

March 2001

**Aging Trends**  
No. 1

The Aging Trends series was developed with support from the National Institute on Aging.

# Trends in Causes of Death Among the Elderly



By **Nadine R. Sahyoun, Ph.D., RD**  
**Harold Lentzner, Ph.D.**  
**Donna Hoyert, Ph.D.**  
**Kristen N. Robinson, Ph.D.**

## H i g h l i g h t s

The leading causes of death among the elderly are chronic diseases, notably cardiovascular disease and cancer. Other major causes of death include:

- Chronic respiratory diseases such as emphysema and chronic bronchitis
- Diseases common among the elderly such as Alzheimer's and renal diseases
- Infectious diseases and injuries

Significant trends in mortality among the elderly have emerged:

- Death from heart disease and atherosclerosis has declined dramatically for all groups.
- Death from cancer decreased for men in the 1990's after increasing in the previous 2 decades.
- Hypertension declined among older white men, but drastically increased among older black men.
- Biomedical advances, public health initiatives, and social changes may reduce mortality and increase longevity.

## Overview

Since 1900, life expectancy in the United States has dramatically increased, and the principal causes of death have changed. At the beginning of the 20<sup>th</sup> century, many Americans died young. Most did not live past the age of 65, their lives often abruptly ended by one of a variety of deadly infectious diseases. But over time, death rates dropped at all ages, most dramatically for the young. By the dawn of the 21<sup>st</sup> century, the vast majority of children born in any given year could expect to live through childhood and into their eighth decade or beyond.

**Percent of newborns living to age 65**

<b>1900</b>	Boys	<div style="width: 39%;"></div>	39%
	Girls	<div style="width: 43%;"></div>	43%
<b>1997</b>	Boys	<div style="width: 77%;"></div>	77%
	Girls	<div style="width: 86%;"></div>	86%

## Life expectancy has increased, but will the expansion continue?

For those born in the second half of the 20<sup>th</sup> century, chronic diseases replaced acute infections as the major causes of death. Today, death in the United States is largely reserved for the elderly. Roughly three-fourths of all deaths are at ages 65 and older.

Will we see major advances in life expectancies in the 21<sup>st</sup> century? Experts disagree. Some say we can not continue to reduce mortality at the oldest ages without making dramatic and unforeseen medical advances

continued

<sup>1</sup> Fries JE. Aging, natural death and the compression of morbidity. *New Engl J Med*. 303:130-5, 1980.

<sup>2</sup> Fries JE. Strategies for reduction of morbidity. *Am J Clin Nutr*. 55:1257S-62S, 1992.

<sup>3</sup> McCormick J, Skrabanek P. Coronary heart disease is not preventable by population interventions. *Lancet*. ii:839-41, 1988.

<sup>4</sup> Rothenberg R, Lentzner HR, Parker RA. Population aging patterns: the expansion of mortality. *J Gerontol*. 46(2): S66-70, 1991.

<sup>5</sup> Manton KG, Stallard E, Corder L. Changes in morbidity and chronic disability in the U.S. elderly population: evidence from the 1982, 1984, and 1989 National Long Term Care Surveys. *J Gerontol*. 50B(4): S194-S204, 1995.

<sup>6</sup> Manton KG, Vaupel JW. Survival after the age of 80 in the United States, Sweden, France, England and Japan. *New Engl J Med*. 333(18): 1232-5, 1995.

<sup>7</sup> Schneider EL, Brody JA. Aging, natural death and the compression of morbidity: another view. *New Engl J Med*. 309(14): 854-6, 1983.

against such major killers as cardiovascular disease and cancer.<sup>1-3</sup> But others counter that it is not only possible—other societies like Japan have already achieved significantly higher life expectancies—but likely as we reap the benefits of a more robust, better educated population taking better care of themselves and using modern medical technologies and therapies.<sup>4-7</sup>

## Quality of life is an important concern

Perhaps a more pressing question is this: If we succeed in extending life expectancy, what will these added years bring? Will they be spent in active, productive, fulfilling endeavors, or will they be overshadowed by declining health, loss of memory, and lingering illness? How valuable is a longer life if we simply increase the time we spend functionally limited by such debilitating ailments as heart disease, osteoporosis, or Alzheimer's disease?

