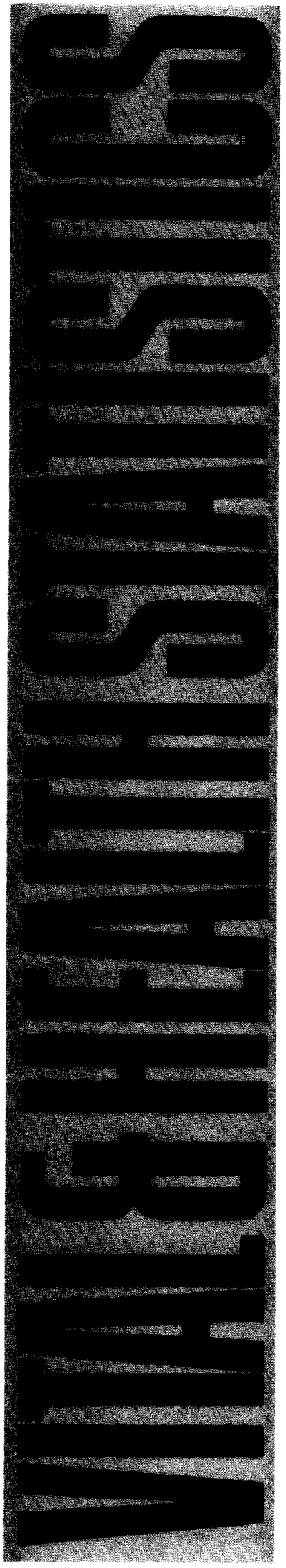

Changes in Mortality Among the Elderly: United States, 1940-78

Mortality statistics for people 65 years of age and over by age and sex are presented for 1940-78. Data on leading causes of death are shown for 1950-78. Quality of data, projections and the consequences of future growth of the elderly are also discussed. Cross-national trends in mortality for the elderly are also examined.

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Symbols

- - -	Data not available
. . .	Category not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
Z	Quantity more than zero but less than 500 where numbers are rounded to thousands
*	Figure does not meet standards of reliability or precision
#	Figure suppressed to comply with confidentiality requirements

Changes in Mortality Among the Elderly

by Lois A. Fingerhut, M.A., Division of Analysis

Introduction

This report examines mortality trends among the elderly population (people 65 years of age and over), principal causes of death contributing to mortality changes, projections of population change under varying assumptions of mortality decline, changing patterns of mortality in the United States compared with other countries, quality of data, and implications of aging on the health care system and other social and economic programs for the elderly.

Mortality among the elderly has become an area of growing interest and public health concern. Increasing longevity of the population as a result of declining death rates has made the population 65 years of age and over more numerous in absolute and relative terms and has altered the nature and demand for a variety of social and health services.

Growth in the size of the elderly population in the United States, especially during recent years, has resulted mainly from decreases in mortality among the elderly. These reductions are virtually without precedent. Continued reductions in death rates among the older population would contribute to longer life expectancy as well as to more elderly in the population.

Data sources

Unless otherwise stated, all U.S. data in this report are from the National Center for Health Statistics (NCHS), Division of Vital Statistics. Death rates for 1940-59 are from the *Vital Statistics Rates in the United States 1940-60.*[1] Some 1950-59 cause-specific death rates were obtained from this publication; others were calculated from deaths as published in the annual volumes of *Vital Statistics of the United States*[2] and populations from the U.S. Bureau of the Census series report *P-25, No. 310.*[3] Death rates for 1960-78 were obtained from published and unpublished trend tables of NCHS. These tables are available on request from the Division of Vital Statistics, NCHS. Death rates for 1961-69 and 1971 are based on revised population estimates and supersede rates published in the annual volumes of *Vital Statistics of the United States* for the respective years.

Throughout this publication, death rates for the population 85 years of age and over in 1970 are based on populations revised by the U.S. Bureau of the Census to correct for overestimates of the population 85 years of age and over, and specifically, the population 100 years of age and over.

The enumerated count of the group 85 years of age and over was 542,379 for males and 968,522 for females;[4] the revised figures are 489,000 and 919,000.[5]

Demographic background

Demographic background

Men and women in the United States are reaching 65 years of age in greater numbers and proportions than ever before. In 1940, the elderly in the United States numbered 9.0 million. By 1979, their number had increased to 24.7 million. The proportion of elderly in the total population increased from 7 percent in 1940 to an estimated 11 percent in 1979. Furthermore, the ratio of persons 65 years of age and over to those 20-64 years of age (which often is cited as a measure of dependency of the elderly population on the work force) grew from 12 per 100 in 1940 to 20 per 100 in 1979.[1,6]

Among the elderly population, an increasing proportion has been in the older ages. In 1940, 42 percent of the elderly were 65-69 years of age, and 13 percent were 80 years of age and over; by 1979, 35 percent were 65-69 years of age, and 21 percent were 80 years of age and over. The median age of the elderly population increased from 66.4 years in 1940 to 71.5 years in 1979.[1,6]

In addition to changes in age distribution, an increasing proportion of the elderly are female. In 1940, there were 95 males for every 100 females; by 1979, the ratio was 70 to 100.[1,6]

The aging of the U.S. population in the 20th century is a consequence of two factors—declining fertility and declining mortality. Declining fertility reduces the proportion of young persons to older persons; declining mortality results in more persons surviving. During the first half of this century, the major factor was declining fertility.[7] The cohort of females born during 1865-75 completed their childbearing years with an average of four children each; females born at the turn of the century had only two to three children each.[8]

During the same period, however, declining mortality had the opposite effect of declining fertility. Mortality decline was concentrated at younger ages, which resulted in a relative increase in the number of younger people in the population. On the other hand, decreases in mortality occurred across the age spectrum during the second half of this century (table A).

Table A. Percent change in death rate for selected years, by age: United States, 1925-78

Age	*1925-35*	*1935-45*	*1945-55*	*1968-78*
	Percent change			
Under 1 year	-19.2	-30.2	-32.9	-36.7
1-4 years	-31.3	-54.5	-44.3	-22.8
5-14 years	-25.0	-40.0	-45.9	-21.2
15-24 years	-28.9	-29.6	-40.0	-5.0
25-34 years	-16.7	-32.5	-44.0	-13.8
35-44 years	-13.9	-25.8	-33.0	-25.3
45-54 years	-4.9	-17.2	-20.9	-18.8
55-64 years	-0.4	-11.6	-15.6	-16.9
65-74 years	-5.8	-12.5	-10.5	-18.7
75-84 years	-5.2	-13.0	-10.6	-13.3
85 years and over	-17.5	-6.7	-9.4	-24.9

SOURCES: Vital Statistics Rates in the United States, 1900-40, table 6; 1940-60, table 63; and Final 1978 Mortality Statistics table 7, Monthly Vital Statistics Report.

This resulted in a larger elderly population than would have occurred if declines in mortality remained solely at younger ages.

The size of the elderly population from now until approximately 2040 has been determined largely by past trends in fertility. The "baby boom" infants of the mid-1940's through the late 1950's will reach 65 years of age during 2010-25. The decrease in the number of births after the early 1960's will affect the number of elderly in the population after 2025 and further changes in the size of the elderly population will result mainly from changes in mortality patterns for this population.

The large-scale immigration to the United States between 1905-14 (mostly young adult males) affected the age distribution as the group moved through the age structure (much like the baby boom generation did). Assuming the average age of immigrants was 20-25 years of age, most reached retirement age between 1945 and the late 1950's. By now, most of the 1914 immigrants, however, probably have died. Today the annual influx of immigrants is approximately 600,000, with only 2 percent 60 years of age and over.[9]

Mortality trends

From 1940 to 1978, the death rate for the elderly decreased by 27 percent to 53 deaths per 1,000 population 65 years of age and over. The decline was twice as great for females as for males—33 percent compared with 17 percent. Life expectancy at age 65 increased 3.5 years from 1940 to 1978, reaching 16.3 years. For elderly females, the increase in life expectancy was more than twice as great as for elderly males.

Sex	Life expectancy at age 65	
	1940	1978
Male	12.1	14.0
Female	13.6	18.4

Some of the change in mortality for the elderly is obscured by the aging of the elderly population. Analysis of time trends in mortality is enhanced by examining age-specific death rates and age-adjusted death rates,[a] which are relatively free from the distortions associated with a changing age composition. The age-adjusted rate shows the level of mortality assuming no changes occurred in the age composition of the population—in this case, the population 65 years of age and over—from year to year.

From 1940 to 1978, the age-adjusted death rate for the elderly decreased by 38 percent, 11 percentage points more than the decline in the unadjusted death rate. The age-adjusted rate decreased by 25 percent for males and 47 percent for females, far more than indicated by the change in the unadjusted death rate.

Sex	Age adjusted		
	1940	1978	Percent change
Both sexes	72.2	45.0	-37.7
Male	79.5	60.0	-24.5
Female	65.3	34.8	-46.7
	Unadjusted		
Both sexes	72.2	52.9	-26.7
Male	77.9	64.9	-16.7
Female	66.7	44.7	-33.0

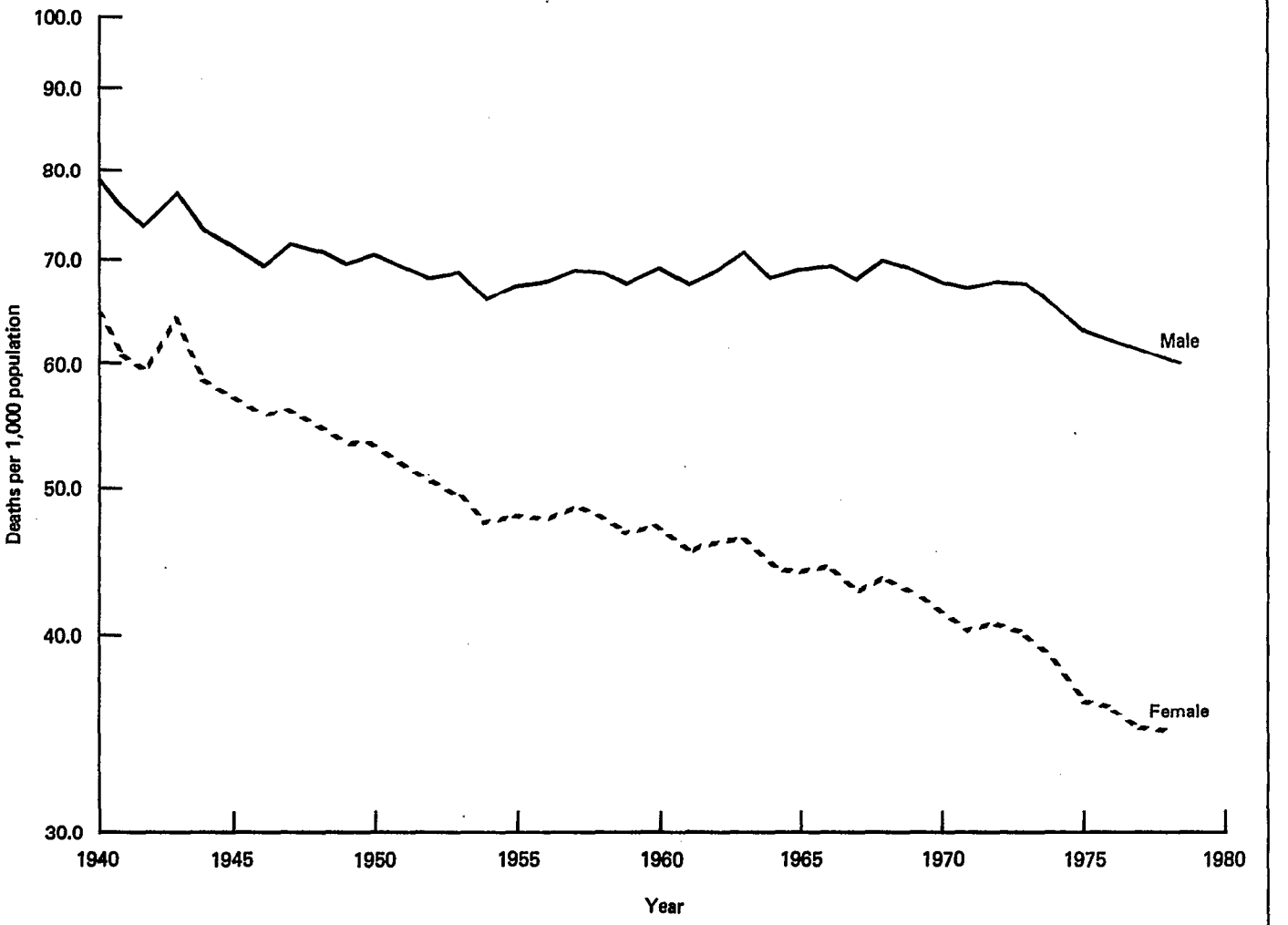
In recent time trend analyses of mortality, the years through 1978 (the most recent year for which final mortality data were available) are grouped into three periods characterized by varying paces of mortality change—1940-54, 1955-67, and 1968-78[10-12] (figure 1). During the earliest period (1940-54), mortality declined rapidly; age-adjusted death rates among people 65 years of age and over decreased by an average annual rate[b] of 1.1 percent for males and 2.0 percent for females (table B). During 1955-67, mortality rates leveled and changed little among the elderly; the age-adjusted death rate increased 0.2 percent annually for males but decreased 1.0 percent annually for females. From 1968 through 1978, mortality declined sharply again; age-adjusted death rates decreased by an average annual rate of 1.5 percent for males and 2.3 percent for females. Because of the very large differences in levels and trends in mortality between males and females, the following sections discuss males and females separately.

Trends in death rates by age

In each of the five age groups—65-69, 70-74, 75-79, 80-84, and 85 years of age and over—death rates decreased for males and females during 1940-78. Age-specific death rates for males 65 years of age and over

[a] Age adjusted by the direct method to the population 65 years of age and over in 1940 using the five age groups 65-69, 70-74, 75-79, 80-84, and 85 years of age and over.

[b] Throughout this report, annual rates of change were calculated by fitting a regression line to the logarithm of the death rates for every year. The slope of the line is the estimate of the annual rate of change of the death rates.



NOTES: Age adjusted by the direct method to the population 65 years of age and over in the United States as enumerated in 1940, using 5 age groups. Death rates for the group 85 years of age and over in 1970 used in computation of rates are based on population estimates revised by the U.S. Bureau of the Census to correct for overestimates of the group 100 years of age and over. See "Data sources" in text for more complete discussion.

Figure 1. Age-adjusted death rates for persons 65 years of age and over, by sex: United States, 1940-78

decreased, ranging from 22 percent to 30 percent; rates for females decreased more—from 40 percent to 50 percent (tables 1, 2, 3).

During 1940-54, death rates for the five age groups declined annually by approximately 1 percent for males and 2 percent for females (table B). For males, the annual decreases were slightly greater at older ages; the reverse was true for females. Death rates during 1955-67 were characterized by little change for males but by 1-percent average annual declines for females in each age group under 85 years. Declines in death rates for the most recent period (1968-78) were greater than those for 1940-54 among most age groups; the largest declines were among males 65-69 years of age and among those 85 years of age and over, regardless of sex.

Although the periods 1940-54, 1955-67, and 1968-78 are generally the most convenient intervals for describing mortality trends, this is not always the case. For example, trends in mortality for males 65-69 and 80-84 years of age and for females 70-74 years of age are best described in the following periods:

Sex and age	*Years*	*Annual percent change*	*Years*	*Annual percent change*	*Years*	*Annual percent change*
Males 65-69	1940-46	(-2.1)	1947-67	(0.1)	1968-78	(-2.2)
Males 80-84	1940-49	(-2.4)	1950-63	(-0.2)	1964-78	(-0.9)
Females 70-74	1940-56	(-2.2)	1957-71	(-1.2)	1972-78	(-3.0)

Table B. Average annual percent change in death rates among persons 65 years of age and over for selected years, by sex and age: United States, 1940-78

Sex and age	1940-54	1955-67	1968-78
Both sexes	Average annual percent change		
65 years and over[1]	-1.5	-0.5	-2.0
65-69 years	-1.4	-0.5	-2.4
70-74 years	-1.6	-0.6	-1.7
75-79 years	-1.5	-0.6	-1.4
80-84 years	-1.7	-0.8	-1.9
85 years and over	-1.4	0.3	-2.8
Male			
65 years and over[1]	-1.1	0.2	-1.5
65-69 years	-0.7	0.1	-2.2
70-74 years	-1.0	0.2	-1.5
75-79 years	-1.1	0.2	-0.9
80-84 years	-1.3	-0.4	-1.2
85 years and over	-1.5	0.9	-2.2
Female			
65 years and over[1]	-2.0	-1.0	-2.3
65-69 years	-2.3	-1.1	-2.6
70-74 years	-2.2	-1.3	-2.0
75-79 years	-1.9	-1.2	-1.7
80-84 years	-1.9	-1.1	-2.3
85 years and over	-1.3	0.0	-3.0

[1]Age adjusted by the direct method to the population 65 years of age and over in the United States as enumerated in 1940, using 5 age groups.

