162	-0.098	-0.219
Hyp Heart/Renal Dis	-0.094	13.569	-0.175	-0.277	-0.532
Other External NI	-0.106	-0.164	-0.187	-0.155	-0.316
Poisoning	-0.161	-0.202	-0.247	-0.245	2.308
Suicide	-0.163	-0.190	-0.205	-0.177	-0.309
MVA	-0.165	3.676	-0.307	-0.290	-0.343
Fracture,Trauma,Burn	-0.340	9.086	10.958	11.230	7.279
All Other	-0.606	-0.857	-1.231	-1.809	-3.449
Shigellosis,Amebiasis	.	.	-0.038	20.356	-0.066
Whooping Cough	.	.	.	.	.
Strep Throat	.	.	.	.	.
Meningococcal Inf	.	.	.	14.359	-0.066
Measles	.	.	.	.	.
Hyper Prostate	na	na	na	na	na

TABLE 38

Average Years of Life Remaining
Among White Males and Females
Living at least to Age 65
California, 1980

| Age Reached | Years of Life Remaining | |
	Males	Females
65	14.24	18.19
66	13.63	17.45
67	13.03	16.74
68	12.44	16.02
69	11.85	15.31
70	11.31	14.61
71	10.79	13.94
72	10.25	13.26
73	9.75	12.63
74	9.27	11.99
75	8.78	11.38
76	8.32	10.76
77	7.90	10.17
78	7.48	9.59
79	7.05	9.02
80	6.65	8.46
81	6.27	7.96
82	5.90	7.45
83	5.57	6.99
84	5.22	6.52
85	4.90	6.09
86	4.60	5.70
87	4.38	5.33
88	4.13	4.96
89	3.92	4.65
90	3.68	4.29
91	3.40	3.98
92	3.22	3.69
93	3.06	3.43
94	2.85	3.19
95	2.60	2.90
96	2.46	2.64
97	2.13	2.33
98	1.73	1.85
99	1.24	1.26
100 and older	0.50	0.50

TABLE 39
Expected Years of Life Remaining
When Certain Causes of Death were Eliminated
As Underlying and as Any Mention on the Death Certificate
Among White Males and Females Age 65, California, 1980

| | Expected Years of Life | | | |
| | Underlying | | Any Mention | |
Cause Eliminated	Males	Females	Males	Females
None*	14.24	18.19	14.24	18.19
	-	-	-	-
IHD	17.23	20.94	18.17	21.75
	(2.99)†	(2.75)	(3.93)	(3.56)
Diabetes	14.33	18.32	14.75	18.86
	(0.09)	(0.13)	(0.51)	(0.67)
Ca Digestive	14.31	18.68	14.81	18.75
	(0.07)	(0.49)	(0.57)	(0.56)
Ca Respiratory	14.75	18.47	14.94	18.50
	(0.51)	(0.28)	(0.70)	(0.31)
Ca Breast	-	18.45	-	18.51
	-	(0.26)	-	(0.32)
Ca Genital	14.47	18.37	14.58	18.40
	(0.23)	(0.18)	(0.34)	(0.21)
All Other Heart Dis	14.90	18.91	18.97	22.75
	(0.66)	(0.72)	(4.73)	(4.56)
Hypertension	14.27	18.23	14.58	18.66
	(0.03)	(0.04)	(0.34)	(0.47)
CVD	14.91	19.29	15.51	20.12
	(0.67)	(1.10)	(1.27)	(1.93)
Atherosclerosis	14.35	18.36	15.07	19.29
	(0.11)	(0.17)	(0.83)	(1.10)
Pneumonia	14.49	18.45	15.22	19.07
	(0.25)	(0.26)	(0.98)	(0.88)
COPD	14.67	18.44	15.34	18.77
	(0.43)	(0.25)	(1.10)	(0.58)

* No causes of death were removed, therefore this represents the average years of life remaining for those reaching age 65 in 1980.

† Numbers in parentheses are the gains in life expectancy when the cause was removed.

TABLE 40

Conditional Probabilities of Death From All Causes and From Eleven Major Causes
Among White Males Age 65 and Older, California, 1980

						Cause of Death						
Age	All Causes	IHD	Diab	Ca Digest	Ca Resp	Ca Genit	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD
65	0.02715	0.00826	0.00023	0.00210	0.00350	0.00055	0.00239	0.00004	0.00124	0.00013	0.00041	0.00146
66	0.02973	0.00947	0.00045	0.00231	0.00288	0.00054	0.00251	0.00000	0.00132	0.00014	0.00047	0.00157
67	0.03178	0.00960	0.00034	0.00235	0.00357	0.00064	0.00267	0.00006	0.00162	0.00027	0.00049	0.00165
68	0.03348	0.00987	0.00039	0.00240	0.00418	0.00099	0.00281	0.00009	0.00171	0.00024	0.00060	0.00185
69	0.03854	0.01117	0.00036	0.00296	0.00424	0.00102	0.00306	0.00015	0.00246	0.00032	0.00084	0.00261
70	0.04224	0.01245	0.00051	0.00296	0.00418	0.00109	0.00356	0.00013	0.00251	0.00031	0.00076	0.00283
71	0.04281	0.01371	0.00076	0.00291	0.00443	0.00097	0.00274	0.00010	0.00252	0.00031	0.00107	0.00278
72	0.04909	0.01498	0.00087	0.00353	0.00481	0.00122	0.00388	0.00004	0.00368	0.00035	0.00110	0.00271
73	0.05310	0.01689	0.00084	0.00356	0.00503	0.00145	0.00379	0.00014	0.00397	0.00059	0.00152	0.00324
74	0.05483	0.01702	0.00081	0.00410	0.00400	0.00182	0.00412	0.00017	0.00435	0.00054	0.00133	0.00322
75	0.06141	0.01880	0.00080	0.00427	0.00603	0.00182	0.00433	0.00032	0.00497	0.00051	0.00190	0.00376
76	0.06962	0.02223	0.00084	0.00439	0.00601	0.00211	0.00500	0.00014	0.00584	0.00090	0.00197	0.00408
77	0.07199	0.02303	0.00093	0.00419	0.00448	0.00285	0.00521	0.00032	0.00652	0.00077	0.00253	0.00499
78	0.07648	0.02347	0.00095	0.00389	0.00509	0.00313	0.00655	0.00029	0.00720	0.00113	0.00240	0.00451
79	0.08292	0.02580	0.00113	0.00496	0.00453	0.00241	0.00693	0.00033	0.00825	0.00128	0.00325	0.00547
80	0.09143	0.02914	0.00122	0.00467	0.00529	0.00349	0.00791	0.00083	0.00830	0.00179	0.00358	0.00446
81	0.09865	0.03225	0.00091	0.00479	0.00474	0.00378	0.00826	0.00050	0.01043	0.00227	0.00443	0.00630
82	0.11046	0.03733	0.00096	0.00516	0.00488	0.00380	0.00840	0.00040	0.01413	0.00221	0.00579	0.00550
83	0.11459	0.03675	0.00102	0.00534	0.00572	0.00471	0.01126	0.00070	0.01399	0.00273	0.00464	0.00458
84	0.12496	0.04018	0.00136	0.00742	0.00507	0.00457	0.01128	0.00043	0.01342	0.00278	0.00699	0.00628
85	0.13851	0.04633	0.00131	0.00590	0.00484	0.00492	0.01435	0.00074	0.01607	0.00320	0.00681	0.00541
86	0.15820	0.05501	0.00117	0.00546	0.00390	0.00614	0.01570	0.00127	0.02029	0.00351	0.00907	0.00761
87	0.16279	0.05548	0.00126	0.00799	0.00445	0.00479	0.01473	0.00080	0.02146	0.00514	0.00947	0.00514
88	0.17907	0.05874	0.00209	0.00852	0.00508	0.00732	0.01839	0.00120	0.02123	0.00583	0.00867	0.00867
89	0.18114	0.06387	0.00152	0.00743	0.00389	0.00760	0.01487	0.00270	0.02095	0.00439	0.01200	0.00760
90	0.18421	0.06366	0.00185	0.00821	0.00144	0.00534	0.01869	0.00082	0.02197	0.00637	0.01314	0.00719
91	0.22211	0.07284	0.00154	0.00667	0.00487	0.00616	0.02821	0.00180	0.03103	0.00692	0.01308	0.00667
92	0.23445	0.08594	0.00180	0.00683	0.00288	0.00683	0.02373	0.00108	0.03704	0.00971	0.01546	0.00467
93	0.23707	0.08397	0.00278	0.00742	0.00232	0.00603	0.02598	0.00278	0.02830	0.00742	0.01902	0.00650
94	0.24168	0.07583	0.00370	0.00370	0.00123	0.00678	0.02589	0.00000	0.04192	0.01048	0.02343	0.00925
95	0.28994	0.10431	0.00164	0.00329	0.00575	0.00739	0.03450	0.00329	0.03614	0.01068	0.01314	0.00739
96	0.25564	0.08907	0.00116	0.00347	0.00116	0.00463	0.03008	0.00347	0.03702	0.01619	0.01966	0.00231
97	0.27036	0.07799	0.00000	0.00520	0.00173	0.00520	0.04679	0.00347	0.03813	0.02773	0.02253	0.00867
98	0.29287	0.09262	0.00000	0.00501	0.00250	0.00751	0.04506	0.00250	0.05257	0.01252	0.02503	0.00250
99	0.25554	0.07155	0.00000	0.00681	0.00000	0.00341	0.02044	0.00000	0.02726	0.01363	0.03066	0.00681
100+	1.00000	0.36806	0.00694	0.00000	0.00694	0.02083	0.14583	0.00000	0.15972	0.02778	0.07639	0.02778

TABLE 41
Conditional Probabilities of Death From All Causes and From Twelve Major Causes
Among White Females Age 65 and Older, California, 1980

							Cause of Death						
Age	All Causes	IHD	Diab	Ca Digest	Ca Resp	Ca Breast	Ca Genit	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD
65	0.01463	0.00267	0.00034	0.00105	0.00132	0.00138	0.00062	0.00086	0.00005	0.00112	0.00009	0.00024	0.00067
66	0.01652	0.00368	0.00037	0.00124	0.00126	0.00107	0.00060	0.00118	0.00006	0.00096	0.00007	0.00020	0.00101
67	0.01736	0.00362	0.00036	0.00157	0.00155	0.00108	0.00074	0.00125	0.00010	0.00104	0.00014	0.00041	0.00082
68	0.01813	0.00452	0.00036	0.00151	0.00142	0.00114	0.00074	0.00118	0.00004	0.00123	0.00004	0.00028	0.00095
69	0.01977	0.00482	0.00036	0.00174	0.00130	0.00117	0.00084	0.00149	0.00005	0.00170	0.00013	0.00043	0.00095
70	0.02278	0.00540	0.00048	0.00203	0.00148	0.00116	0.00069	0.00190	0.00007	0.00190	0.00011	0.00045	0.00118
71	0.02359	0.00534	0.00064	0.00170	0.00145	0.00117	0.00077	0.00143	0.00012	0.00213	0.00022	0.00060	0.00124
72	0.02753	0.00702	0.00061	0.00214	0.00161	0.00120	0.00096	0.00229	0.00014	0.00274	0.00017	0.00059	0.00129
73	0.02944	0.00762	0.00065	0.00237	0.00146	0.00127	0.00068	0.00257	0.00018	0.00271	0.00037	0.00065	0.00130
74	0.03233	0.00957	0.00070	0.00212	0.00149	0.00120	0.00078	0.00263	0.00015	0.00346	0.00039	0.00053	0.00114
75	0.03382	0.00938	0.00073	0.00272	0.00131	0.00115	0.00095	0.00272	0.00016	0.00410	0.00034	0.00098	0.00111
76	0.03821	0.01107	0.00057	0.00289	0.00165	0.00123	0.00109	0.00305	0.00011	0.00481	0.00071	0.00107	0.00128
77	0.04238	0.01252	0.00089	0.00288	0.00128	0.00134	0.00112	0.00402	0.00010	0.00558	0.00077	0.00108	0.00128
78	0.04506	0.01399	0.00075	0.00341	0.00140	0.00113	0.00090	0.00378	0.00020	0.00638	0.00079	0.00109	0.00151
79	0.04850	0.01517	0.00079	0.00298	0.00089	0.00122	0.00087	0.00426	0.00029	0.00710	0.00116	0.00155	0.00163
80	0.05900	0.01857	0.00116	0.00359	0.00108	0.00157	0.00111	0.00603	0.00047	0.00893	0.00121	0.00224	0.00145
81	0.06189	0.01936	0.00088	0.00352	0.00109	0.00120	0.00093	0.00622	0.00037	0.00969	0.00171	0.00200	0.00160
82	0.07303	0.02494	0.00112	0.00369	0.00115	0.00085	0.00106	0.00617	0.00057	0.01245	0.00184	0.00293	0.00175
83	0.07457	0.02455	0.00095	0.00363	0.00117	0.00148	0.00126	0.00711	0.00044	0.01223	0.00209	0.00275	0.00164
84	0.08690	0.02886	0.00113	0.00353	0.00096	0.00182	0.00117	0.00891	0.00051	0.01563	0.00247	0.00432	0.00175
85	0.09776	0.03341	0.00192	0.00481	0.00096	0.00139	0.00119	0.00931	0.00046	0.01651	0.00327	0.00404	0.00192
86	0.10909	0.03684	0.00098	0.00515	0.00102	0.00160	0.00146	0.01008	0.00062	0.01829	0.00382	0.00537	0.00178
87	0.11572	0.03812	0.00141	0.00481	0.00087	0.00126	0.00102	0.01248	0.00097	0.02025	0.00388	0.00612	0.00189
88	0.13279	0.04522	0.00163	0.00432	0.00138	0.00188	0.00125	0.01447	0.00100	0.02368	0.00520	0.00639	0.00169
89	0.13403	0.04687	0.00155	0.00383	0.00081	0.00188	0.00108	0.01426	0.00094	0.02623	0.00632	0.00746	0.00141
90	0.15325	0.05533	0.00105	0.00452	0.00097	0.00121	0.00121	0.01758	0.00113	0.02605	0.00678	0.00920	0.00161
91	0.17009	0.06292	0.00130	0.00532	0.00090	0.00181	0.00130	0.02057	0.00040	0.02900	0.00702	0.00913	0.00181
92	0.18874	0.06582	0.00225	0.00582	0.00079	0.00198	0.00119	0.02009	0.00145	0.03569	0.01057	0.01176	0.00159
93	0.20562	0.07609	0.00136	0.00460	0.00119	0.00221	0.00119	0.02332	0.00102	0.04034	0.01106	0.01123	0.00136
94	0.21014	0.07575	0.00214	0.00449	0.00086	0.00257	0.00107	0.02482	0.00086	0.04237	0.01305	0.01284	0.00150
95	0.23327	0.07681	0.00254	0.00508	0.00028	0.00198	0.00141	0.02824	0.00113	0.04264	0.01864	0.01610	0.00311
96	0.24586	0.08555	0.00231	0.00925	0.00154	0.00347	0.00193	0.03314	0.00154	0.04008	0.01580	0.01696	0.00231
97	0.22160	0.08191	0.00112	0.00785	0.00056	0.00337	0.00056	0.02693	0.00168	0.04208	0.01010	0.01290	0.00168
98	0.22869	0.09051	0.00323	0.00485	0.00000	0.00162	0.00162	0.02909	0.00242	0.03071	0.01616	0.01131	0.00242
99	0.24459	0.07348	0.00101	0.00201	0.00101	0.00302	0.00201	0.03624	0.00101	0.05335	0.01208	0.01610	0.00302
100+	1.00000	0.33949	0.00231	0.00462	0.00000	0.00462	0.00000	0.13395	0.00462	0.16397	0.09007	0.09238	0.00462

TABLE 42

Cumulative Conditional Probabilities of Death From Eleven Major Causes
Among White Males Age 65 and Older, California, 1980

					Cause of Death					
Age	IHD	Diab	Ca Digest	Ca Resp	Ca Genit	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD
65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
66	0.0258	0.0198	0.0373	0.0539	0.0175	0.0276	0.0089	0.0131	0.0075	0.0106	0.0278
67	0.0546	0.0583	0.0772	0.0970	0.0342	0.0558	0.0089	0.0267	0.0153	0.0223	0.0570
68	0.0829	0.0867	0.1167	0.1488	0.0535	0.0849	0.0214	0.0428	0.0297	0.0342	0.0867
69	0.1110	0.1181	0.1557	0.2076	0.0824	0.1146	0.0405	0.0593	0.0418	0.0482	0.1191
70	0.1419	0.1457	0.2021	0.2652	0.1112	0.1458	0.0706	0.0823	0.0580	0.0672	0.1631
71	0.1749	0.1834	0.2467	0.3198	0.1407	0.1807	0.0945	0.1048	0.0728	0.0837	0.2090
72	0.2097	0.2371	0.2888	0.3752	0.1659	0.2064	0.1120	0.1265	0.0871	0.1060	0.2521
73	0.2461	0.2961	0.3377	0.4329	0.1961	0.2414	0.1192	0.1567	0.1025	0.1278	0.2924
74	0.2852	0.3503	0.3845	0.4903	0.2304	0.2737	0.1415	0.1877	0.1271	0.1567	0.3382
75	0.3224	0.3999	0.4356	0.5335	0.2710	0.3071	0.1682	0.2199	0.1485	0.1805	0.3812
76	0.3613	0.4462	0.4859	0.5950	0.3093	0.3402	0.2153	0.2547	0.1675	0.2127	0.4289
77	0.4045	0.4917	0.5344	0.6526	0.3512	0.3762	0.2352	0.2930	0.1989	0.2440	0.4772
78	0.4461	0.5385	0.5775	0.6925	0.4037	0.4110	0.2762	0.3329	0.2240	0.2814	0.5323
79	0.4855	0.5829	0.6146	0.7346	0.4572	0.4516	0.3109	0.3738	0.2582	0.3145	0.5786
80	0.5255	0.6318	0.6583	0.7691	0.4953	0.4914	0.3470	0.4170	0.2939	0.3558	0.6304
81	0.5668	0.6804	0.6961	0.8061	0.5459	0.5329	0.4306	0.4568	0.3399	0.3975	0.6691
82	0.6084	0.7131	0.7313	0.8363	0.5957	0.5723	0.4768	0.5024	0.3927	0.4444	0.7188
83	0.6519	0.7444	0.7654	0.8642	0.6408	0.6085	0.5096	0.5579	0.4392	0.4997	0.7579
84	0.6899	0.7738	0.7969	0.8934	0.6905	0.6515	0.5609	0.6069	0.4904	0.5391	0.7868
85	0.7267	0.8085	0.8355	0.9163	0.7332	0.6897	0.5888	0.6485	0.5364	0.5916	0.8220
86	0.7638	0.8379	0.8625	0.9354	0.7735	0.7323	0.6307	0.6920	0.5827	0.6364	0.8485
87	0.8018	0.8605	0.8839	0.9487	0.8168	0.7724	0.6929	0.7394	0.6266	0.6878	0.8806
88	0.8341	0.8809	0.9103	0.9615	0.8452	0.8041	0.7259	0.7816	0.6805	0.7330	0.8989
89	0.8627	0.9094	0.9339	0.9736	0.8816	0.8372	0.7672	0.8166	0.7318	0.7676	0.9247
90	0.8882	0.9263	0.9508	0.9813	0.9126	0.8591	0.8438	0.8449	0.7635	0.8069	0.9432
91	0.9090	0.9432	0.9661	0.9836	0.9304	0.8818	0.8629	0.8692	0.8011	0.8422	0.9576
92	0.9285	0.9547	0.9762	0.9900	0.9472	0.9096	0.8969	0.8972	0.8345	0.8708	0.9685
93	0.9463	0.9651	0.9843	0.9930	0.9617	0.9278	0.9128	0.9232	0.8710	0.8972	0.9744
94	0.9597	0.9775	0.9910	0.9948	0.9714	0.9431	0.9442	0.9384	0.8923	0.9220	0.9807
95	0.9689	0.9900	0.9936	0.9955	0.9798	0.9547	0.9442	0.9556	0.9152	0.9453	0.9876
96	0.9784	0.9943	0.9953	0.9981	0.9868	0.9664	0.9657	0.9669	0.9330	0.9552	0.9917
97	0.9843	0.9964	0.9966	0.9985	0.9899	0.9737	0.9817	0.9750	0.9521	0.9657	0.9927
98	0.9880	0.9964	0.9980	0.9989	0.9924	0.9821	0.9937	0.9813	0.9764	0.9747	0.9952
99	0.9913	0.9964	0.9990	0.9994	0.9952	0.9880	1.0000	0.9876	0.9845	0.9820	0.9958
100+	0.9931	0.9964	1.0000	0.9994	0.9960	0.9899	1.0000	0.9899	0.9906	0.9883	0.9968

TABLE 43
Cumulative Conditional Probabilities of Death From Twelve Major Causes
Among White Females Age 65 and Older, California, 1980

							Cause of Death					
Age	IHD	Diab	Ca Digest	Ca Resp	Ca Breast	Ca Genit	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD
65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
66	0.0085	0.0232	0.0204	0.0553	0.0564	0.0359	0.0088	0.0082	0.0075	0.0029	0.0058	0.0274
67	0.0200	0.0478	0.0441	0.1072	0.0995	0.0700	0.0207	0.0188	0.0138	0.0052	0.0106	0.0679
68	0.0311	0.0714	0.0738	0.1700	0.1422	0.1119	0.0332	0.0362	0.0205	0.0095	0.0202	0.1002
69	0.0448	0.0943	0.1017	0.2265	0.1866	0.1527	0.0447	0.0427	0.0283	0.0106	0.0266	0.1371
70	0.0591	0.1171	0.1334	0.2775	0.2313	0.1984	0.0590	0.0517	0.0390	0.0146	0.0363	0.1730
71	0.0748	0.1468	0.1695	0.3341	0.2746	0.2352	0.0769	0.0633	0.0506	0.0180	0.0463	0.2171
72	0.0900	0.1858	0.1990	0.3882	0.3174	0.2756	0.0901	0.0822	0.0633	0.0243	0.0593	0.2623
73	0.1094	0.2218	0.2354	0.4469	0.3601	0.3242	0.1107	0.1038	0.0793	0.0290	0.0718	0.3082
74	0.1300	0.2592	0.2745	0.4988	0.4041	0.3579	0.1331	0.1312	0.0947	0.0392	0.0851	0.3531
75	0.1551	0.2981	0.3086	0.5503	0.4447	0.3954	0.1554	0.1539	0.1138	0.0496	0.0956	0.3913
76	0.1789	0.3378	0.3508	0.5939	0.4821	0.4395	0.1777	0.1772	0.1356	0.0583	0.1146	0.4273
77	0.2060	0.3678	0.3942	0.6470	0.5207	0.4885	0.2018	0.1932	0.1603	0.0759	0.1347	0.4676
78	0.2355	0.4127	0.4357	0.6866	0.5613	0.5367	0.2325	0.2067	0.1879	0.0943	0.1540	0.5061
79	0.2670	0.4486	0.4828	0.7282	0.5941	0.5741	0.2600	0.2328	0.2181	0.1124	0.1726	0.5499
80	0.2997	0.4847	0.5221	0.7535	0.6279	0.6084	0.2897	0.2683	0.2502	0.1377	0.1981	0.5950
81	0.3378	0.5353	0.5672	0.7826	0.6694	0.6500	0.3297	0.3228	0.2887	0.1628	0.2330	0.6331
82	0.3751	0.5715	0.6088	0.8104	0.6993	0.6830	0.3685	0.3637	0.3280	0.1962	0.2625	0.6727
83	0.4202	0.6147	0.6497	0.8378	0.7190	0.7181	0.4046	0.4228	0.3753	0.2301	0.3029	0.7134
84	0.4614	0.6486	0.6870	0.8636	0.7510	0.7570	0.4432	0.4650	0.4184	0.2655	0.3380	0.7487
85	0.5062	0.6861	0.7205	0.8832	0.7873	0.7901	0.4880	0.5104	0.4693	0.3044	0.3891	0.7834
86	0.5536	0.7443	0.7623	0.9011	0.8125	0.8211	0.5307	0.5476	0.5185	0.3514	0.4328	0.8184
87	0.6007	0.7709	0.8026	0.9183	0.8388	0.8555	0.5724	0.5928	0.5676	0.4009	0.4851	0.8475
88	0.6441	0.8052	0.8361	0.9314	0.8573	0.8768	0.6184	0.6557	0.6161	0.4458	0.5382	0.8751
89	0.6897	0.8402	0.8628	0.9497	0.8817	0.8999	0.6655	0.7131	0.6662	0.4989	0.5872	0.8969
90	0.7307	0.8690	0.8833	0.9590	0.9029	0.9171	0.7058	0.7598	0.7143	0.5549	0.6369	0.9127
91	0.7725	0.8859	0.9042	0.9686	0.9146	0.9339	0.7489	0.8084	0.7557	0.6069	0.6900	0.9284
92	0.8128	0.9038	0.9250	0.9762	0.9295	0.9492	0.7915	0.8230	0.7947	0.6525	0.7345	0.9432
93	0.8478	0.9292	0.9440	0.9818	0.9431	0.9608	0.8261	0.8670	0.8346	0.7095	0.7822	0.9540
94	0.8807	0.9418	0.9561	0.9885	0.9554	0.9703	0.8586	0.8920	0.8711	0.7579	0.8191	0.9615
95	0.9066	0.9574	0.9655	0.9924	0.9667	0.9770	0.8861	0.9087	0.9016	0.8033	0.8526	0.9681
96	0.9274	0.9721	0.9739	0.9934	0.9736	0.9840	0.9109	0.9260	0.9259	0.8544	0.8858	0.9789
97	0.9452	0.9823	0.9857	0.9976	0.9828	0.9913	0.9331	0.9442	0.9433	0.8877	0.9126	0.9850
98	0.9580	0.9861	0.9932	0.9988	0.9896	0.9929	0.9468	0.9592	0.9572	0.9037	0.9280	0.9884
99	0.9690	0.9945	0.9968	0.9988	0.9921	0.9965	0.9582	0.9760	0.9650	0.9237	0.9385	0.9922
100+	0.9759	0.9965	0.9980	1.0000	0.9958	1.0000	0.9692	0.9814	0.9756	0.9352	0.9500	0.9958

TABLE 44
Conditional Probabilities of Death From All Causes and From Nine Major Causes
Among White Males Age 65 and Older, California, 1980

