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Vital and Health Statistics

Series 3, Number 34

December 2010

Life Expectancy Free of Chronic Condition-induced Activity Limitations Among White and Black Americans, 2000–2006



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

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Suggested citation

Molla MT, Madans JH. Life expectancy free of chronic condition-induced activity limitations among white and black Americans, 2000–2006. National Center for Health Statistics. Vital Health Stat 3(34). 2010.

Library of Congress Cataloging-in-Publication Data

Molla, Michael T., author.

Life expectancy, free of chronic condition-induced activity limitations among White and Black Americans, 2000–2006 / Authors, Michael T. Molla, Ph.D. and Jennifer H. Madans, Ph.D.

p. ; cm. — (Vital and health statistics. Series 3, Analytical and epidemiological studies ; Number 34) (DHHS publication ; No. (PHS) 2011-1418)

“December 2010.”

Includes bibliographical references.

ISBN 0-8406-0645-1

1. Medical statistics—United States. 2. Life expectancy—United States. 3. Chronic diseases—United States—Statistics. 4. United States—Statistics, Medical. 5. United States—Statistics, Vital. 6. African Americans—Health and hygiene—Statistics. I. Madans, Jennifer H., author. II. National Center for Health Statistics (U.S.), issuing body. III. Title. IV. Series: Vital & health statistics. Series 3, Analytical and epidemiological studies ; no. 34. V. Series: DHHS publication ; no. (PHS) 2011–1418.

[DNLM: 1. Life Expectancy—United States—Statistics. 2. African Continental Ancestry Group—United States—Statistics. 3. European Continental Ancestry Group—United States—Statistics. W2 A N148vc no.34 2010]

RA407.3.M545 2010

610.72—dc22

2010050122

For sale by the U.S. Government Printing Office
Superintendent of Documents
Mail Stop: SSOP
Washington, DC 20402–9328
Printed on acid-free paper.

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Analytical and Epidemiological
Studies

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Hyattsville, Maryland
December 2010
DHHS Publication No. (PHS) 2011-1418

National Center for Health Statistics

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Contents

Abstract	1
Introduction	1
Active Life Expectancy (Active Life)	2
Sources of Data	2
Expected Years Free of Chronic Condition-induced Activity Limitations	2
Methodology	3
Results	3
Change in the Components of Expected Years of Active Life, 2000–2006	3
Change in Active Life Expectancy Between 2000 and 2006	4
Conclusion	6
References	7
Appendix I. NHIS Questions on Chronic Condition-induced Activity Limitations	19
Appendix II. Technical Notes	20
Figures	
1. A schematic presentation of the model	3
2. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for white males: United States, 2000 and 2006	5
3. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for white females: United States, 2000 and 2006	6
4. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for black males: United States, 2000 and 2006	6
5. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for black females: United States, 2000 and 2006	7
6. Percentage of males surviving, by age and race: United States, 2000 and 2006	7
7. Percentage of females surviving, by age and race: United States, 2000 and 2006	8
Text tables	
A. Gains in life expectancy in years between 2000 and 2006	4
B. Gains in life expectancy free of chronic condition-induced activity limitations between 2000 and 2006 for males, females, and white and black populations	5
C. Gains in life expectancy free of chronic condition-induced activity limitations between 2000 and 2006 for white and black populations, by sex at ages 25, 45, and 65	5
Detailed tables	
1. Life expectancy at selected ages, by sex: United States, 2000–2006	10
2. Life expectancy for white persons at selected ages, by sex: United States, 2000–2006	11
3. Life expectancy for black persons at selected ages, by sex: United States, 2000–2006	12
4. Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006	13

5.	Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006	14
6.	Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006	15
7.	Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006	16
8.	Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006	17
9.	Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006	18

Objective

Life expectancy without activity limitations or active life expectancy is one of the health expectancy measures that is used to summarize population health. The measure differentiates the remaining years of life that are expected to be spent with activity limitations from expected years of life without activity limitations. The objective of this study was to estimate life expectancy with and without activity limitations for the white and black populations of the United States in the years 2000–2006, focusing on expected years free of chronic condition-induced activity limitations.