Sex differences in mortality

Mortality differences between males and females 65 years of age and over have increased steadily over time. In 1940, the age-adjusted death rate for males was 22 percent higher than that for females; by 1978, the difference had increased to 73 percent. One way to summarize the sex differences in mortality is by the mortality-sex ratio (hereinafter referred to as the sex ratio), which is the ratio of the death rate for males to the death rate for females.

The sex ratio increased annually from 1940 through 1978 by approximately 2 percent for people 65-69 and 70-74 years of age but increased more slowly at older ages (table C). During the earliest of the three periods (1940-54) the sex ratio increased rapidly at 65-69 years of age (2.5 percent annually) but tapered off gradually with advancing age to almost no change at the oldest ages (tables C and 4).

Mortality change was relatively slow during 1955-67, but annual increases in the sex ratio were greater than increases for the earlier period and generally were greater than those for the latest period (1968-78). At 65-69 through 75-79 years of age, the sex ratio increased annually by an average of 2 percent; at 80-84 and 85 years of age and over, the annual increase was 1 percent.

Although the 1978 sex ratio is as large as it has been, the annual increase in the sex ratio slowed during 1968-78 for people 65-69 through 75-79 years of age as a result of the accelerating decline of male mortality. For people 80-84 years of age, the ratio increased; for the oldest people (85 years of age and over), the annual increase remained at 1 percent.

Table C. Average annual percent change in mortality-sex ratios[1] among persons 65 years of age and over for selected years, by age: United States, 1940-78

Year	65 years and over[2]	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
	Average annual percent change					
1940-54	1.2	2.5	1.6	1.0	0.7	-0.2
1955-67	1.7	2.3	2.4	1.9	1.0	1.0
1968-78	1.3	0.9	1.1	1.4	1.7	1.0

[1]Ratio of male death rate to female death rate.
[2]Age adjusted by the direct method to the population 65 years of age and over in the United States as enumerated in 1940, using 5 age groups.

Cause of death

Diseases of heart, Malignant neoplasms, and Cerebrovascular diseases accounted for three of every four deaths among the population 65 years of age and over in 1950 as well as in 1978.[c] As early as 1900, these causes, and Influenza and pneumonia were responsible for approximately 50 percent of the mortality among the elderly;[d] influenza and pneumonia caused approximately 12 percent of the deaths at these ages in 1900. Trends in mortality among the elderly since 1950 are discussed for each leading cause of death.

Diseases of heart

Trends and patterns in mortality from heart disease largely determine the salient features of general mortality in the United States (figure 2). Heart disease was the leading cause of death among the total population and among the elderly in 1950 and 1978. Among people 65 years of age and over, 44 of every 100 deaths in 1978 resulted from heart disease.

From 1950 to 1954, death rates from heart disease decreased for males and females 65 years of age and over (table D),[e] with particularly large decreases noted for males 85 years of age and over and for females 65-74 years of age. Death rates from heart disease remained unchanged during the next 12 years for males 65-84 years of age and for females 85 years of age and over (table 5). Characteristic of total mortality trends for females during this period, average annual declines of approximately 1 percent were observed for females 65-84 years of age. During 1968-78, death rates declined rapidly in all age-sex groups; with annual decreases averaging more than 2 percent and paralleling those reported for all causes of death combined. The greatest decline was for females 65-74 years of age—3.5 percent annually.

The sex ratio increased from 1950 to 1978 for each 10-year age group; the greatest increase was found to be for 65-74 years of age (table 6). By 1978, the sex ratio ranged from 2.1 at 65-74 years of age to 1.2 at 85 years of age and over.

Malignant neoplasms

Malignant neoplasms (cancer) is the only major cause of death for which death rates among the elderly have continued to rise since 1900 (figure 3). In 1978, cancer was the second leading cause of death among the elderly under 85 years of age and the third cause of death among those 85 years of age and over. Cancer accounted for 26 percent of all deaths among those 65-74 years of age, 18 percent among those 75-84 years of age, and 10 percent among those 85 years of age and over.

The term "cancer" collectively describes many malignant neoplasms. Cancer of the lung (trachea, bronchus, and lung), colon (large intestine except rectum), genital organs, and breast (among females)[f] accounted for more than half of all deaths from cancer among the elderly in 1978. In 1950, these causes accounted for approximately 40 percent of deaths from cancer for males and approximately 50 percent of deaths from cancer for females (table E).

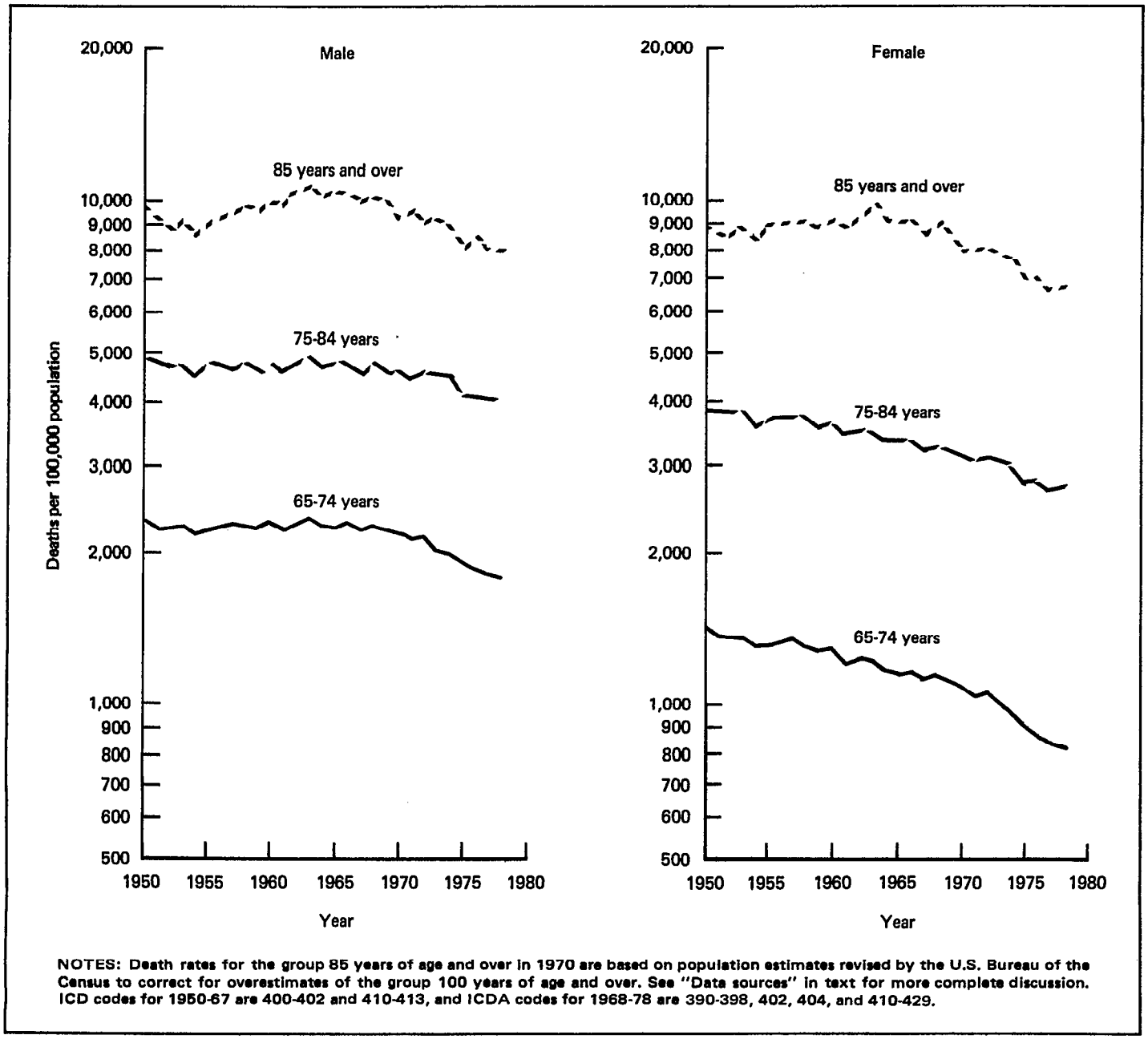
The total death rate for cancer rose almost without interruption among elderly males since 1950,

[c]Because of problems of comparability among specific causes of death between the 5th and 6th revisions of the *International Classification of Diseases* (ICD), 1950 was chosen as the starting point of this analysis.[13]

[d]Deaths from chronic nephritis were included in deaths from heart disease.

[e]Up to this point in the report, mortality changes have been discussed by 5-year age groups. To simplify the discussion, this section on causes of death examines mortality change in death rates grouped into 10-year age categories—65-74, 75-84, and 85 years of age and over.

[f]ICD codes for these cancer sites are trachea, bronchus, and lung for 1950-67, codes 162, 163; *International Classification of Diseases, Adapted for Use in the United States* (ICDA) codes for 1968-78, code 162; colon: for 1950-67, codes 152, 153; for 1968-78, 153; genital organs: for 1950-67, codes 171-179; for 1968-78, 180-187; and breast for 1950-67, 170; for 1968-78, 174.



NOTES: Death rates for the group 85 years of age and over in 1970 are based on population estimates revised by the U.S. Bureau of the Census to correct for overestimates of the group 100 years of age and over. See "Data sources" in text for more complete discussion. ICD codes for 1950-67 are 400-402 and 410-413, and ICDA codes for 1968-78 are 390-398, 402, 404, and 410-429.

Figure 2. Death rates among persons 65 years of age and over for Diseases of heart, by sex and age: United States, 1950-78

while annual decreases were observed among elderly females before the mid-60's (table 7). Since then, the cancer death rate for elderly females increased.

From 1950 to 1967, cancer mortality among all elderly males increased an average of about 1 percent per year (table F); increases generally were slower after 1955. Most of the increase was due to the rapid rise in lung cancer mortality.

Lung cancer was the leading cause of deaths from cancer among males 65-84 years of age in 1978; among males 85 years of age and over, cancer of the genital organs (predominantly prostate) was the leading cause of deaths from cancer. Among females 65-74 years of age, breast cancer accounted for most cancer deaths. Among females 75 years of age and over, colon cancer had the highest death rate for cancer, followed by breast cancer (tables 8-11).

During 1968-78, changes in lung cancer mortality for the elderly had a large influence on total cancer mortality (table G). For males 65 years of age and over, increases in lung cancer death rates decelerated in each 10-year age group; the greatest changes occurred for males 65-74 years of age. Annual increases in lung cancer mortality for that age-sex group decreased from 8.6 percent during 1950-54 to 2.4 percent for 1968-78, with a corresponding rate of change in total cancer mortality of 1.5 percent to 0.8 percent.

However, annual increases in lung cancer mortality for females 65-74 years of age accelerated

from 0.2 percent for 1950-54 to 8.0 percent during 1968-78. As a result, the 1950-54 annual decrease of 0.7 percent for females in total mortality from cancer reversed to an annual increase of 0.6 percent during 1968-78.

The sex ratio for all cancer increased greatly from 1950 to 1967 among the elderly because cancer mortality increased among males and decreased among females (table 12). Since 1968, increases in the ratio slowed because of the upturn in death rates for cancer of the lung for females. The extremely rapid mortality increases noted for females are associated with their prevalence of cigarette smoking which, for the 1901-10 birth cohort, peaked during the 1960's. Smoking prevalence peaked for the 1901-10 cohort of males about 20-25 years earlier and has declined more rapidly than for females.[14]

Table D. Average annual percent change in death rates among persons 65 years of age and over for Diseases of heart, by age, sex, and years: 1950-78

Sex and years	65-74 years	75-84 years	85 years and over
	Average annual percent change		
Male			
1950-54	-1.0	-1.2	-2.6
1955-67	0.0	-0.2	1.0
1968-78	-2.5	-1.5	-2.4
Female			
1950-54	-2.0	-1.7	-1.1
1955-67	-1.3	-1.1	0.1
1968-78	-3.5	-2.1	-2.9

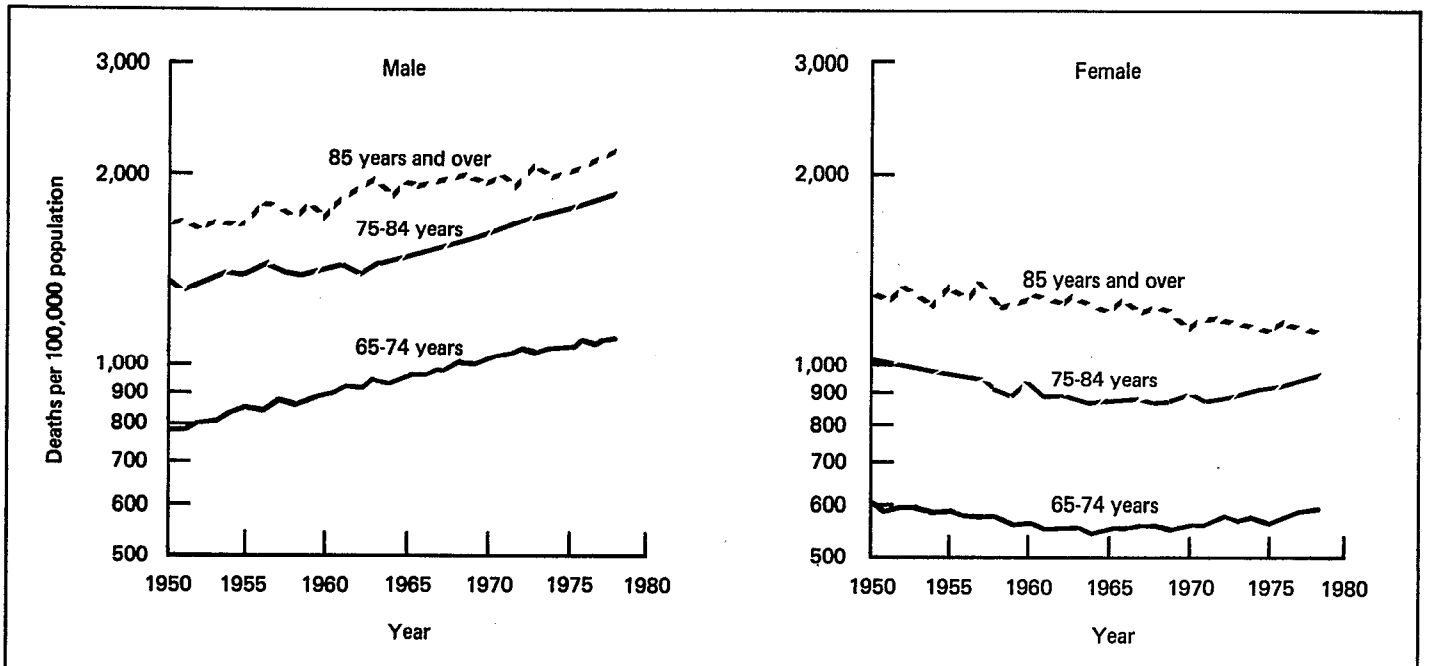
NOTES: ICD codes for 1950-67 are 400-402 and 410-443; ICDA codes for 1968-78 are 390-398, 402, 404, and 410-429.

Cerebrovascular diseases

Cerebrovascular diseases (stroke) was the third leading cause of death among the elderly 65-74 years of age and 75-84 years of age and the second leading cause among those 85 years of age and over (table 13). In 1978, stroke was responsible for 8 percent of all deaths of people 65-74 years of age increasing to 16 percent of all deaths for those 85 years of age and over.