					Cause of Death					
Age	All Causes	IHD	Diab	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD	All Cancer
65	0.02715	0.00826	0.00023	0.00239	0.00004	0.00124	0.00013	0.00041	0.00146	0.00835
66	0.02973	0.00947	0.00045	0.00251	0.00000	0.00132	0.00014	0.00047	0.00157	0.00795
67	0.03178	0.00960	0.00034	0.00267	0.00006	0.00162	0.00027	0.00049	0.00165	0.00893
68	0.03348	0.00987	0.00039	0.00281	0.00009	0.00171	0.00024	0.00060	0.00185	0.00995
69	0.03854	0.01117	0.00036	0.00306	0.00015	0.00246	0.00032	0.00084	0.00261	0.01098
70	0.04224	0.01245	0.00051	0.00356	0.00013	0.00251	0.00031	0.00076	0.00283	0.01160
71	0.04281	0.01371	0.00076	0.00274	0.00010	0.00252	0.00031	0.00107	0.00278	0.01128
72	0.04909	0.01498	0.00087	0.00388	0.00004	0.00368	0.00035	0.00110	0.00271	0.01339
73	0.05310	0.01689	0.00084	0.00379	0.00014	0.00397	0.00059	0.00152	0.00324	0.01363
74	0.05483	0.01702	0.00081	0.00412	0.00017	0.00435	0.00054	0.00133	0.00322	0.01387
75	0.06141	0.01880	0.00080	0.00433	0.00032	0.00497	0.00051	0.00190	0.00376	0.01575
76	0.06962	0.02223	0.00084	0.00500	0.00014	0.00584	0.00090	0.00197	0.00408	0.01737
77	0.07199	0.02303	0.00093	0.00521	0.00032	0.00652	0.00077	0.00253	0.00499	0.01676
78	0.07648	0.02347	0.00095	0.00655	0.00029	0.00720	0.00113	0.00240	0.00451	0.01641
79	0.08292	0.02580	0.00113	0.00693	0.00033	0.00825	0.00128	0.00325	0.00547	0.01628
80	0.09143	0.02914	0.00122	0.00791	0.00083	0.00830	0.00179	0.00358	0.00446	0.01830
81	0.09865	0.03225	0.00091	0.00826	0.00050	0.01043	0.00227	0.00443	0.00630	0.01894
82	0.11046	0.03733	0.00096	0.00840	0.00040	0.01413	0.00221	0.00579	0.00550	0.01849
83	0.11459	0.03675	0.00102	0.01126	0.00070	0.01399	0.00273	0.00464	0.00458	0.02111
84	0.12496	0.04018	0.00136	0.01128	0.00043	0.01342	0.00278	0.00699	0.00628	0.02455
85	0.13851	0.04633	0.00131	0.01435	0.00074	0.01607	0.00320	0.00681	0.00541	0.02140
86	0.15820	0.05501	0.00117	0.01570	0.00127	0.02029	0.00351	0.00907	0.00761	0.02243
87	0.16279	0.05548	0.00126	0.01473	0.00080	0.02146	0.00514	0.00947	0.00514	0.02500
88	0.17907	0.05874	0.00209	0.01839	0.00120	0.02123	0.00583	0.00867	0.00867	0.02720
89	0.18114	0.06387	0.00152	0.01487	0.00270	0.02095	0.00439	0.01200	0.00760	0.02602
90	0.18421	0.06366	0.00185	0.01869	0.00082	0.02197	0.00637	0.01314	0.00719	0.02095
91	0.22211	0.07284	0.00154	0.02821	0.00180	0.03103	0.00692	0.01308	0.00667	0.02565
92	0.23445	0.08594	0.00180	0.02373	0.00108	0.03704	0.00971	0.01546	0.00467	0.02481
93	0.23707	0.08397	0.00278	0.02598	0.00278	0.02830	0.00742	0.01902	0.00650	0.02041
94	0.24168	0.07583	0.00370	0.02589	0.00000	0.04192	0.01048	0.02343	0.00925	0.01665
95	0.28994	0.10431	0.00164	0.03450	0.00329	0.03614	0.01068	0.01314	0.00739	0.02053
96	0.25564	0.08907	0.00116	0.03008	0.00347	0.03702	0.01619	0.01966	0.00231	0.01157
97	0.27036	0.07799	0.00000	0.04679	0.00347	0.03813	0.02773	0.02253	0.00867	0.01560
98	0.29287	0.09262	0.00000	0.04506	0.00250	0.05257	0.01252	0.02503	0.00250	0.02003
99	0.25554	0.07155	0.00000	0.02044	0.00000	0.02726	0.01363	0.03066	0.00681	0.02385
100+	1.00000	0.36806	0.00694	0.14583	0.00000	0.15972	0.02778	0.07639	0.02778	0.04167

TABLE 45

Conditional Probabilities of Death From All Causes and From Nine Major Causes
Among White Females Age 65 and Older, California, 1980

					Cause of Death					
Age	All Causes	IHD	Diab	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD	All Cancer
65	0.01463	0.00267	0.00034	0.00086	0.00005	0.00112	0.00009	0.00024	0.00067	0.00583
66	0.01652	0.00368	0.00037	0.00118	0.00006	0.00096	0.00007	0.00020	0.00101	0.00554
67	0.01736	0.00362	0.00036	0.00125	0.00010	0.00104	0.00014	0.00041	0.00082	0.00624
68	0.01813	0.00452	0.00036	0.00118	0.00004	0.00123	0.00004	0.00028	0.00095	0.00615
69	0.01977	0.00482	0.00036	0.00149	0.00005	0.00170	0.00013	0.00043	0.00095	0.00631
70	0.02278	0.00540	0.00048	0.00190	0.00007	0.00190	0.00011	0.00045	0.00118	0.00705
71	0.02359	0.00534	0.00064	0.00143	0.00012	0.00213	0.00022	0.00060	0.00124	0.00709
72	0.02753	0.00702	0.00061	0.00229	0.00014	0.00274	0.00017	0.00059	0.00129	0.00801
73	0.02944	0.00762	0.00065	0.00257	0.00018	0.00271	0.00037	0.00065	0.00130	0.00801
74	0.03233	0.00957	0.00070	0.00263	0.00015	0.00346	0.00039	0.00053	0.00114	0.00772
75	0.03382	0.00938	0.00073	0.00272	0.00016	0.00410	0.00034	0.00098	0.00111	0.00829
76	0.03821	0.01107	0.00057	0.00305	0.00011	0.00481	0.00071	0.00107	0.00128	0.00929
77	0.04238	0.01252	0.00089	0.00402	0.00010	0.00558	0.00077	0.00108	0.00128	0.00905
78	0.04506	0.01399	0.00075	0.00378	0.00020	0.00638	0.00079	0.00109	0.00151	0.00882
79	0.04850	0.01517	0.00079	0.00426	0.00029	0.00710	0.00116	0.00155	0.00163	0.00805
80	0.05900	0.01857	0.00116	0.00603	0.00047	0.00893	0.00121	0.00224	0.00145	0.01006
81	0.06189	0.01936	0.00088	0.00622	0.00037	0.00969	0.00171	0.00200	0.00160	0.00964
82	0.07303	0.02494	0.00112	0.00617	0.00057	0.01245	0.00184	0.00293	0.00175	0.00985
83	0.07457	0.02455	0.00095	0.00711	0.00044	0.01223	0.00209	0.00275	0.00164	0.01065
84	0.08690	0.02886	0.00113	0.00891	0.00051	0.01563	0.00247	0.00432	0.00175	0.01035
85	0.09776	0.03341	0.00192	0.00931	0.00046	0.01651	0.00327	0.00404	0.00192	0.01224
86	0.10909	0.03684	0.00098	0.01008	0.00062	0.01829	0.00382	0.00537	0.00178	0.01274
87	0.11572	0.03812	0.00141	0.01248	0.00097	0.02025	0.00388	0.00612	0.00189	0.01180
88	0.13279	0.04522	0.00163	0.01447	0.00100	0.02368	0.00520	0.00639	0.00169	0.01290
89	0.13403	0.04687	0.00155	0.01426	0.00094	0.02623	0.00632	0.00746	0.00141	0.01110
90	0.15325	0.05533	0.00105	0.01758	0.00113	0.02605	0.00678	0.00920	0.00161	0.01113
91	0.17009	0.06292	0.00130	0.02057	0.00040	0.02900	0.00702	0.00913	0.00181	0.01315
92	0.18874	0.06582	0.00225	0.02009	0.00145	0.03569	0.01057	0.01176	0.00159	0.01361
93	0.20562	0.07609	0.00136	0.02332	0.00102	0.04034	0.01106	0.01123	0.00136	0.01311
94	0.21014	0.07575	0.00214	0.02482	0.00086	0.04237	0.01305	0.01284	0.00150	0.01198
95	0.23327	0.07681	0.00254	0.02824	0.00113	0.04264	0.01864	0.01610	0.00311	0.01214
96	0.24586	0.08555	0.00231	0.03314	0.00154	0.04008	0.01580	0.01696	0.00231	0.02042
97	0.22160	0.08191	0.00112	0.02693	0.00168	0.04208	0.01010	0.01290	0.00168	0.01459
98	0.22869	0.09051	0.00323	0.02909	0.00242	0.03071	0.01616	0.01131	0.00242	0.01212
99	0.24459	0.07348	0.00101	0.03624	0.00101	0.05335	0.01208	0.01610	0.00302	0.01007
100+	1.00000	0.33949	0.00231	0.13395	0.00462	0.16397	0.09007	0.09238	0.00462	0.02540

TABLE 46
Cumulative Conditional Probabilities of Death From Nine Major Causes
Among White Males Age 65 and Older, California, 1980

			Cause of Death						
Age	IHD	Diab	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD	All Cancer
65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
66	0.0258	0.0198	0.0276	0.0089	0.0131	0.0075	0.0106	0.0278	0.0398
67	0.0546	0.0583	0.0558	0.0089	0.0267	0.0153	0.0223	0.0570	0.0767
68	0.0829	0.0867	0.0849	0.0214	0.0428	0.0297	0.0342	0.0867	0.1169
69	0.1110	0.1181	0.1146	0.0405	0.0593	0.0418	0.0482	0.1191	0.1602
70	0.1419	0.1457	0.1458	0.0706	0.0823	0.0580	0.0672	0.1631	0.2065
71	0.1749	0.1834	0.1807	0.0945	0.1048	0.0728	0.0837	0.2090	0.2534
72	0.2097	0.2371	0.2064	0.1120	0.1265	0.0871	0.1060	0.2521	0.2971
73	0.2461	0.2961	0.2414	0.1192	0.1567	0.1025	0.1278	0.2924	0.3468
74	0.2852	0.3503	0.2737	0.1415	0.1877	0.1271	0.1567	0.3382	0.3949
75	0.3224	0.3999	0.3071	0.1682	0.2199	0.1485	0.1805	0.3812	0.4413
76	0.3613	0.4462	0.3402	0.2153	0.2547	0.1675	0.2127	0.4289	0.4910
77	0.4045	0.4917	0.3762	0.2352	0.2930	0.1989	0.2440	0.4772	0.5425
78	0.4461	0.5385	0.4110	0.2762	0.3329	0.2240	0.2814	0.5323	0.5888
79	0.4855	0.5829	0.4516	0.3109	0.3738	0.2582	0.3145	0.5786	0.6308
80	0.5255	0.6318	0.4914	0.3470	0.4170	0.2939	0.3558	0.6304	0.6692
81	0.5668	0.6804	0.5329	0.4306	0.4568	0.3399	0.3975	0.6691	0.7089
82	0.6084	0.7131	0.5723	0.4768	0.5024	0.3927	0.4444	0.7188	0.7462
83	0.6519	0.7444	0.6085	0.5096	0.5579	0.4392	0.4997	0.7579	0.7791
84	0.6899	0.7738	0.6515	0.5609	0.6069	0.4904	0.5391	0.7868	0.8124
85	0.7267	0.8085	0.6897	0.5888	0.6485	0.5364	0.5916	0.8220	0.8467
86	0.7638	0.8379	0.7323	0.6307	0.6920	0.5827	0.6364	0.8485	0.8729
87	0.8018	0.8605	0.7724	0.6929	0.7394	0.6266	0.6878	0.8806	0.8966
88	0.8341	0.8809	0.8041	0.7259	0.7816	0.6805	0.7330	0.8989	0.9187
89	0.8627	0.9094	0.8372	0.7672	0.8166	0.7318	0.7676	0.9247	0.9390
90	0.8882	0.9263	0.8591	0.8438	0.8449	0.7635	0.8069	0.9432	0.9548
91	0.9090	0.9432	0.8818	0.8629	0.8692	0.8011	0.8422	0.9576	0.9653
92	0.9285	0.9547	0.9096	0.8969	0.8972	0.8345	0.8708	0.9685	0.9757
93	0.9463	0.9651	0.9278	0.9128	0.9232	0.8710	0.8972	0.9744	0.9836
94	0.9597	0.9775	0.9431	0.9442	0.9384	0.8923	0.9220	0.9807	0.9885
95	0.9689	0.9900	0.9547	0.9442	0.9556	0.9152	0.9453	0.9876	0.9916
96	0.9784	0.9943	0.9664	0.9657	0.9669	0.9330	0.9552	0.9917	0.9945
97	0.9843	0.9964	0.9737	0.9817	0.9750	0.9521	0.9657	0.9927	0.9957
98	0.9880	0.9964	0.9821	0.9937	0.9813	0.9764	0.9747	0.9952	0.9968
99	0.9913	0.9964	0.9880	1.0000	0.9876	0.9845	0.9820	0.9958	0.9979
100+	0.9931	0.9964	0.9899	1.0000	0.9899	0.9906	0.9883	0.9968	0.9988

TABLE 47
Cumulative Conditional Probabilities of Death From Nine Major Causes
Among White Females Age 65 and Older, California, 1980

				Cause of Death				
Age	IHD	Diab	All Oth Heart	Hyp	CVD	Athero	Pnx	COPD	All Cancer
65	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
66	0.0085	0.0232	0.0088	0.0082	0.0075	0.0029	0.0058	0.0274	0.0364
67	0.0200	0.0478	0.0207	0.0188	0.0138	0.0052	0.0106	0.0679	0.0705
68	0.0311	0.0714	0.0332	0.0362	0.0205	0.0095	0.0202	0.1002	0.1083
69	0.0448	0.0943	0.0447	0.0427	0.0283	0.0106	0.0266	0.1371	0.1449
70	0.0591	0.1171	0.0590	0.0517	0.0390	0.0146	0.0363	0.1730	0.1817
71	0.0748	0.1468	0.0769	0.0633	0.0506	0.0180	0.0463	0.2171	0.2221
72	0.0900	0.1858	0.0901	0.0822	0.0633	0.0243	0.0593	0.2623	0.2618
73	0.1094	0.2218	0.1107	0.1038	0.0793	0.0290	0.0718	0.3082	0.3055
74	0.1300	0.2592	0.1331	0.1312	0.0947	0.0392	0.0851	0.3531	0.3480
75	0.1551	0.2981	0.1554	0.1539	0.1138	0.0496	0.0956	0.3913	0.3879
76	0.1789	0.3378	0.1777	0.1772	0.1356	0.0583	0.1146	0.4273	0.4292
77	0.2060	0.3678	0.2018	0.1932	0.1603	0.0759	0.1347	0.4676	0.4740
78	0.2355	0.4127	0.2325	0.2067	0.1879	0.0943	0.1540	0.5061	0.5160
79	0.2670	0.4486	0.2600	0.2328	0.2181	0.1124	0.1726	0.5499	0.5552
80	0.2997	0.4847	0.2897	0.2683	0.2502	0.1377	0.1981	0.5950	0.5893
81	0.3378	0.5353	0.3297	0.3228	0.2887	0.1628	0.2330	0.6331	0.6299
82	0.3751	0.5715	0.3685	0.3637	0.3280	0.1962	0.2625	0.6727	0.6665
83	0.4202	0.6147	0.4046	0.4228	0.3753	0.2301	0.3029	0.7134	0.7016
84	0.4614	0.6486	0.4432	0.4650	0.4184	0.2655	0.3380	0.7487	0.7367
85	0.5062	0.6861	0.4880	0.5104	0.4693	0.3044	0.3891	0.7834	0.7684
86	0.5536	0.7443	0.5307	0.5476	0.5185	0.3514	0.4328	0.8184	0.8025
87	0.6007	0.7709	0.5724	0.5928	0.5676	0.4009	0.4851	0.8475	0.8346
88	0.6441	0.8052	0.6184	0.6557	0.6161	0.4458	0.5382	0.8751	0.8611
89	0.6897	0.8402	0.6655	0.7131	0.6662	0.4989	0.5872	0.8969	0.8867
90	0.7307	0.8690	0.7058	0.7598	0.7143	0.5549	0.6369	0.9127	0.9058
91	0.7725	0.8859	0.7489	0.8084	0.7557	0.6069	0.6900	0.9284	0.9223
92	0.8128	0.9038	0.7915	0.8230	0.7947	0.6525	0.7345	0.9432	0.9389
93	0.8478	0.9292	0.8261	0.8670	0.8346	0.7095	0.7822	0.9540	0.9532
94	0.8807	0.9418	0.8586	0.8920	0.8711	0.7579	0.8191	0.9615	0.9643
95	0.9066	0.9574	0.8861	0.9087	0.9016	0.8033	0.8526	0.9681	0.9724
96	0.9274	0.9721	0.9109	0.9260	0.9259	0.8544	0.8858	0.9789	0.9788
97	0.9452	0.9823	0.9331	0.9442	0.9433	0.8877	0.9126	0.9850	0.9872
98	0.9580	0.9861	0.9468	0.9592	0.9572	0.9037	0.9280	0.9884	0.9917
99	0.9690	0.9945	0.9582	0.9760	0.9650	0.9237	0.9385	0.9922	0.9946
100+	0.9759	0.9965	0.9692	0.9814	0.9756	0.9352	0.9500	0.9958	0.9965

TABLE 48

Conditional Probabilities of Death from All Ischemic Heart Disease
and from IHD with or without Diabetes, Atherosclerosis, and COPD
Among White Males Age 65 and Older, California, 1980

Age	All IHD	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
				IHD Combined			
65	0.00991	0.00086	0.00904	0.00096	0.00895	0.00113	0.00877
66	0.01111	0.00109	0.01002	0.00115	0.00996	0.00143	0.00968
67	0.01141	0.00120	0.01022	0.00110	0.01031	0.00147	0.00994
68	0.01201	0.00129	0.01073	0.00118	0.01084	0.00156	0.01046
69	0.01343	0.00152	0.01190	0.00171	0.01171	0.00178	0.01164
70	0.01529	0.00123	0.01406	0.00180	0.01349	0.00191	0.01338
71	0.01706	0.00197	0.01509	0.00203	0.01503	0.00236	0.01469
72	0.01892	0.00216	0.01676	0.00220	0.01672	0.00224	0.01668
73	0.02123	0.00224	0.01899	0.00230	0.01892	0.00288	0.01834
74	0.02155	0.00212	0.01943	0.00237	0.01918	0.00292	0.01863
75	0.02379	0.00245	0.02134	0.00253	0.02126	0.00327	0.02052
76	0.02782	0.00284	0.02499	0.00360	0.02422	0.00375	0.02407
77	0.02903	0.00216	0.02688	0.00369	0.02534	0.00402	0.02501
78	0.02978	0.00261	0.02717	0.00350	0.02628	0.00421	0.02557
79	0.03354	0.00277	0.03077	0.00427	0.02928	0.00483	0.02871
80	0.03768	0.00287	0.03481	0.00445	0.03324	0.00499	0.03270
81	0.04213	0.00311	0.03902	0.00586	0.03627	0.00664	0.03549
82	0.04960	0.00334	0.04626	0.00656	0.04304	0.00562	0.04398
83	0.04613	0.00303	0.04310	0.00672	0.03941	0.00474	0.04138
84	0.05277	0.00400	0.04877	0.00786	0.04491	0.00541	0.04736
85	0.05817	0.00334	0.05483	0.00667	0.05150	0.00667	0.05150
86	0.07178	0.00378	0.06800	0.01184	0.05994	0.00766	0.06412
87	0.07188	0.00431	0.06757	0.01078	0.06110	0.00611	0.06577
88	0.07673	0.00489	0.07183	0.01342	0.06331	0.00789	0.06883
89	0.08214	0.00392	0.07822	0.01550	0.06664	0.00695	0.07519
90	0.08449	0.00498	0.07951	0.01148	0.07301	0.00758	0.07691
91	0.09534	0.00577	0.08957	0.01676	0.07858	0.00659	0.08875
92	0.11299	0.00500	0.10799	0.02114	0.09185	0.00692	0.10607
93	0.10992	0.00398	0.10594	0.01990	0.09003	0.00746	0.10246
94	0.10938	0.00530	0.10408	0.02453	0.08485	0.00994	0.09944
95	0.13441	0.00717	0.12724	0.02688	0.10753	0.00986	0.12455
96	0.11735	0.00250	0.11486	0.02122	0.09613	0.00999	0.10737
97	0.10446	0.00380	0.10066	0.03039	0.07407	0.00570	0.09877
98	0.12894	0.00549	0.12346	0.03841	0.09053	0.00274	0.12620
99	0.10019	0.00371	0.09647	0.01855	0.08163	0.00371	0.09647
100+	1.00000	0.01667	0.98333	0.23333	0.76667	0.06667	0.93333

TABLE 49
Conditional Probabilities of Death from All Ischemic Heart Disease
and from IHD with or without Diabetes, Atherosclerosis, and COPD
Among White Females Age 65 and Older, California, 1980

Age	All IHD	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
65	0.00336	0.00052	0.00285	0.00039	0.00297	0.00029	0.00308
66	0.00437	0.00079	0.00358	0.00053	0.00385	0.00049	0.00388
67	0.00445	0.00089	0.00357	0.00054	0.00392	0.00039	0.00407
68	0.00562	0.00088	0.00474	0.00068	0.00495	0.00064	0.00498
69	0.00587	0.00099	0.00488	0.00074	0.00513	0.00047	0.00540
70	0.00685	0.00138	0.00547	0.00088	0.00597	0.00068	0.00616
71	0.00684	0.00139	0.00545	0.00074	0.00610	0.00056	0.00628
72	0.00888	0.00148	0.00739	0.00139	0.00748	0.00067	0.00820
73	0.00989	0.00156	0.00833	0.00130	0.00859	0.00077	0.00912
74	0.01156	0.00168	0.00988	0.00153	0.01003	0.00086	0.01070
75	0.01155	0.00181	0.00974	0.00130	0.01025	0.00112	0.01043
76	0.01367	0.00171	0.01196	0.00186	0.01181	0.00120	0.01247
77	0.01553	0.00199	0.01353	0.00191	0.01361	0.00117	0.01435
78	0.01733	0.00232	0.01502	0.00216	0.01518	0.00122	0.01612
79	0.01847	0.00235	0.01611	0.00275	0.01572	0.00103	0.01744
80	0.02257	0.00286	0.01972	0.00323	0.01934	0.00143	0.02115
81	0.02474	0.00231	0.02242	0.00373	0.02101	0.00128	0.02346
82	0.03159	0.00290	0.02868	0.00457	0.02702	0.00182	0.02977
83	0.03022	0.00249	0.02773	0.00485	0.02537	0.00175	0.02848
84	0.03676	0.00369	0.03307	0.00616	0.03061	0.00211	0.03465
85	0.04234	0.00448	0.03787	0.00784	0.03450	0.00218	0.04016
86	0.04627	0.00321	0.04306	0.00835	0.03792	0.00211	0.04416
87	0.04985	0.00322	0.04664	0.00869	0.04116	0.00221	0.04764
88	0.05855	0.00410	0.05445	0.01003	0.04852	0.00221	0.05634
89	0.05952	0.00357	0.05595	0.01203	0.04749	0.00189	0.05763
90	0.06679	0.00329	0.06349	0.01148	0.05530	0.00296	0.06383
91	0.07799	0.00285	0.07515	0.01634	0.06166	0.00327	0.07473
92	0.08643	0.00419	0.08225	0.01620	0.07024	0.00251	0.08392
93	0.09470	0.00542	0.08928	0.01880	0.07591	0.00325	0.09145
94	0.09650	0.00410	0.09240	0.01957	0.07692	0.00387	0.09263
95	0.10194	0.00516	0.09678	0.02245	0.07949	0.00273	0.09921
96	0.10963	0.00332	0.10631	0.02824	0.08140	0.00208	0.10756
97	0.10859	0.00358	0.10501	0.02924	0.07936	0.00358	0.10501
98	0.11522	0.00688	0.10834	0.02150	0.09372	0.00344	0.11178
99	0.10435	0.00326	0.10109	0.01848	0.08587	0.00326	0.10109
100+	1.00000	0.00585	0.99415	0.22807	0.77193	0.02339	0.97661

TABLE 50

Conditional Probabilities of Death from All Other Heart Disease
and from All Other Heart Disease with or without Diabetes, Atherosclerosis, and COPD
Among White Males Age 65 and Older, California, 1980

| Age | All Other Heart Dease Combined | | | | | | |
	All OthHt	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
65	0.01143	0.00086	0.01057	0.00067	0.01076	0.00171	0.00972
66	0.01297	0.00093	0.01204	0.00071	0.01225	0.00206	0.01091
67	0.01334	0.00124	0.01210	0.00086	0.01248	0.00198	0.01136
68	0.01345	0.00103	0.01242	0.00086	0.01259	0.00206	0.01138
69	0.01614	0.00142	0.01472	0.00135	0.01479	0.00290	0.01323
70	0.01832	0.00129	0.01703	0.00173	0.01659	0.00320	0.01512
71	0.01799	0.00161	0.01638	0.00134	0.01665	0.00338	0.01461
72	0.02098	0.00189	0.01909	0.00140	0.01958	0.00331	0.01767
73	0.02296	0.00173	0.02123	0.00163	0.02132	0.00366	0.01930
74	0.02276	0.00170	0.02106	0.00190	0.02087	0.00389	0.01887
75	0.02639	0.00236	0.02403	0.00193	0.02446	0.00481	0.02158
76	0.02937	0.00210	0.02727	0.00298	0.02638	0.00454	0.02482
77	0.03158	0.00202	0.02955	0.00300	0.02857	0.00470	0.02687
78	0.03578	0.00290	0.03288	0.00338	0.03240	0.00624	0.02954
79	0.03839	0.00276	0.03563	0.00422	0.03417	0.00627	0.03212
80	0.04352	0.00336	0.04017	0.00403	0.03949	0.00591	0.03761
81	0.04664	0.00280	0.04384	0.00533	0.04131	0.00771	0.03893
82	0.05160	0.00252	0.04908	0.00585	0.04575	0.00743	0.04417
83	0.05606	0.00341	0.05265	0.00649	0.04957	0.00662	0.04943
84	0.06110	0.00413	0.05697	0.00657	0.05453	0.00797	0.05313
85	0.07161	0.00476	0.06686	0.00756	0.06405	0.00926	0.06235
86	0.07992	0.00346	0.07646	0.01078	0.06914	0.00946	0.07046
87	0.08336	0.00333	0.08003	0.00893	0.07443	0.00762	0.07574
88	0.08925	0.00486	0.08439	0.01208	0.07717	0.01004	0.07921
89	0.08793	0.00426	0.08367	0.01350	0.07443	0.00711	0.08082
90	0.09727	0.00516	0.09210	0.01356	0.08371	0.00925	0.08801
91	0.12243	0.00596	0.11647	0.01354	0.10888	0.01219	0.11024
92	0.12093	0.00574	0.11519	0.01722	0.10371	0.00804	0.11290
93	0.12438	0.00444	0.11994	0.01481	0.10958	0.00938	0.11500
94	0.11687	0.00594	0.11093	0.01717	0.09970	0.00726	0.10961
95	0.16645	0.00705	0.15940	0.02994	0.13650	0.01233	0.15412
96	0.13827	0.00247	0.13580	0.02346	0.11481	0.00741	0.13086
97	0.15867	0.00554	0.15314	0.03506	0.12362	0.01107	0.14760
98	0.14422	0.00816	0.13605	0.02993	0.11429	0.00816	0.13605
99	0.12110	0.00000	0.12110	0.00734	0.11376	0.00734	0.11376
100+	1.00000	0.04348	0.95652	0.17391	0.82609	0.07246	0.92754