Methods

Life expectancies for the total as well as the white and black populations for the years 2000–2006 were calculated separately using abridged single decrement life tables. Expected years of life with and without chronic condition-induced activity limitations were calculated using Sullivan's method. The statistical analysis is based on data from the U.S. Census Bureau and the National Center for Health Statistics.

Results

Results of the study show that during the 7-year period, expected years free of chronic condition-induced activity limitations increased for the total population as well as the white and black populations of both sexes. For the total population, all males and all females, years free of chronic condition-induced activity limitations increased significantly at all ages except at 85 and over. Expected years free of chronic condition-induced activity limitations increased at age 75 and under for the white population and at age 65 and under for the black population.

Keywords: Mortality • nonfatal health outcomes • summary measures of population health

Life Expectancy Free of Chronic Condition-induced Activity Limitations Among White and Black Americans, 2000–2006

by Michael T. Molla, Ph.D., and Jennifer H. Madans, Ph.D.

Introduction

In 1900, deaths occurred mainly because of communicable diseases (acute conditions). The leading causes of death at that time included tuberculosis, pneumonia, and diarrhea (1). By the end of the century, all the communicable diseases that were major causes of death had been greatly reduced and most of the major causes of death were noncommunicable diseases or chronic conditions. By the year 2000 for example, the top 10 leading causes of death in the United States included diseases of the heart, malignant neoplasms, cerebrovascular diseases, chronic lower respiratory diseases, diabetes mellitus, Alzheimer's disease, nephritis, nephrotic syndrome and nephrosis, and septicemia. In the year 2000, these causes jointly accounted for 68 percent of all deaths in the United States (2). In the same 100-year period, death rates declined resulting in an increase in the average life expectancy of the population. In the United States, average life expectancy was 47.3 years in 1900 and rose to 77.0 years in 2000, an increase of 62.8 percent. The change in mortality also caused a change in the age structure of the population, which eventually led to the aging of the population. A history of declining mortality has been the principal cause of population aging not only in the United States, but in other low-mortality countries such as Sweden (3). In the United States, the population aged 65

and over, which was only 4.1 percent of the total population in 1900, rose to 12.4 percent by the year 2000; more than three times the 1900 percentage.

In an aging population, chronic conditions are not only major causes of death, but are also major causes of activity and functional limitations. According to the World Health Organization, major chronic conditions affecting the health of older people (aged 65 and over) include cardiovascular diseases, hypertension, stroke, diabetes, cancer, chronic obstructive pulmonary disease, and musculoskeletal conditions (4). In the United States, millions of Americans with chronic conditions have work disabilities (5). For older adults, chronic conditions contribute to loss or decrease in functioning and increase in dependency (6). The oldest and fastest-growing population subgroup (those aged 85 and over) (7), is the most vulnerable to chronic conditions (8). More recent research findings showed that in the period 1997–2004, the percentage of Americans needing help with activities of daily living (ADLs) or instrumental activities of daily living (IADLs) have continued to decline while reports of some chronic conditions and impairment continued to rise (9). For example, a National Academy of Sciences study showed that about 80 percent of the older population suffered from at least one chronic condition and nearly 40 percent had activity limitations due to chronic conditions (10).

Active Life Expectancy (Active Life)

By the year 2000, all developed countries and a number of developing countries have either already completed or are completing the epidemiologic transition and in the process, realized that extension of life might not necessarily mean the extension of healthy life (11). This transition also has expanded the conceptual horizon of population health and population health measures. Population health measures need to account both for morbidity and mortality. New concepts such as the expansion and compression of morbidity, burden of disease, activity and functional limitations, disability, and the disablement process became integral parts of the conceptual framework of the new set of indexes that were developed to measure population health.