Death rates for stroke have decreased more rapidly than rates for heart disease (figure 4). The most striking trends in stroke mortality have been the most recent (since 1968). For males and females in the three 10-year age groups, death rates for this cause decreased 3-5 percent annually, compared with earlier (1950-54 and 1955-67) annual declines of 1-2 percent among males and 1-3 percent among females (tables H and 13).

From 1950 through 1967, annual stroke mortality decreases among the elderly under 85 years of age were greater for females than for males. Since 1968, mortality reductions became similar for males and females because of the accelerated reduction in mortality among males. Although decreases in mortality from heart disease slowed since 1975, the rates of de-



NOTES: Death rates for the group 85 years of age and over in 1970 are based on population estimates revised by the U.S. Bureau of the Census to correct for overestimates of the group 100 years of age and over. See "Data sources" in text for more complete discussion. ICD codes for 1950-67 are 140-205 and ICDA codes for 1968-78 are 140-209.

Figure 3. Death rates among persons 65 years of age and over for Malignant neoplasms, by sex and age: United States, 1950-78

Table E. Percent of deaths from Malignant neoplasms among persons 65 years of age and over, by sex, age, selected year, and leading cancer site: United States, 1950 and 1978

Year, leading cancer site, and ICDA code	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Percent					
1978						
Leading sites	55.7	55.4	53.8	57.6	50.9	49.1
Cancer of lung 162	36.1	25.9	14.9	14.4	9.1	6.1
Cancer of colon 153	9.7	11.6	13.2	13.7	17.4	20.1
Cancer of breast 174	...	...	...	16.8	13.9	13.8
Cancer of genital organs 180-187	9.9	17.9	25.7	12.7	10.5	9.1
1950						
Leading sites	36.3	39.7	40.6	51.4	48.1	46.6
Cancer of lung 162, 163	12.5	6.2	3.7	3.8	3.3	2.2
Cancer of colon 152, 153	10.7	11.6	10.8	14.1	17.1	18.5
Cancer of breast 170	...	...	...	15.5	14.0	15.0
Cancer of genital organs 171-179	13.1	21.9	26.1	18.0	13.7	10.9

Table F. Average annual percent change in death rates among persons 65 years of age and over for Malignant neoplasms, by age, sex, and years: 1950-78

Sex and years	65-74 years	75-84 years	85 years and over
	Average annual percent change		
Male			
1950-54	1.5	1.0	0.2
1955-67	1.1	0.6	1.1
1968-78	0.8	2.0	1.0
Female			
1950-54	−0.7	−0.6	−0.3
1955-67	−0.5	−0.9	−0.4
1968-78	0.6	0.9	−0.6

NOTE: ICD codes for 1950-67 are 140-205; ICDA codes for 1968-78 are 140-209.

cline in stroke mortality among the elderly increased to 5-7 percent annually.

The sex ratio for stroke mortality increased slowly among the elderly under 85 years of age (table 14). Most of the increase occurred during 1950-67. At the oldest ages, death rates for strokes have been similar for females and males. Since the 1960's, the sex ratio for people 85 years of age and over has been near 1.00.

Table G. Average annual percent change in death rates among persons 65 years of age and over by selected cancer site, sex, year, and age: United States, 1950-78

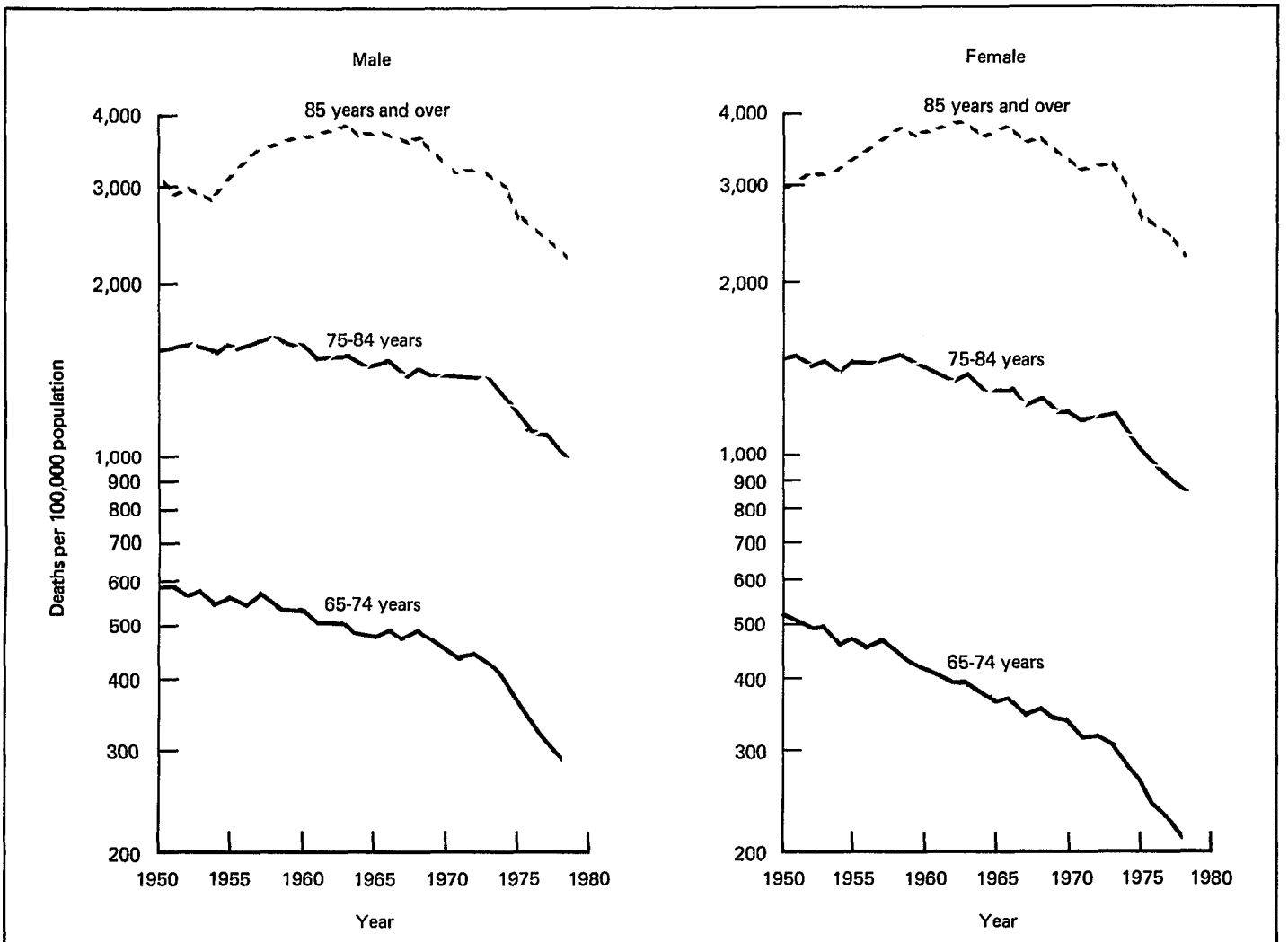
Cancer site, sex, and years	*65-74 years*	*75-84 years*	*85 years and over*
CANCER OF BREAST			
Female	Average annual percent change		
1950-54	−0.1	−0.7	−0.1
1955-67	−0.2	−1.1	−0.8
1968-78	0.8	0.9	−0.8
CANCER OF LUNG			
Male			
1950-54	8.6	8.3	5.2
1955-67	5.4	6.8	6.9
1968-78	2.4	5.1	5.0
Female			
1950-54	0.2	0.7	2.0
1955-67	2.8	1.5	3.6
1968-78	8.0	6.0	3.3
CANCER OF COLON			
Male			
1950-54	−0.2	0.9	−0.3
1955-67	0.7	0.6	1.4
1968-78	1.0	1.7	1.7
Female			
1950-54	−0.7	−1.2	0.5
1955-67	−0.2	−0.6	−0.4
1967-78	0.0	0.9	−0.3
CANCER OF GENITAL ORGANS			
Male			
1950-54	0.9	1.3	1.9
1955-67	−0.4	−0.5	0.8
1968-78	0.3	1.4	0.7
Female			
1950-54	−1.4	−0.8	−1.7
1955-67	−1.0	−1.3	−1.1
1968-78	−1.5	−0.4	−1.5

NOTES: ICD codes for cancer of the breast are for 1950-67, 170 and ICDA codes for 1968-78, 174; for cancer of the lung 1950-67, 162-163 and for 1968-78, 162; for cancer of the colon 1950-57, 152-153 and for 1958-78, 153; and for cancer of the genital organs for 1950-67, 171-179 and for 1968-78, 180-187.

Table H. Average annual percent change in death rates among persons 64 years of age and over for Cerebrovascular diseases, by age, sex, and years: United States, 1950-78

Sex and years	*65-74 years*	*75-84 years*	*85 years and over*
Male	Average annual percent change		
1950-54	−1.7	−0.3	−1.1
1955-67	−1.6	−1.0	1.0
1968-78	−4.9	−3.4	−4.3
Female			
1950-54	−2.8	−0.9	1.8
1955-67	−2.5	−1.5	0.4
1968-78	−5.2	−3.4	−4.2

NOTE: ICD codes for 1950-67 are 330-334; ICDA codes for 1968-78 are 430-438.



NOTES: Death rates for the group 85 years of age and over in 1970 are based on population estimates revised by the U.S. Bureau of the Census to correct for overestimates of the group 100 years of age and over. See "Data sources" in text for more complete discussion. ICD codes for 1950-67 are 330-334, and ICDA codes for 1968-78 are 430-438.

Figure 4. Death rates among persons 65 years of age and over for Cerebrovascular diseases, by sex and age: United States, 1950-78

Cross-national comparisons

Current Situation—1977

Analysis of age-adjusted death rates for males and females 65 years of age and over showed the United States compared favorably with other selected industrialized countries. Eight countries were selected for comparison with the United States as illustrative of economically advanced, industrialized countries with reasonably complete vital statistics. In 1977, the most recent year of comparable data, the age-adjusted death rate for elderly males was 60.3 deaths per 1,000 population in the United States (table J). Higher age-adjusted death rates were noted in England and Wales, the Federal Republic of Germany, Australia, and France. Rates for the remaining countries studied (Netherlands, Sweden, Japan, and Canada) were only slightly lower than for the United States.[15]

For females, only the age-adjusted death rate for Canada was lower than the U.S. rate (table J). The age-adjusted death rate for females in England and Wales was 22 percent higher than in the United

Table J. Age-adjusted death rates for 1977 and average annual percent change in death rates for 1950-54, 1955-67, 1968-77 among persons 65 years of age and over, by age: Selected countries

Sex and country	*Age-adjusted death rate per 1,000 population, 1977*[1]	*1950-77*	*1950-54*	*1955-67*	*1968-77*
Male		Average annual percent change			
Australia	65.4	−0.2	−0.8	0.1	−1.6
Canada	58.5	−0.3	−1.2	−0.4	−0.8
England and Wales	72.1	−0.3	−1.1	−0.3	−1.0
France	63.7	−0.6	−0.7	−1.0	−0.3
Federal Republic of Germany	70.9	0.1	1.2	−0.1	−1.2
Japan	56.6	−1.6	−2.2	−1.0	−2.6
Netherlands	60.1	0.3	−0.3	0.1	−0.2
Sweden	58.5	−0.2	−1.2	−0.1	−0.1
United States	60.3	−0.3	−1.5	0.2	−1.5
Female					
Australia	38.7	−1.0	−1.6	−0.8	−2.1
Canada	33.8	−1.7	−2.6	−1.6	−1.9
England and Wales	42.5	−1.0	−3.1	−0.9	−1.0
France	35.4	−1.5	−1.4	−1.8	−1.2
Federal Republic of Germany	43.7	−1.2	−0.3	−1.7	−2.1
Japan	38.0	−2.0	−2.8	−1.4	−2.7
Netherlands	35.0	−1.5	−1.6	−1.7	−2.3
Sweden	35.7	−1.7	−1.7	−1.6	−1.9
United States	34.9	−1.3	−2.3	−1.0	−2.3

[1] Age adjusted by the direct method to the population 65 years of age and over in the United States as enumerated in 1940, using 5 age groups.

SOURCES: United Nations Demographic Yearbook, 1966. Pub. No. 67-XIII-1. New York. United Nations, 1967; United Nations Demographic Yearbook, 1974. Pub. No. ST/ESA/STAT/R/3. New York. United Nations, 1975. United Nations Demographic Yearbook, 1978. Pub. No. ST/ESA/STAT/SER.R/8. New York. United Nations, 1979; personal communication, and data computed by the Division of Analysis from data compiled by the Division of Vital Statistics.

States; in the Federal Republic of Germany, it was 25 percent higher than in the United States.

Generally, death rates of males and females 65-79 years of age were lower for the United States than the rates for Australia, England and Wales, and the Federal Republic of Germany, but the U.S. rates were higher than the rates in Japan, Sweden, the Netherlands, France, and Canada (table K). For the elderly 80-84 and 85 years of age and over, the U.S. rates were lower than those of any of the countries compared, with the exception of Canada, for which the rate for people 80-84 years of age was approximately the same. Overall, death rates for males and females in England and Wales and the Federal Republic of Germany were higher than in most countries; death rates for males in Japan and death rates for females in France were lower for those under 80 years of age than in most other countries.

In each country, the sex ratio decreased with increasing age (table L). At 65-69 years of age, the ratio was highest in France–2.4 times higher for males than for females. (In the United States, the ratio was 2.1.) France also had the highest ratio for elderly 70-74 and 75-79 years of age; only the ratios in Canada and the United States for the elderly 80-84 years of age and 85 years of age and over and in Sweden at 85 years of age and over were as high. The lowest ratio was observed for Japan for each age

Table K. Death rates among persons 65 years of age and over, by age, sex, and country: Selected countries, 1977

Sex and country	*65-69 years*	*70-74 years*	*75-79 years*	*80-84 years*	*85 years and over*
Male	Deaths per 1,000 population				
Australia	36.5	55.7	85.8	127.1	216.4
Canada[1]	32.9	50.6	75.5	113.9	188.8
England and Wales[1]	38.9	62.3	96.5	142.4	232.2
France	32.7	51.3	84.4	133.6	237.0
Federal Republic of Germany	37.6	61.8	94.4	142.8	228.6
Japan	26.9	46.2	77.0	124.2	207.4
Netherlands	33.6	52.4	78.1	116.1	194.3
Sweden[1]	29.4	47.1	77.9	124.2	219.0
United States	34.7	53.2	81.5	113.6	173.0
Female					
Australia	17.4	28.7	50.7	86.2	177.1
Canada[1]	16.1	26.4	42.4	73.5	148.7
England and Wales[1]	19.2	32.1	54.9	97.1	188.6
France	13.6	24.1	45.7	85.6	189.3
Federal Republic of Germany	17.9	32.5	58.8	104.7	196.5
Japan	15.0	27.3	51.1	92.5	181.1
Netherlands	14.8	25.5	46.8	80.3	164.4
Sweden[1]	14.3	25.2	47.8	85.4	173.3
United States	16.9	27.7	47.4	73.9	135.4

[1]Data derived from annual statistical reports of the respective countries.

SOURCE: United Nations Demographic Yearbook Historical Supplement. New York. United Nations, 1979.

Table L. Mortality-sex ratios[1] among persons 65 years of age and over, by age and country: Selected countries, 1977

Country	*65 years and over*[2]	*65-69 years*	*70-74 years*	*75-79 years*	*80-84 years*	*85 years and over*
	Ratio					
Australia	1.69	2.10	1.94	1.69	1.47	1.22
Canada	1.73	2.04	1.92	1.78	1.55	1.27
England and Wales	1.70	2.03	1.94	1.76	1.47	1.23
France	1.80	2.40	2.13	1.85	1.56	1.25
Federal Republic of Germany	1.62	2.10	1.90	1.61	1.36	1.16
Japan	1.49	1.79	1.69	1.51	1.34	1.15
Netherlands	1.72	2.27	2.05	1.67	1.45	1.18
Sweden	1.64	2.06	1.87	1.63	1.45	1.26
United States	1.73	2.05	1.92	1.72	1.54	1.28

[1]Ratio of male death rate to female death rate.
[2]Age adjusted by the direct method to the population 65 years of age and over as enumerated in 1940, using 5 age groups.