TABLE 51
Conditional Probabilities of Death from All Other Heart Disease
and from All Other Heart Disease with or without Diabetes, Atherosclerosis, and COPD
Among White Females Age 65 and Older, California, 1980

Age	All OthHt	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
				All Other Heart Disease Combined			
65	0.00476	0.00068	0.00408	0.00033	0.00443	0.00071	0.00405
66	0.00601	0.00079	0.00522	0.00032	0.00569	0.00091	0.00510
67	0.00602	0.00086	0.00516	0.00035	0.00567	0.00082	0.00520
68	0.00648	0.00066	0.00581	0.00026	0.00622	0.00092	0.00556
69	0.00794	0.00098	0.00696	0.00059	0.00735	0.00098	0.00696
70	0.00897	0.00119	0.00778	0.00060	0.00837	0.00105	0.00792
71	0.00913	0.00113	0.00800	0.00072	0.00841	0.00119	0.00794
72	0.01137	0.00135	0.01003	0.00098	0.01039	0.00133	0.01004
73	0.01245	0.00139	0.01106	0.00121	0.01124	0.00108	0.01137
74	0.01445	0.00166	0.01279	0.00128	0.01317	0.00146	0.01300
75	0.01455	0.00166	0.01289	0.00119	0.01336	0.00163	0.01293
76	0.01640	0.00155	0.01485	0.00161	0.01479	0.00190	0.01450
77	0.01929	0.00168	0.01761	0.00189	0.01741	0.00160	0.01769
78	0.01981	0.00224	0.01756	0.00172	0.01809	0.00202	0.01779
79	0.02210	0.00224	0.01986	0.00256	0.01954	0.00189	0.02022
80	0.02798	0.00255	0.02544	0.00297	0.02501	0.00202	0.02596
81	0.02884	0.00217	0.02667	0.00329	0.02555	0.00187	0.02696
82	0.03529	0.00271	0.03258	0.00441	0.03088	0.00210	0.03319
83	0.03578	0.00245	0.03333	0.00461	0.03117	0.00242	0.03336
84	0.04320	0.00403	0.03917	0.00582	0.03738	0.00245	0.04074
85	0.04837	0.00434	0.04403	0.00734	0.04103	0.00280	0.04557
86	0.05519	0.00301	0.05218	0.00831	0.04688	0.00265	0.05254
87	0.05708	0.00315	0.05393	0.00886	0.04822	0.00230	0.05478
88	0.06767	0.00421	0.06346	0.01108	0.05659	0.00318	0.06450
89	0.06648	0.00383	0.06265	0.01087	0.05561	0.00293	0.06355
90	0.07879	0.00394	0.07485	0.01057	0.06822	0.00243	0.07636
91	0.08917	0.00367	0.08550	0.01498	0.07419	0.00283	0.08634
92	0.09415	0.00375	0.09040	0.01627	0.07788	0.00362	0.09054
93	0.10974	0.00484	0.10490	0.01990	0.08983	0.00287	0.10687
94	0.11068	0.00407	0.10662	0.02010	0.09058	0.00497	0.10571
95	0.12019	0.00481	0.11538	0.02344	0.09675	0.00361	0.11659
96	0.13098	0.00452	0.12646	0.02217	0.10881	0.00411	0.12687
97	0.10746	0.00060	0.10687	0.02149	0.08597	0.00597	0.10149
98	0.13367	0.00596	0.12771	0.02129	0.11239	0.00170	0.13197
99	0.10949	0.00108	0.10840	0.01843	0.09106	0.00217	0.10732
100+	1.00000	0.01402	0.98598	0.18692	0.81308	0.01402	0.98598

TABLE 52

Conditional Probabilities of Death from All Hypertension
and from Hypertension with or without Diabetes, Atherosclerosis, and COPD
Among White Males Age 65 and Older, California, 1980

Age	Hypertension Combined						
	All Hyp	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
65	0.00125	0.00027	0.00097	0.00019	0.00106	0.00007	0.00118
66	0.00122	0.00029	0.00093	0.00016	0.00106	0.00014	0.00108
67	0.00132	0.00024	0.00108	0.00023	0.00110	0.00009	0.00123
68	0.00145	0.00037	0.00109	0.00016	0.00129	0.00019	0.00126
69	0.00193	0.00037	0.00157	0.00014	0.00179	0.00019	0.00174
70	0.00180	0.00022	0.00157	0.00030	0.00150	0.00017	0.00163
71	0.00218	0.00036	0.00182	0.00024	0.00194	0.00030	0.00188
72	0.00252	0.00025	0.00226	0.00038	0.00214	0.00025	0.00226
73	0.00237	0.00044	0.00193	0.00040	0.00198	0.00026	0.00212
74	0.00232	0.00028	0.00204	0.00048	0.00184	0.00025	0.00207
75	0.00286	0.00044	0.00242	0.00050	0.00237	0.00022	.0.00264
76	0.00371	0.00051	0.00320	0.00060	0.00311	0.00030	0.00341
77	0.00351	0.00073	0.00278	0.00050	0.00301	0.00033	0.00318
78	0.00347	0.00042	0.00306	0.00098	0.00249	0.00038	0.00310
79	0.00369	0.00034	0.00334	0.00068	0.00300	0.00038	0.00331
80	0.00470	0.00055	0.00416	0.00105	0.00365	0.00027	0.00443
81	0.00439	0.00053	0.00386	0.00090	0.00349	0.00042	0.00397
82	0.00479	0.00072	0.00407	0.00096	0.00383	0.00030	0.00449
83	0.00484	0.00081	0.00404	0.00087	0.00397	0.00027	0.00458
84	0.00418	0.00046	0.00372	0.00099	0.00319	0.00046	0.00372
85	0.00694	0.00088	0.00606	0.00149	0.00544	0.00053	0.00641
86	0.00697	0.00063	0.00633	0.00158	0.00538	0.00063	0.00633
87	0.00558	0.00074	0.00483	0.00136	0.00421	0.00025	0.00533
88	0.00622	0.00065	0.00556	0.00213	0.00409	0.00000	0.00622
89	0.00740	0.00056	0.00685	0.00296	0.00444	0.00056	0.00685
90	0.00631	0.00068	0.00564	0.00113	0.00519	0.00068	0.00564
91	0.00805	0.00144	0.00661	0.00144	0.00661	0.00057	0.00747
92	0.00811	0.00000	0.00811	0.00284	0.00527	0.00000	0.00811
93	0.00943	0.00105	0.00838	0.00262	0.00681	0.00000	0.00943
94	0.00768	0.00070	0.00699	0.00140	0.00629	0.00000	0.00768
95	0.00766	0.00096	0.00670	0.00096	0.00670	0.00000	0.00766
96	0.01187	0.00000	0.01187	0.00527	0.00659	0.00000	0.01187
97	0.00997	0.00000	0.00997	0.00399	0.00598	0.00000	0.00997
98	0.00585	0.00292	0.00292	0.00292	0.00292	0.00000	0.00585
99	0.00390	0.00390	0.00000	0.00390	0.00000	0.00000	0.00390
100+	1.00000	0.00000	1.00000	0.00000	1.00000	0.25000	0.75000

TABLE 53
Conditional Probabilities of Death from All Hypertension
and from Hypertension with or without Diabetes, Atherosclerosis, and COPD
Among White Females Age 65 and Older, California, 1980

Age	All Hyp	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
65	0.00077	0.00015	0.00062	0.00009	0.00068	0.00008	0.00069
66	0.00084	0.00020	0.00064	0.00013	0.00071	0.00007	0.00077
67	0.00112	0.00029	0.00084	0.00019	0.00094	0.00006	0.00106
68	0.00100	0.00018	0.00082	0.00020	0.00079	0.00008	0.00092
69	0.00109	0.00028	0.00081	0.00015	0.00094	0.00009	0.00099
70	0.00117	0.00031	0.00085	0.00017	0.00100	0.00006	0.00111
71	0.00151	0.00038	0.00112	0.00037	0.00114	0.00004	0.00146
72	0.00171	0.00043	0.00127	0.00035	0.00135	0.00008	0.00163
73	0.00188	0.00035	0.00153	0.00033	0.00155	0.00018	0.00170
74	0.00233	0.00041	0.00191	0.00036	0.00196	0.00010	0.00222
75	0.00238	0.00062	0.00176	0.00044	0.00195	0.00016	0.00222
76	0.00250	0.00029	0.00220	0.00045	0.00205	0.00016	0.00234
77	0.00279	0.00062	0.00217	0.00035	0.00244	0.00019	0.00261
78	0.00309	0.00065	0.00245	0.00042	0.00268	0.00009	0.00300
79	0.00332	0.00064	0.00269	0.00047	0.00286	0.00013	0.00320
80	0.00468	0.00068	0.00399	0.00094	0.00374	0.00015	0.00453
81	0.00443	0.00047	0.00396	0.00058	0.00385	0.00019	0.00423
82	0.00572	0.00056	0.00516	0.00109	0.00463	0.00006	0.00566
83	0.00462	0.00049	0.00413	0.00082	0.00380	0.00016	0.00445
84	0.00572	0.00096	0.00475	0.00154	0.00418	0.00011	0.00561
85	0.00597	0.00117	0.00480	0.00129	0.00468	0.00016	0.00581
86	0.00613	0.00051	0.00562	0.00168	0.00445	0.00019	0.00594
87	0.00658	0.00087	0.00570	0.00159	0.00498	0.00010	0.00647
88	0.00809	0.00074	0.00735	0.00221	0.00588	0.00007	0.00802
89	0.00783	0.00093	0.00689	0.00187	0.00596	0.00014	0.00768
90	0.00766	0.00070	0.00696	0.00157	0.00609	0.00035	0.00731
91	0.00819	0.00076	0.00743	0.00208	0.00612	0.00000	0.00819
92	0.00843	0.00029	0.00814	0.00233	0.00610	0.00000	0.00843
93	0.01076	0.00113	0.00962	0.00245	0.00830	0.00000	0.01076
94	0.00833	0.00048	0.00786	0.00262	0.00571	0.00024	0.00810
95	0.01018	0.00223	0.00795	0.00286	0.00732	0.00064	0.00954
96	0.00918	0.00000	0.00918	0.00131	0.00787	0.00000	0.00918
97	0.01192	0.00063	0.01129	0.00251	0.00941	0.00063	0.01129
98	0.00908	0.00091	0.00817	0.00363	0.00545	0.00000	0.00908
99	0.00572	0.00000	0.00572	0.00229	0.00343	0.00000	0.00572
100+	1.00000	0.00000	1.00000	0.33333	0.66667	0.00000	1.00000

TABLE 54
Conditional Probabilities of Death from All Cerebrovascular Disease
and from CVD with or without Diabetes, Atherosclerosis, and COPD
Among White Males Age 65 and Older, California, 1980

Age	All CVD	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
				CVD Combined			
65	0.00222	0.00022	0.00200	0.00034	0.00188	0.00009	0.00212
66	0.00259	0.00032	0.00227	0.00047	0.00211	0.00016	0.00243
67	0.00324	0.00041	0.00283	0.00053	0.00271	0.00017	0.00307
68	0.00338	0.00043	0.00295	0.00062	0.00276	0.00030	0.00308
69	0.00450	0.00059	0.00391	0.00071	0.00379	0.00036	0.00414
70	0.00459	0.00039	0.00420	0.00094	0.00364	0.00037	0.00422
71	0.00511	0.00059	0.00451	0.00091	0.00420	0.00053	0.00457
72	0.00629	0.00082	0.00547	0.00116	0.00513	0.00053	0.00576
73	0.00747	0.00095	0.00652	0.00144	0.00603	0.00060	0.00687
74	0.00802	0.00070	0.00732	0.00153	0.00649	0.00075	0.00727
75	0.00924	0.00090	0.00833	0.00186	0.00738	0.00071	0.00853
76	0.01117	0.00119	0.00998	0.00223	0.00894	0.00074	0.01042
77	0.01191	0.00135	0.01055	0.00218	0.00973	0.00119	0.01072
78	0.01338	0.00165	0.01172	0.00244	0.01094	0.00079	0.01259
79	0.01526	0.00189	0.01338	0.00287	0.01239	0.00079	0.01447
80	0.01666	0.00145	0.01521	0.00268	0.01398	0.00109	0.01557
81	0.01942	0.00199	0.01743	0.00346	0.01596	0.00131	0.01811
82	0.02391	0.00208	0.02183	0.00516	0.01875	0.00166	0.02225
83	0.02465	0.00140	0.02325	0.00486	0.01979	0.00100	0.02365
84	0.02614	0.00165	0.02449	0.00578	0.02036	0.00165	0.02449
85	0.02968	0.00217	0.02751	0.00651	0.02318	0.00174	0.02795
86	0.03670	0.00177	0.03493	0.00738	0.02932	0.00166	0.03504
87	0.03827	0.00219	0.03608	0.00768	0.03059	0.00195	0.03632
88	0.03848	0.00419	0.03430	0.00998	0.02850	0.00322	0.03526
89	0.04255	0.00236	0.04019	0.00855	0.03401	0.00091	0.04164
90	0.04229	0.00221	0.04008	0.01041	0.03188	0.00288	0.03941
91	0.05363	0.00449	0.04914	0.01039	0.04324	0.00225	0.05138
92	0.06464	0.00236	0.06228	0.01774	0.04691	0.00197	0.06267
93	0.05477	0.00256	0.05221	0.01177	0.04300	0.00358	0.05119
94	0.06513	0.00271	0.06242	0.01764	0.04749	0.00068	0.06445
95	0.06865	0.00464	0.06401	0.01484	0.05380	0.00093	0.06772
96	0.05294	0.00000	0.05294	0.00387	0.04906	0.00000	0.05294
97	0.06589	0.00000	0.06589	0.02326	0.04264	0.00194	0.06395
98	0.08696	0.00281	0.08415	0.00561	0.08135	0.00000	0.08696
99	0.05693	0.00000	0.05693	0.01518	0.04175	0.00000	0.05693
100+	1.00000	0.05882	0.94118	0.20588	0.79412	0.08824	0.91176

TABLE 55
Conditional Probabilities of Death from All Cerebrovascular Disease and from CVD with or without Diabetes, Atherosclerosis, and COPD Among White Females Age 65 and Older, California, 1980

Age	All CVD	CVD Combined With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD
65	0.00176	0.00029	0.00147	0.00031	0.00145	0.00006	0.00170
66	0.00170	0.00034	0.00137	0.00032	0.00138	0.00007	0.00163
67	0.00202	0.00035	0.00167	0.00041	0.00161	0.00016	0.00186
68	0.00209	0.00027	0.00182	0.00027	0.00182	0.00010	0.00198
69	0.00294	0.00038	0.00256	0.00050	0.00244	0.00011	0.00283
70	0.00344	0.00050	0.00295	0.00053	0.00292	0.00020	0.00324
71	0.00354	0.00066	0.00288	0.00068	0.00286	0.00010	0.00344
72	0.00475	0.00066	0.00410	0.00081	0.00394	0.00034	0.00442
73	0.00490	0.00046	0.00444	0.00074	0.00416	0.00026	0.00464
74	0.00634	0.00084	0.00550	0.00110	0.00524	0.00021	0.00614
75	0.00662	0.00091	0.00572	0.00129	0.00534	0.00027	0.00635
76	0.00799	0.00078	0.00721	0.00169	0.00630	0.00047	0.00753
77	0.00916	0.00105	0.00811	0.00182	0.00734	0.00035	0.00881
78	0.00987	0.00117	0.00870	0.00191	0.00796	0.00032	0.00955
79	0.01201	0.00148	0.01054	0.00255	0.00946	0.00032	0.01170
80	0.01464	0.00186	0.01278	0.00302	0.01162	0.00033	0.01431
81	0.01642	0.00156	0.01487	0.00281	0.01361	0.00044	0.01599
82	0.02052	0.00186	0.01866	0.00428	0.01624	0.00040	0.02012
83	0.02130	0.00169	0.01961	0.00422	0.01708	0.00039	0.02091
84	0.02568	0.00209	0.02360	0.00580	0.01988	0.00060	0.02508
85	0.02722	0.00311	0.02411	0.00583	0.02139	0.00080	0.02642
86	0.03137	0.00208	0.02930	0.00647	0.02491	0.00055	0.03082
87	0.03439	0.00253	0.03186	0.00750	0.02690	0.00061	0.03379
88	0.04011	0.00302	0.03708	0.00756	0.03254	0.00046	0.03964
89	0.04378	0.00353	0.04026	0.00938	0.03441	0.00049	0.04329
90	0.04600	0.00350	0.04250	0.00905	0.03695	0.00051	0.04549
91	0.05036	0.00299	0.04736	0.01197	0.03838	0.00064	0.04971
92	0.05824	0.00227	0.05597	0.01261	0.04563	0.00128	0.05696
93	0.06569	0.00275	0.06294	0.01560	0.05009	0.00128	0.06440
94	0.06791	0.00254	0.06537	0.01294	0.05498	0.00046	0.06745
95	0.07152	0.00216	0.06936	0.01695	0.05456	0.00154	0.06998
96	0.07445	0.00338	0.07107	0.01227	0.06218	0.00127	0.07318
97	0.07529	0.00364	0.07165	0.01639	0.05889	0.00121	0.07407
98	0.05415	0.00355	0.05060	0.01332	0.04083	0.00089	0.05326
99	0.08877	0.00110	0.08767	0.01753	0.07123	0.00110	0.08767
100+	1.00000	0.01835	0.98165	0.21101	0.78899	0.01835	0.98165

TABLE 56
Conditional Probabilities of Death from All Cancer
and from Cancer with or without Diabetes, Atherosclerosis, and Chronic Obstructive Pulmonary Disease
Among White Males Age 65 and Older, California, 1980

Age	All Ca	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD	With IHD	Without IHD
					Cancer Combined				
65	0.00915	0.00026	0.00890	0.00007	0.00909	0.00073	0.00843	0.00077	0.00839
66	0.00924	0.00016	0.00908	0.00019	0.00905	0.00080	0.00844	0.00089	0.00835
67	0.01000	0.00036	0.00963	0.00014	0.00986	0.00083	0.00916	0.00098	0.00901
68	0.01135	0.00038	0.01097	0.00019	0.01116	0.00113	0.01022	0.00121	0.01014
69	0.01255	0.00045	0.01210	0.00024	0.01231	0.00111	0.01144	0.00113	0.01142
70	0.01363	0.00050	0.01313	0.00024	0.01339	0.00133	0.01230	0.00145	0.01217
71	0.01362	0.00049	0.01312	0.00026	0.01336	0.00160	0.01202	0.00166	0.01196
72	0.01586	0.00044	0.01542	0.00055	0.01532	0.00149	0.01437	0.00229	0.01357
73	0.01606	0.00042	0.01564	0.00055	0.01550	0.00164	0.01442	0.00215	0.01391
74	0.01615	0.00050	0.01565	0.00045	0.01570	0.00165	0.01450	0.00203	0.01412
75	0.01885	0.00090	0.01795	0.00065	0.01820	0.00205	0.01681	0.00243	0.01642
76	0.02119	0.00053	0.02066	0.00071	0.02048	0.00237	0.01882	0.00311	0.01808
77	0.02030	0.00076	0.01954	0.00072	0.01957	0.00233	0.01796	0.00315	0.01714
78	0.02104	0.00056	0.02048	0.00090	0.02014	0.00232	0.01872	0.00341	0.01763
79	0.02069	0.00075	0.01993	0.00075	0.01993	0.00230	0.01839	0.00373	0.01696
80	0.02379	0.00100	0.02280	0.00100	0.02280	0.00240	0.02139	0.00425	0.01954
81	0.02491	0.00105	0.02387	0.00141	0.02350	0.00272	0.02219	0.00513	0.01978
82	0.02520	0.00059	0.02461	0.00125	0.02395	0.00308	0.02212	0.00563	0.01957
83	0.02807	0.00086	0.02720	0.00180	0.02627	0.00186	0.02620	0.00525	0.02281
84	0.03250	0.00075	0.03175	0.00217	0.03033	0.00217	0.03033	0.00696	0.02554
85	0.03063	0.00113	0.02950	0.00200	0.02863	0.00295	0.02768	0.00590	0.02473
86	0.03169	0.00136	0.03033	0.00208	0.02960	0.00281	0.02887	0.00750	0.02418
87	0.03732	0.00122	0.03610	0.00280	0.03451	0.00195	0.03537	0.00878	0.02854
88	0.03959	0.00161	0.03798	0.00322	0.03637	0.00274	0.03685	0.00837	0.03122
89	0.03934	0.00091	0.03843	0.00310	0.03625	0.00273	0.03661	0.00874	0.03060
90	0.03293	0.00089	0.03204	0.00222	0.03070	0.00133	0.03159	0.00957	0.02336
91	0.04236	0.00028	0.04208	0.00480	0.03756	0.00254	0.03982	0.01101	0.03135
92	0.04382	0.00120	0.04263	0.00438	0.03944	0.00199	0.04183	0.01315	0.03068
93	0.03364	0.00000	0.03364	0.00414	0.02950	0.00259	0.03105	0.00776	0.02587
94	0.03514	0.00000	0.03514	0.00413	0.03100	0.00138	0.03376	0.01240	0.02274
95	0.03862	0.00094	0.03768	0.00659	0.03203	0.00283	0.03580	0.01130	0.02732
96	0.02100	0.00000	0.02100	0.00525	0.01575	0.00131	0.01969	0.00656	0.01444
97	0.02767	0.00000	0.02767	0.00395	0.02372	0.00198	0.02569	0.00791	0.01976
98	0.04864	0.00286	0.04578	0.01144	0.03720	0.00000	0.04864	0.01144	0.03720
99	0.04580	0.00000	0.04580	0.00763	0.03817	0.00382	0.04198	0.01527	0.03053
100+	1.00000	0.00000	1.00000	0.18182	0.81818	0.09091	0.90909	0.45455	0.54545

TABLE 57
Conditional Probabilities of Death from All Cancer and from Cancer with or without Diabetes, Atherosclerosis, and Chronic Obstructive Pulmonary Disease Among White Females Age 65 and Older, California, 1980

	Cancer Combined								
Age	All Ca	With Diab	Without Diab	With Ath	Without Ath	With COPD	Without COPD	With IHD	Without IHD
65	0.00628	0.00019	0.00608	0.00007	0.00621	0.00031	0.00597	0.00024	0.00604
66	0.00608	0.00024	0.00584	0.00004	0.00605	0.00032	0.00576	0.00025	0.00583
67	0.00678	0.00022	0.00656	0.00009	0.00669	0.00030	0.00648	0.00031	0.00647
68	0.00667	0.00011	0.00655	0.00009	0.00658	0.00031	0.00636	0.00037	0.00630
69	0.00694	0.00031	0.00663	0.00016	0.00678	0.00036	0.00658	0.00048	0.00646
70	0.00789	0.00024	0.00765	0.00013	0.00777	0.00045	0.00744	0.00062	0.00727
71	0.00803	0.00016	0.00787	0.00010	0.00793	0.00034	0.00769	0.00056	0.00747
72	0.00908	0.00032	0.00875	0.00021	0.00886	0.00049	0.00859	0.00073	0.00834
73	0.00893	0.00033	0.00860	0.00016	0.00876	0.00043	0.00850	0.00087	0.00806
74	0.00879	0.00031	0.00848	0.00019	0.00860	0.00053	0.00826	0.00072	0.00807
75	0.00953	0.00047	0.00906	0.00011	0.00942	0.00045	0.00908	0.00080	0.00874
76	0.01051	0.00043	0.01008	0.00023	0.01027	0.00062	0.00989	0.00101	0.00950
77	0.01047	0.00058	0.00990	0.00043	0.01004	0.00058	0.00990	0.00126	0.00922
78	0.01038	0.00030	0.01008	0.00028	0.01010	0.00023	0.01015	0.00133	0.00904
79	0.00981	0.00042	0.00939	0.00030	0.00952	0.00025	0.00956	0.00131	0.00850
80	0.01199	0.00065	0.01134	0.00048	0.01151	0.00040	0.01159	0.00134	0.01065
81	0.01183	0.00049	0.01134	0.00085	0.01098	0.00038	0.01145	0.00184	0.01000
82	0.01309	0.00062	0.01247	0.00103	0.01206	0.00050	0.01259	0.00215	0.01094
83	0.01359	0.00072	0.01288	0.00081	0.01278	0.00049	0.01310	0.00225	0.01134
84	0.01317	0.00053	0.01264	0.00071	0.01246	0.00032	0.01285	0.00295	0.01022
85	0.01630	0.00084	0.01545	0.00112	0.01517	0.00048	0.01581	0.00333	0.01296
86	0.01722	0.00047	0.01675	0.00107	0.01615	0.00033	0.01689	0.00321	0.01401
87	0.01600	0.00041	0.01559	0.00118	0.01483	0.00015	0.01585	0.00337	0.01263
88	0.01749	0.00100	0.01649	0.00153	0.01596	0.00020	0.01729	0.00366	0.01383
89	0.01488	0.00064	0.01424	0.00086	0.01402	0.00007	0.01481	0.00322	0.01166
90	0.01646	0.00078	0.01568	0.00156	0.01490	0.00026	0.01620	0.00407	0.01239
91	0.01836	0.00022	0.01815	0.00196	0.01641	0.00022	0.01815	0.00359	0.01478
92	0.02051	0.00101	0.01950	0.00231	0.01820	0.00029	0.02022	0.00534	0.01517
93	0.01991	0.00113	0.01878	0.00225	0.01766	0.00094	0.01897	0.00451	0.01540
94	0.01918	0.00047	0.01871	0.00213	0.01705	0.00000	0.01918	0.00497	0.01421
95	0.02057	0.00032	0.02025	0.00158	0.01898	0.00095	0.01962	0.00506	0.01550
96	0.02986	0.00087	0.02900	0.00433	0.02554	0.00000	0.02986	0.00606	0.02380
97	0.02184	0.00062	0.02122	0.00437	0.01747	0.00000	0.02184	0.00250	0.01934
98	0.02077	0.00090	0.01986	0.00090	0.01986	0.00000	0.02077	0.00451	0.01625
99	0.01818	0.00000	0.01818	0.00114	0.01705	0.00000	0.01818	0.00227	0.01591
100+	1.00000	0.00000	1.00000	0.04545	0.95455	0.00000	1.00000	0.31818	0.68182