As we face the challenge of extending and improving life, we must be aware of trends in important measures of health, so that we identify the most effective ways to use resources to achieve these goals. Specifically, we should be familiar with trends in:

- Elderly mortality and the leading causes of death
- Quality of life including measures of illness and disability
- Factors associated with healthy aging
- The cost of illness

## This new series of reports features information to help monitor the health of our aging population

Older Americans can expect to live longer than ever before. Under existing conditions, women who live to age 65 can expect to live about 19 years longer, men about 16 years longer. Whether the added years at the end of the life cycle are healthy, enjoyable, and productive depends, in part, upon preventing and controlling a number of chronic diseases and conditions.

### Top 3 leading causes of death in the United States

**1900's** Pneumonia & Influenza  
Tuberculosis  
Diarrhea & Enteritis

30% of all deaths

**1990's** Heart Disease  
Cancer  
Stroke

60% of all deaths

### Countries with highest life expectancy, 1995

Men		Women	
Japan	76.4 yrs.	Japan	82.9 yrs.
Sweden	76.2	France	82.6
Israel	75.3	Switzerland	81.9
Canada	75.2	Sweden	81.6
Switzerland	75.1	Spain	81.5
Greece	75.1	Canada	81.2
Australia	75.0	Australia	80.9
Norway	74.9	Italy	80.8
Netherlands	74.6	Norway	80.7
Italy	74.4	Netherlands	80.4

*Life expectancy in the U.S. was 72.5 yrs. for men and 78.9 yrs. for women.*

This report is one of a series undertaken by the National Center for Health Statistics, with support from the National Institute on Aging, to help meet the challenge of extending and improving life. By monitoring the health of the elderly, using information compiled from a variety of sources, we hope to help focus research on the most effective ways to use resources and craft health policy.

## What are the leading causes of death?

### Chronic diseases are the leading causes of death

Heart disease and cancer have been the two leading causes of death among persons 65 years of age and older for the past 2 decades, accounting for nearly a million deaths (995,187) in 1997. Over one-third (35 percent) of all deaths are due to heart disease, including heart attacks and chronic ischemic heart disease. Cancer accounted for about one-fifth (22 percent) of all deaths.

Other important chronic diseases among persons 65 years of age and older include stroke (cerebrovascular disease), chronic obstructive pulmonary diseases, diabetes, and pneumonia and influenza.

The leading causes of death are the same for different age-race-sex groups, but their ranking order varies. Heart disease remains the leading cause of death for most of the groups. Cancer is as common as heart disease within the youngest age group, 65-74 years of age, but decreases in importance with age, ranking third among women 85 years of age and older.

The third leading cause of death is most often stroke. However, among white men and women 65-74 years old, the third leading cause is chronic obstructive pulmonary diseases and allied conditions

(COPD), which includes chronic bronchitis, emphysema, asthma, and other chronic respiratory diseases. Deaths from COPD are believed to be caused primarily by cigarette smoking. COPD ranks as the fourth or fifth cause of death for almost all other

**Leading causes of deaths for persons 65 years of age and older**

White	Black	American Indian	Asian or Pacific Islander	Hispanic
1. Heart Disease	Heart Disease	Heart Disease	Heart Disease	Heart Disease
2. Cancer	Cancer	Cancer	Cancer	Cancer
3. Stroke	Stroke	Diabetes	Stroke	Stroke
4. COPD	Diabetes	Stroke	Pneu/Influenza	COPD
5. Pneu/Influenza	Pneu/Influenza	COPD	COPD	Pneu/Influenza

Click on the racial group or ethnic origin listed in the table above for more detailed information on cause of death.



For trend data from our on-line data warehouse, [click here.](#)

<sup>8</sup> Hoyert DL. Mortality trends for Alzheimer's disease, 1979-91. National Center for Health Statistics. Vital Health. 20(28), 1996.

<sup>9</sup> Pinner RW, Teutsch SM, Simonsen L, Klug LA, Graber JM, Clarke MJ, Berkelman RL. Trends in infectious diseases mortality in the United States. J Am Med Assoc. 275(3): 189-93, 1996.

<sup>10</sup> CDC. Pneumonia and influenza death rates, United States, 1979-1994. MMWR Morb Mortal Wkly Rep. 44(28):535-7, July 21, 1995.

age-race-sex groups. The remaining leading causes vary in rank among different age, race, and sex groups.