SOURCE: Data derived from tables K and J.

group. Mortality sex ratios in Canada and England and Wales most nearly paralleled the U.S. ratios for each age group.

Trends 1950-77

From 1950 to 1977, age-adjusted death rates for males showed very little change for each country except for Japan, where the rate decreased by 1.6 percent per year. Age-adjusted rates for females averaged declines of 1-2 percent annually, with declines in Japan at 2 percent annually (which exceeded all others). During these 28 years, however, mortality decline was not constant. For most countries, the early 1950's and the late 1960's through the 1970's were periods of mortality decline. The interim years 1955-67 were characterized by slowed mortality decline.

Trends 1950-54.—For most countries, the years 1950-54 were characterized by moderate annual declines in age-adjusted mortality among the elderly (table J). Led by Japan, death rates for males averaged decreases of 1-2 percent annually; led by England and Wales, death rates for females fell by an average of 2-3 percent. Without exception, reductions in age-adjusted death rates for females exceeded those for males. In the United States, age-adjusted death rates for males declined annually by 1.5 percent, second to Japan. By contrast, mortality increased by 1.2 percent per year in the Federal Republic of Germany.

The age-adjusted death rate decline for females in the United States during this period was exceeded by England and Wales, Japan, and Canada. Unlike the other countries, the Federal Republic of Germany had essentially no change during 1950-54.

Trends 1955-67.—The U.S. pattern of slow mortality decline during 1955-67 was followed in most countries for males but not for females (table J). Lack of change in male mortality was characteristic of most countries. Exceptions were France and Japan, which had 1 percent annual declines.

In the United States, the age-adjusted death rates for females during 1955-67 declined an average of 1 percent annually, which was much slower than during preceding years and slower than in most other countries. In France, the Federal Republic of Germany, the Netherlands, and Sweden, the age-adjusted death rate declined at approximately the same pace or faster than during the early 1950's.

Trends 1968-77.—The pattern of mortality decline from 1968-77 in the United States also was evident in many of the other countries (table J). Declines averaging 1-2 percent in age-adjusted death rates for males were the norm. Exceptions were found for France, the Netherlands, and Sweden, for which mortality did not decline; mortality declined most rapidly in Japan. Mortality rates for females improved in almost every country, averaging more than 2 percent per year. The rates of decline remained fairly similar to those in 1955-67 only in England and Wales, and in France, mortality decline slowed compared with 1955-67. Similar to death rates for males in Japan, death rates for females in Japan showed the fastest declines.

Annual rates of change in age-specific death rates do not show important differences compared with age-adjusted death rates (table 15). Because the number of deaths in many of the countries studied is much lower than in the United States (Australia, Canada, the Netherlands, and Sweden each has less than one-tenth the number of deaths of the United States), age-specific rates are subject to much more random error than age-adjusted rates.

Quality of data

Questions have been raised periodically about the quality of the demographic information upon which death rates for the elderly are based. In particular, census undercounts and the accuracy of age reporting are targets for concern for the elderly population. Furthermore, the issue of quality of cause of death coding also has been questioned.

Population coverage and age misreporting

Data for the death rates published by the National Center for Health Statistics are provided by two independent sources and as such are subject to errors from both. Denominators (population) for death rates are supplied by the U.S. Bureau of the Census in intercensal and postcensal estimates, and decennial censuses. Errors associated with population data often are serious, especially when estimating size of the elderly population. Errors of coverage and of age misreporting are common among this group. For the population 65 years of age and over, the net undercount in the 1970 census was estimated by the U.S. Bureau of the Census to be 1.8 percent, but this varied greatly by age—from a net overcount of 15 percent (a result of misreported ages) for black females 65-69 years of age to undercounts of 6 percent for white females and 21 percent for black females at the oldest ages.[16] In general, net undercounts were lower for males.

For the elderly, a large part of the net undercount rate was a result of their being omitted from the census. Medicare enrollment data were used to evaluate the overall omission rate of the elderly for the 1970 census. Analysis of these data found that approximately 5 percent of the population 65 years of age and over were not counted in the census—3.5 percent of the elderly 65-69 years of age, 5.2 percent of those 70-74 years of age, and 5.8 percent of those 75 years of age and over. Omission was most pronounced (13.7 percent) for elderly males other than white males.[17]

Problems with the numerator of the death rate mainly result from misreporting age. Hambright's 1960 analysis of comparability between age on death certificates and age on census schedules concluded that agreement between the two sources was poor for the other than white population, especially at older ages.[18] For the elderly other than white at 65-69 years of age, only 61 percent of the ages on death certificates and census schedules matched. This proportion decreased to 50 percent at 85-89 years of age and 44 percent at 95-99 years of age.

The combination of errors in numerators and denominators is perhaps most exaggerated in death rates for the population 85 years of age and over. For this group, age data are generally of poor quality.[19-22] Because of the lack of consistency between reporting ages on death certificates and on census schedules, biases enter the death rate from both the numerator and the denominator. In addition, these errors are compounded because of the relative size of the population 85 years of age and over.

To eliminate a potential source of bias—population statistics—Rosenwaike[23] reconstructed the population 85 years of age and over using the method of "extinct generations," that is, summing deaths that occur at and after 85 years of age (single years) for 1951-65. These figures are used as denominators for the death rate.

The method of extinct generations, however, is valuable only if it is assumed that ages on death certificates are more reasonable than ages reported on census schedules.

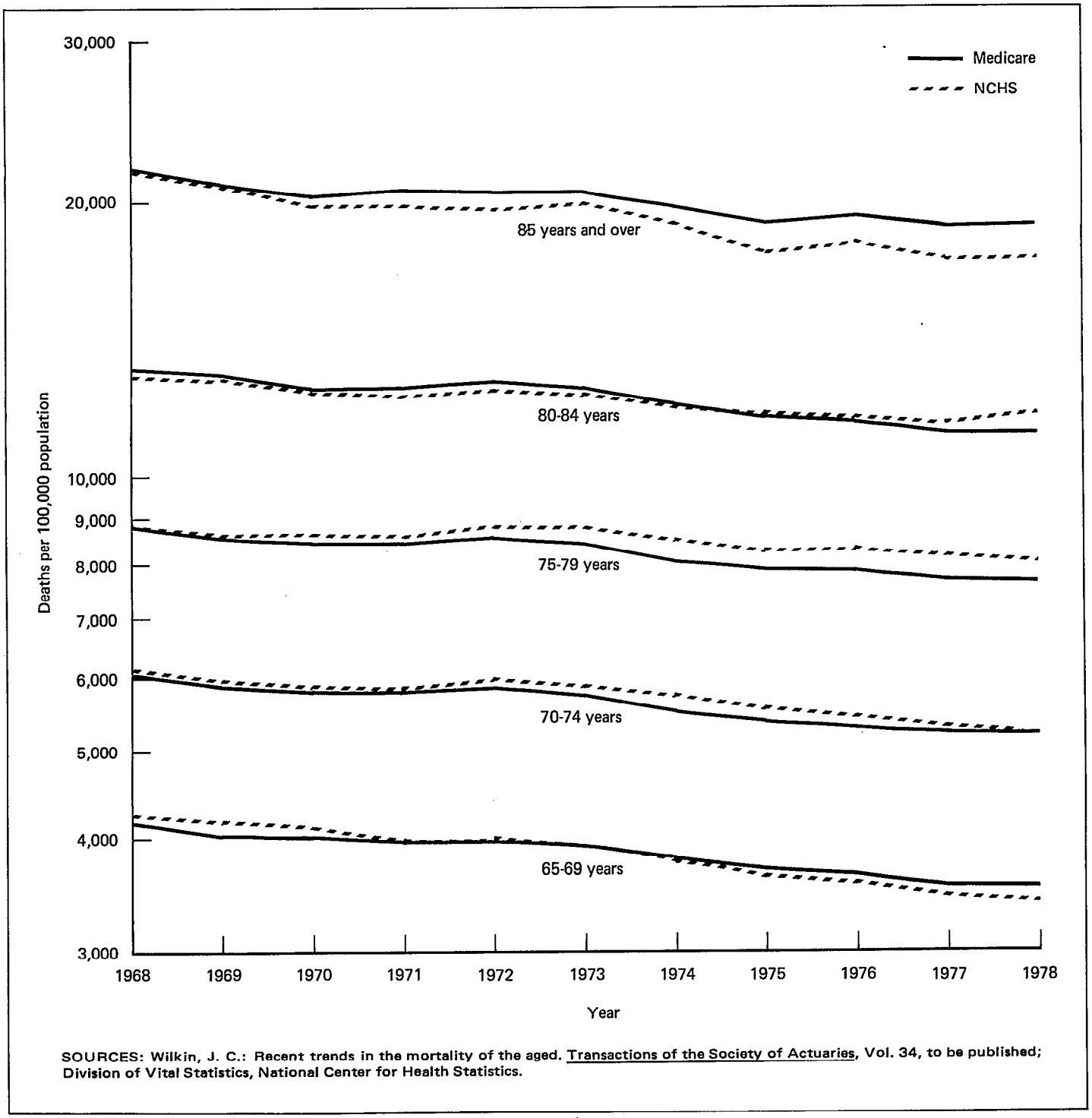
For all persons, reconstructed death rates and NCHS rates at 85 years of age and over were similar; the maximum difference was only 4 percent during the 15 years. However, among females other than white, reconstructed rates for 1951-60 were 7-19 percent higher than NCHS rates.[20] Similar large data discrepancies among females other than white are noted by Kitagawa and Hauser.[20]

Medicare data

Since 1968, the Medicare program has been a second source of mortality data for the elderly. Comparability between numerators and denominators in

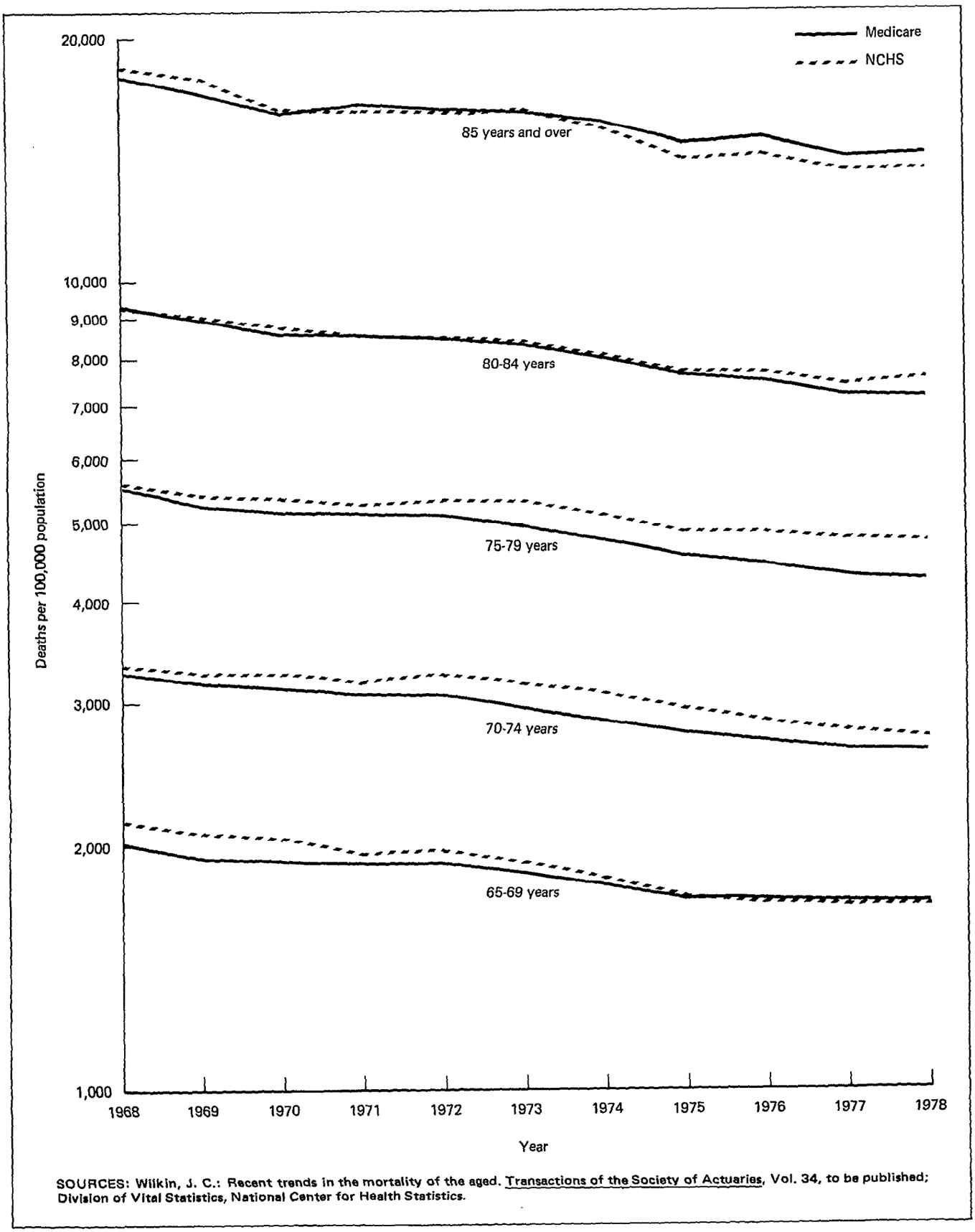
Medicare data is not an issue, because both come from the same source. Furthermore, because proof of age is an eligibility requirement for Medicare, reliability of age data is not questioned as often as age on death certificates or census records are. The U.S. Bureau of the Census uses Medicare death rates for the elderly to construct national population projections.

Wilkin[24] compared trends from 1968-78 in age-adjusted and age-specific death rates for males and females published by the Medicare program with those published by NCHS. Medicare reported age-adjusted death rates for males that were slightly higher (0.1 percent) and age-adjusted death rates for females that were lower (2.6 percent) than NCHS rates. According to Wilkin, this is consistent with the sex differential in the estimated net census undercount of the elderly for 1970, 0.9 percent for males and 2.4 percent for females. Annual rates of decline in the age-adjusted rates from both sources were similar.



SOURCES: Wilkin, J. C.: Recent trends in the mortality of the aged. Transactions of the Society of Actuaries, Vol. 34, to be published; Division of Vital Statistics, National Center for Health Statistics.

Figure 5. Death rates among males 65 years of age and over based on Medicare data and National Center for Health Statistics data, by age: United States, 1968-78



SOURCES: Wilkin, J. C.: Recent trends in the mortality of the aged. Transactions of the Society of Actuaries, Vol. 34, to be published; Division of Vital Statistics, National Center for Health Statistics.

Figure 6. Death rates among females 65 years of age and over based on Medicare data and National Center for Health Statistics data, by age: United States, 1968-78

Medicare and NCHS age-specific death rates from 1968-78 are shown in figures 5 and 6. The NCHS death rates are not as consistent across age groups as the Medicare rates, but they are more consistent than the NCHS rates shown by Wilkin. The NCHS rates for 1968, 1969, and 1971 plotted in the figures are based on revised population estimates made available after the 1970 census became final. The NCHS death rates shown by Wilkin were published in the annual volumes of *Vital Statistics of the United States* for 1968, 1969, and 1971; these death rates were unrevised. The ratio of Medicare death rates to the NCHS revised and unrevised death rates as well as the average annual rates of change for the Medicare and NCHS revised and unrevised death rates are given in tables M and N. Regardless of revision, the annual rates of change in NCHS and Medicare data at 65-69 years of age and 75-79 years of age were very different. Although the Medicare data appear to be more reasonable estimates of mortality risk than the NCHS data, certain qualifications limit their usefulness: (1) the Medicare data are not cause-specific, and (2) data date back only to 1966.