TABLE 58

Conditional Probabilities of Death from All Atherosclerosis
and from Atherosclerosis with or without Diabetes and COPD
Among White Males Age 65 and Older, California, 1980

| Age | Atherosclerosis Combined | | | | |
	All Ath	With Diab	Without Diab	With COPD	Without COPD
65	0.00153	0.00019	0.00134	0.00011	0.00142
66	0.00191	0.00024	0.00167	0.00030	0.00161
67	0.00224	0.00026	0.00198	0.00024	0.00199
68	0.00224	0.00026	0.00198	0.00027	0.00196
69	0.00320	0.00049	0.00271	0.00047	0.00273
70	0.00341	0.00033	0.00307	0.00043	0.00298
71	0.00351	0.00046	0.00305	0.00044	0.00307
72	0.00431	0.00061	0.00370	0.00044	0.00387
73	0.00476	0.00058	0.00418	0.00063	0.00414
74	0.00521	0.00065	0.00456	0.00076	0.00446
75	0.00596	0.00055	0.00541	0.00052	0.00544
76	0.00716	0.00078	0.00639	0.00060	0.00657
77	0.00754	0.00083	0.00671	0.00093	0.00661
78	0.00814	0.00087	0.00727	0.00087	0.00727
79	0.00962	0.00102	0.00860	0.00091	0.00872
80	0.01052	0.00109	0.00943	0.00091	0.00961
81	0.01322	0.00074	0.01248	0.00184	0.01137
82	0.01466	0.00101	0.01365	0.00155	0.01311
83	0.01652	0.00140	0.01512	0.00147	0.01505
84	0.01773	0.00106	0.01667	0.00128	0.01645
85	0.01920	0.00105	0.01815	0.00209	0.01710
86	0.02623	0.00146	0.02477	0.00282	0.02341
87	0.02552	0.00123	0.02429	0.00184	0.02368
88	0.03310	0.00258	0.03052	0.00307	0.03003
89	0.03379	0.00128	0.03251	0.00256	0.03124
90	0.03052	0.00089	0.02962	0.00245	0.02807
91	0.04015	0.00170	0.03845	0.00311	0.03704
92	0.05120	0.00318	0.04803	0.00238	0.04882
93	0.04426	0.00309	0.04117	0.00206	0.04220
94	0.05788	0.00136	0.05652	0.00136	0.05652
95	0.05965	0.00280	0.05685	0.00373	0.05592
96	0.05670	0.00129	0.05541	0.00000	0.05670
97	0.08629	0.00192	0.08437	0.00000	0.08629
98	0.07616	0.00846	0.06770	0.00282	0.07334
99	0.04580	0.00382	0.04198	0.00000	0.04580
100+	1.00000	0.06452	0.93548	0.12903	0.87097

TABLE 59

Conditional Probabilities of Death from All Atherosclerosis
and from Atherosclerosis with or without Diabetes and COPD
Among White Females Age 65 and Older, California, 1980

			Atherosclerosis Combined		
Age	All Ath	With Diab	Without Diab	With COPD	Without COPD
65	0.00088	0.00014	0.00075	0.00008	0.00080
66	0.00100	0.00023	0.00077	0.00011	0.00089
67	0.00114	0.00022	0.00091	0.00006	0.00107
68	0.00111	0.00018	0.00093	0.00008	0.00104
69	0.00150	0.00016	0.00134	0.00011	0.00140
70	0.00181	0.00036	0.00145	0.00024	0.00157
71	0.00183	0.00034	0.00149	0.00010	0.00173
72	0.00258	0.00041	0.00216	0.00020	0.00238
73	0.00272	0.00040	0.00232	0.00016	0.00255
74	0.00338	0.00052	0.00286	0.00031	0.00307
75	0.00325	0.00047	0.00278	0.00031	0.00295
76	0.00460	0.00064	0.00395	0.00023	0.00436
77	0.00502	0.00062	0.00440	0.00014	0.00488
78	0.00519	0.00072	0.00448	0.00046	0.00473
79	0.00695	0.00087	0.00609	0.00032	0.00664
80	0.00810	0.00126	0.00684	0.00048	0.00762
81	0.00886	0.00088	0.00798	0.00030	0.00856
82	0.01185	0.00134	0.01051	0.00041	0.01145
83	0.01269	0.00095	0.01174	0.00049	0.01220
84	0.01543	0.00121	0.01422	0.00036	0.01508
85	0.01864	0.00200	0.01664	0.00092	0.01772
86	0.02123	0.00139	0.01983	0.00037	0.02085
87	0.02217	0.00158	0.02059	0.00071	0.02146
88	0.02583	0.00172	0.02411	0.00099	0.02483
89	0.02975	0.00227	0.02748	0.00064	0.02911
90	0.03138	0.00163	0.02975	0.00095	0.03044
91	0.03956	0.00161	0.03795	0.00108	0.03849
92	0.04647	0.00257	0.04391	0.00114	0.04533
93	0.05247	0.00203	0.05043	0.00074	0.05173
94	0.05307	0.00233	0.05074	0.00047	0.05261
95	0.06316	0.00248	0.06068	0.00093	0.06223
96	0.06586	0.00297	0.06289	0.00127	0.06458
97	0.06235	0.00122	0.06112	0.00122	0.06112
98	0.05674	0.00177	0.05496	0.00000	0.05674
99	0.05682	0.00000	0.05682	0.00111	0.05571
100+	1.00000	0.00000	1.00000	0.00000	1.00000

Figure 1
Survival (Lx) Curves
Among White Males and Females Aged 65 and Older
California, 1980

* = Mean age of death
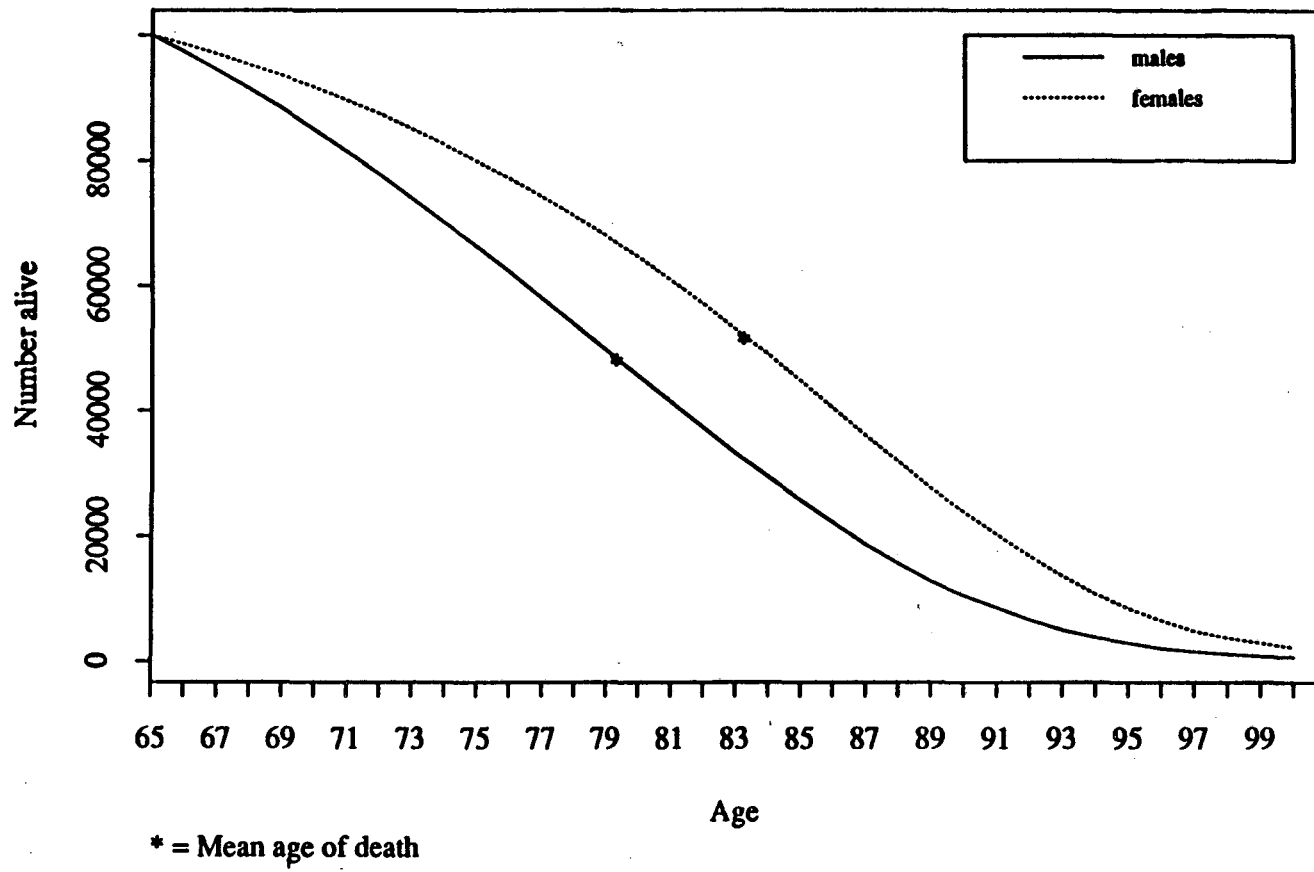
Figure 2
Hazard Functions for All Deaths
Among White Males and Females Aged 65 and Older
California, 1980
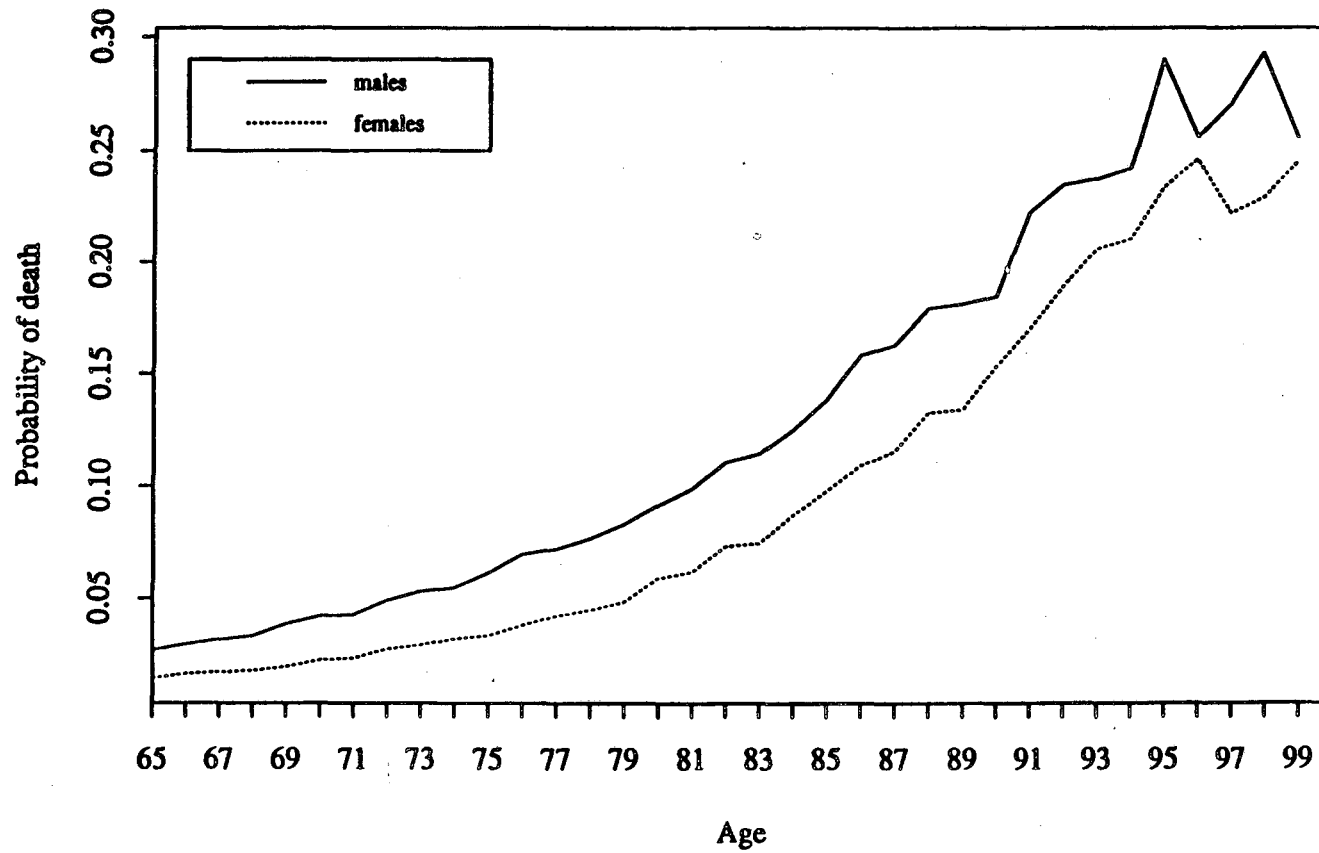
Figure 3
Hazard Functions Removing Ischemic Heart Disease
As Underlying Cause and as Any Mention
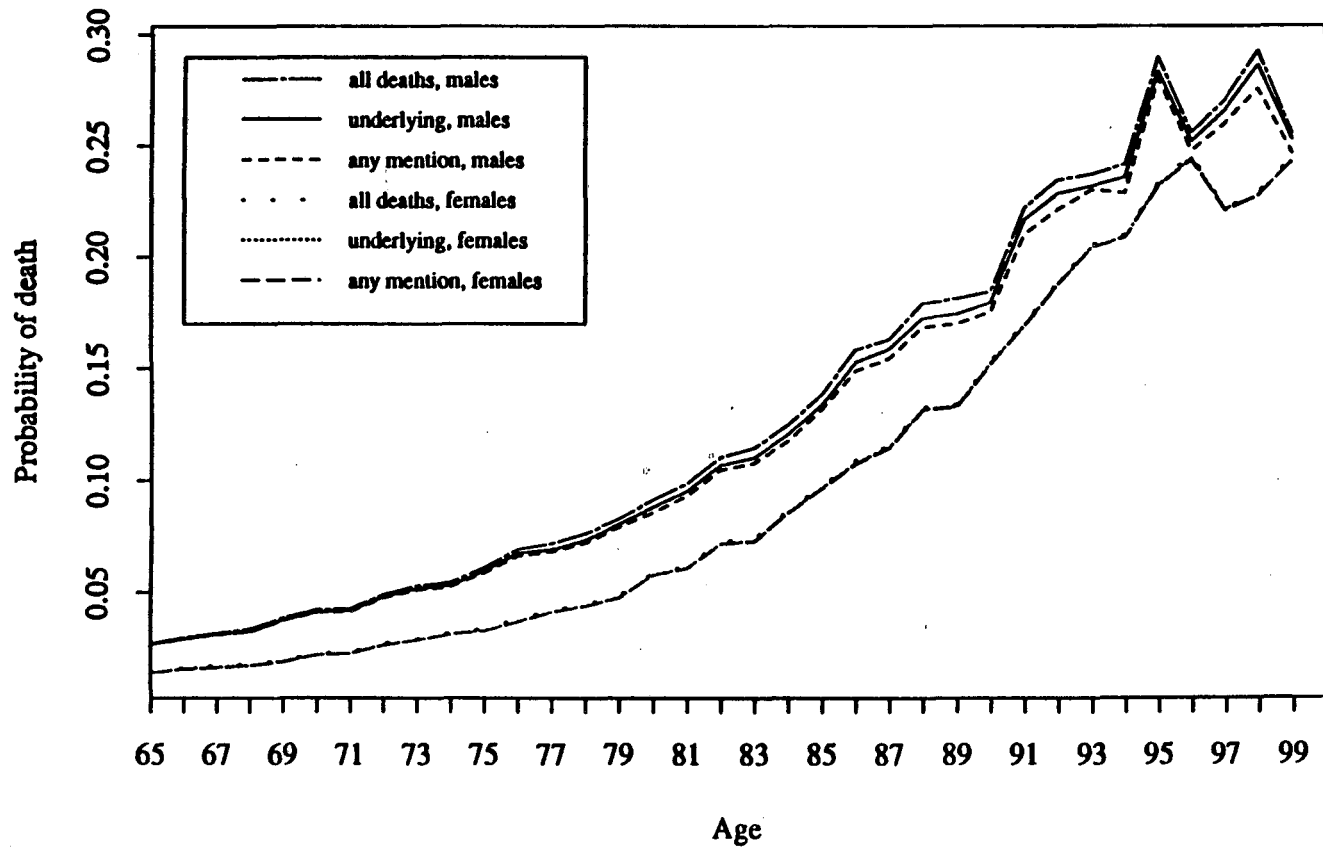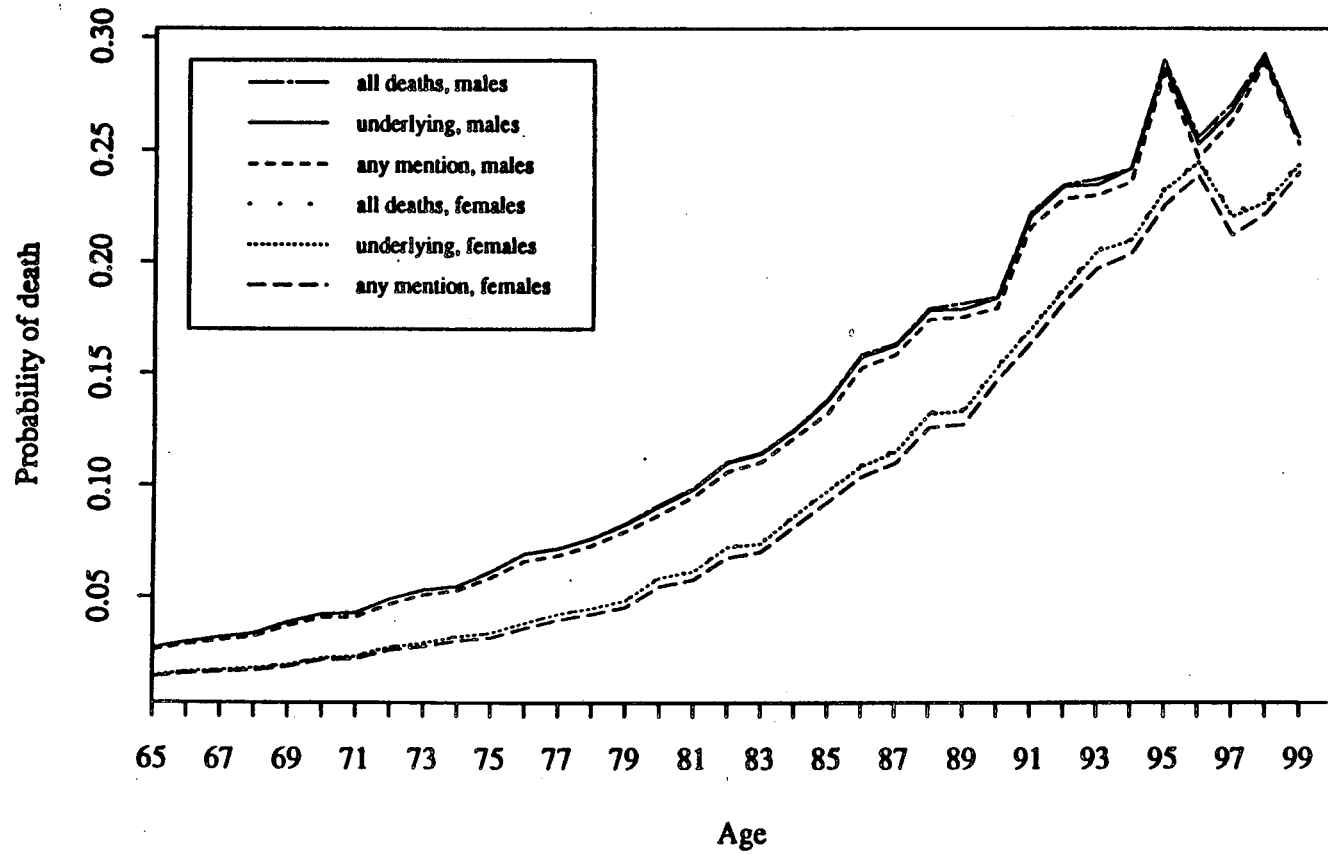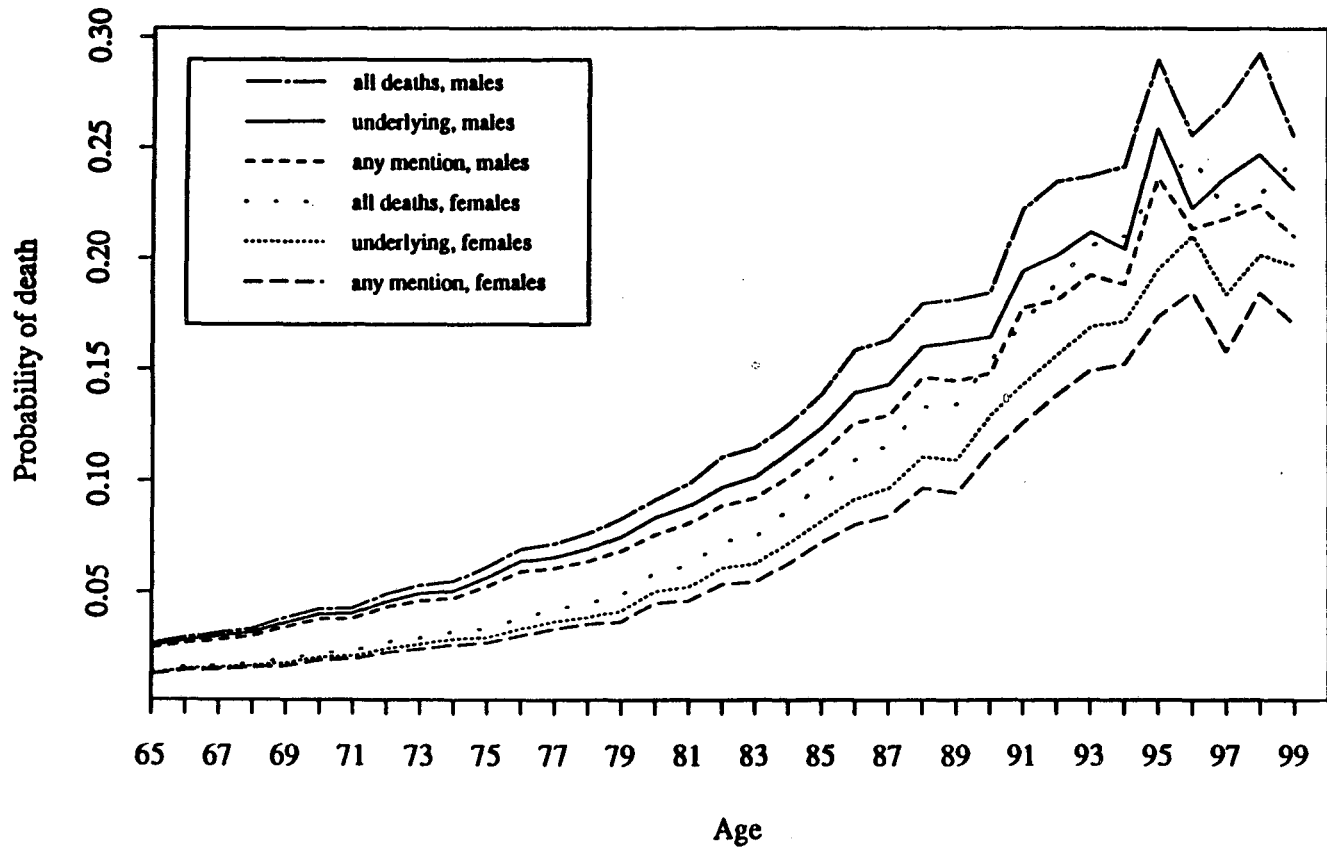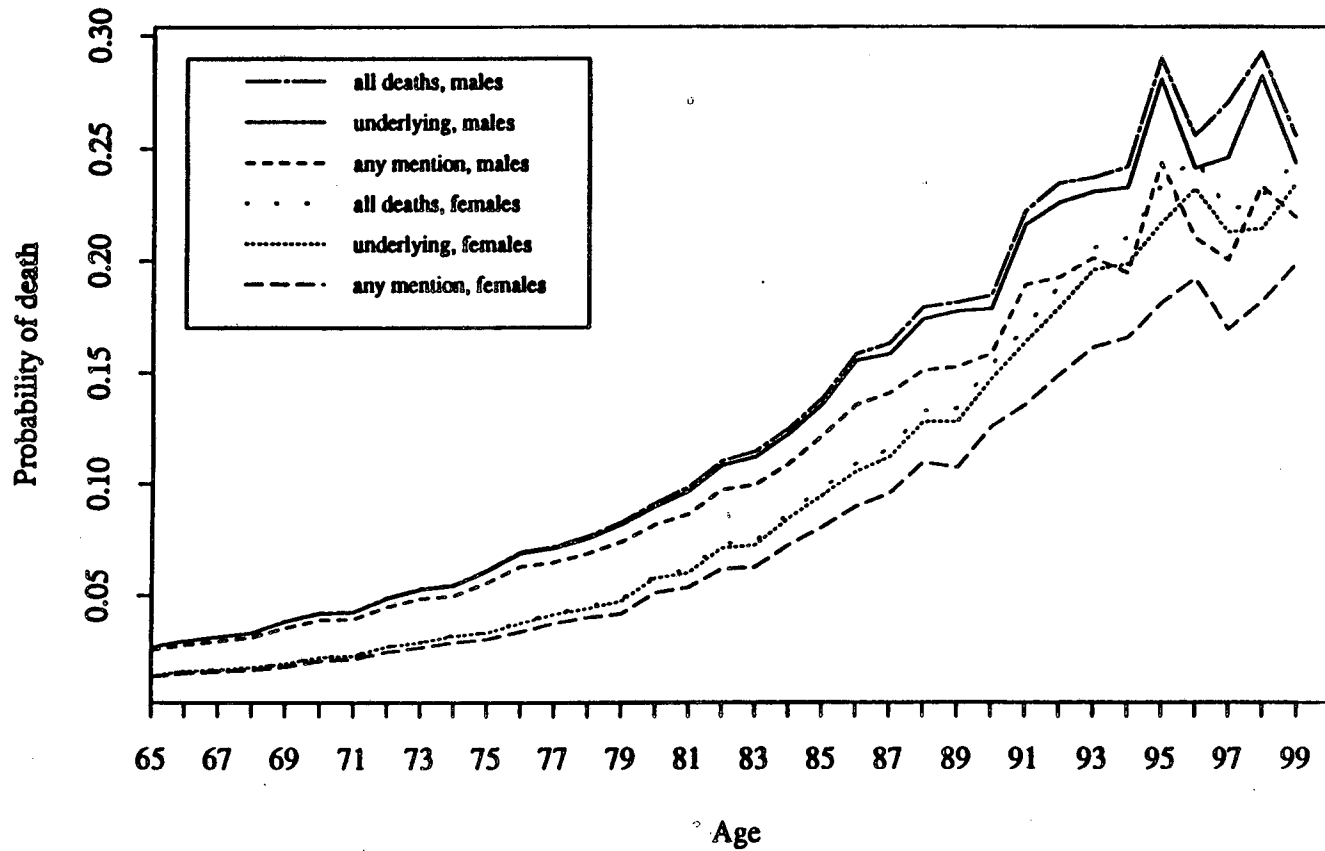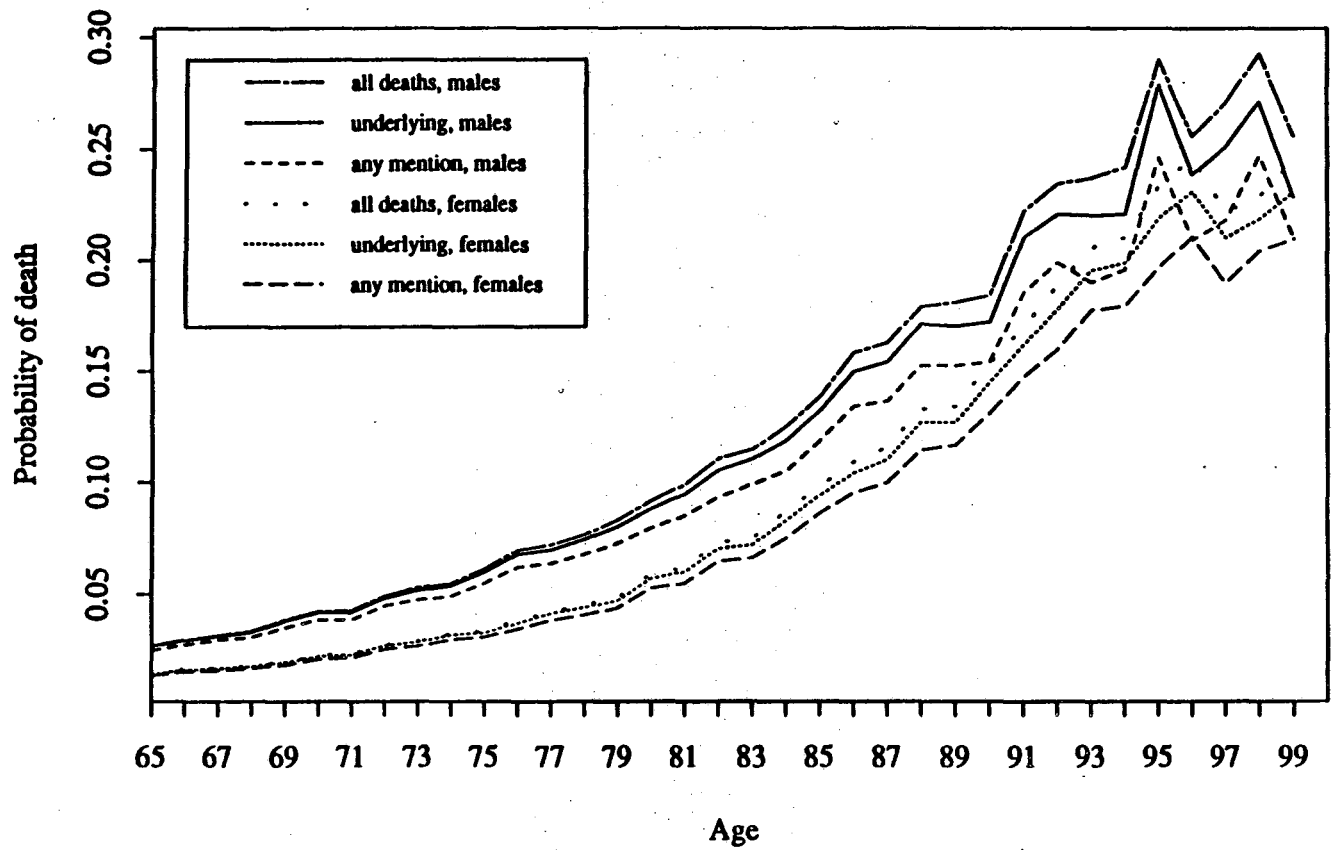Among White Males and Females Aged 65 and Older, California, 1980