One of these indexes adjusts life expectancy for the years expected to be lived with limitations and is called active life expectancy or simply, active life. Active life expectancy is perceived as a useful tool for health planning and making health-related policy decisions. One indication of the perceived usefulness of the concept of active life expectancy for policy makers is the fact that “years of active life” has been included among national and international health goals. In the United States for example, the goal in 2000 was 65 years of active life expectancy for the total population (12). The promotion of health-related risk-free behaviors, the creation of healthy environments at the state and community levels, and increasing access to high-quality health care are recognized as essential elements for achieving a longer and healthier life (13).

Sources of Data

This study is based on data for 2000–2006 from the National Vital Statistics System (NVSS) and the National Health Interview Survey

(NHIS), both from the Centers for Disease Control and Prevention’s National Center for Health Statistics. Single-year complete life tables were constructed for the 7 years, 2000–2006, by the Division of Vital Statistics based on NVSS data for the total population, all males, all females, and for the white and black populations by sex (14,15). Life tables are not currently available for other racial or ethnic groups and so race-specific analyses are shown for the white and black populations only. Abridged life table values were summarized from the complete life tables by the authors.

In general, the word “active” refers to continuing participation in social, economic, cultural, spiritual, and civic affairs, not just the ability to be physically active or to participate in the labor force. In the context of public health, “active” is used to differentiate persons with and without limitations in social roles (4). NHIS collects information on activity limitations based on a variety of questions from the family core questionnaire. [Appendix I](#) includes a list of these questions. Information collected on activity limitations varies by age and type of limitation. Respondents are asked about work limitations: whether they need personal assistance with personal care or ADLs such as eating, bathing, dressing, and getting around the home, and whether they need personal assistance with handling routine needs or IADLs such as everyday household chores, which includes using the telephone, managing money, and shopping or running errands.

Information on cognitive impairment is collected using indicators that identify respondents who are limited because of difficulty remembering. Other indicators are used to collect information on difficulty walking without any special equipment or limitations related to specific personal care. NHIS collects information on children who receive special education or early intervention services. Information is also collected on limitations related to play activities for young children. Depending on the ability of a person to perform the social roles expected of his or her age, each

person is classified into one of the following four categories: not limited; unable to perform major activity; limited in kind or amount of major activity; or limited in other activities.

Whenever limitations are identified, the respondent is asked to specify the health conditions causing the limitations. Each condition reported as a cause of a person’s activity limitation or limitations has been classified as chronic or nonchronic. Conditions are considered chronic if they are not cured once they are acquired such as heart disease, diabetes, and birth defects. Additionally, conditions are considered chronic if they have already existed continuously for 3 or more months after onset (16–18).

Expected Years Free of Chronic Condition-induced Activity Limitations

In the prevalence-based Sullivan model, the operational definition of active life is based on mortality and nonfatal health outcome components (19). The mortality component is unidimensional and is measured by total expected years of remaining life. On the other hand, the nonfatal health outcome, which is a multidimensional measure, can be defined in many ways. The operational definition of active life varies from one study to another. The variability in definition is partly because of the multidimensional nature of the nonfatal component of the measure and the interests of the investigation, but it also is due to variations in the sources of health survey data and variation in the age of the population under study.

In some studies, active life has been defined simply as the “duration of functional well-being” (20,21). This distinction is nonspecific and could be operationalized in many ways. In other studies, active life is defined as the expected or remaining years of life free of disability (22,23), but disability can also be defined and operationalized in many ways. In studies that focused exclusively on the elderly population,

active life is often defined as expected years free of disability, related specifically to ADLs or IADLs (24–29). Active life has also been defined based on disability where disability is expressed in terms of limitations in kind and amount of work (30).

In this study, active life is defined by combining aspects of age-specific activity limitations including inability to perform a major activity, ability to perform a major activity but being limited in kind or amount of a major activity, or being limited in activities other than the major activity for a person's age; and whether or not the limitations were caused by chronic conditions when limitations were reported. The report compared two groups of persons with different limitation statuses. The first group included persons free of all types of activity limitations. The second group included persons with all activity limitations caused by chronic conditions. The analysis does not include persons with activity limitations caused by acute conditions or activity limitations with cause unknown. Hence, active life expectancy or active life at any age is defined as the remaining years of life that are free of chronic condition-induced activity limitations.