Metropolitan Life Insurance Company data

The Metropolitan Life Insurance Company provides another source of mortality statistics. Although data are not national or representative of the population at large, they provide an independent check on the recent trends in mortality rates for the elderly population. Because of selections required to become a policyholder—generally, better health and higher socioeconomic status than the rest of the population—the death rates from Metropolitan Life are compared with NCHS death rates based on the white U.S. population. Data for whites are used as a surrogate for socioeconomic status. Since 1968, male death rates from Metropolitan Life declined faster and

Table M. Ratio of death rates based on Medicare data to death rates based on National Center for Health Statistics unrevised and revised data, by age, sex, and year: United States, 1968-71

Sex and year	65-69 years		70-74 years		75-79 years		80-84 years		85 years and over	
	M/N.U.[1]	M/N.R.[2]	M/N.U.[1]	M/N.R.[2]	M/N.U.[1]	M/N.R.[2]	M/N.U.[1]	M/N.R.[2]	M/N.U.[1]	M/N.R.[2]
Male					Ratio					
1968	0.9753	0.9831	0.9375	0.9872	1.0213	1.0002	1.0811	1.0233	1.0741	1.0077
1969	0.9706	0.9678	0.9380	0.9875	1.0064	0.9919	1.0681	1.0052	1.0722	1.0044
1970	...	...	...	...	...	...	...	...	1.1364	1.0245
1971	0.9945	1.0001	0.9573	0.9966	0.9673	0.9803	1.0853	1.0239	1.1251	1.0439
Female										
1968	0.9115	0.9393	0.9382	0.9834	1.0040	0.9818	1.0224	1.0018	0.9315	0.9690
1969	0.9034	0.9267	0.9297	0.9743	0.9988	0.9785	1.0082	0.9857	0.9074	0.9631
1970	...	...	...	...	...	...	...	...	1.0409	0.9877
1971	0.9489	0.9746	0.9268	0.9689	0.9860	0.9715	1.0289	1.0099	0.9458	1.0159

[1]The ratio of Medicare (M) data to NCHS unrevised (N.U.) data.
[2]The ratio of Medicare (M) data to NCHS revised (N.R.) data.

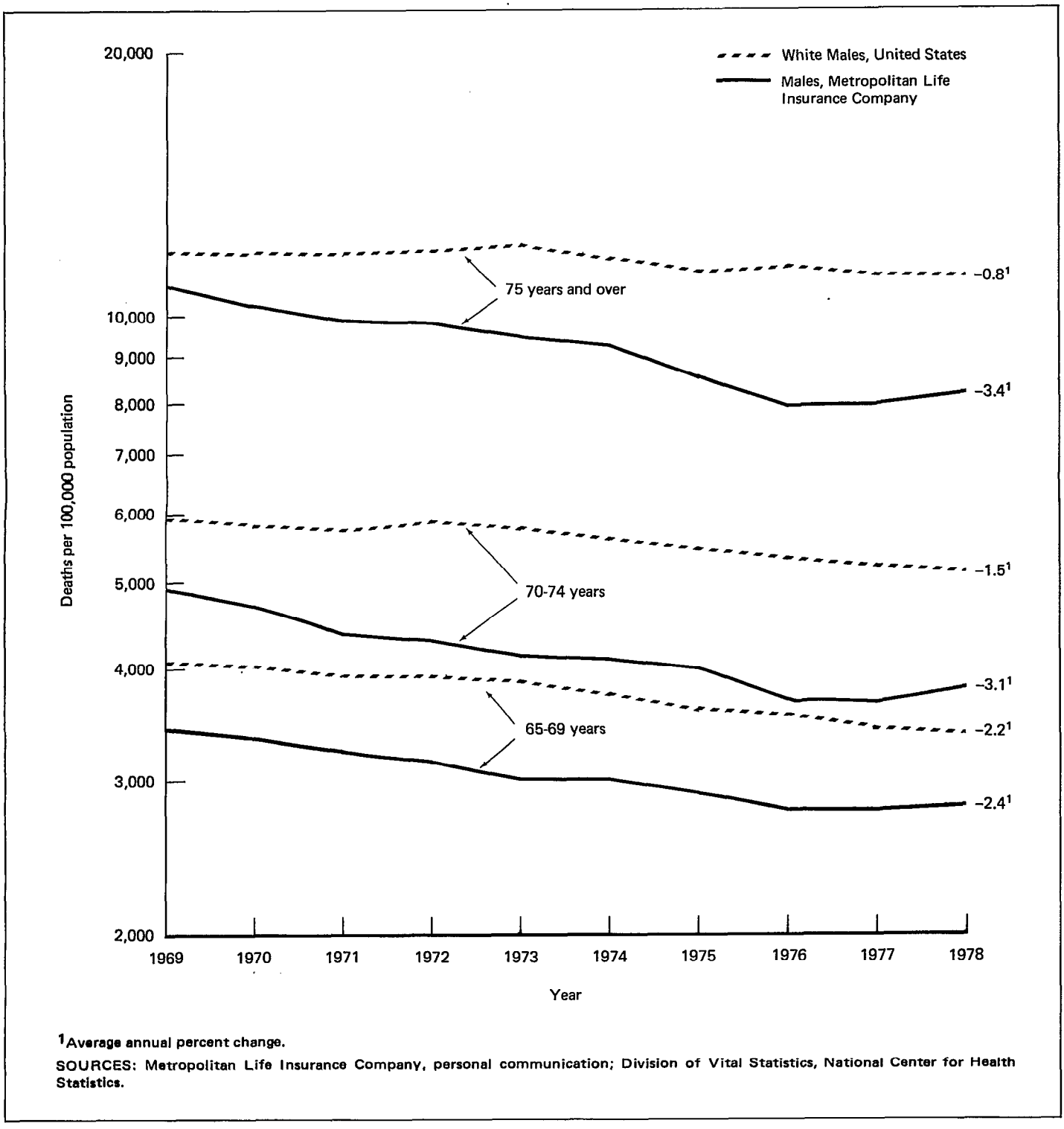
NOTE: See "Data sources" in text for 1970 data on persons 85 years of age and over.

SOURCES: Wilkin, J. C.: Recent trends in mortality of the aged. Transactions of the Society of Actuaries, Vol. 34, to be published; Division of Vital Statistics, National Center for Health Statistics.

Table N. Average annual percent change in death rates among persons 65 years of age and over based on Medicare data and National Center for Health Statistics unrevised and revised data, by age and sex: United States, 1968-78

Sex	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
Male	Average annual percent change				
Medicare	-1.6	-1.5	-1.4	-1.5	-1.5
NCHS unrevised	-2.2	-2.0	-0.7	-0.6	-1.3
NCHS revised	-2.2	-1.5	-0.9	-1.2	-2.2
Female					
Medicare	-1.7	-2.3	-2.6	-2.6	-2.1
NCHS unrevised	-2.9	-2.5	-1.6	-2.1	-3.4
NCHS revised	-2.6	-2.0	-1.7	-2.3	-3.0

SOURCES: Wilkin, J. C.: Recent trends in mortality of the aged. Transactions of the Society of Actuaries, Vol. 34, to be published; Division of Vital Statistics, National Center for Health Statistics.



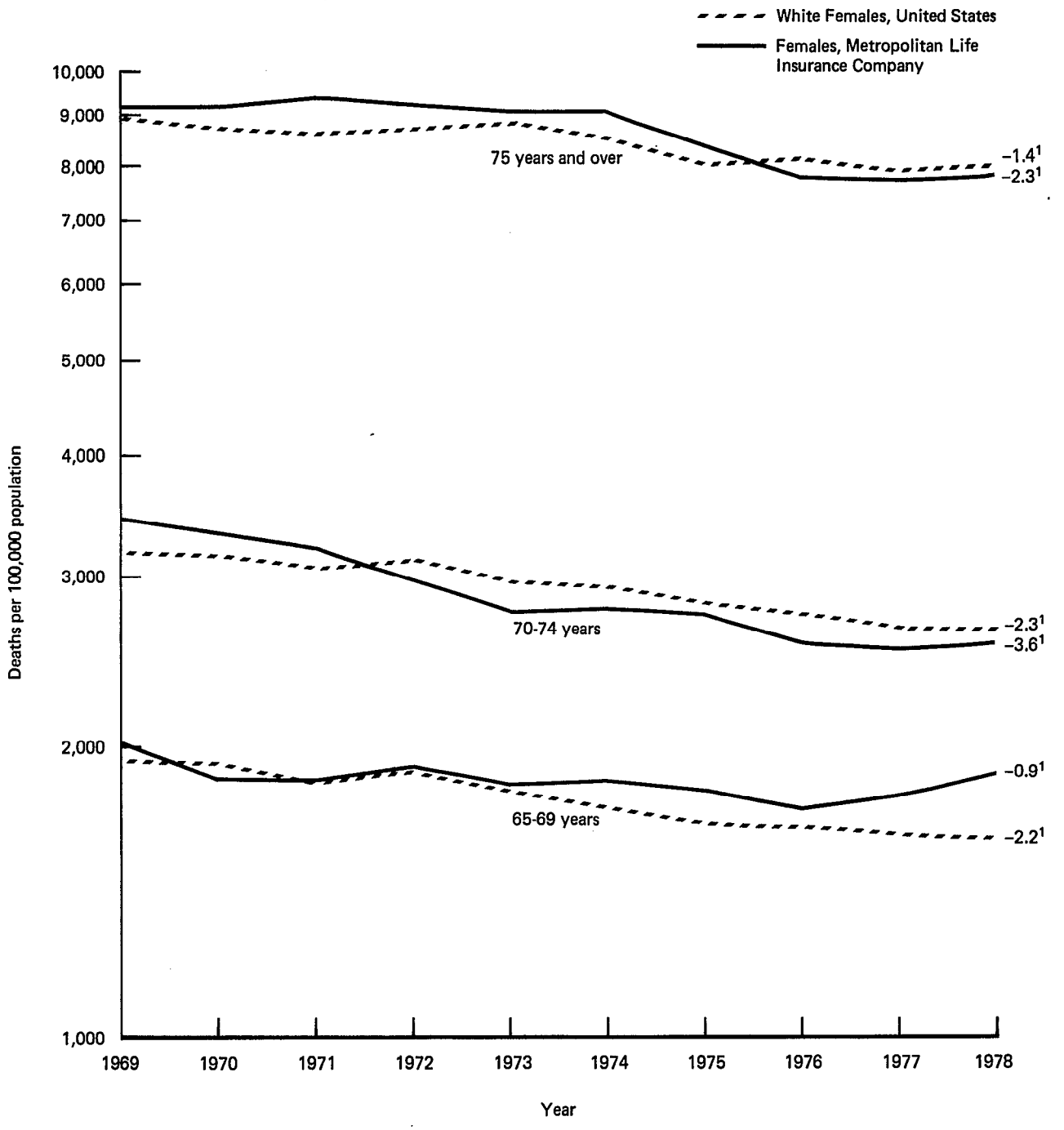
¹Average annual percent change.

SOURCES: Metropolitan Life Insurance Company, personal communication; Division of Vital Statistics, National Center for Health Statistics.

Figure 7. Death rates among white males 65 years of age and over in the United States and among males 65 years of age and over with standard ordinary policies from the Metropolitan Life Insurance Company and the annual average percent change, by age: 1969-78

were lower than death rates for white males in the United States (figure 7). Among males 70-74 and 75 years of age and over, the gap appears to be widening. However, some of the differences between the U.S. rates and Metropolitan rates at 75 years of age and over probably were a result of a younger Metropolitan Life population. That is, the proportion of males 75-79 years of age to males 85 years of age may have been larger in the insurance population than in the U.S. population. The "selection" factor is likely to be the major factor in the difference between the two sets of rates.

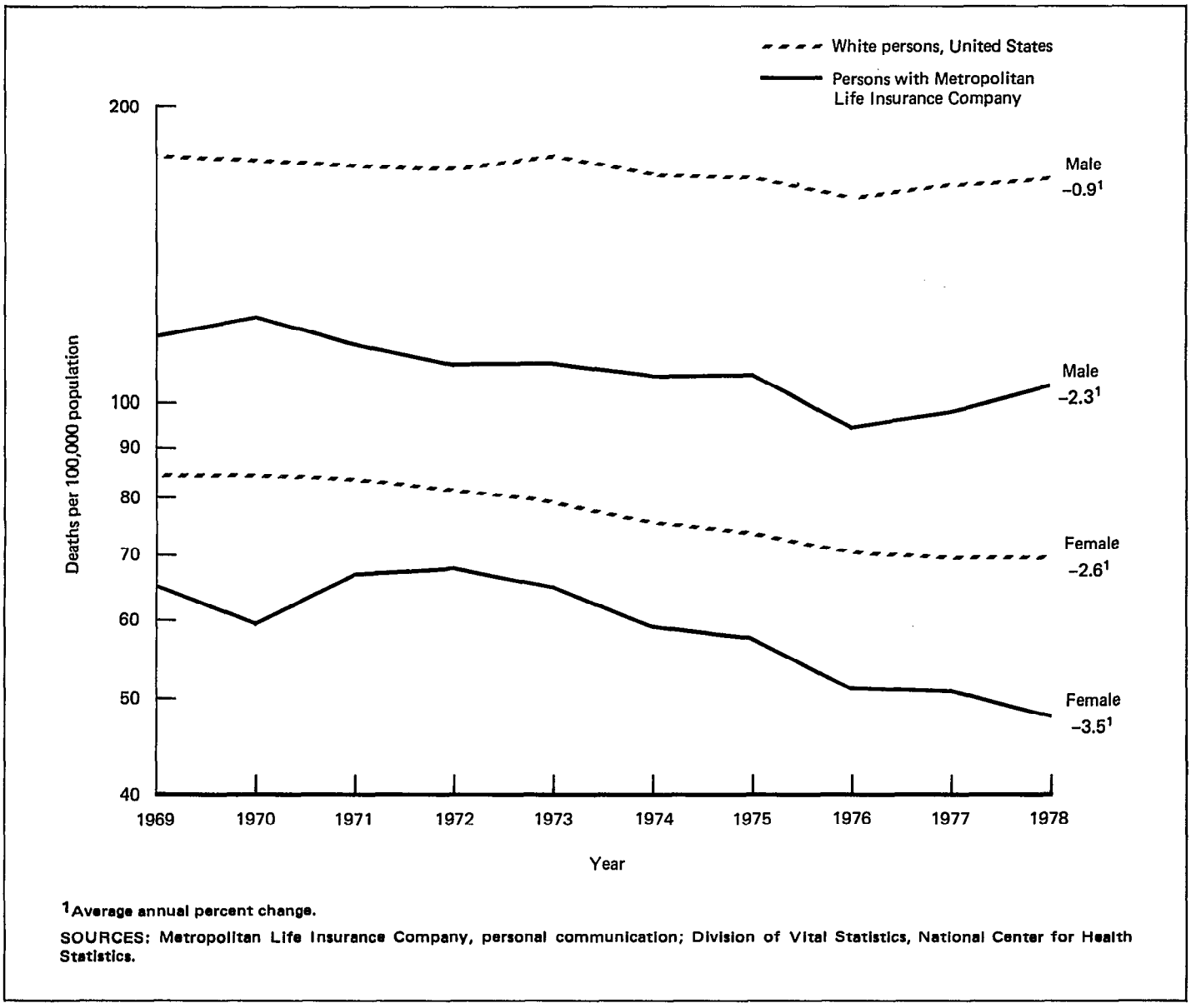
Among elderly females, however, the death rates from the two sources showed remarkably similar trends and absolute values. According to statisticians at Metropolitan Life, elderly females usually were in-



[1]Average annual percent change.

SOURCES: Metropolitan Life Insurance Company, personal communication; Division of Vital Statistics, National Center for Health Statistics.

Figure 8. Death rates among white females 65 years of age and over in the United States and among females 65 years of age and over with standard ordinary policies from the Metropolitan Life Insurance Company and the annual average percent change, by age: 1969-78



[1]Average annual percent change.

SOURCES: Metropolitan Life Insurance Company, personal communication; Division of Vital Statistics, National Center for Health Statistics.

Figure 9. Death rates among white persons in the United States 25-34 years of age and among persons 25-34 years of age with standard ordinary policies from the Metropolitan Life Insurance Company and the average annual percent change, by sex: 1969-78

sured under family policies and were not underwritten separately; therefore, most elderly females did not have to pass a physical examination to be insured. This helped to explain the similarity with U.S. rates (figure 8).