Legend:
- — · — all deaths, males
- ——— underlying, males
- – – – any mention, males
- · · · all deaths, females
- ·········· underlying, females
- — — — · any mention, females

Y-axis: Probability of death

X-axis: Age (65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99)
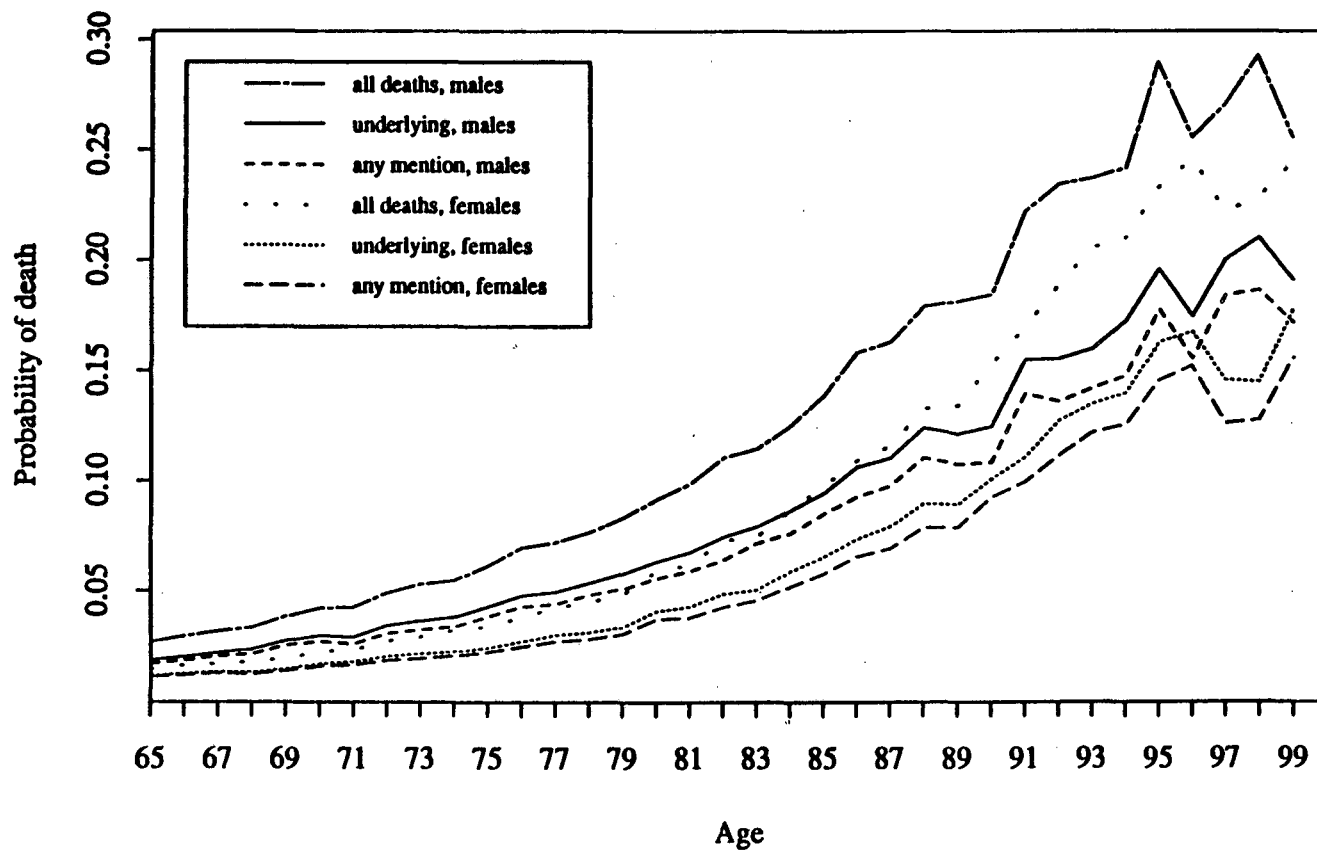
Figure 4
Hazard Functions Removing All Other Heart Disease
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980
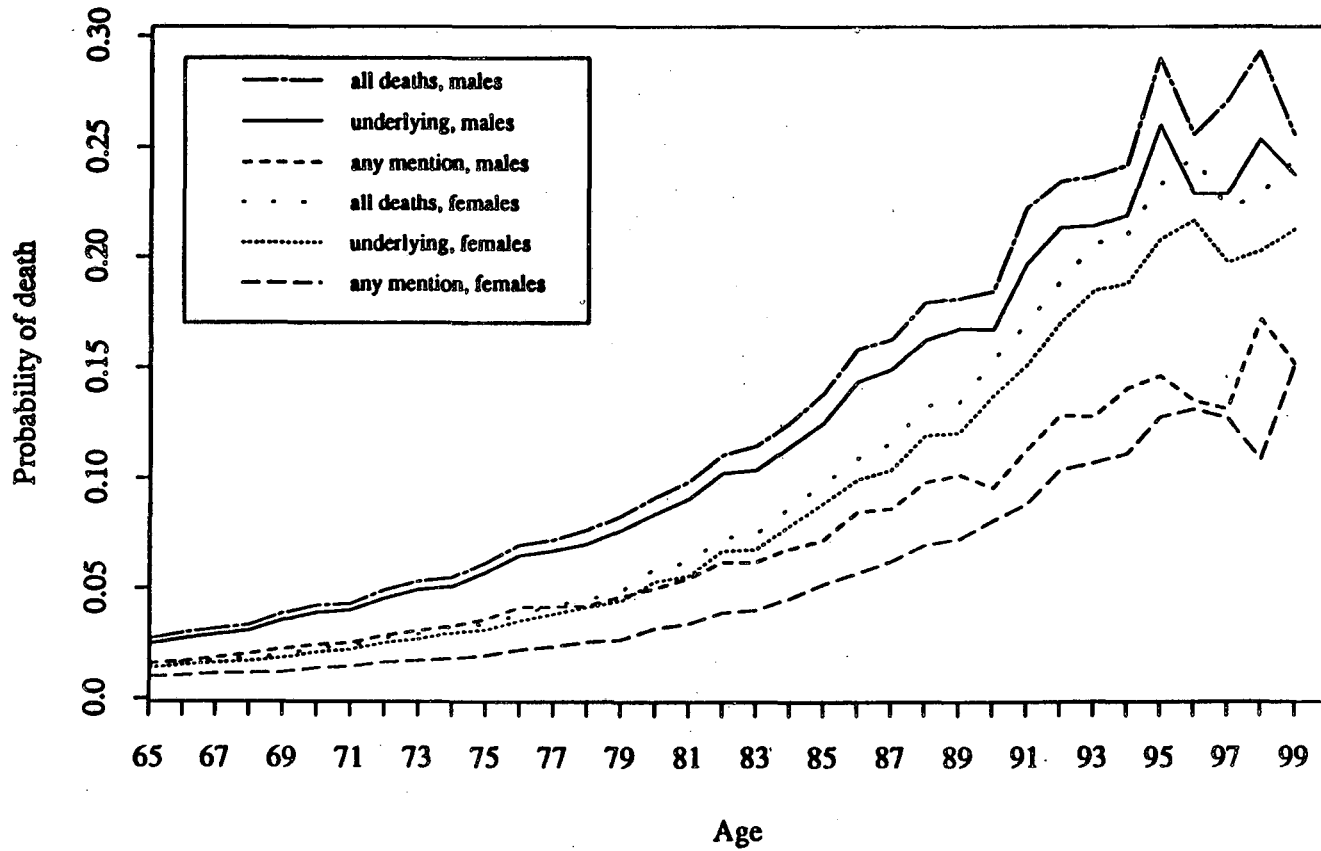
Figure 5
Hazard Functions Removing Diabetes
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980
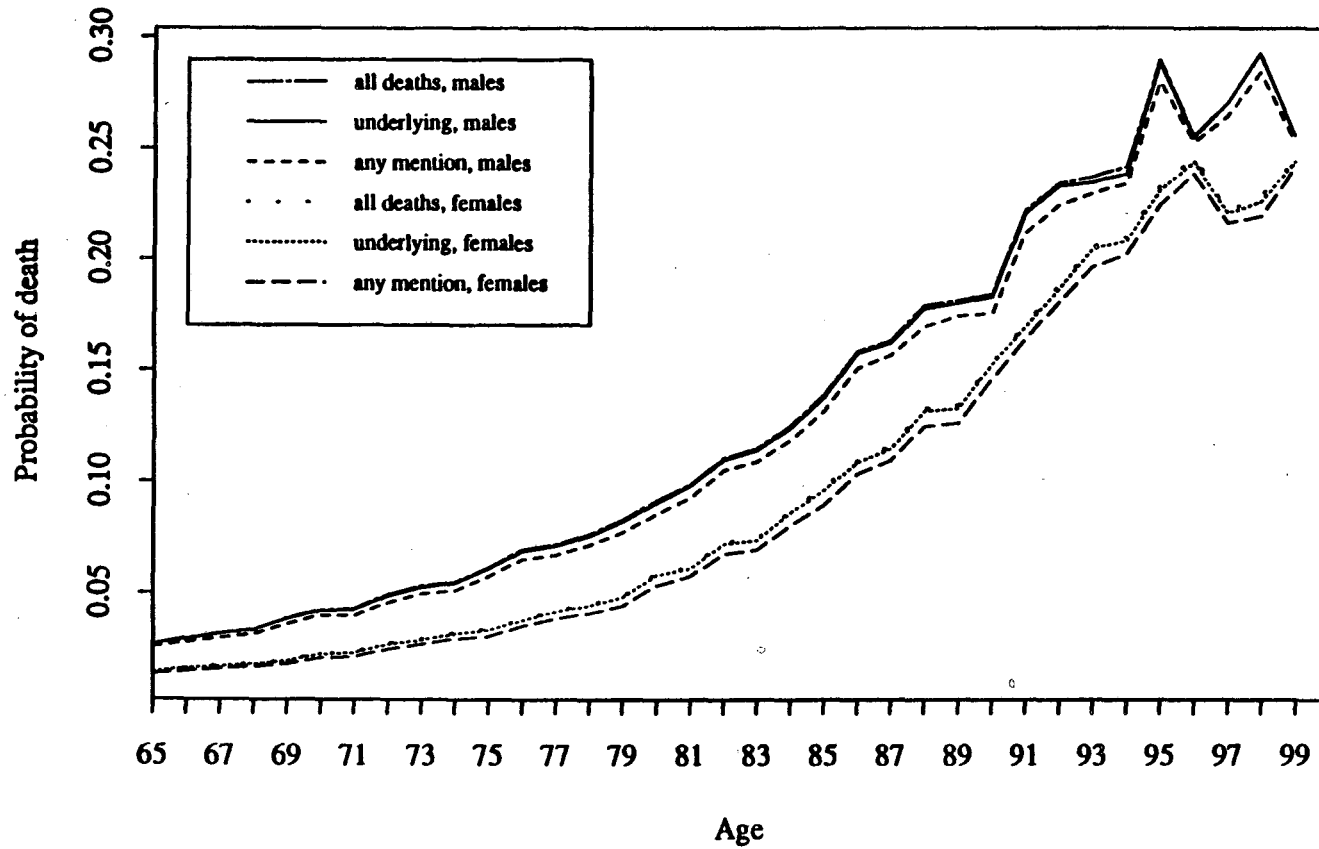
Figure 6
Hazard Functions Removing Malignant Neoplasms of the Digestive Organs
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Legend:
- all deaths, males
- underlying, males
- any mention, males
- all deaths, females
- underlying, females
- any mention, females

Y-axis: Probability of death

X-axis: Age
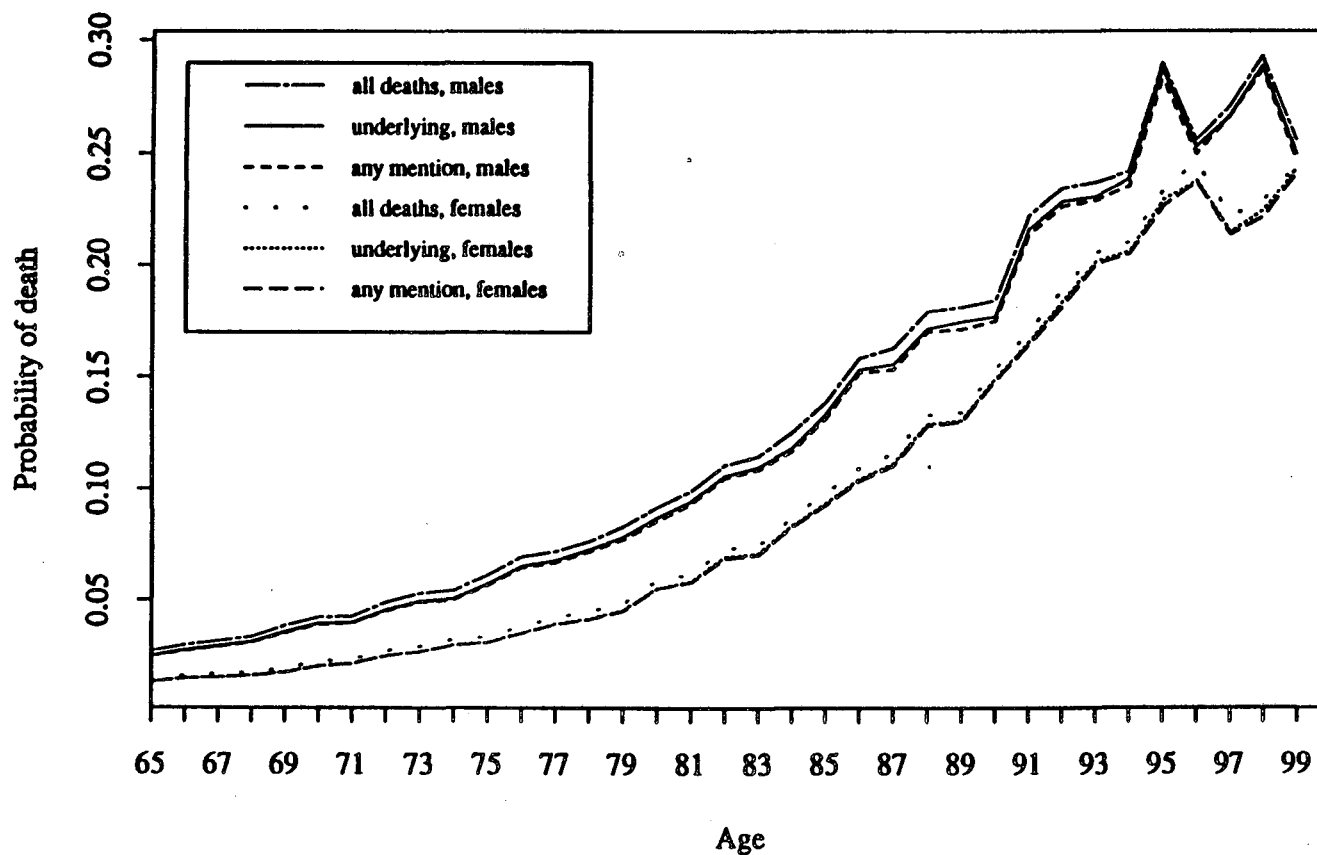
Figure 7
Hazard Functions Removing Malignant Neoplasms of the Respiratory Organs
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980
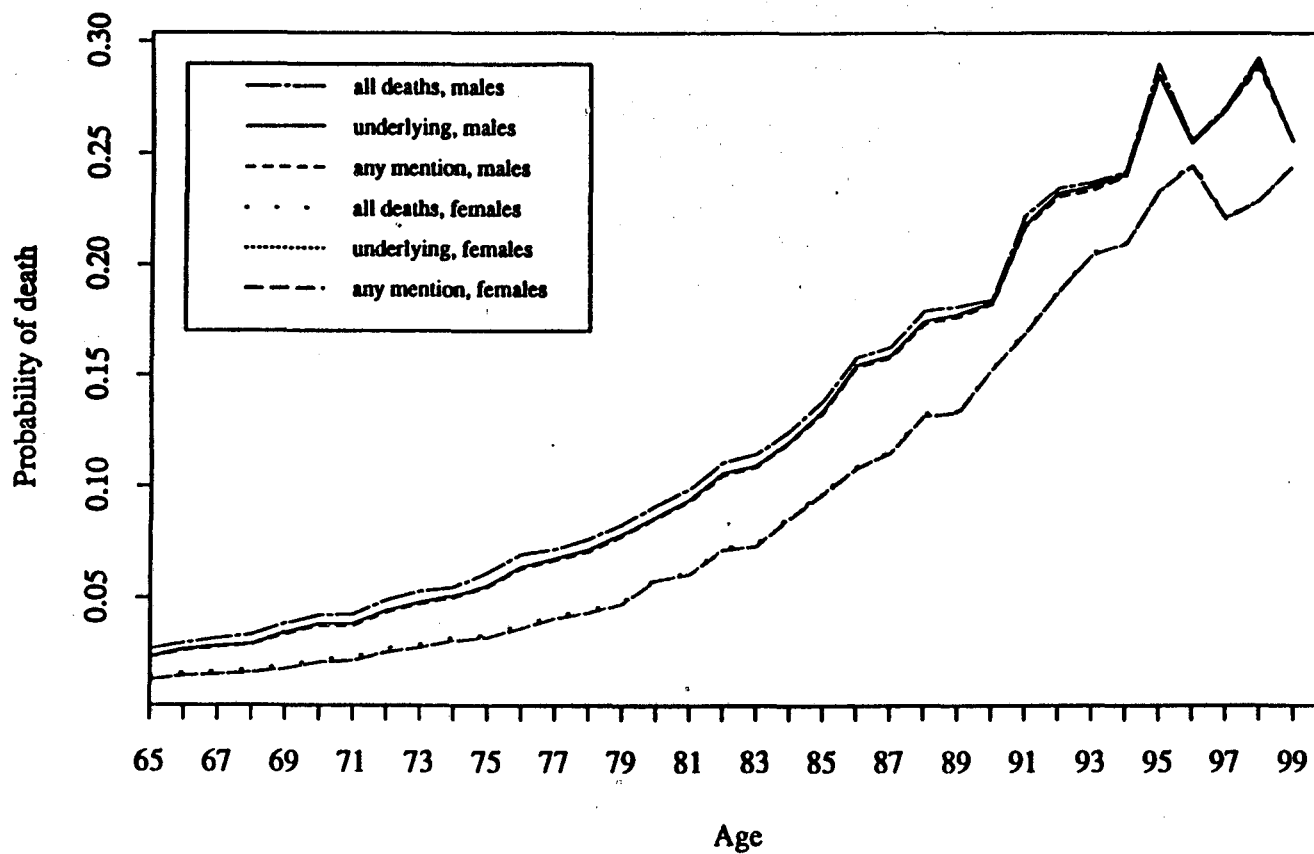
Figure 8
Hazard Functions Removing Malignant Neoplasms of the Breast
As Underlying Cause and as Any Mention
Among White Females Aged 65 and Older, California, 1980
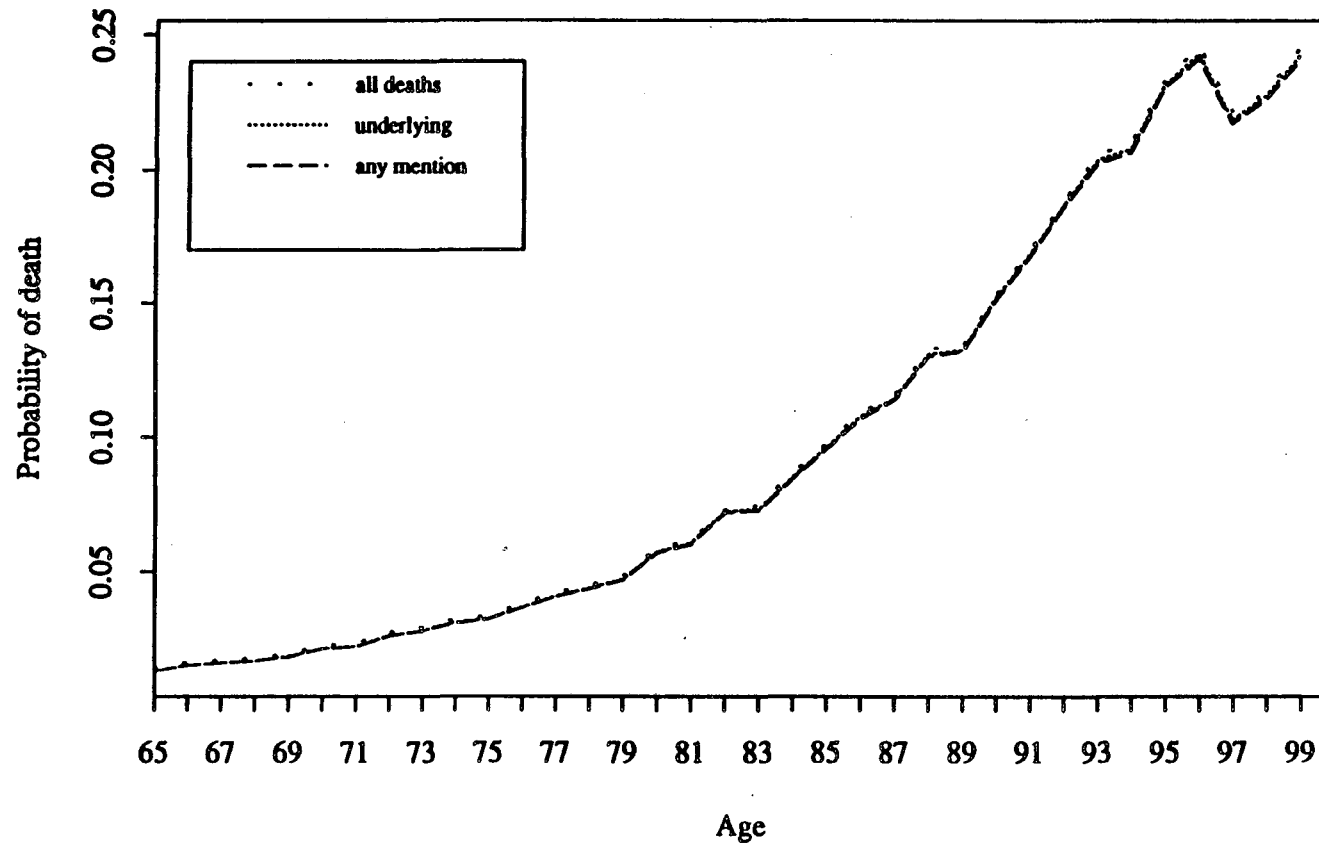
Figure 9
Hazard Functions Removing Malignant Neoplasms of the Genital Organs
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Legend:
- —·— all deaths, males
- —— underlying, males
- – – – any mention, males
- · · · all deaths, females
- ·········· underlying, females
- — — · any mention, females