Methodology

Sullivan's method was used to compute expected years with and without chronic condition-induced activity limitations. The method, presented schematically in [Figure 1](#), combines standard life table values and age-specific prevalence rates of nonfatal health outcomes from cross-sectional health survey data to estimate expected years with and without the observed health outcomes that negatively impact the health of those who are still alive.

In this study, a model was used to estimate expected years of life with and without chronic condition-induced activity limitations. Then, the estimated total life expectancies and the expected years without activity limitations were used to calculate the percentage of remaining life expected to be lived

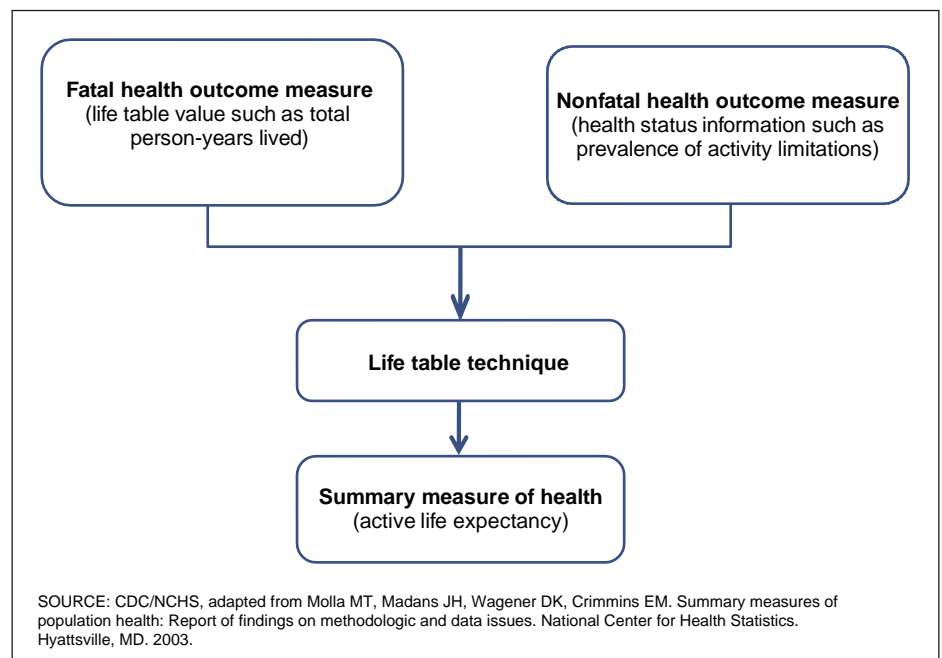


Figure 1. A schematic presentation of the model

without such limitations. Gains in expected years of life free of chronic condition-induced activity limitations during the years 2000–2006 were also calculated. Expected years of life with and without chronic condition-induced activity limitations were calculated separately for the total as well as the white and black populations with and without taking gender into account using the following formula:

$$e'_x = \frac{1}{l_x} \sum_{i=x}^{\omega} (1 - {}_n\pi_i) {}_nL_i,$$

where

e'_x is the remaining years free of chronic condition-induced activity limitations for persons who have reached age x ; l_x is the number of life table survivors at age x ; $(1 - {}_n\pi_x)$ represents the age-specific rate of a health state free of chronic condition-induced activity limitations; ${}_nL_x$ is the total number of years lived by a cohort in the age interval $(x, x + n)$; and ω is the oldest age category.

Standard errors for the expected years of life without chronic condition-induced activity limitations were calculated using the approach described in [Appendix II](#). Differences in gains of expected years of life free of chronic condition-induced activity limitations between population subgroups

were tested using a two-tailed Z test at the 0.05 level of significance and the results are noted in the text.