Recently, however, more females have become policyholders, regardless of marital status. The family policy is being eliminated slowly, and females must acquire their own policies, which necessitates physical examinations. This factor was evident in the comparison of the death rates for females 25-34 years of age, for which death rates based on Metropolitan Life data were lower than U.S. rates (figure 9).

Cause of death

Accuracy of cause of death coding on the death certificate also has been questioned. Percy et al.[25] recently compared coding of malignant neoplasms on death certificates with coding on hospital records based on results of the Third National Cancer Survey (1969-71). Although results were not presented by age, leading sites of cancer mortality for the elderly were examined. Death rates for cancer of the lung, breast, and prostate were considered accurate, with very high agreement between primary sites diagnosed in hospitals and primary sites recorded on death certificates. Deaths from cancer of the colon are believed to be overreported in death certificates; most of the error was associated with underreporting of rectal cancer.

In another study, by Gittelsohn and Sennings,[26] hospital records were matched with death certificates for approximately 10,000 Vermont residents for 1969-75. Again, cause-specific data were not pre-

sented by age. However, for the leading causes of death among the elderly, agreement between both records at the 3-digit level of ICDA coding was as follows:

Cause of death and ICDA code	*Percent agreement*
All neoplasms 140-239	77
Lung 162	86
Breast. 174	74
Colon 153	77
Prostate. 185	87
Ovary 183	86
Uterus 182	71
Circulatory system 390-458	71
Acute MI 410	87
IHD 412	65
Cerebrovascular diseases 430-438	69

Furthermore, of all the death certificates coded with Cerebrovascular diseases, 91 percent also were mentioned on hospital records. Similarly, 93 percent of the death certificates coded with heart disease had hospital records mentioning heart disease.

These data from both studies suggest a certain amount of inconsistency between coding on death certificates and on hospital records. However, which coding needs improvement is not clear. Certification of cause of death probably needs to be more reliable in both sources.

Projections

Population projections are based on assumptions of the future course of the components of population change—births, deaths, and migration. For most national data, several series of projections customarily are presented based on different fertility assumptions with the same mortality assumption applied to each series. However, in light of the recent, rapid decrease in mortality, demographers have begun to reassess singular assumptions of mortality change.

Evidently, the assumption of a slow and steady reduction in mortality through 2050 is too conservative in the current national projections.[27] The 1974 mortality data were the most recent final mortality figures available when projections were prepared. Since 1974, mortality decline has been much faster than was anticipated based on the previous 20 years. As a result, the population 65 years of age and over projected in 1977 for 1979 was underestimated as follows:

Age	*Current 1979 estimate*[4]	*Projection for 1979 made in 1977*[27]	*Percent difference (estimate as base)*
65 years and over	24,658	24,426	−0.9
65-69 years	8,688	8,656	−0.4
70-74 years	6,584	6,560	−0.4
75-79 years	4,274	4,249	−0.6
80-84 years	2,780	2,750	−0.9
85 years and over	2,332	2,211	−5.2

Accurate assumptions of mortality decline are crucial to plan effectively for the needs of the elderly. To illustrate the consequences of varying assumptions of rates of mortality decline on projections of the elderly, four sets of projections of the population 65 years of age and over in 2000 are shown in table O. Each set varies only in its assumption of mortality decline. Projection A, prepared by the U.S. Bureau of the Census in 1972, was made before the beginning of the accelerated decline in mortality and as such, it projects a modest 17 percent increase in the population 65 years of age and over by 2000. This projection was superseded by projection B, the latest official national projection of the U.S. Bureau of the Census. When the projection was prepared, the extent of the mortality decline had not been anticipated. Projection C, a modification of the most recent Social Security Administration (SSA) projection, accounts for the recent rapid mortality decline, but assumes mortality improvement will slow after 1985. Projection D, prepared by Rice et al.[28], assumes that the rapid reduction in mortality will continue through 2003. A similar assumption was made by Crimmins[2] in her projections.

These projections suggest a wide range for growth of the elderly population. From 1979 to 2000, the population 65 years of age and over may increase by as little as 29 percent (projection B) or as much as 49 percent (projection D).[g] Growth of the population 85 years of age and over will be the most dramatic; this age group probably will double in number from 1979 to 2000 to nearly 5 million (projection C) and will account for 14 percent of the population 65 years of age and over.

[g]Projection A is no longer considered realistic by the U.S. Bureau of the Census.

Table O. Number and percent distribution of persons 65 years of age and over in 1979 and alternative projections to the year 2000, according to age: United States

Age	1979		Projection A		Projection B		Projection C		Projection D	
	Number in thousands	Percent distribution	Number in thousands	Percent distribution	Number in thousands	Percent distribution	Number in thousands	Percent distribution	Number in thousands	Percent distribution
65 years and over	24,658	100.0	28,841	100.0	31,822	100.0	34,599	100.0	36,697	100.0
65-69 years	8,688	35.2	8,532	29.6	9,192	28.9	9,521	27.5	9,531	26.0
70-74 years	6,584	26.7	7,759	26.9	8,244	25.9	8,669	25.1	8,900	24.3
75-79 years	4,274	17.3	6,159	21.4	6,394	20.1	6,821	19.7	7,324	20.0
80-84 years	2,780	11.3	3,845	13.3	4,236	13.3	4,660	13.5	4,994	13.6
85 years and over	2,332	9.5	2,546	8.8	3,756	11.8	4,928	14.2	5,948	16.2

SOURCES: Projection A. U.S. Bureau of the Census: Projections of the population of the United States by age and sex: 1972-2020. Current Population Reports, Series P-25, No. 493, Dec. 1972.

Projection B. U.S. Bureau of the Census: Projections of the population of the United States: 1977-2050. Current Population Reports, Series P-25, No. 704, July 1977.

Projection C. Social Security Administration: U.S. population projections for OASDI cost estimates, 1980. Actuarial study No. 82. SSA Pub. No. 11-11529, June 1980 (modified to omit that portion of the Social Security area population not included in projections of U.S. population).

Projection D. Unpublished projections prepared by NCHS.[28]

Summary

After rapid mortality decline in the 1940's and early 1950's, death rates among the elderly U.S. population began to stabilize. Around 1968, mortality for the elderly began to decline even more sharply than before.

The result of declining mortality is longer life expectancy. In 1940, life expectancy at birth had not reached 65 years of age; by 1978, it was just beyond 73 years of age. During these 38 years, life expectancy at 65 years of age increased by 3½ years to 16.3 years. In 1978, 73 percent of the elderly 65 years of age could expect to reach 75 years of age, compared with 61 percent in 1940.

Inasmuch as heart disease is the leading cause of death among the elderly, mortality trends from this cause parallel the decline for all causes combined. Since 1968, death rates from stroke have been decreasing more rapidly than death rates from heart disease. Cancer is the only major cause of death among the elderly with increasing death rates; the rapid increases since 1968 primarily are associated with lung cancer.

The decline in mortality among the elderly population is not unique. Although trends in mortality differ among age groups and with time, changes in mortality of the population 25-64 years of age have been similar to those of the population 65 years of age and over, decreasing by 2-3 percent per year since 1968. Before the late 1960's, mortality decline in the group 25-64 years of age also was very slow, averaging less than 1 percent per year.

The recent sustained accelerations in total mortality decline were not foreseen during the early 1960's. At that time, it generally was believed that further decreases in the death rate for the United States "as experienced in the past cannot be anticipated." For the elderly, only death rates for white females were expected to show further decreases.[29]

However, the death rate did decrease and even faster than before. However, can the decline continue at the same pace as in the past decade? Will it taper off gradually, or will it continue to accelerate before slowing? These questions have led those responsible for national population projections to consider more than one assumption of the course of mortality decline. Population projections based on single assumptions of regular, small declines in mortality rates at older ages no longer are considered reasonable.[10] Alternative mortality assumptions result in projected increases in the size of the elderly population that range from 32 million (29 percent more than in 1979) to as high as 37 million in 2000 (49-percent increase since 1979).[27,28]

Discussion

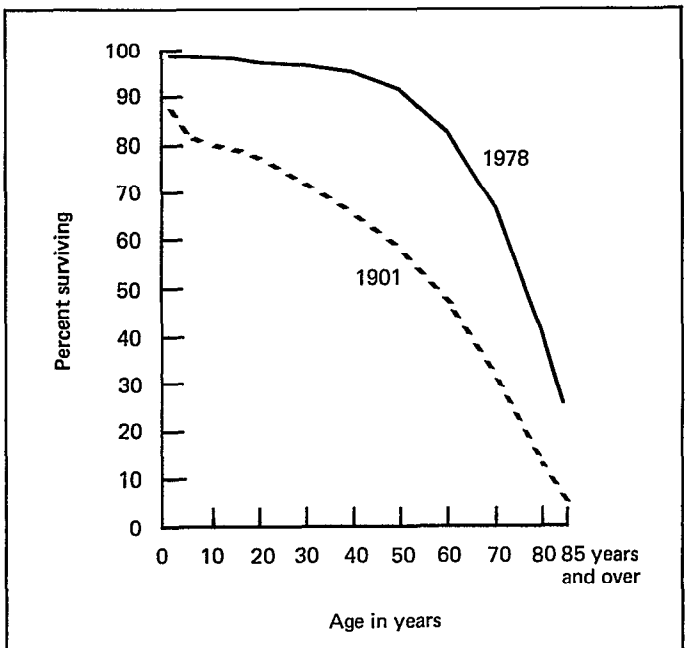
By the end of this century, the number and age distribution of the elderly population will have changed sufficiently to warrant a close look at some of the potential consequences of aging–health, social, and economic–for the elderly 65 years of age and over and for the general population.

The degree of societal impact the large increases in the elderly population will have largely depends upon the future health of the elderly. For example, if use of nursing homes remains constant, the number of elderly nursing home residents may reach 2.4 million in 2000, more than half of whom would be 85 years of age and over. On the other hand, if the health of the elderly improves or alternative treatments are developed, the number may be reduced. In any case, the very old probably will have the greatest need for medical and social services. Will the resources be sufficient to meet their needs?

Similarly, population increases based on decreasing mortality will account for large increases in short-stay hospitalization rates for the elderly 65 years of age and over. The annual number of hospital days may increase 80 percent, to 171 million; for those 85 years of age and over, the annual number of hospital days may increase 3.3 times to 44 million days. Geriatric patients have many needs that can be met only if staff are aware of their needs, not only from a medical standpoint but from a social services view as well.

However, morbidity and use of health services may not necessarily increase; in fact, the elderly population in the future may be healthier than today's elderly. Factors leading to declines in mortality may lead to changes in morbidity and patterns of health care.[28,30] In his model for national health, Fries "foresees continued decline in premature death and emergence of a pattern of natural death at the end of a natural life span."[31] Morbidity would be compressed until near the end of the life span when "everything comes apart at once."[31] To reach this target, postponement of debilitating chronic illness by changing lifestyles will be crucial. Although Fries' model does not include any significant increases in the human life span, like others,[32,33] it predicts continued rectangularization of the survival curve (figure 10).

Because of the relatively large gap between life expectancy of males and females, females often face many years alone as a result of widowhood. Dr. Robert Butler, Director of the National Institute on Aging, believes that elderly women, "the poorest of the poor in our society," should become the focus of more attention.[34] In 1979, less than 40 percent of the 14 million elderly women in the United States



SOURCES: U.S. Bureau of the Census: U.S. Life Tables, 1890, 1901, 1910 and 1901-1910. Washington. Government Printing Office, 1921, and NCHS Final Mortality Statistics, 1978. Monthly Vital Statistics Report. Vol. 29-No. 6, Supp. DHHS Pub. No. (PHS) 80-1120. Public Health Service. Hyattsville, Md., Sept. 17, 1980.

Figure 10. Percent of population surviving by age: United States, 1901 and 1978

were married and living with their husbands, compared with 75 percent of elderly men married and living with their wives.[35] Poverty is a likely state for these older women living alone and small Social Security payments often are their only source of income.

The Social Security system is enmeshed in the consequences of the aging population. Soon after the turn of the century, the system will be faced with the aging of the baby-boom generation. The number of beneficiaries per 100 covered workers is projected (under an intermediate series) to increase from 30 in 1979 to 40 in 2015 to 52 in 2030.[36] The elderly will live longer and retire earlier; therefore they will collect benefits for a longer time. To accommodate this unanticipated increase in the elderly population, the Social Security system must make certain adjustments, such as (1) raise the tax rate, (2) restructure benefits, or (3) receive funds from general revenues. Each may be used in some degree. For example, benefits could be restructured to offset large financial burdens on future working generations. Incentives may be developed to encourage workers to remain in the labor force beyond the current retirement age.

The socioeconomic status of the future elderly will be related to labor force participation rates and educational attainment levels. Historical trends have shown large-scale reductions in labor force participation of the elderly as a result of increasing public and private retirement benefits.[37] As of 1980, approximately 28 percent of males 65-69 years of age were in the labor force, compared with 60 percent of males 60-64 years of age.[38] Statisticians at the U.S. Bureau of Labor Statistics project (under a middle-growth series) that, by 2000 only 20 percent of males 65-69 years of age will be in the labor force.[38] However, given the current uncertainty of future Social Security payments under the Old-Age and Survivors Disability and Hospital Insurance program, labor force participation rates among the elderly probably will rise. Similarly, the current patterns of high inflation may preclude early retirement and thereby delay the time the population begins to collect Social Security payments.

The issue of the elderly and labor force cannot be reconciled easily. If people remain in the labor force after 62 or 65 years of age, careers of younger workers may not progress satisfactorily. On the other hand, if retirement is mandatory at 62 and 65 years of age, the increase in the number of retired elderly will place a large burden on the younger working population.

In 1979, approximately 40 percent of people 65 years of age and over had completed high school compared with less than 30 percent of that age group only 10 years earlier. Higher educational attainment rates result from the replacement of older, less educated cohorts by younger, more educated ones.[39] With educational attainment rates among the elderly increasing faster than among the younger cohorts, the elderly may have less educational disadvantage in the job market than they had in the past.[37]

Society will likely accommodate large increases in the older population. The baby-boom generation created the need for more schools, more jobs, and more housing and will create the need for more geriatric services as they age. Furthermore, consumption patterns of the baby-boom cohort have changed and will continue to change as this generation ages. The older person in 2000 probably will be well educated and more likely to be prosperous and therefore, have more discretionary income for the market.