(y-axis) Probability of death — 0.05, 0.10, 0.15, 0.20, 0.25, 0.30

(x-axis) Age — 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99

Figure 10
Hazard Functions Removing Hypertension
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Figure 11
Hazard Functions Removing Cerebrovascular Disease
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Figure 12
Hazard Functions Removing Atherosclerosis
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Legend:
—·— all deaths, males
——— underlying, males
– – – any mention, males
· · · all deaths, females
·········· underlying, females
—– —· any mention, females

X-axis: Age (65 to 99)
Y-axis: Probability of death (0.05 to 0.30)

Figure 13
Hazard Functions Removing Pneumonia
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980

Figure 14
Hazard Functions Removing Chronic Obstructive Pulmonary Disease
As Underlying Cause and as Any Mention
Among White Males and Females Aged 65 and Older, California, 1980
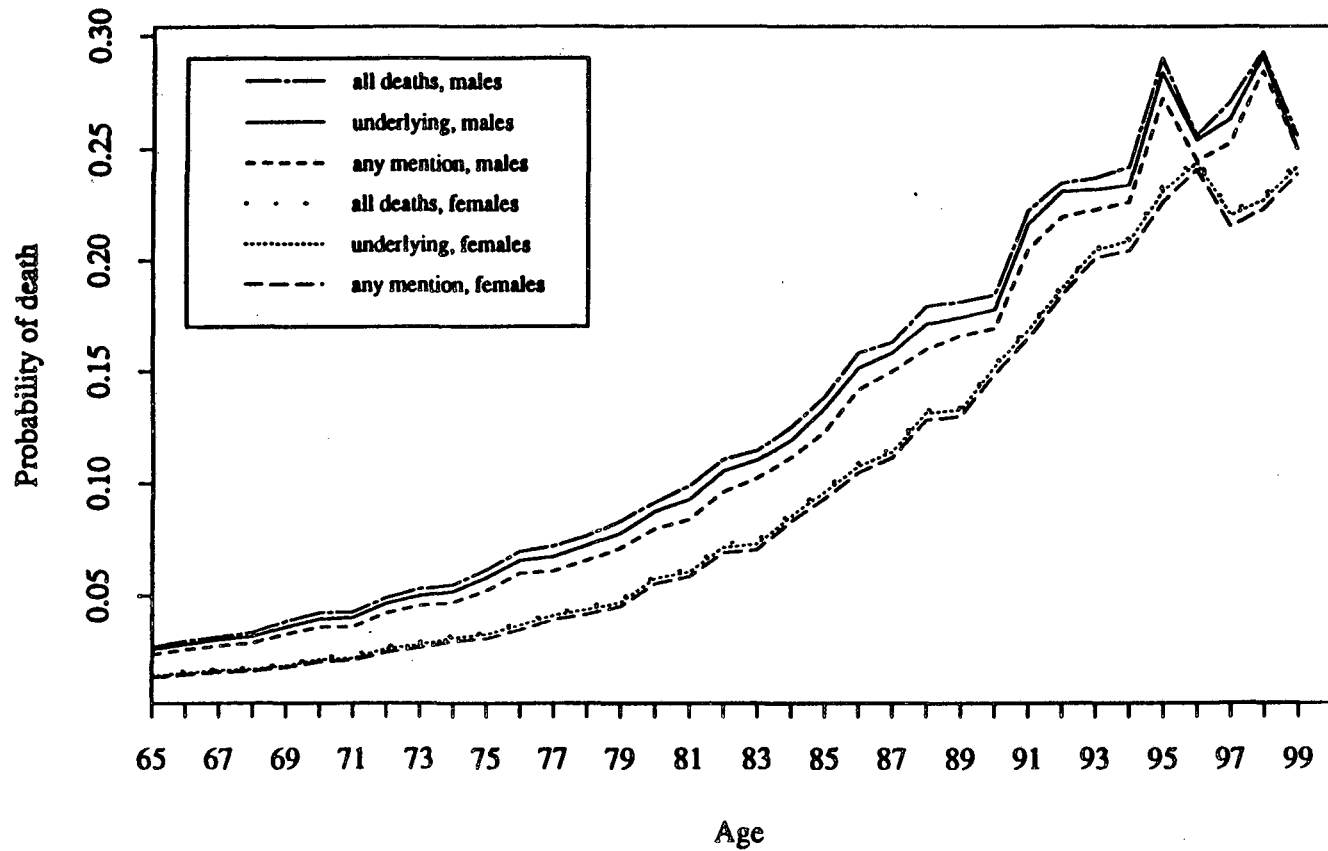
Figure 15
Cumulative Hazard Functions
For Nine Major Causes of Death
Among White Males Aged 65 and Older, California, 1980
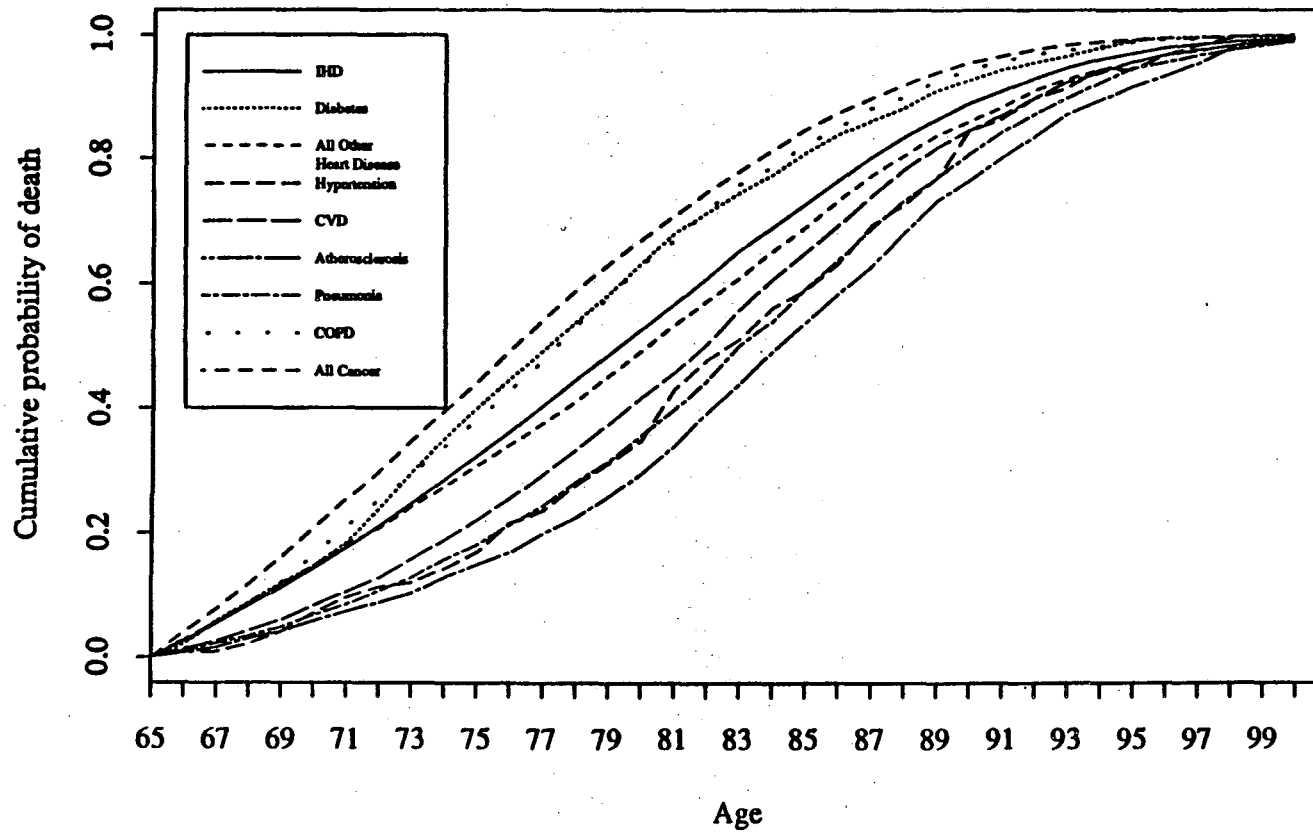
Figure 16
Cumulative Hazard Functions
For Nine Major Causes of Death
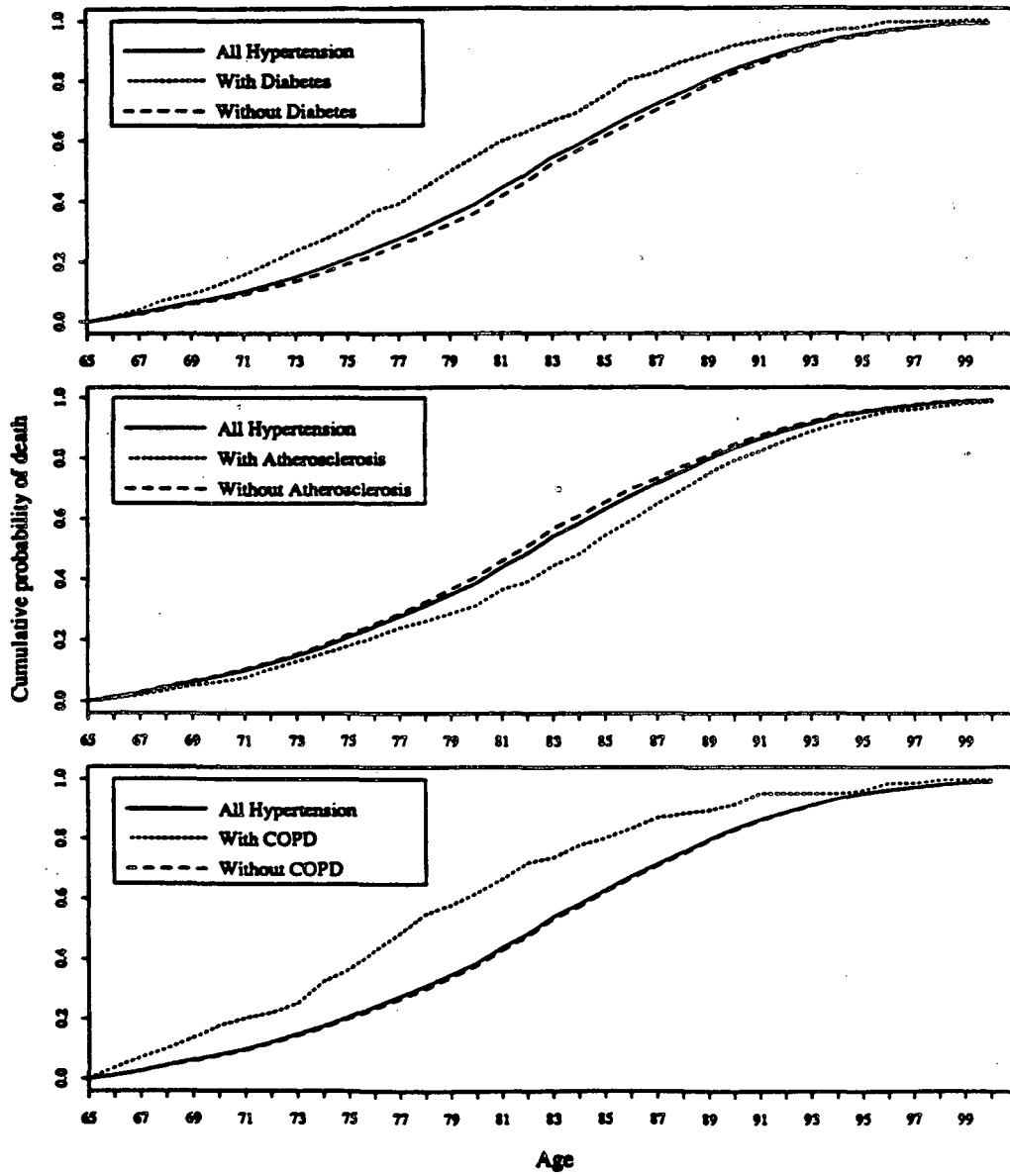Among White Females Aged 65 and Older, California, 1980
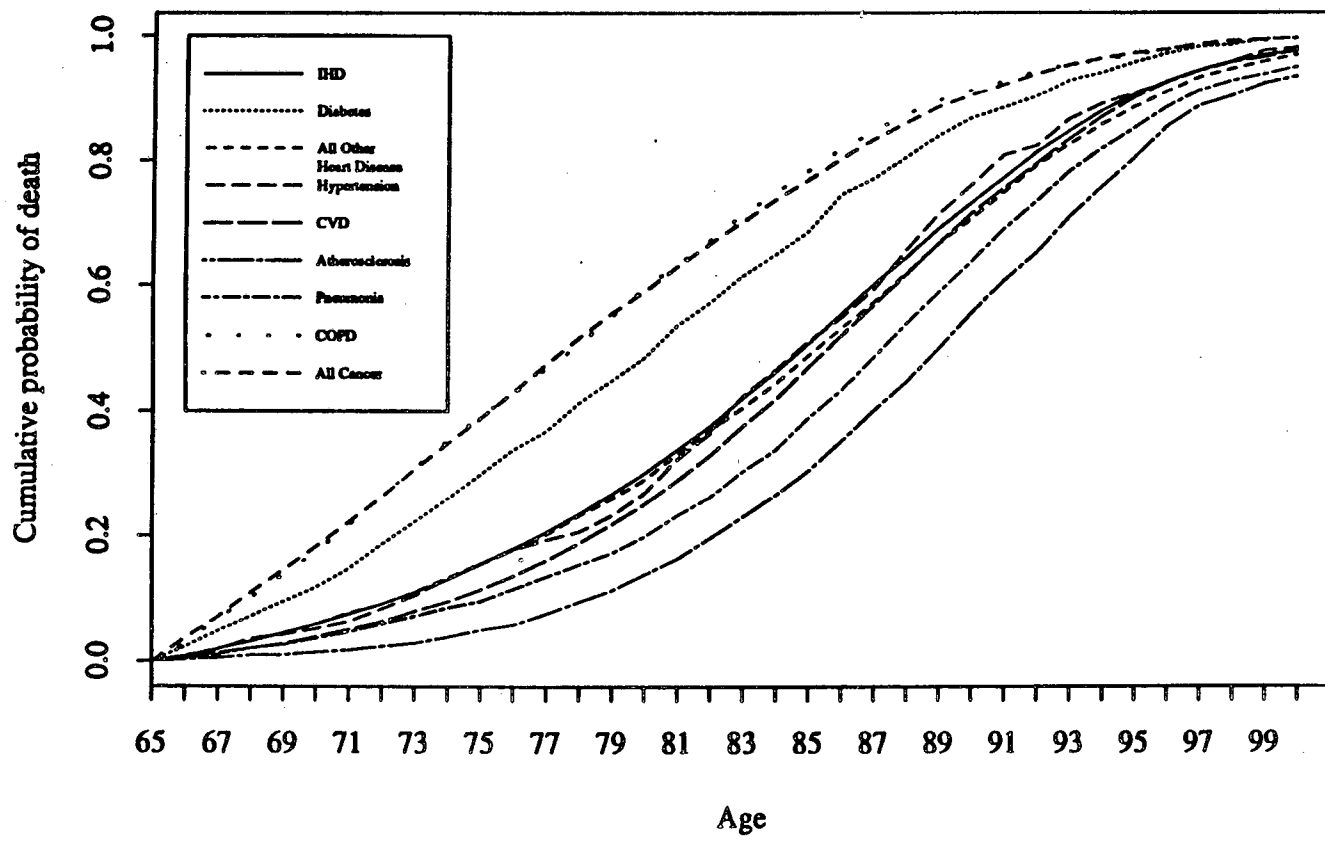
Figure 17
Cumulative Hazard Functions for Ischemic Heart Disease
With and Without Diabetes, Atherosclerosis, and COPD
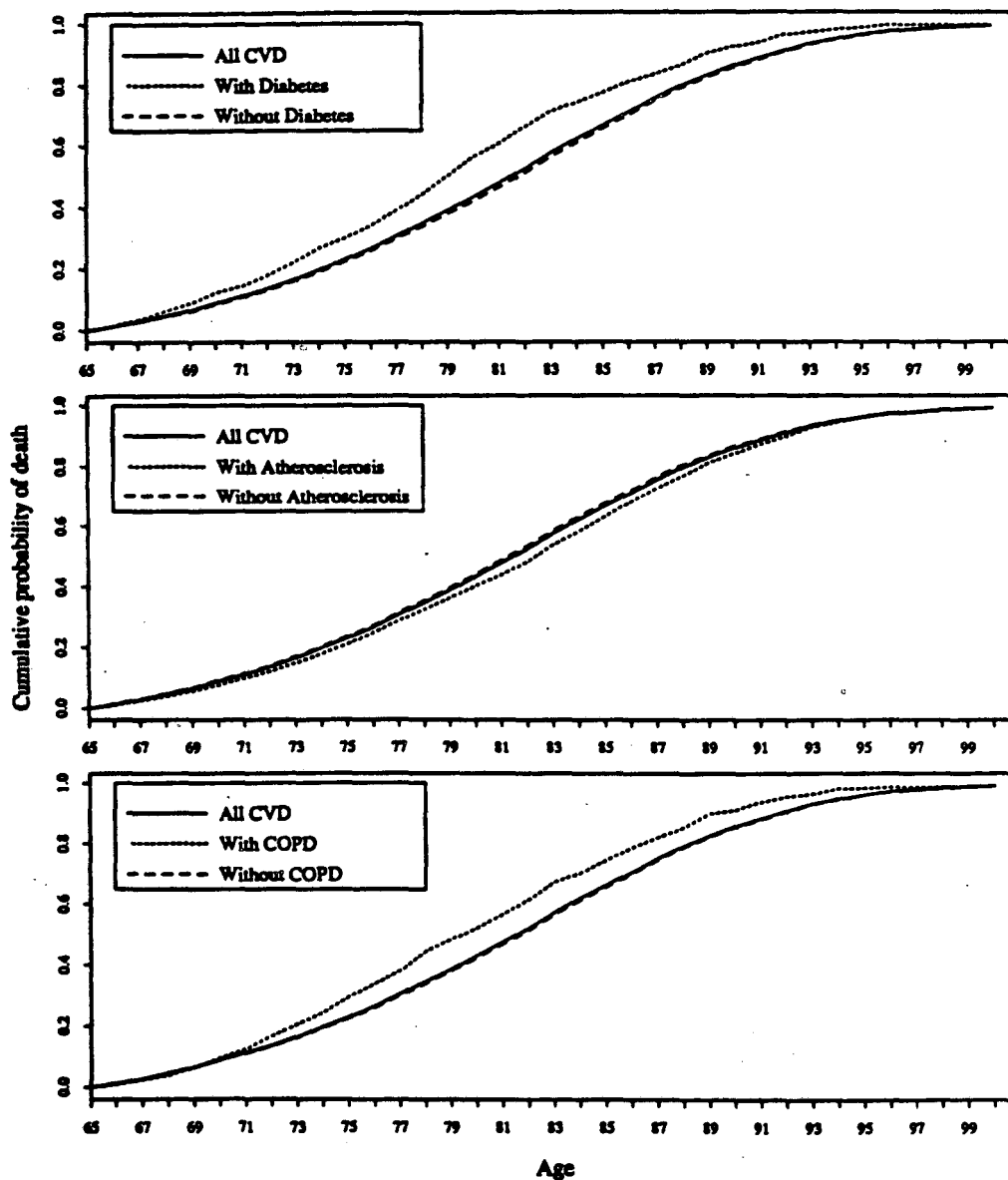Among White Males Aged 65 and Older, California, 1980
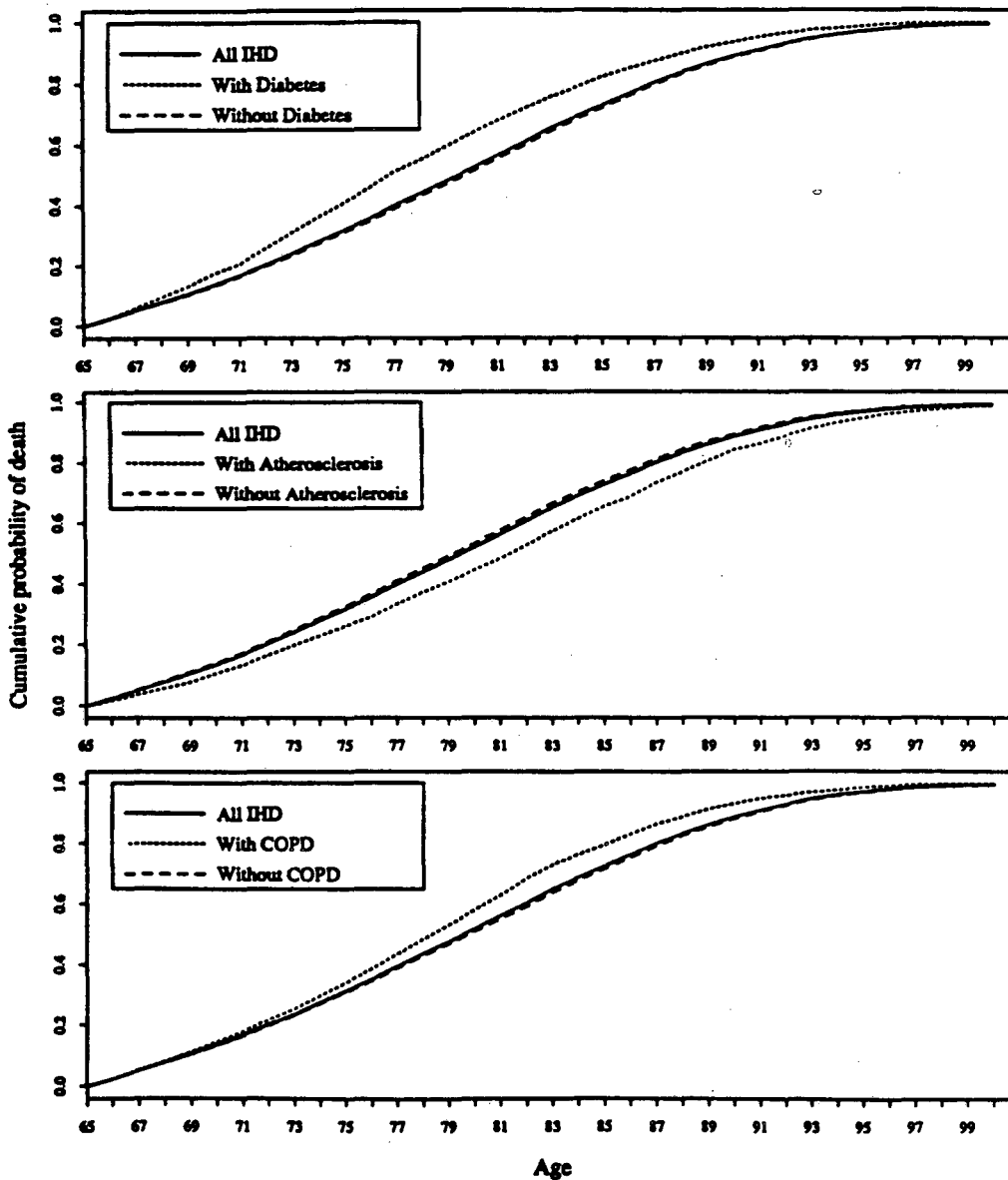
Figure 18
Cumulative Hazard Functions for Ischemic Heart Disease
With and Without Diabetes, Atherosclerosis, and COPD
Among White Females Aged 65 and Older, California, 1980
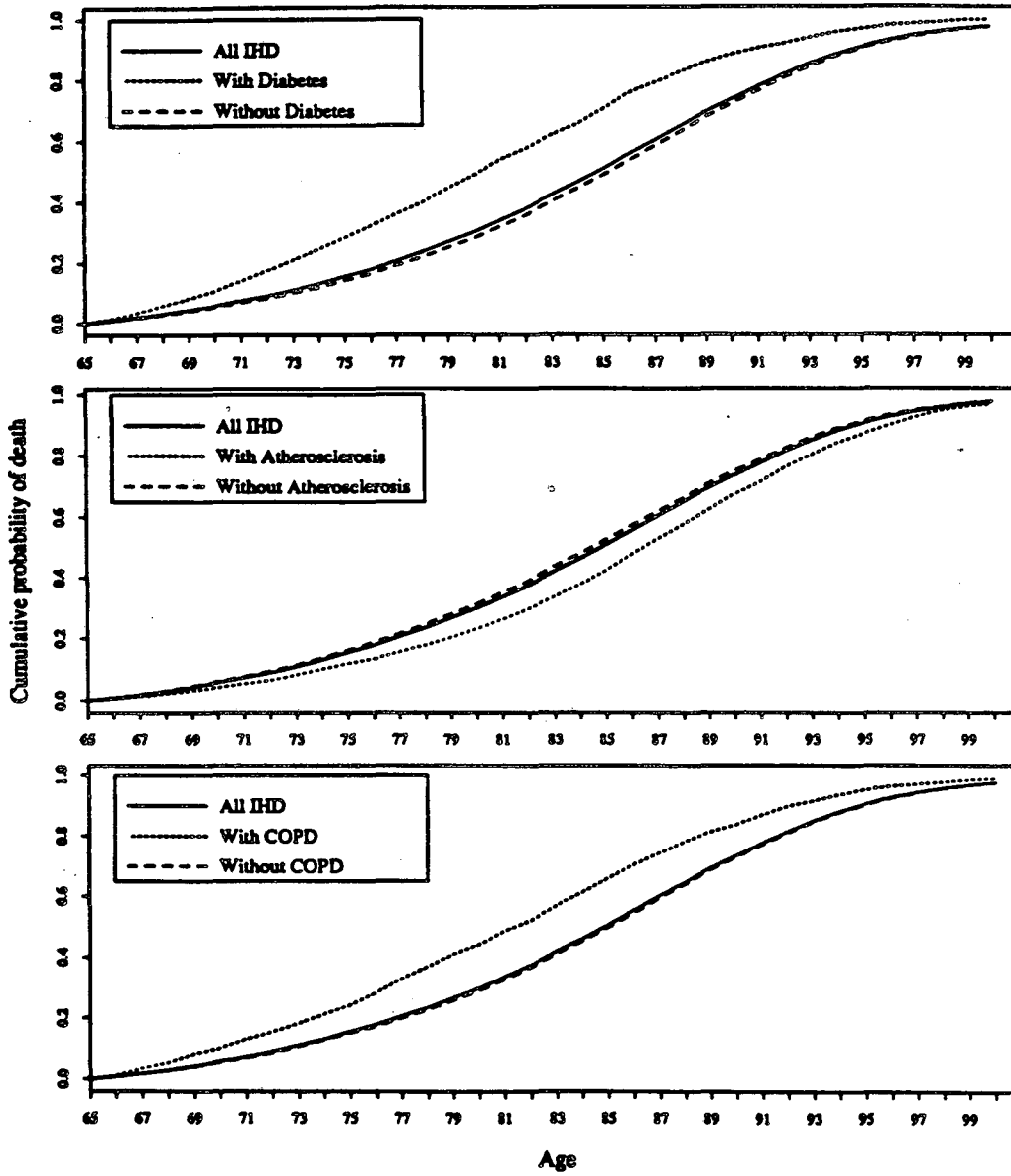
Figure 19
Cumulative Hazard Functions for All Other Heart Disease
With and Without Diabetes, Atherosclerosis, and COPD
Among White Males Aged 65 and Older, California, 1980
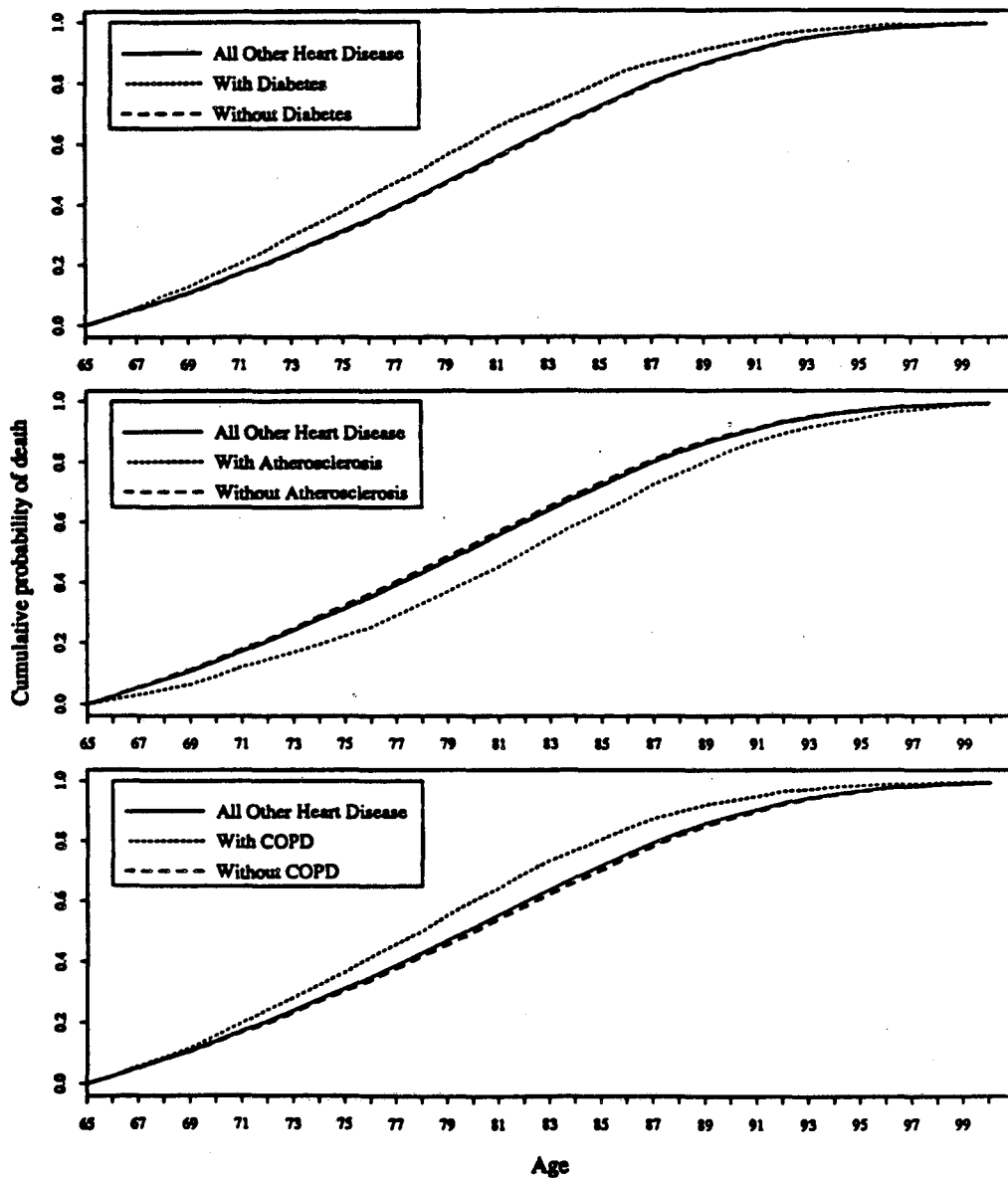
Figure 20
Cumulative Hazard Functions for All Other Heart Disease
With and Without Diabetes, Atherosclerosis, and COPD
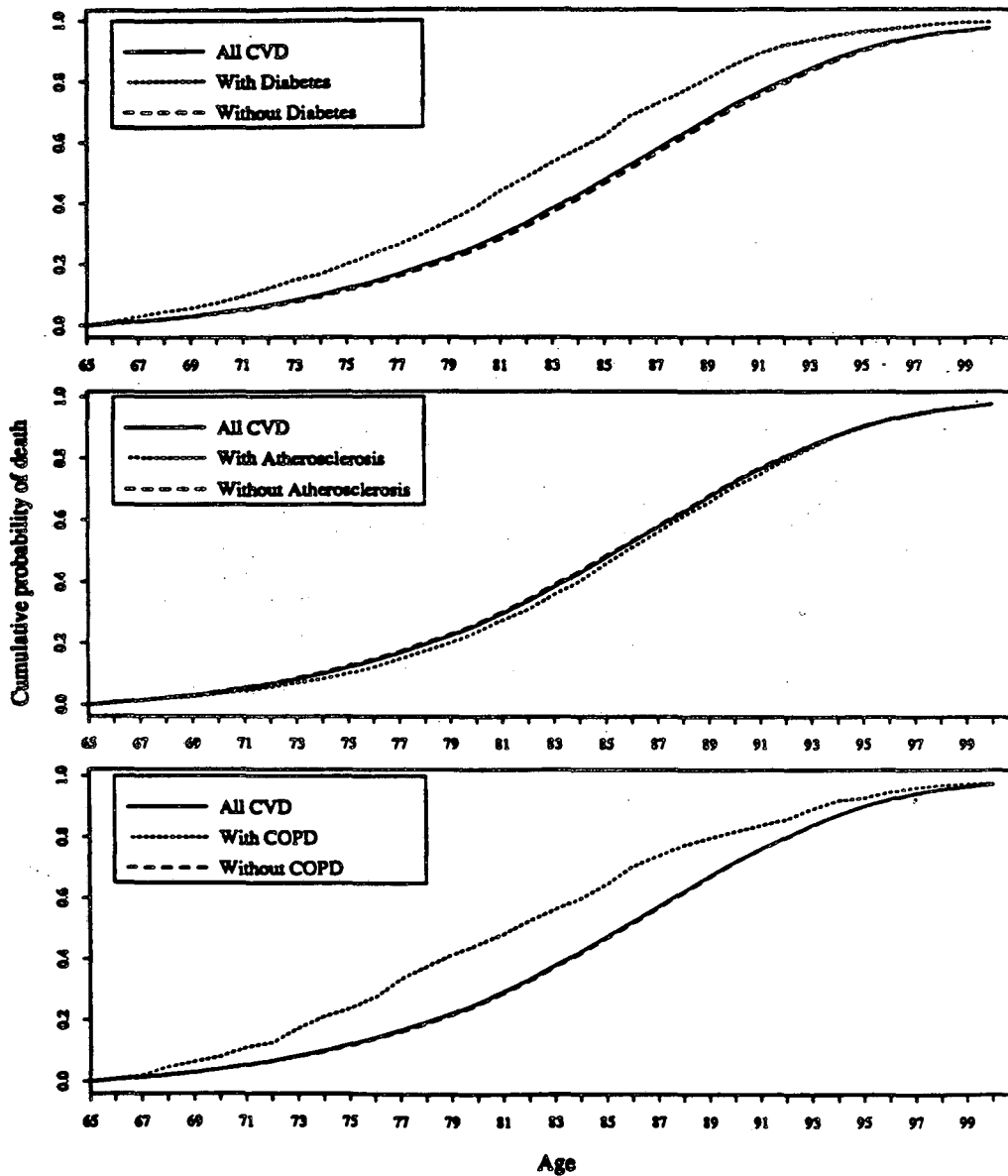Among White Females Aged 65 and Older, California, 1980
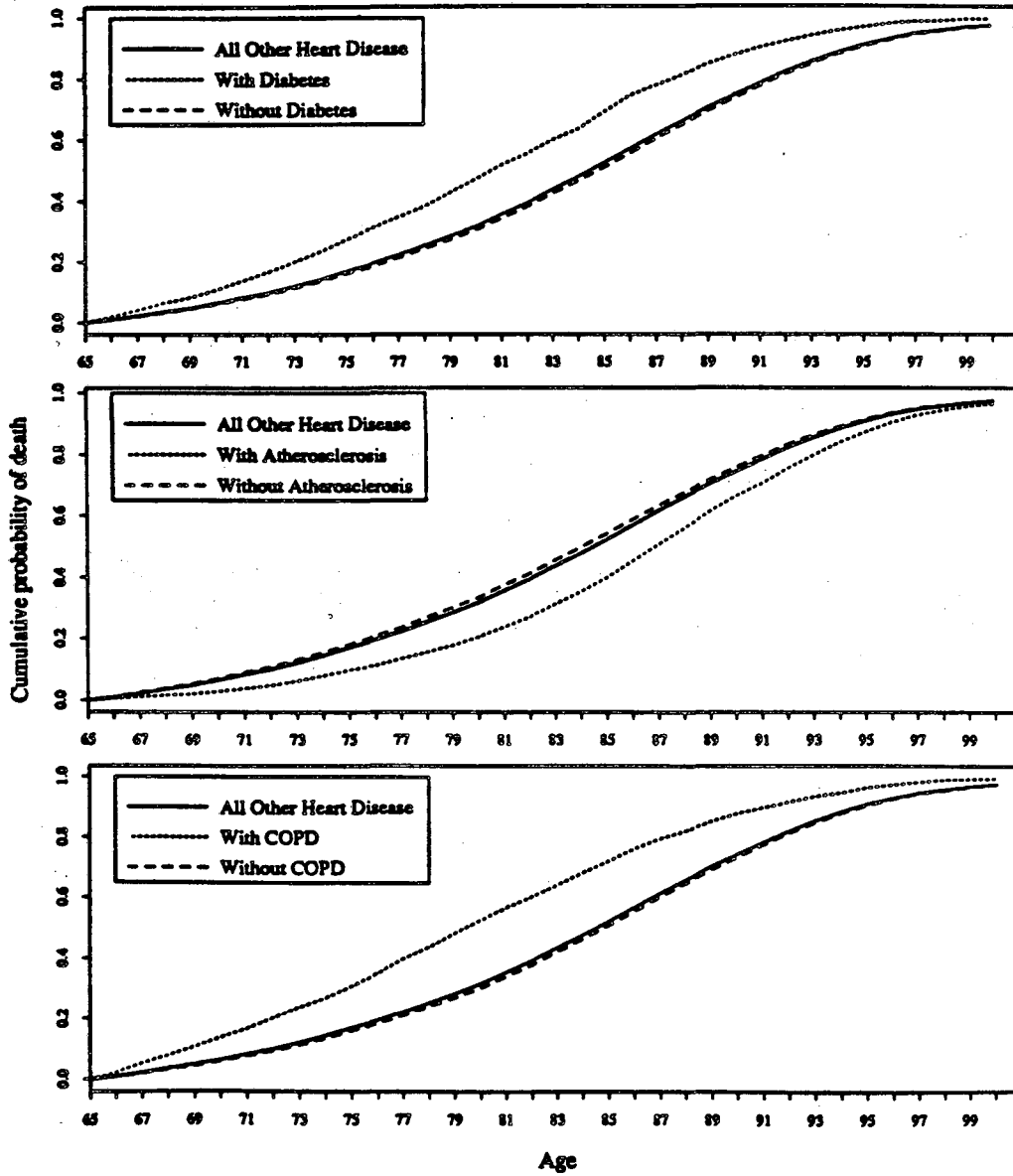
Figure 21
Cumulative Hazard Functions for Hypertension
With and Without Diabetes, Atherosclerosis, and COPD
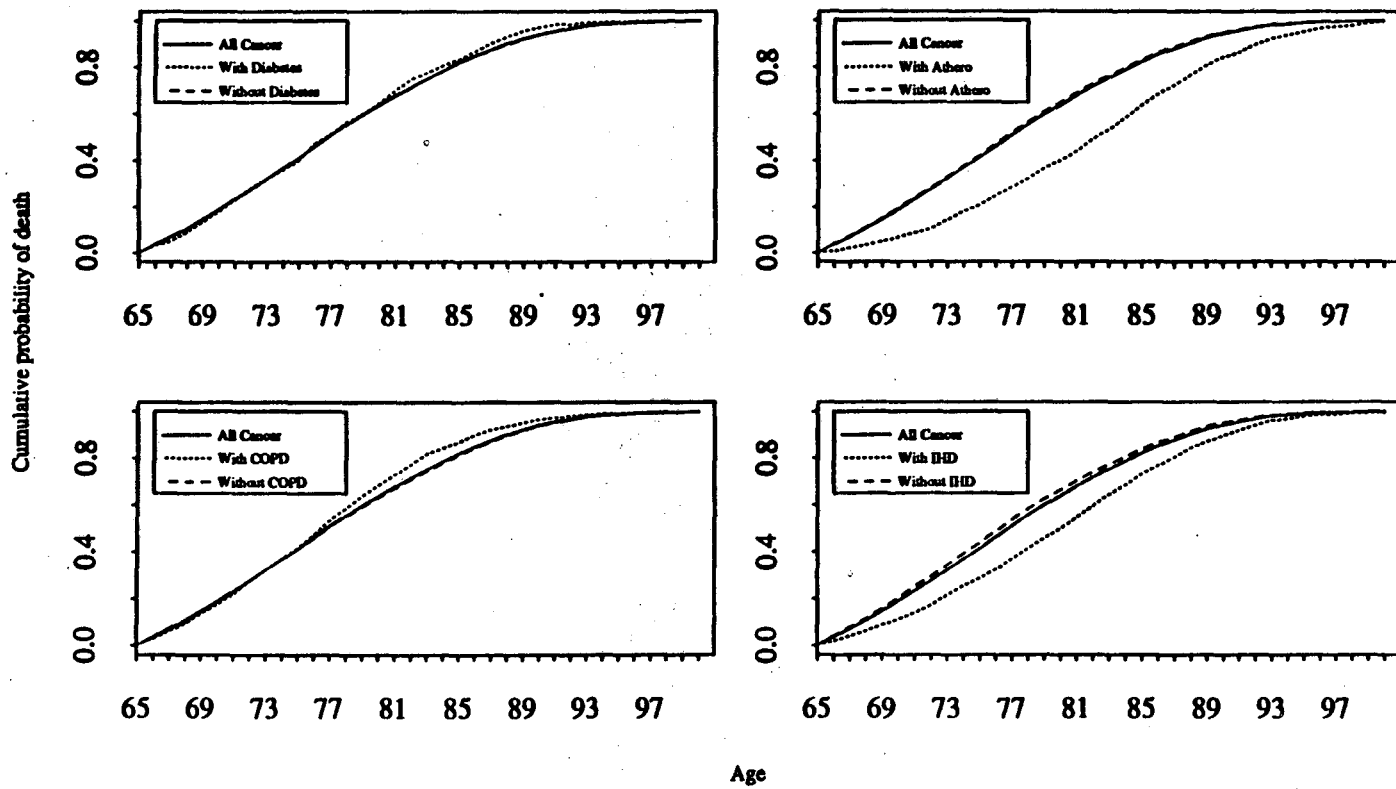Among White Males Aged 65 and Older, California, 1980
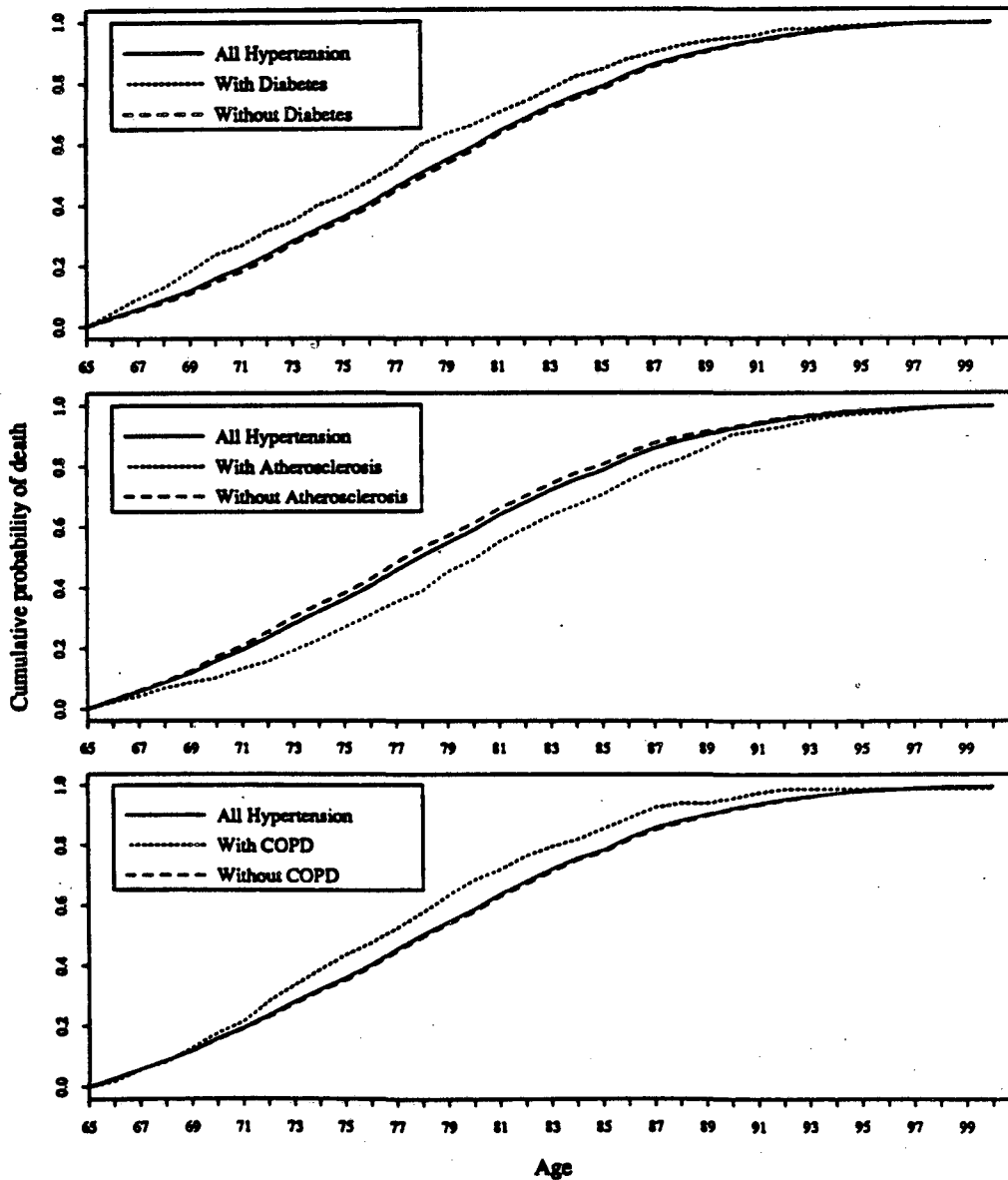
Figure 22
Cumulative Hazard Functions for Hypertension
With and Without Diabetes, Atherosclerosis, and COPD
Among White Females Aged 65 and Older, California, 1980