Elderly decedents frequently suffer from more than one life-threatening condition at the time of death. It is sometimes difficult for the attending physician or other official charged with filling out the death certificate to identify the initiating cause among several grave conditions. While a single cause, known as the underlying cause of death, is used in nearly all statistical reporting systems, the death certificate also allows for the listing of other causes in addition to a single underlying cause—up to 20 diseases and conditions.

## Other major causes of death among the elderly include Alzheimer's disease and renal diseases

Alzheimer's disease and several important renal diseases (including nephritis, nephrotic syndrome, and nephrosis) have gained importance as causes of death among the elderly over the past 2 decades. Alzheimer's disease is now among the 10 leading causes of death for older white persons, but not for other racial groups. This cause of death increased significantly from 1979 to 1988, stabilized for a few years, and gradually increased after 1992.<sup>8</sup> The increase may be due to improvements in diagnosis and reporting of Alzheimer's disease, wider knowledge of the condition within the medical community, and other unidentifiable factors. This disease became a ranked condition in 1994.

By considering all conditions listed on the death certificate, we have a better understanding of the true cause of death.

[Click here to learn more about the multiple-cause-of-death system](#)

Nephritis, nephrotic syndrome, and nephrosis ranks between sixth and tenth as a cause of death. It is a relatively more common cause of death among black than among white persons.

## Older adults are vulnerable to common infectious diseases

Although infectious diseases are no longer the most common causes of death, pneumonia, influenza, and septicemia remain among the top 10 causes of death. They were responsible for 5.5 percent or 95,640 deaths of people 65 years of age and older in 1997. However, the role infectious diseases play in declining health and mortality is not fully apparent. This is because several other medical conditions caused by infectious diseases, such as endocarditis and rheumatic heart disease, are classified as diseases of the heart despite their infectious origins. A study of deaths attributed to diseases known to be caused by infectious organisms showed a 25-percent increase in mortality between 1980 and 1992 for persons 65 years of age and older.<sup>9</sup>

The combined death rate from pneumonia and influenza has increased in recent years for all age-race-sex groups. This increase may be partly due to the higher tendency by medical certifiers to record pneumonia as the underlying cause of death with advancing age. But it also may reflect an increase in the severity of pneumonia, attributed to changes in the population at risk of contracting pneumonia or other respiratory pathogens, the increasing occurrence of drug-resistant microorganisms, and the detection of new respiratory infections.<sup>10</sup>

<sup>11</sup> Marrie TJ. Pneumonia. Clin Geriatr Med. 8:721-34, 1992.

Pneumonia is now one of the most serious infections in elderly persons, especially among women and the oldest old. In a study of nursing home-acquired pneumonia patients, pneumonia resulted in death among 40 percent of individuals who required hospitalization.<sup>11</sup>

Septicemia ranks as the sixth leading cause of death for black women 85 years of age and older, but is less important for other demographic groups. This disease is nonspecific and often occurs as a consequence of other bacterial infections of the urinary tract, skin, or respiratory system.

## Injuries remain a major cause of death well into old age

Death from injury is the leading cause of death among children and young adults. And although its relative importance decreases among the elderly, it remains a frequent cause of death among people 65 years of age and older (2 percent, or 31,400 deaths in 1997). Injuries from motor vehicle crashes, firearms, suffocation, and falls account for most deaths.

## What are the significant trends?

### Important changes in mortality have occurred over 2 decades

Between 1979-81 and 1995-97, the death rate from all causes decreased among persons 65-74 years of age (by 6 percent for women and 19 percent for men) and those 75-84 years of age (by 8 percent for women and 16 percent for men). The death rate increased slightly for women 85 years of age and older, but declined by about 3 percent for men of the same age. Among all three age groups, the decrease has been much greater for men.

### Circulatory diseases have declined

A primary reason for the overall decline in mortality is the decrease in the death rate for heart disease and stroke. Heart disease declined by 30-40 percent for both women and men ages 65-74 and 75-84; stroke declined by about 35-40 percent for men and women in the same two age groups. Declines at the oldest age group for heart disease and stroke were more modest, but still significant (heart disease, 14 percent for women and 19 percent for men; stroke, 27 percent for women and 29 percent for men).