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Table 1. Death rates among persons 65 years of age and over, by age: United States, 1940-78

Year	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
	Deaths per 1,000 population				
1940	39.7	61.1	94.8	145.6	235.7
1941	37.9	58.2	88.4	139.6	218.7
1942	37.0	56.5	84.9	134.3	211.1
1943	37.5	58.8	89.9	142.2	230.3
1944	35.7	55.9	85.9	133.0	215.3
1945	34.8	53.9	84.5	125.7	209.6
1946	33.5	52.2	82.3	120.1	210.6
1947	34.2	53.5	84.0	121.8	216.9
1948	33.8	52.3	82.5	118.8	213.2
1949	33.5	51.3	80.6	116.3	203.2
1950	33.8	51.5	78.9	120.9	202.0
1951	33.0	50.3	78.2	119.1	197.6
1952	32.6	49.2	76.4	117.4	190.6
1953	32.7	49.0	75.8	118.9	191.9
1954	31.4	46.9	72.1	112.3	181.6
1955	31.7	47.0	73.7	114.7	189.8
1956	31.7	46.7	73.1	115.2	192.3
1957	32.6	47.7	73.1	115.9	197.9
1958	31.9	47.0	72.9	116.2	198.0
1959	31.1	46.1	71.0	114.1	194.2
1960	31.4	47.2	72.0	117.2	198.6
1961	30.7	45.0	69.5	111.3	196.3
1962	31.1	45.4	70.7	111.7	204.9
1963	31.3	46.1	71.9	112.8	209.9
1964	30.3	44.5	69.4	108.0	199.2
1965	30.5	44.2	69.8	108.1	200.7
1966	30.6	44.9	69.8	107.8	199.8
1967	29.9	44.1	67.8	104.0	192.2
1968	30.8	45.3	69.5	106.4	195.8
1969	30.2	44.1	67.3	104.6	188.2
1970	29.7	43.7	67.2	101.6	175.4
1971	28.6	43.0	66.3	99.0	174.3
1972	28.8	44.0	67.5	99.1	173.5
1973	28.0	43.0	67.2	97.8	174.3
1974	27.0	41.9	64.5	94.7	165.3
1975	25.7	40.5	62.1	91.0	151.9
1976	25.4	39.5	61.9	90.3	154.9
1977	24.8	38.5	60.7	88.1	147.3
1978	24.6	37.9	60.2	89.5	147.0

Table 2. Death rates among males 65 years of age and over, by age: United States, 1940-78

Year	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
	Deaths per 1,000 population				
1940	45.5	68.0	103.7	156.6	246.4
1941	43.9	65.5	97.2	151.8	231.9
1942	43.1	63.3	93.7	146.1	222.1
1943	43.5	66.0	99.0	154.6	242.6
1944	41.6	62.9	94.8	143.6	225.5
1945	41.0	61.0	93.7	136.6	220.7
1946	39.7	59.0	91.4	129.9	221.1
1947	41.0	61.3	93.9	132.0	229.3
1948	40.9	60.4	92.7	129.6	226.4
1949	40.8	59.6	91.3	128.1	215.0
1950	41.6	60.6	89.6	133.4	216.4
1951	41.1	59.7	89.1	132.1	208.2
1952	40.7	58.3	87.3	132.5	196.7
1953	41.0	58.5	87.1	134.4	199.2
1954	39.8	56.7	83.3	127.5	187.4
1955	40.2	57.5	85.4	130.3	195.9
1956	40.5	57.5	85.3	131.3	200.5
1957	42.0	59.0	85.6	131.4	207.3
1958	41.4	58.2	85.9	132.0	208.3
1959	40.7	57.6	84.0	129.5	205.4
1960	41.4	59.5	86.2	133.7	211.9
1961	40.8	56.9	83.9	127.9	210.8
1962	41.6	57.8	85.6	128.7	222.5
1963	42.4	59.6	88.1	131.3	229.4
1964	41.0	58.0	85.6	126.4	216.4
1965	41.4	58.3	87.0	128.1	220.8
1966	41.7	59.4	87.4	128.0	220.1
1967	40.7	59.1	85.8	124.6	213.4
1968	42.2	61.3	88.4	127.6	217.3
1969	41.6	59.6	86.4	126.8	208.8
1970	41.2	58.9	86.8	123.9	197.7
1971	39.9	58.2	86.2	122.1	197.5
1972	40.0	59.8	88.4	123.4	196.0
1973	39.3	58.7	88.1	122.4	198.1
1974	38.0	57.2	85.1	118.6	188.8
1975	36.4	55.6	82.5	115.9	175.7
1976	35.9	54.3	82.6	115.2	179.8
1977	34.7	53.2	81.5	113.6	173.0
1978	34.4	52.4	80.7	116.0	172.6

Table 3. Death rates among females 65 years of age and over, by age: United States, 1940-78

Year	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
	Deaths per 1,000 population				
1940	33.9	54.3	86.5	136.0	227.6
1941	32.0	51.1	80.3	129.2	208.8
1942	30.9	49.8	77.0	124.3	202.9
1943	31.7	51.8	81.7	131.9	221.2
1944	29.9	49.3	77.8	124.3	207.8
1945	28.9	47.0	76.3	116.7	201.3
1946	27.6	45.8	74.2	112.0	203.0
1947	27.7	46.2	75.2	113.2	207.2
1948	27.0	44.7	73.5	110.0	203.1
1949	26.6	43.6	71.1	106.6	194.4
1950	26.4	43.2	69.6	110.7	191.9
1951	25.4	41.8	68.8	108.6	190.1
1952	25.0	41.0	67.1	105.7	186.1
1953	24.9	40.5	66.0	107.1	186.6
1954	23.7	38.2	62.7	100.6	177.4
1955	23.9	37.7	63.8	102.9	185.5
1956	23.7	37.3	63.0	103.2	186.6
1957	24.1	37.8	62.9	104.4	191.5
1958	23.4	37.3	62.2	104.6	191.0
1959	22.7	36.2	60.5	102.9	186.8
1960	22.6	36.7	60.7	105.3	190.1
1961	21.9	35.0	58.2	99.5	186.9
1962	22.0	35.1	59.0	99.7	194.0
1963	22.0	35.2	59.4	99.8	197.9
1964	21.4	33.7	57.1	95.4	189.1
1965	21.4	33.1	57.0	94.7	189.0
1966	21.5	33.6	56.9	94.3	188.5
1967	21.0	32.7	54.8	90.6	180.4
1968	21.5	33.3	56.1	92.8	184.3
1969	20.9	32.6	54.0	90.6	177.1
1970	20.4	32.4	53.8	87.7	163.5
1971	19.5	31.8	52.8	85.0	162.2
1972	19.8	32.4	53.5	84.7	162.0
1973	19.0	31.6	53.4	83.4	162.3
1974	18.2	30.7	51.1	80.9	153.9
1975	17.3	29.5	48.8	76.9	140.3
1976	17.1	28.6	48.5	76.3	143.1
1977	16.9	27.7	47.4	73.9	135.4
1978	16.9	27.2	47.1	75.1	135.4

Table 4. Mortality-sex ratios[1] among persons 65 years of age and over, by age: United States, 1940-78

Year	65 years and over[2]	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
	Ratio					
1940	1.22	1.34	1.25	1.20	1.15	1.08
1941	1.24	1.37	1.28	1.21	1.17	1.11
1942	1.24	1.39	1.27	1.22	1.18	1.09
1943	1.24	1.37	1.27	1.21	1.17	1.10
1944	1.24	1.39	1.28	1.22	1.16	1.09
1945	1.26	1.42	1.30	1.23	1.17	1.10
1946	1.25	1.44	1.29	1.23	1.16	1.09
1947	1.28	1.48	1.33	1.25	1.17	1.11
1948	1.30	1.51	1.35	1.26	1.18	1.11
1949	1.32	1.53	1.37	1.28	1.20	1.11
1950	1.34	1.58	1.40	1.29	1.21	1.13
1951	1.35	1.62	1.43	1.30	1.22	1.10
1952	1.35	1.63	1.42	1.30	1.25	1.06
1953	1.37	1.65	1.44	1.32	1.25	1.07
1954	1.39	1.68	1.48	1.33	1.27	1.06
1955	1.39	1.68	1.53	1.34	1.27	1.06
1956	1.41	1.71	1.54	1.35	1.27	1.07
1957	1.42	1.74	1.56	1.36	1.26	1.08
1958	1.43	1.77	1.56	1.38	1.26	1.09
1959	1.44	1.79	1.59	1.39	1.26	1.10
1960	1.47	1.83	1.62	1.42	1.27	1.11
1961	1.49	1.86	1.63	1.44	1.29	1.13
1962	1.50	1.89	1.65	1.45	1.29	1.15
1963	1.53	1.93	1.69	1.48	1.32	1.16
1964	1.54	1.92	1.72	1.50	1.32	1.14
1965	1.57	1.93	1.76	1.53	1.35	1.17
1966	1.57	1.94	1.77	1.54	1.36	1.17
1967	1.59	1.94	1.81	1.57	1.38	1.18
1968	1.61	1.96	1.84	1.58	1.38	1.18
1969	1.62	1.99	1.83	1.60	1.40	1.18
1970	1.64	2.02	1.82	1.61	1.41	1.21
1971	1.66	2.05	1.83	1.63	1.44	1.22
1972	1.66	2.02	1.85	1.65	1.46	1.21
1973	1.68	2.07	1.86	1.65	1.47	1.22
1974	1.69	2.09	1.86	1.67	1.47	1.23
1975	1.72	2.10	1.88	1.69	1.51	1.25
1976	1.72	2.10	1.90	1.70	1.51	1.26
1977	1.73	2.05	1.92	1.72	1.54	1.28
1978	1.73	2.04	1.93	1.71	1.54	1.27

[1] Ratio of male death rate to female death rate.

[2] Age adjusted by the direct method to the population 65 years of age and over as enumerated in 1940 using 5 age groups.

SOURCE: Data derived from tables 2 and 3.

Table 5. Death rates among persons 65 years of age and over for Diseases of heart, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 population					
1950	2,310.1	4,825.0	9,654.4	1,435.0	3,873.0	8,800.0
1951	2,256.6	4,811.1	9,375.4	1,375.4	3,796.1	8,687.8
1952	2,236.2	4,733.5	8,817.9	1,369.1	3,760.9	8,549.9
1953	2,263.2	4,760.6	9,008.7	1,366.2	3,762.2	8,631.3
1954	2,189.3	4,562.6	8,637.2	1,303.5	3,570.8	8,354.8
1955	2,224.8	4,713.5	9,044.7	1,302.2	3,686.4	8,826.9
1956	2,246.0	4,745.7	9,288.4	1,306.4	3,688.6	8,934.7
1957	2,295.1	4,735.6	9,596.4	1,328.3	3,694.3	9,121.9
1958	2,275.9	4,741.3	9,683.4	1,295.0	3,663.6	9,063.2
1959	2,248.9	4,633.1	9,540.6	1,259.6	3,561.5	8,922.5
1960	2,291.3	4,742.4	9,788.9	1,261.3	3,582.7	9,016.8
1961	2,236.9	4,617.7	9,816.4	1,215.6	3,438.0	8,895.1
1962	2,274.3	4,701.3	10,414.7	1,228.8	3,489.6	9,288.0
1963	2,316.3	4,807.5	10,686.2	1,218.6	3,480.4	9,498.1
1964	2,250.3	4,620.4	10,086.8	1,174.9	3,356.7	9,144.6
1965	2,237.6	4,695.5	10,312.1	1,157.2	3,347.2	9,088.2
1966	2,270.8	4,676.8	10,244.5	1,168.8	3,334.1	9,014.6
1967	2,220.7	4,554.9	9,968.3	1,131.0	3,207.3	8,686.6
1968	2,257.5	4,652.6	10,078.0	1,140.9	3,259.2	8,850.1
1969	2,208.2	4,584.0	9,829.2	1,104.0	3,170.4	8,606.4
1970	2,170.3	4,534.8	9,346.0	1,082.7	3,120.8	8,000.9
1971	2,113.1	4,490.7	9,407.2	1,043.9	3,070.8	7,979.3
1972	2,116.3	4,531.8	9,203.8	1,045.4	3,082.1	7,968.6
1973	2,068.2	4,519.5	9,308.6	994.5	3,036.4	7,916.8
1974	1,988.9	4,305.2	8,897.1	948.1	2,903.5	7,537.7
1975	1,886.8	4,156.1	8,171.0	890.8	2,742.4	6,850.9
1976	1,847.6	4,136.1	8,274.9	856.2	2,731.1	6,965.4
1977	1,795.3	4,082.4	8,053.3	831.8	2,662.5	6,655.3
1978	1,761.6	4,064.1	7,990.6	823.1	2,665.6	6,673.5

NOTE: ICD codes for 1950-67 are 400-402 and 410-443, and ICDA codes for 1968-78 are 390-898, 402, 404, and 410-429.

Table 6. Mortality-sex ratios[1] among persons 65 years of age and over for Diseases of heart, by age: United States, 1950-78

Year	65-74 years	75-84 years	85 years and over
		Ratio	
1950	1.61	1.25	1.10
1951	1.64	1.27	1.08
1952	1.63	1.26	1.03
1953	1.66	1.27	1.04
1954	1.68	1.28	1.03
1955	1.71	1.28	1.02
1956	1.72	1.29	1.04
1957	1.73	1.28	1.05
1958	1.76	1.29	1.07
1959	1.79	1.30	1.07
1960	1.82	1.32	1.09
1961	1.84	1.34	1.10
1962	1.85	1.35	1.12
1963	1.90	1.38	1.13
1964	1.92	1.38	1.10
1965	1.93	1.40	1.13
1966	1.94	1.40	1.14
1967	1.96	1.42	1.15
1968	1.98	1.43	1.14
1969	2.00	1.45	1.14
1970	2.00	1.45	1.17
1971	2.02	1.46	1.18
1972	2.02	1.47	1.16
1973	2.08	1.49	1.18
1974	2.10	1.48	1.18
1975	2.12	1.52	1.19
1976	2.16	1.51	1.19
1977	2.16	1.53	1.21
1978	2.14	1.52	1.20

[1] Rates of male death rate to female death rate.

SOURCE: Data derived from table 5.

Table 7. Death rates among persons 65 years of age and over for Malignant neoplasms, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 population					
1950	791.5	1,332.6	1,668.3	612.3	1,000.7	1,299.7
1951	788.5	1,307.3	1,689.1	592.1	987.0	1,284.2
1952	809.1	1,349.2	1,665.6	594.8	990.2	1,304.7
1953	815.0	1,358.9	1,677.9	594.6	986.3	1,296.5
1954	839.4	1,371.6	1,688.8	589.4	972.5	1,275.3
1955	851.0	1,373.9	1,691.0	585.7	962.7	1,303.3
1956	849.3	1,416.6	1,767.9	578.2	957.3	1,286.0
1957	879.3	1,384.5	1,753.4	573.2	945.9	1,309.7
1958	862.5	1,358.6	1,704.9	571.2	919.4	1,268.6
1959	872.8	1,356.4	1,762.8	560.5	903.2	1,241.1
1960	890.5	1,389.4	1,741.2	560.2	924.1	1,263.9
1961	902.4	1,394.8	1,840.8	557.9	891.9	1,273.5
1962	907.7	1,387.2	1,879.7	555.0	885.4	1,264.3
1963	929.8	1,405.2	1,923.9	551.0	881.2	1,280.7
1964	925.9	1,416.6	1,840.3	542.6	868.2	1,238.9
1965	946.1	1,451.6	1,911.1	549.4	874.6	1,234.9
1966	955.4	1,477.9	1,905.4	551.0	872.5	1,252.9
1967	976.8	1,505.2	1,919.0	557.3	867.1	1,215.0
1968	998.2	1,520.1	1,936.1	553.1	869.4	1,223.6
1969	997.3	1,541.1	1,952.9	552.6	871.5	1,202.5
1970	1,006.8	1,588.3	1,908.6	557.9	891.9	1,155.8
1971	1,018.4	1,614.7	1,953.3	557.1	877.1	1,173.2
1972	1,036.1	1,651.7	1,917.4	571.5	878.1	1,174.0
1973	1,033.7	1,665.7	2,018.0	563.7	887.0	1,142.7
1974	1,045.2	1,715.1	1,984.7	566.4	902.0	1,133.9
1975	1,051.8	1,728.4	1,987.4	563.1	910.3	1,128.2
1976	1,060.1	1,782.1	2,042.0	576.0	922.9	1,159.0
1977	1,067.6	1,809.4	2,102.3	581.3	939.1	1,143.5
1978	1,076.7	1,849.4	2,137.2	588.7	958.8	1,139.3

NOTE: ICD codes for 1950-67 are 140-205, and ICDA codes for 1968-78 are 140-209.

Table 8. Death rates among persons 65 years of age and over for cancer of colon, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 population					
1950	84.9	155.0	181.0	86.1	171.6	240.0
1951	85.6	151.1	194.9	83.3	168.8	230.8
1952	87.1	159.1	178.8	82.0	165.9	231.0
1953	85.0	158.1	191.3	81.8	163.7	241.0
1954	84.2	158.4	179.9	83.7	164.2	240.9
1955	85.9	158.4	202.8	83.9	162.5	245.9
1956	87.5	169.1	200.6	81.9	161.4	227.4
1957	89.4	162.7	209.2	81.6	159.6	243.5
1958	87.4	160.2	205.4	81.2	155.2	250.2
1959	87.5	160.9	214.6	79.8	159.4	231.1
1960	86.7	164.0	205.6	79.6	159.6	232.6
1961	89.6	165.3	215.8	79.6	157.9	235.8
1962	88.3	159.0	242.8	81.8	153.4	233.9
1963	90.5	162.3	224.1	80.1	155.8	242.6
1964	88.7	170.6	215.0	80.5	152.2	230.0
1965	93.2	172.5	242.5	80.1	150.0	227.0
1966	93.8	175.4	227.6	81.2	151.2	244.0
1967	94.0	172.2	237.1	79.5	152.5	223.3
1968	95.2	177.7	229.5	79.4	149.7	235.3
1969	95.6	181.8	245.8	77.4	153.3	229.8
1970	95.7	184.8	244.4	81.0	157.4	224.8
1971	97.0	183.8	236.6	78.0	151.5	224.1
1972	95.8	194.2	235.2	80.7	150.3	229.7
1973	96.0	188.5	252.3	78.5	159.3	214.2
1974	100.8	197.4	267.6	79.9	156.9	224.9
1975	99.1	200.1	241.9	77.0	158.9	211.6
1976	102.6	207.5	260.7	79.8	159.0	229.6
1977	104.5	202.8	273.9	77.6	162.5	221.8
1978	104.9	214.3	282.1	80.4	167.1	228.5

NOTE: ICD codes for 1950-57 are 152 and 153, and for 1958-67, 153. ICDA code for 1968-78 is 153.