Figure 23
Cumulative Hazard Functions for Cerebrovascular Disease
With and Without Diabetes, Atherosclerosis, and COPD
Among White Males Aged 65 and Older, California, 1980

Figure 24
Cumulative Hazard Functions for Cerebrovascular Disease
With and Without Diabetes, Atherosclerosis, and COPD
Among White Females Aged 65 and Older, California, 1980

Figure 25

Cumulative Hazard Functions for All Cancer

With and Without Diabetes, Atherosclerosis, COPD, and IHD
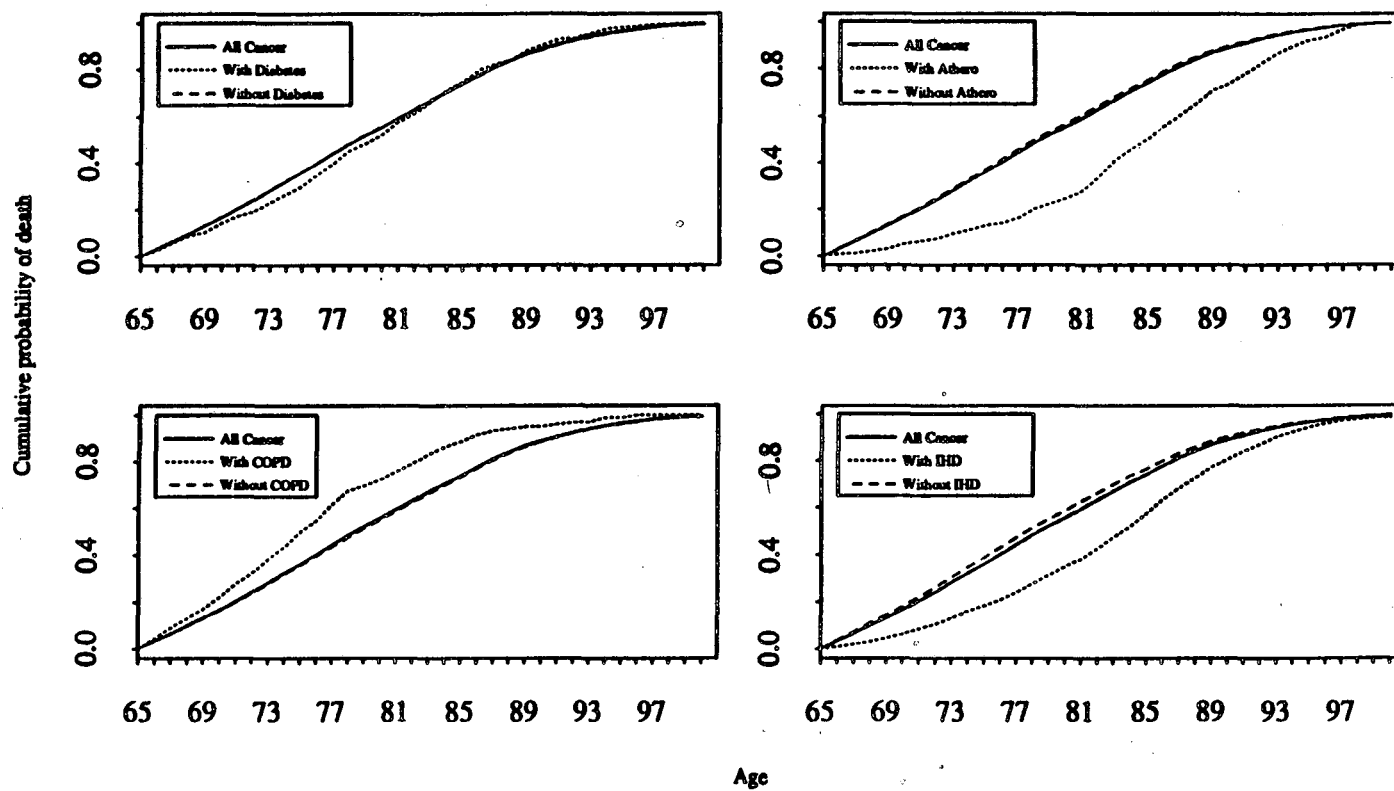
Among White Males Aged 65 and Older, California, 1980

Age

Figure 26

Cumulative Hazard Functions for All Cancer

With and Without Diabetes, Atherosclerosis, COPD, and IHD

Among White Females Aged 65 and Older, California, 1980

Cumulative probability of death

Age

Figure 27

Cumulative Hazard Functions for All Atherosclerosis

With and Without Diabetes and COPD

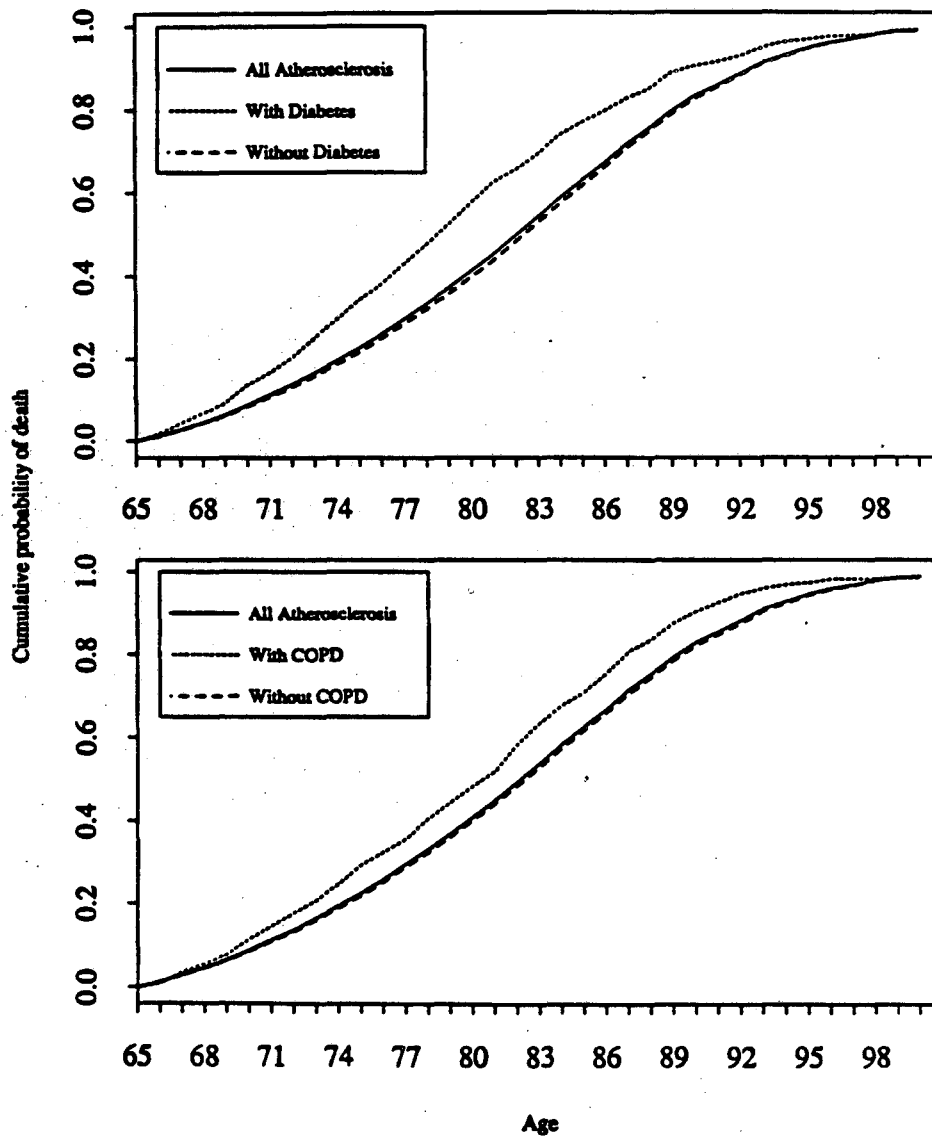Among White Males Aged 65 and Older, California, 1980