For the two racial groups examined, diseases of the heart decreased at a slower rate for black than for white persons (20 vs 37 percent for ages 65-74; 16 vs 32 percent for ages 75-84; and 8 vs 18 percent for ages 85+). The decline in stroke followed a similar pattern with the reduction more modest among the black population.

### The decrease in mortality from atherosclerosis is striking

Death from atherosclerosis, which includes arteriosclerosis or "hardening of the arteries," has dropped over 2 decades for all age, sex, and racial groups. In 1979, atherosclerosis ranked as one of the top five causes of death, especially within the oldest age group. As an underlying cause, this disease declined over the years so that today it does not even rank among the top 10 leading causes of death for most age groups.

<sup>12</sup> Hoyert DL, Rosenberg H, MacDorman MF. Effect of changes in death certificate format on cause-specific mortality trends, United States, 1979-92. Office for National Statistics. Studies on Medical and Population Subjects. 64:47-58, 2000.

Such a drastic decline in atherosclerosis may reflect both a decrease in incidence over time and a change in reporting practice. Atherosclerosis is now frequently regarded as a preclinical process or a risk factor so the condition may have been recorded less frequently over time as physicians choose a more specific cause of death.<sup>12</sup>

## Cancer rates among men decreased in the 1990's

Since 1990, there has been an overall downward trend among white men 65-74 (3 percent decline) and 75-84 years of age (6 percent) and among black men 65-74 (9 percent) and 75-84 years of age (2 percent), although the trend varies greatly by type of cancer. This decrease does not hold among women or the oldest old. For example, respiratory and intrathoracic cancer (largely lung cancer) increased until 1990 and then decreased among white men 65-84 years of age. But it continued to increase among black men, the oldest old, and all women. Breast cancer increased until 1990 and then stabilized among white women 65-84 years old; it continued to increase among the oldest group of white women and among black women over 75 years of age.

## Chronic bronchitis, emphysema, and other COPD conditions increased as causes of death, especially among women

Nonspecific or undifferentiated chronic lung disease is the largest contributor to the increase in COPD; emphysema has also increased among women. The increase is more pronounced among older age groups, particularly women, and among black persons. Although research points to a true increase in COPD over time, a portion of this increase may be artificial and could be the result of changes in reporting practices.

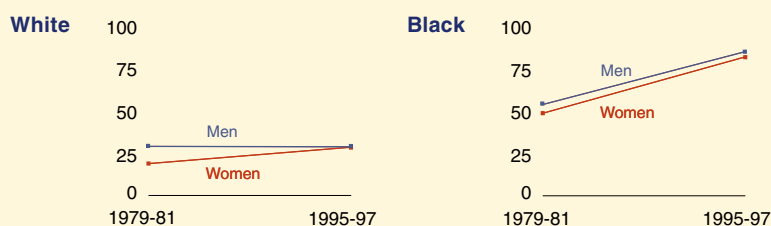
## Deaths from motor vehicle injuries and suicide

Deaths from motor vehicle injuries decreased over time for white men except the oldest old, but there was no common trend among older black men. Motor vehicle deaths increased for older white women, but remained the same for black women. The number of deaths from suicide and homicide has remained relatively small, although suicides increased by about 25 percent from 4,500 in 1981 to 5,700 in 1997. The rate of suicide is higher for elderly white men than for any other age group, including teenagers.

## Hypertension mortality declined among white men, but drastically increased among older black men of all ages

When we examine the data by race and age, the differences are striking. Between 1979-81 and 1995-97, mortality from hypertension decreased among older white men (75-84 and 85+ years particularly), but dramatically increased among older black men. Similarly, although mortality from hypertension increased among older white women, the increase was much greater among older black women.

**Death rates from hypertension remained low for older whites, but were high and increased for older blacks** (deaths per 100,000 population)





<sup>13</sup> Sandhu JS, Keating A, Hozumi N. Human gene therapy. *Crit Rev Biotechnol*. 17(4):307-326, 1997.

<sup>14</sup> Thurlimann B. Hormonal treatment of breast cancer: new developments. *Oncology*. 55(6):501-507, 1998.