Table 9. Death rates among persons 65 years of age and over for cancer of trachea, bronchus, and lung, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	*75-84 years*	*85 years and over*	*65-74 years*	*75-84 years*	*85 years and over*
	Deaths per 100,000 population					
1950	98.7	82.6	62.4	23.3	32.9	28.2
1951	108.4	85.3	60.5	22.1	33.6	30.6
1952	117.7	95.6	71.1	24.5	33.8	28.9
1953	127.1	106.2	69.2	23.4	32.8	29.4
1954	139.6	110.5	75.0	22.9	34.5	31.8
1955	148.9	126.9	73.9	23.9	34.1	30.3
1956	163.7	133.3	85.0	24.1	33.9	31.1
1957	173.5	138.8	89.6	24.2	34.3	34.6
1958	181.1	143.2	91.5	24.6	36.0	36.4
1959	192.1	152.2	111.5	24.2	34.4	30.9
1960	204.2	167.1	107.7	24.4	32.8	38.8
1961	217.1	176.2	128.7	25.6	35.8	39.4
1962	228.1	191.4	126.2	25.6	35.6	40.1
1963	240.2	205.9	142.7	27.3	35.0	43.2
1964	247.0	218.6	135.6	27.7	38.2	38.7
1965	261.8	231.7	155.0	30.4	36.6	43.7
1966	272.6	254.2	156.0	31.7	40.9	50.7
1967	284.7	278.1	173.7	34.2	41.9	43.8
1968	305.5	292.9	193.6	39.1	49.7	55.3
1969	312.8	303.3	205.2	42.1	47.5	51.3
1970	320.8	330.8	215.1	43.1	52.4	52.7
1971	334.5	357.1	236.6	48.6	55.0	58.7
1972	345.4	373.3	228.4	53.0	56.4	57.4
1973	350.3	381.5	252.5	55.0	60.5	58.4
1974	354.4	407.2	262.0	60.2	64.2	63.2
1975	365.4	417.9	267.4	64.5	66.8	65.7
1976	371.8	443.0	289.7	71.7	74.9	69.3
1977	382.4	467.8	305.3	76.7	78.6	70.1
1978	389.0	478.6	317.4	84.9	87.1	70.0

NOTE: ICD codes for 1950-67 are 162 and 163, and ICDA code for 1968-78 is 162.

Table 10. Death rates among persons 65 years of age and over for cancer of genital organs, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 population					
1950	103.9	291.4	436.2	110.1	136.9	141.4
1951	100.6	286.5	421.9	105.7	132.3	132.8
1952	103.5	290.2	464.5	106.0	132.6	138.3
1953	105.7	296.9	451.9	105.8	131.0	134.8
1954	106.1	305.5	464.1	102.5	132.0	128.9
1955	106.4	296.2	465.7	103.0	126.5	136.3
1956	105.3	309.1	488.4	99.3	124.1	137.4
1957	103.4	299.8	479.2	99.8	118.9	135.2
1958	104.3	286.9	470.1	100.3	123.0	138.6
1959	102.0	278.5	467.9	98.4	119.2	133.7
1960	102.1	285.9	468.2	97.9	119.1	131.4
1961	101.3	286.1	508.4	98.4	112.9	123.0
1962	102.3	284.8	505.6	95.0	114.1	129.1
1963	104.6	282.4	514.9	93.4	115.0	128.4
1964	103.0	282.4	497.4	91.6	112.9	123.3
1965	100.4	286.6	513.3	92.7	108.9	124.3
1966	101.3	283.6	507.1	91.7	110.4	128.1
1967	102.4	286.4	513.6	90.2	104.5	118.6
1968	105.8	285.1	512.3	86.0	107.7	120.4
1969	102.9	288.5	493.2	84.5	105.7	121.1
1970	103.7	299.4	481.6	85.6	104.9	113.1
1971	103.2	297.9	493.8	83.3	105.0	116.8
1972	106.1	300.8	489.0	83.5	104.9	114.3
1973	105.5	309.3	514.3	79.4	103.3	108.4
1974	106.9	310.5	493.9	77.7	102.2	110.5
1975	105.4	312.4	494.9	77.4	102.5	108.7
1976	106.4	321.4	514.6	77.5	108.7	106.4
1977	105.4	322.1	527.0	75.3	102.8	104.4
1978	107.1	331.6	548.7	74.7	100.8	103.6

NOTE: ICD codes for 1950-67 are 171-179, and ICDA codes for 1968-78 are 180-187.

Table 11. Death rates among females 65 years of age and over for cancer of breast, by age: United States, 1950-78

Year	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 females		
1950	95.0	139.8	195.5
1951	91.1	143.6	196.7
1952	91.2	133.9	184.8
1953	93.6	140.5	198.8
1954	93.2	136.4	193.9
1955	92.8	141.3	198.2
1956	93.6	136.3	199.1
1957	93.0	136.0	199.8
1958	90.4	129.5	182.8
1959	89.2	125.9	191.3
1960	90.0	129.9	191.9
1961	90.3	130.6	194.9
1962	90.5	125.5	188.2
1963	90.1	119.2	183.3
1964	89.3	120.3	188.4
1965	90.2	126.8	181.4
1966	90.2	122.7	177.3
1967	90.9	122.6	181.7
1968	94.3	124.1	179.4
1969	93.0	120.1	170.2
1970	93.8	127.4	165.6
1971	92.9	125.2	170.4
1972	98.1	125.4	169.9
1973	101.1	128.1	169.4
1974	97.5	130.3	168.9
1975	97.0	130.7	160.0
1976	98.9	130.5	163.8
1977	102.2	135.3	169.4
1978	98.9	133.1	157.2

NOTE: ICD code for 1950-67 is 170, and ICDA code for 1968-78 is 174.

Table 12. Mortality-sex ratios[1] among persons 65 years of age and over for Malignant neoplasms, by age: United States, 1950-78

Year	65-74 years	75-84 years	85 years and over
		Ratio	
1950	1.29	1.33	1.28
1951	1.33	1.32	1.32
1952	1.36	1.36	1.28
1953	1.37	1.38	1.29
1954	1.42	1.41	1.32
1955	1.45	1.43	1.30
1956	1.47	1.48	1.37
1957	1.53	1.46	1.34
1958	1.51	1.48	1.34
1959	1.56	1.50	1.42
1960	1.59	1.50	1.38
1961	1.62	1.56	1.45
1962	1.64	1.57	1.49
1963	1.69	1.59	1.50
1964	1.71	1.63	1.49
1965	1.72	1.66	1.55
1966	1.73	1.69	1.52
1967	1.75	1.74	1.58
1968	1.80	1.75	1.58
1969	1.80	1.77	1.62
1970	1.80	1.78	1.65
1971	1.83	1.84	1.66
1972	1.81	1.88	1.63
1973	1.83	1.88	1.77
1974	1.85	1.90	1.75
1975	1.87	1.90	1.76
1976	1.84	1.93	1.76
1977	1.84	1.93	1.84
1978	1.83	1.93	1.88

[1] Ratio of male death rate to female death rate.

SOURCE: Data derived from table 7.

Table 13. Death rates among persons 65 years of age and over for Cerebrovascular diseases, by sex and age: United States, 1950-78

Year	Male			Female		
	65-74 years	75-84 years	85 years and over	65-74 years	75-84 years	85 years and over
	Deaths per 100,000 population					
1950	589.6	1,543.6	3,048.6	522.1	1,462.2	2,949.4
1951	593.7	1,546.0	2,925.8	511.1	1,490.8	3,047.8
1952	572.8	1,559.1	2,965.9	499.9	1,451.7	3,127.6
1953	573.2	1,552.7	2,918.3	493.1	1,461.6	3,147.3
1954	550.9	1,514.9	2,887.2	461.2	1,414.6	3,179.1
1955	554.7	1,553.1	3,185.5	462.1	1,452.8	3,365.0
1956	548.1	1,547.5	3,257.8	452.4	1,443.6	3,480.9
1957	561.8	1,594.1	3,474.5	460.5	1,470.9	3,655.3
1958	552.4	1,601.0	3,529.1	444.4	1,490.7	3,775.4
1959	534.1	1,566.7	3,558.0	429.7	1,462.9	3,695.0
1960	530.7	1,555.9	3,643.1	415.7	1,441.1	3,704.4
1961	503.6	1,495.9	3,659.2	400.0	1,375.9	3,746.8
1962	502.4	1,493.2	3,771.4	393.3	1,359.6	3,844.2
1963	500.4	1,497.1	3,803.2	389.3	1,365.2	3,824.4
1964	481.4	1,448.8	3,638.5	372.5	1,295.5	3,673.8
1965	480.9	1,439.0	3,693.7	362.6	1,284.3	3,731.4
1966	482.2	1,445.1	3,663.8	364.3	1,281.7	3,740.4
1967	468.1	1,398.4	3,548.6	343.7	1,219.0	3,560.4
1968	483.1	1,418.2	3,591.6	351.6	1,248.8	3,618.3
1969	465.7	1,373.9	3,396.1	339.8	1,190.1	3,450.0
1970	449.5	1,361.6	3,211.2	333.3	1,183.1	3,247.0
1971	438.9	1,358.9	3,167.5	313.5	1,151.1	3,204.0
1972	439.3	1,356.2	3,188.6	312.1	1,162.3	3,212.4
1973	425.0	1,338.5	3,133.8	301.3	1,167.6	3,230.1
1974	400.4	1,277.2	2,969.5	283.7	1,114.0	3,013.0
1975	363.1	1,176.7	2,650.9	256.9	1,014.5	2,656.6
1976	334.7	1,098.9	2,574.4	238.1	962.1	2,592.6
1977	310.4	1,060.0	2,402.4	221.0	916.5	2,435.6
1978	290.0	984.5	2,244.2	207.9	865.5	2,298.5

NOTE: ICD codes for 1950-67 are 330-334, and ICDA codes for 1968-78 are 430-438.

Table 14. Mortality-sex ratios[1] among persons 65 years of age and over for Cerebrovascular diseases, by age: United States, 1950-78

Year	65-74 years	75-84 years	85 years and over
		Ratio	
1950	1.13	1.06	1.03
1951	1.16	1.04	0.96
1952	1.15	1.07	0.95
1953	1.16	1.06	0.93
1954	1.19	1.07	0.91
1955	1.20	1.07	0.95
1956	1.21	1.07	0.94
1957	1.22	1.08	0.95
1958	1.24	1.07	0.93
1959	1.24	1.07	0.96
1960	1.28	1.08	0.98
1961	1.26	1.09	0.98
1962	1.28	1.10	0.98
1963	1.29	1.10	0.99
1964	1.29	1.12	0.99
1965	1.33	1.12	0.99
1966	1.32	1.13	0.98
1967	1.36	1.15	1.00
1968	1.37	1.14	0.99
1969	1.37	1.15	0.98
1970	1.35	1.15	0.99
1971	1.40	1.18	0.99
1972	1.41	1.17	0.99
1973	1.41	1.15	0.97
1974	1.41	1.15	0.99
1975	1.41	1.16	1.00
1976	1.41	1.14	0.99
1977	1.40	1.16	0.99
1978	1.39	1.14	0.98

[1] Ratio of male death rate to female death rate.

SOURCE: Data derived from table 13.

Table 15. Average annual percent change in death rates among persons 65 years of age and over, by age and sex: Selected countries, 1950-77

Sex and country	1950-54					1955-67					1968-77				
	65-79 years	70-74 years	75-79 years	80-84 years	85 years and over	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over	65-69 years	70-74 years	75-79 years	80-84 years	85 years and over
Male	Average annual percent change														
Australia	-1.0	-0.5	-0.2	-1.6	-1.0	0.5	0.2	0.2	0.2	0.5	-2.1	-1.4	-1.7	-1.2	-1.6
Canada	-0.7	-1.3	-1.5	-1.4	-0.7	-0.1	0.0	-0.4	-0.9	-0.8	-1.3	-0.5	-0.5	-0.9	-0.9
England and Wales	-0.8	-1.0	-1.2	-1.0	-1.8	0.0	-0.1	-0.5	-0.8	0.2	-1.5	-1.0	-0.7	-0.5	-0.9
France	-0.6	-0.8	-0.6	-1.3	-0.4	-0.1	-0.8	-1.2	-1.3	-1.9	-1.6	-0.9	0.4	0.4	0.9
Federal Republic of Germany	1.0	1.2	1.5	0.9	1.2	0.9	0.4	-0.4	-0.7	-1.0	-1.9	-1.2	-0.8	-0.8	-1.4
Japan	-3.5	-1.8	-0.7	---	---	-1.5	-1.5	-1.0	-0.1	-0.5	-3.6	-2.9	-2.7	-1.8	-1.3
Netherlands	-0.1	-0.1	-0.4	-1.1	0.1	1.6	0.7	-0.2	-0.8	-1.1	0.0	0.0	0.0	-0.4	-1.0
Sweden	-0.2	-0.4	-1.5	-1.9	-2.3	0.2	0.1	0.0	-0.3	-0.8	0.1	-0.3	0.0	0.0	-0.2
United States	-0.9	-1.5	-1.7	-0.7	-3.3	0.1	0.2	0.2	-0.4	0.9	-2.1	-1.4	-0.8	-1.3	-2.3
Female															
Australia	-1.7	-1.7	-0.8	-2.3	-1.5	-0.8	-0.7	-0.8	-0.9	-0.9	-2.4	-2.3	-2.3	-1.8	-1.8
Canada	-3.0	-3.1	-2.3	-3.0	-1.1	-1.5	-1.6	-2.0	-1.5	-1.1	-1.7	-1.6	-1.8	-2.2	-2.3
England and Wales	-3.1	-3.4	-3.5	-3.1	-2.0	-1.1	-1.2	-1.3	-0.2	-0.9	-1.2	-1.3	-1.3	-0.5	-0.8
France	-2.2	-2.0	-1.4	-1.0	0.1	-1.9	-1.8	-1.9	-1.7	-1.7	-2.6	-2.4	-1.5	-0.5	0.7
Federal Republic of Germany	-1.9	-0.8	0.2	0.4	0.5	-1.4	-1.8	-1.9	-1.8	-1.4	-2.7	-2.4	-2.2	-1.9	-1.5
Japan	-4.0	-2.4	-1.5	---	---	-2.6	-2.3	-1.3	-0.2	-0.4	-4.0	-3.3	-3.0	-2.3	-1.0
Netherlands	-2.2	-1.5	-1.6	-1.0	-1.5	-1.8	-1.9	-1.8	-1.7	-1.2	-2.1	-2.5	-2.3	-2.5	-1.8
Sweden	-1.5	-1.8	-2.2	-1.8	-1.3	-2.2	-2.0	-1.3	-1.4	-1.1	-1.8	-2.5	-2.2	-2.0	-1.1
United States	-2.3	-2.7	-2.5	-2.0	-1.7	-1.1	-1.3	-1.2	-1.1	0.0	-2.8	-1.9	-1.7	-2.4	-3.1

SOURCES: Derived from United Nations Demographic Yearbook, 1966. Pub. No. 67-XIII-1. New York. United Nations, 1967; United Nations Demographic Yearbook, 1974. Pub. No. ST/ESA/STAT/R/3. New York. United Nations, 1975; United Nations Demographic Yearbook, 1978. Pub. No. ST/ESA/STAT/SER.R/8. New York. United Nations, 1979, and National Center for Health Statistics; Data computed by Division of Analysis from data compiled by the Division of Vital Statistics.

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