Figure 28

Cumulative Hazard Functions for All Atherosclerosis

With and Without Diabetes and COPD

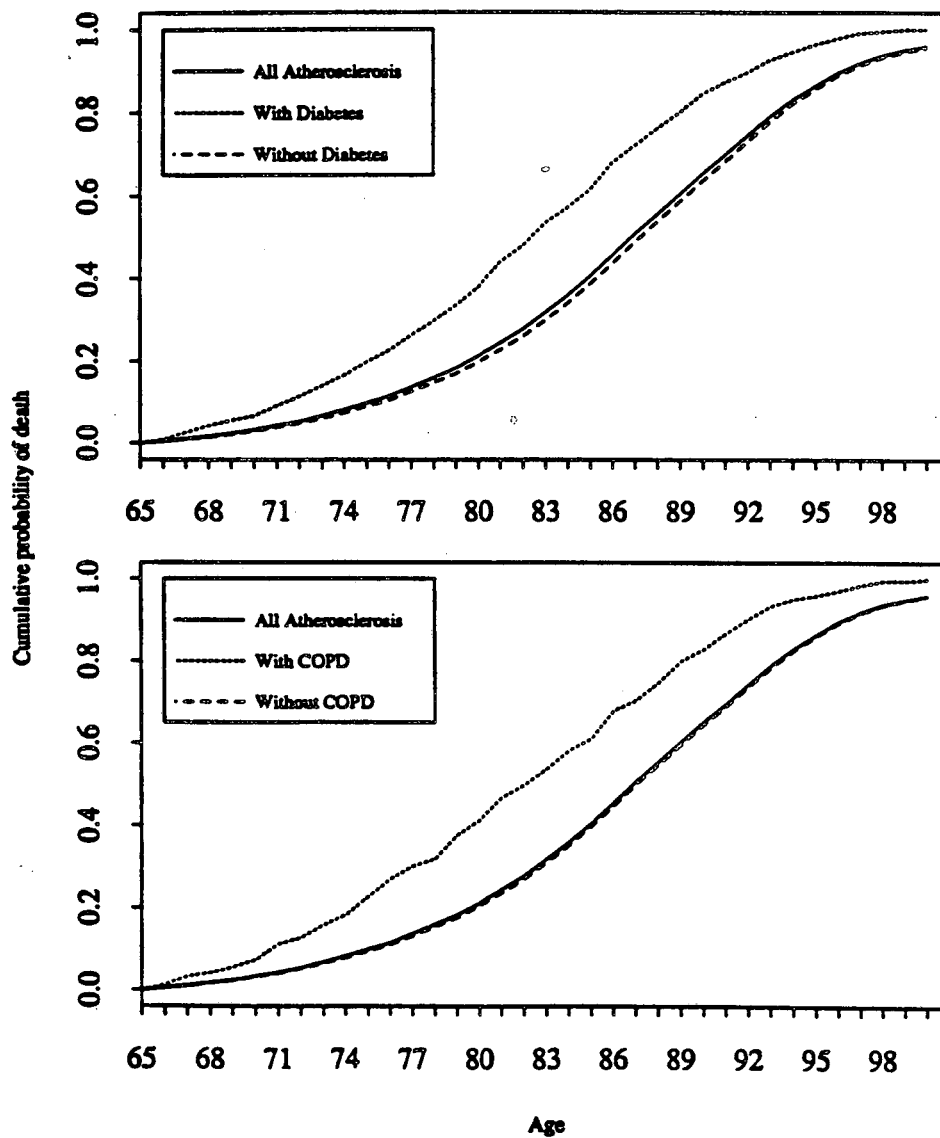Among White Females Aged 65 and Older, California, 1980

Figure 29
Cumulative Hazard Functions for All Diabetes
With and Without Atherosclerosis
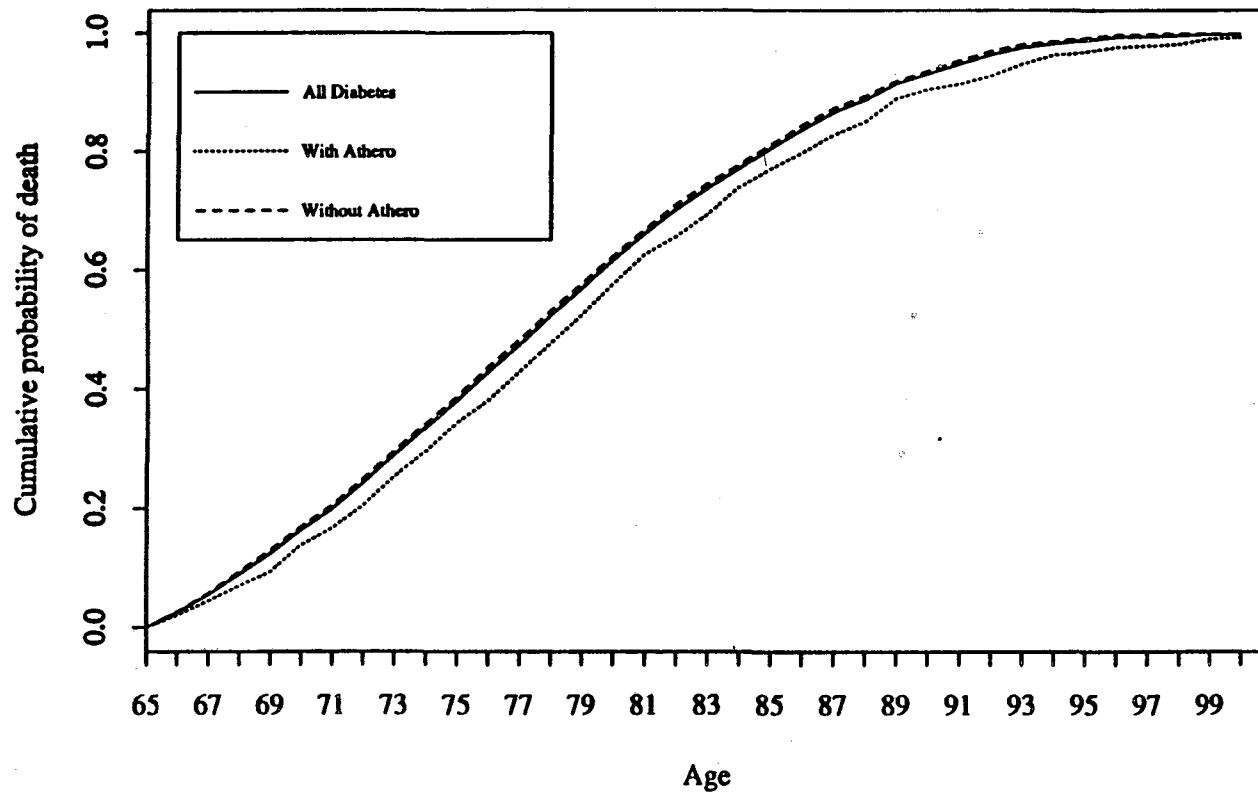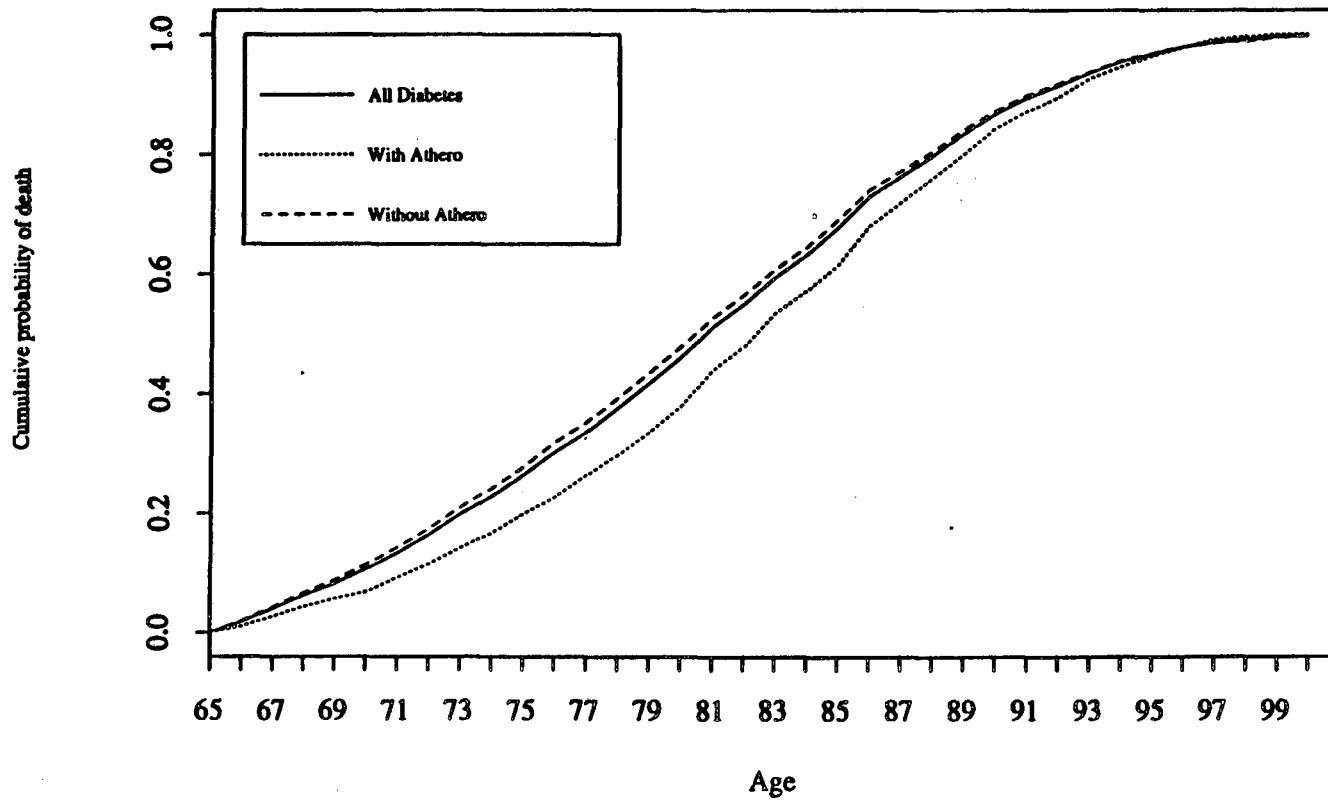### Among White Males Aged 65 and Older, California, 1980

Figure 30
Cumulative Hazard Functions for All Diabetes
With and Without Atherosclerosis
Among White Females Aged 65 and Older, California, 1980

APPENDIX A

U.S. Standard Certificate of Death

(1949 Revision of Standard Certificate)
CERTIFICATE OF DEATH

BIRTH NO. _____ STATE OF _____ STATE FILE NO. _____

1. PLACE OF DEATH a. COUNTY	2. USUAL RESIDENCE (Where deceased lived. If institution: residence before admission.) a. STATE — b. COUNTY
b. CITY (If outside corporate limits, write RURAL and give township) — c. LENGTH OF STAY (in this place)	c. CITY (If outside corporate limits, write RURAL and give township)
d. FULL NAME OF HOSPITAL OR INSTITUTION (If not in hospital or institution, give street address or location)	d. STREET ADDRESS (If rural, give location)

3. NAME OF DECEASED (Type or Print)	a. (First)	b. (Middle)	c. (Last)	4. DATE OF DEATH (Month) (Day) (Year)
5. SEX	6. COLOR OR RACE	7. MARRIED, NEVER MARRIED, WIDOWED, DIVORCED (Specify)	8. DATE OF BIRTH	9. AGE (In years last birthday) Months Days Hours Min.

10a. USUAL OCCUPATION (Give kind of work done during most of working life, even if retired)	10b. KIND OF BUSINESS OR INDUSTRY	11. BIRTHPLACE (State or foreign country)	12. CITIZEN OF WHAT COUNTRY?

13. FATHER'S NAME	14. MOTHER'S MAIDEN NAME

15. WAS DECEASED EVER IN U.S. ARMED FORCES? (Yes, no, or unknown) (If yes, give war or dates of service)	16. SOCIAL SECURITY NO.	17. INFORMANT

MEDICAL CERTIFICATION

18. CAUSE OF DEATH Enter only one cause per line for (a), (b), and (c)		INTERVAL BETWEEN ONSET AND DEATH
*This does not mean the mode of dying, such as heart failure, asthenia, etc. It means the disease, injury, or complication which caused death.	I. DISEASE OR CONDITION DIRECTLY LEADING TO DEATH* (a) _____	_____
	ANTECEDENT CAUSES Morbid conditions, if any, giving rise to the above cause (a) stating the underlying cause last. DUE TO (b) _____	_____
	DUE TO (c) _____	_____
	II. OTHER SIGNIFICANT CONDITIONS Conditions contributing to the death but not related to the disease or condition causing death.	

19a. DATE OF OPERATION	19b. MAJOR FINDINGS OF OPERATION	20. AUTOPSY? YES ☐ NO ☐

21a. ACCIDENT SUICIDE HOMICIDE (Specify)	21b. PLACE OF INJURY (e.g., in or about home, farm, factory, street, office bldg., etc.)	21c. (CITY, TOWN, OR TOWNSHIP) (COUNTY) (STATE)
21d. TIME OF INJURY (Month) (Day) (Year) (Hour)	21e. INJURY OCCURRED WHILE AT WORK ☐ NOT WHILE AT WORK ☐	21f. HOW DID INJURY OCCUR?

22. I hereby certify that I attended the deceased from _____, 19____, to _____, 19____, that I last saw the deceased alive on _____, 19____, and that death occurred at _____ m., from the causes and on the date stated above.

23a. SIGNATURE (Degree or title)	23b. ADDRESS	23c. DATE SIGNED

24a. BURIAL, CREMATION, REMOVAL (Specify)	24b. DATE	24c. NAME OF CEMETERY OR CREMATORY	24d. LOCATION (City, town, or county) (State)

DATE REC'D BY LOCAL REG.	REGISTRAR'S SIGNATURE	25. FUNERAL DIRECTOR	ADDRESS

APPENDIX B

Groups of Causes of Death
Terms and Codes for This Study, ICD8 and ICD9

Group Name This Study	NCHS Group Name ICD 9	ICD 8 Code Numbers	ICD 9 Code Numbers
Shig,Amebiasis	Shigellosis and Amebiasis	4,6	4,6
Other Intest Inf	Certain Other Intestinal Infections	8-9	7-9
TB	Tuberculosis	10-19	10-18
Whooping Cough	Whooping Cough	33	33
Strep Throat	Streptococcal Sore Throat, Scarlatina and Erysipelas	34	34-35
Meningococcal Inf	Mengococcal Infection	36	36
Septicemia	Septicemia	38	38
Polio	Acute Poliomyelitis	40-43	45
Measles	Measles	55	55
Viral Hepatitis	Viral Hepatitis	70	70
Syphilis	Syphilis	90-97	90-97
All Other Infections	All Other Infectious and Parasitic Diseases	1-3,5,20-32, 37,39,44-54, 56-69,71-89, 91-136	1-3,5,20-32 37,39-41, 46-54,56-66, 71-88,98-139
Ca Lip,Or/Pharynx	Malignant Neoplasms of Lip, Oral Cavity, and Pharynx	140-149	140-149
Ca Digestive	Malignant Neoplasms of Digestive Organs and Peritoneum	150-159	150-159
Ca Respiratory	Malignant Neoplasms of Respiratory and Intrathoracic Organs	160-163	160-165
Ca Breast	Malignant Neoplasms of Breast	174	174-175
Ca Genital	Malignant Neoplasms of Genital Organs	180-187	179-187
Ca Urinary	Malignant Neoplasms of Urinary Organs	188-189	188-189
Ca Other,Unspec	Malignant Neoplasms of All Other and Unspecified Sites	170-173,190-199	170-173,190-199
Leukemia	Leukemia	204-207	204-208
Ca Other Lymphatic	Other Malignant Neoplasms of Lymphatic and Hematopoetic Tissues	200-203,208,209	200-203
Benign Ca,in situ	Benign Neoplasms, Carcinoma in situ, and Neoplasms of Uncertain Behavior and of Unspecified Nature	210-239	210-239
Diabetes	Diabetes Mellitus	250	250
Nutrit Deficiency	Nutritional Deficiencies	260-269	260-269
Anemia	Anemias	280-285	280-285
Meningitis	Meningitis	320	320-322

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Rheum Heart Dis	Rheumatic Fever and Rheumatic Heart Disease	390-398	390-398
Hyp Heart Dis	Hypertensive Heart Disease	402	402
Hyp Heart/Renal Dis	Hypertensive Heart and Renal Disease	404	404
IHD	Ischemic Heart Disease	410-414	410-414
Other Dis Endocard	Other Diseases of Endocardium	424,428	424
All Other Heart Dis	All Other Forms of Heart Disease	420-423, 425-427,429	415-423, 425-429
Hypertension	Hypertension with or without Renal Disease	400,401,403	401,403
CVD	Cerebrovascular Disease	430-438	430-438
Atherosclerosis	Atherosclerosis	440	440
Other Dis Arteries	Other Diseases of Arteries, Arterioles, and Capillaries	441-448	441-448
Bronchitis	Acute Bronchitis and Bronchiolitis	466	466
Pneumonia	Pneumonia	480-486	480-486
Influenza	Influenza	470-474	487
COPD	Chronic Obstructive Pulmonary Diseases and Allied Conditions	490-493	490-496
Ulcer	Ulcer of Stomach and Duodenum	531-533	531-533
Appendicitis	Appendicitis	540-543	540-543
Hernia,Intest Obstr	Hernia of Abdominal Cavity and Intestinal Obstruction without Mention of Hernia	550-553, 560	550-553, 560
Chron Liver Dis	Chronic Liver Disease and Cirrhosis	571	571
Cholelithiasis	Cholelithiasis and Other Disorders of Gallbladder	574-575	574-575
Nephritis	Nephritis, Nephrotic Syndrome, and Nephrosis	580-584	580-589
Kidney Infection	Infections of Kidney	590	590
Hyper Prostate	Hyperplasia of Prostate	600	600
Sign,Sym Ill Def	Symptoms, Signs, and Ill-Defined Conditions	780-796	780-799
MVA	Motor Vehicle Accidents	810-823	810-825
All Other Accidents	All Other Accidents and Adverse Effects	E800-E807 E825-E949	E800-E807, E826-E949
Suicide	Suicide	E950-E959	E950-E959
Homicide	Homicide and Legal Intervention	E960-E978	E960-E978
All Other External	Other External Causes	E980-E999	E980-E999
Fracture,Trauma,Burn	(no NCHS group for Fractures, Trauma, Burn)	N800-N959	N800-N959
Poisoning	(no NCHS group for Poisoning)	N960-N989	N960-N989
Other External NI	(no NCHS group for Other External		

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	or Unspecified Nature of Injury)	N990-N996	N990-N995
Compl Medical Care	(no NCHS group for Complications of Medical Care)	N997-N999	N996-N999
All Other	All Other Diseases	All Other	All Other
All Cancer	-	140-163,170-174 180-209	140-165,170-175 179-208

APPENDIX C

Groups of Causes of Death
ICD8 and ICD9 Codes and Comparability Ratios

NCHS Group Name ICD 9	ICD 8 Code Numbers	ICD 9 Code Numbers	Comparability Ratio
Shigellosis and Amebiasis	4,6	4,6	0.9818
Certain Other Intestinal Infections	8-9	7-9	0.1821
Tuberculosis	10-19	10-18	0.7668
Whooping Cough	33	33	0.8571
Streptococcal Sore Throat, Scarlatina and Erysipelas	34	34-35	1.4286
Mengococcal Infection	36	36	0.9788
Septicemia	38	38	0.8500
Acute Poliomyelitis	40-43	45	0.5000
Measles	55	55	0.9167
Viral Hepatitis	70	70	1.3986
Syphilis	90-97	90-97	1.0089
All Other Infectious and Parasitic Diseases	1-3,5,20-32, 37,39,44-54, 56-69,71-89, 91-136	1-3,5,20-32 37,39-41, 46-54,56-66, 71-88,98-139	1.0321
Malignant Neoplasms of Lip, Oral Cavity, and Pharynx	140-149	140-149	1.0117
Malignant Neoplasms of Digestive Organs and Peritoneum	150-159	150-159	1.0330
Malignant Neoplasms of Respiratory and Intrathoracic Organs	160-163	160-165	1.0007
Malignant Neoplasms of Breast	174	174-175	1.0089
Malignant Neoplasms of Genital Organs	180-187	179-187	1.0111
Malignant Neoplasms of Urinary Organs	188-189	188-189	0.9924
Malignant Neoplasms of All Other and Unspecified Sites	170-173,190-199	170-173,190-199	0.9557
Leukemia	204-207	204-208	1.0070
Other Malignant Neoplasms of Lymphatic and Hematopoetic Tissues	200-203,208,209	200-203	0.9385
Benign Neoplasms, Carcinoma in situ, and Neoplasms of Uncertain Behavior and of Unspecified Nature	210-239	210-239	1.2085
Diabetes Mellitus	250	250	0.9991
Nutritional Deficiencies	260-269	260-269	0.7167
Anemias	280-285	280-285	0.9296
Meningitis	320	320-322	0.9459

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Rheumatic Fever and Rheumatic Heart Disease	390-398	390-398	0.6648
Hypertensive Heart Disease	402	402	3.3022
Hypertensive Heart and Renal Disease	404	404	1.2119
Ischemic Heart Disease	410-414	410-414	0.8784
Other Diseases of Endocardium	424,428	424	1.2286
All Other Forms of Heart Disease	420-423, 425-427,429	415-423, 425-429	2.5035
Hypertension with or without Renal Disease	400,401,403	401,403	1.2703
Cerebrovascular Disease	430-438	430-438	1.0049
Atherosclerosis	440	440	1.0649
Other Diseases of Arteries, Arterioles, and Capillaries	441-448	441-448	0.7409
Acute Bronchitis and Bronchiolitis	466	466	0.8888
Pneumonia	480-486	480-486	0.9199
Influenza	470-474	487	0.9714
Chronic Obstructive Pulmonary Diseases and Allied Conditions	490-493	490-496	1.8846
Ulcer of Stomach and Duodenum	531-533	531-533	1.1192
Appendicitis	540-543	540-543	1.0080
Hernia of Abdominal Cavity and Intestinal Obstruction without Mention of Hernia	550-553, 560	550-553 560	0.9432
Chronic Liver Disease and Cirrhosis	571	571	1.0110
Cholelithiasis and Other Disorders of Gallbladder	574-575	574-575	1.0494
Nephritis, Nephrotic Syndrome, and Nephrosis	580-584	580-589	1.7397
Infections of Kidney	590	590	0.9878
Hyperplasia of Prostate	600	600	1.0232
Symptoms, Signs, and Ill-Defined Conditions	780-796	780-799	0.9102
Motor Vehicle Accidents	810-823	810-825	1.0117
All Other Accidents and Adverse Effects	E800-E807 E825-E949	E800-E807, E826-E949	0.9841
Suicide	E950-E959	E950-E959	1.0032
Homicide and Legal Intervention	E960-E978	E960-E978	1.0057
Other External Causes	E980-E999	E980-E999	0.9675
Fractures, Trauma, Burns	N800-N959	N800-N959	*
Poisoning	N960-N989	N960-N989	*
Other or Unspecified Effects of External Causes	N990-N996	N990-N995	*
Complications of Medical Care	N997-N999	N996-N999	*

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All Other Diseases	All Other	All Other	0.7786

* NCHS did not calculate comparability ratios for the Nature of Injury codes.

APPENDIX D

Life Table Definitions and Formulae

D_x : The number of deaths observed in the population aged x to $x+1$.

P_x : The midyear estimate of the number of persons in the population at each age x.

M_x : The mortality rate in the population, expressed by the number of deaths divided by the approximate number of years lived by the population at risk, both those alive and those who died, in the age interval x to $x+1$. The expression P_x is used as an estimate of the number of years lived by the population, yielding the rate

$$M_x = \frac{D_x}{P_x}.$$

n : The length of the interval, or number of years in the age interval. For this study, single years of age were used, or $n = 1$.

a_x : The number of years lived by those who died during the age interval x to $x+1$. For this analysis of those over age 65, a_x was set at .5 for each interval. The term a_x is generally set at .5 for ages 5 and over. Younger ages are set at $a_0 = .09$, $a_1 = .43$, $a_2 = .45$, $a_3 = .47$ and $a_4 = .49$ according to Chiang (8), and other estimates are similar. The difference in estimates of time lived by those who died in these younger ages is because deaths in the first year of life occur most often in the first month, and adjustments reflect this observed grouping of deaths in younger ages.

q_x : The probability of dying in the age interval from age x to $x+n$ for those alive at age x. This value can be estimated using the observed M_x as follows:

$$q_x = \frac{(n)(M_x)}{1 + (1-a_x)(n)(M_x)}.$$

The value of q_w, the probability of dying in the open-ended age group, is set at 1.00.

l_x : The number alive at age x. The number surviving at the start of each age interval; generally, the first interval considered, called the radix, is arbitrarily set at 100,000.

d_x : The life table number dying in the interval from age x to $x+n$. It is determined by the probability of dying, as follows:

$$d_x = (q_x)(l_x).$$

L_x : The number of years lived in the interval x to $x+n$ by those alive at the beginning of the interval at age x, including the years lived by those who survived to age $x+n$ and the years lived by those who died in the interval.

$$L_x = (n)(l_{x+n}) + (a_x)(n)(d_x).$$

The number of years lived by those who begin the open-ended age interval, L_w, in this study those 100 years or older, was estimated by the formula

$$L_w = .5 l_w.$$

Chiang presents an alternate method for calculating L_w. Since none survive the interval, $l_w = d_w$, giving $M_x = d_x / L_x$, and

$$L_w = \frac{l_w}{M_w}.$$

$\mathbf{T_x}$: The total number of years lived by those who survived beyond age x,

$$T_x = L_x + L_{x+n} + L_{x+2n} + \cdots L_w.$$

$\mathbf{e_x}$: The expectation of life remaining for those who reach age x,

$$e_x = \frac{T_x}{l_x}.$$