<sup>15</sup> Brinkmann U, Vasmatazis G, Lee B, Yerushalmi N, Essand M, Pastan I. PAGE-1 and X chromosome-linked GAGE-like gene that is expressed in normal and neoplastic prostate, testis, and uterus. *Proc Natl Acad Sci USA*. 95(18):10757-62, 1998.

## What are the possibilities for future progress?

### Biomedical breakthroughs, technological advances, public health initiatives, and social changes may reduce mortality and increase the length of life

While most advances in life expectancy are the measured consequence of advances in social and economic well-being, biomedical science, and public health, scientific and medical breakthroughs have, at times, brought impressive gains over a short period. For example, in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, death from infectious diseases plummeted after the discovery of the germ theory of disease and the broad public health initiatives that followed. Could we be entering such a breakthrough period today? Could emerging medical technologies drawn from new scientific discoveries dramatically reduce or postpone deaths at older ages from such major killers as heart disease, cancer, and respiratory diseases and thus increase life expectancy? Or will the move toward a longer life expectancy be more deliberate?

▶ *Since mortality from any one cause of death may fluctuate from year to year, we averaged the death rate over 3 years and compared rates for 1979-81 to those for 1995-97 to obtain the percent change.*

For heart disease, advances in prevention and treatment offer the hope that death rates will continue to decline. Adopting healthy lifestyles (such as reasonable physical activity, a balanced diet, and stable lean body weight) that are known to reduce risk factors for heart disease may not be magic bullets, but should reduce the onset of circulatory problems, particularly if all segments of the population accept them. Developments in treating heart disease, including aspirin therapies, antibiotics, and more effective emergency and surgical procedures, may well reduce or delay deaths from heart disease.

For cancer, a better understanding of the genetics of cancer (the goal of the Cancer Genome Anatomy Project) may lead eventually to new prevention strategies, targeted screening, or better treatment regimes.<sup>13</sup> Recently approved hormonal treatments for breast cancer may reduce or delay mortality,<sup>14</sup> and gene therapies offer hope that prostate cancer can be effectively treated.<sup>15</sup>

In general, we may expect real changes to continue to come through broader and slower avenues. As knowledge of disease etiology and medical technology progresses at a rapid pace, the multi-pronged approach of public health education, screening, and early intervention and treatment of disease could yield positive results. Because chronic diseases are the result of a long process, it takes time to reap the benefits of efforts made now.

But unbroken progress toward lengthening our life span is not inevitable. Elderly persons, like children, are particularly vulnerable to epidemics. A major epidemic such as influenza or disease-resistant strains of gastrointestinal infections could produce a sharp increase in mortality among the frail elderly and at least temporarily halt the progress in life expectancy. Public health surveillance of known and emerging infections is critical to the long-term health of our aging population.

Moreover, meaningful reductions in mortality, even at the older ages, require reductions in the racial, class, and rural/urban disparities that influence health and well-being.

<sup>16</sup> Manton KG, Corder L, Stallard E. Chronic disability trends in elderly United States populations: 1982-1994. *Proc Natl Acad Sci.* 94:2593-2598, 1997.

<sup>17</sup> Freedman VA, Martin LG. Understanding trends in functional limitations among older Americans. *Am J Public Health.* 88:1457-1462, 1998.

## Improved quality of life?

There is concern that extending life will merely increase the number of years in declining health. Many wonder, for example, whether an improvement in treating potentially fatal heart attacks or strokes will simply lengthen the survival of persons who are physically incapacitated, cognitively impaired, or emotionally distraught. This unhappy scenario, coupled with an unparalleled growth in the population of older persons (projected to reach 70 million by the year 2030), would place severe demands on our health care system as more people spend more years of life chronically disabled.

However, recent findings on levels of disability obtained from several large national surveys suggest that in addition to living longer lives, our noninstitutionalized elderly may now be stronger, healthier, and better able to care for themselves.<sup>16, 17</sup>

Back to  
page 4

## ▶ More about the multiple-cause-of-death system

Good public health policies depend on complete information. By considering not just the single underlying cause of death listed on the death certificate, but also the other accompanying health problems listed on the certificate—the comorbid conditions—we arrive at a much more complete picture of the true cause of death. These comorbid conditions may play as important a role in contributing to death as the underlying cause, especially among the elderly. Understanding their role is necessary if additional advances in life expectancy are to be made.

What happens when we switch to this approach? A number of diseases are more likely to be identified as comorbid conditions present at the time of death rather than as the underlying cause. Of these, the most important are:

**Diabetes:** In 1996 the multiple-cause death rate for diabetes was about 3.3 times higher than the underlying cause rate for older decedents. This means that while approximately 153,000 decedents had diabetes on their death certificate, only about 46,400 had the disease listed as the underlying cause. Many adults develop noninsulin-dependent diabetes mellitus (NIDDM) as they age; the disease can cause weight loss, vision deficits, increased susceptibility to infections, and coma leading to death if the diabetes is not controlled. According to death certificates, roughly 70 percent of all elderly diabetics who died also had heart disease, and in about half of those deaths, heart disease was listed as the underlying cause of death.

**COPD:** The conditions categorized as COPD (chronic obstructive pulmonary diseases) are more likely to be listed as contributing conditions than as the underlying cause of death; the multiple cause of death rate is over twice the underlying cause rate. In 1996, approximately 203,300 elderly decedents had a chronic respiratory disease listed on the death certificate. Nearly 40 percent of these decedents had heart disease or malignant neoplasms listed as the underlying cause of death.

**Atherosclerosis:** Atherosclerosis is now rarely mentioned as the underlying cause of death, although the disease is a precursor of circulatory diseases that are the major causes of death. Over 71,000 elderly persons had atherosclerosis listed as a cause of death, more than 4.5 times the number who had the disease listed as the underlying cause.



<sup>18</sup> Hoyert DL, Rosenberg H, MacDorman MF. Effect of changes in death certificate format on cause-specific mortality trends, United States, 1979-92. Office for National Statistics. Studies on Medical and Population Subjects. 64:47-58, 2000.

<sup>19</sup> Feinlieb MF, ed. Proceedings of 1988 International Symposium on data on aging. National Center for Health Statistics. Vital Health Stat. 5(6), 1991.

<sup>20</sup> Elo IT, Preston SH. Estimating African-American mortality from inaccurate data. Demography. 31:427-58, 1994.

## About the data

Information on mortality comes from death certificates collected by the States and forwarded to NCHS for processing and publishing. Geographic coverage has been complete since 1933, and the high quality and availability of the data (and variety of social, economic, and health factors) have made death rates the best barometer of the health and well-being of a population. However, all data collection systems have limitations, and some of these limitations must be considered when using information to estimate levels and trends of cause-specific mortality in older persons. Here are three examples.

First, changes in coding conventions, in the death certificate format or in the training of those who fill out the death certificates may lead to discontinuities in trends in cause of death. For example, when attending physicians, coroners, and funeral home directors began using the new international coding conventions (ICD-9) in 1979, the number of deaths attributed to septicemia jumped abruptly. The level eventually stabilized after these certifiers received instructions to record more specific causes of death as the underlying cause. As another example, in 1989, after the format was changed to include more space to encourage certifiers to provide more complete information, a study found that the mortality trend for some causes of death changed significantly.<sup>18</sup> Similarly, diabetes as a cause of death rapidly increased after

instructions on the death certificate included diabetes as an example. This may have reminded certifiers to include this disease on the death certificate.

Second, death certificates for the elderly are often incomplete. The completeness of the death certificate depends on the thoroughness of the certifier and on the amount of information available. Studies show that the quality of the decedent's medical history and thus the physician's report of underlying cause of death diminishes with the age of the deceased. This may be because medical conditions of younger decedents are more acute and directly associated with death. The incompleteness for the elderly decedents may be a particular problem for those dying in long-term care institutions where medical certification is handled with less precision, less is known about the decedents' medical histories, and less diagnostic information is available from laboratory tests and autopsy results.<sup>19</sup>

Third, the age on the death certificate is often incorrect for older persons. Misreporting the age of decedents has been documented (both under- and over-reporting), particularly among black decedents, and reported that the errors were greater for women than for men.<sup>20</sup> This results in rates that are either too high or too low.

These factors need to be considered when using mortality data, which remain the most reliable and favored indicator of public health researchers.

### Suggested Citation

Sahyoun NR, Lentzner H, Hoyert D, Robinson KN. Trends in Causes of Death Among the Elderly. Aging Trends; No.1. Hyattsville, Maryland: National Center for Health Statistics. 2001.