Results

Change in the Components of Expected Years of Active Life, 2000–2006

Changes in expected years free of chronic condition-induced activity limitations are consequences of changes in fatal and nonfatal health outcomes. Hence, the results presented in this report include a brief discussion of the changes in the components of expected years free of chronic condition-induced activity limitations.

The period life tables for the years 2000–2006 show that life expectancy rose for males and females as well as the white and the black populations at all ages ([Table A](#)). During the 7-year period, life expectancy at birth for the total population increased by about nine-tenths of a year (average annual gain of about 1.5 months). Male life expectancy at birth increased by about 1.0 years (average annual gain of about 1.7 months) and female life expectancy

Table A. Gains in life expectancy in years between 2000 and 2006

Age in years	Population group				
	All races	Male	Female	White	Black
0	0.9	1.0	0.9	0.9	1.4
1	0.9	1.1	0.9	0.8	1.4
5	0.9	1.1	0.9	0.8	1.5
15	0.9	1.0	0.9	0.8	1.4
25	0.9	1.0	0.8	0.8	1.4
35	0.9	1.1	0.8	0.9	1.3
45	1.0	1.0	0.8	0.9	1.2
55	1.0	1.1	0.8	0.9	1.2
65	0.9	1.0	0.7	0.9	1.0
75	0.6	0.7	0.5	0.5	0.7
85	0.3	0.3	0.3	0.2	0.4

NOTE: Calculated based on detailed Tables 1–3.

at birth increased by nine-tenths of a year with an annual gain of 1.5 months. Between 2000 and 2006, the expectation of life at birth for the white population also increased by about nine-tenths of a year, an average of about 1.5 months per year. During the 7-year period, the expectation of life at birth for the black population increased by a yearly average of about 2.4 months with a total gain of one and four-tenths of a year for the period 2000–2006.

According to the 2000 NHIS, 95.3 percent of all persons with activity limitations reported that their limitations were caused by chronic conditions. Only 1.7 percent of the respondents reported that their limitations were caused by acute conditions. Three percent of the respondents with activity limitations did not state whether their limitations were caused by chronic or acute conditions. In 2006, the percentage of those who reported that their limitations were caused by chronic conditions rose to 96.2 percent and the percentage of persons who reported that their activity limitations were caused by acute conditions remained at 1.7 percent. For the remaining 2.1 percent with activity limitations, it was not known whether the limitations were caused by chronic or acute conditions.

NHIS data also indicated that for the period 2000–2006, the prevalence of chronic condition-induced activity limitations has declined slightly in the United States for both the white and the black populations. In 2000, the age-adjusted prevalence rate of chronic condition-induced activity limitations

was 11.6 percent for white males and 11.3 percent for white females. The age-adjusted prevalence rate was 14.2 percent for black males as well as black females. By 2006, the prevalence rate of chronic condition-induced activity limitations had dropped by 1 percentage point each for white males, white females, and black males and by 2 percentage points for black females.

Change in Active Life Expectancy Between 2000 and 2006

As a consequence of the observed declines in mortality as well as chronic condition-induced activity limitations, expected years of life without chronic condition-induced activity limitations have increased between the years 2000 and 2006. Expected years free of chronic condition-induced activity limitations increased for the total U.S. population as well as the population subgroups indicated in Table B. Gains in years free of chronic condition-induced activity limitations were statistically significant for all groups under age 85 shown in Table B, except for the black population where the gains were significant at age 65 and under.

The comparison of Table A and Table B shows that for the total population as well as the population subgroups shown in these tables, more than one-half of life expectancy gain during the 7-year period was expected to be free of chronic condition-induced activity limitations. The only exception

is the percentage gains in active life expectancy at age 75 for the black population, where the gain in expected years of active life is less than one-half the gain in expected years of life.

As has been observed by cross-sectional as well as longitudinal studies (22,23), on average, females are expected to enjoy more years of active life than males of the same age. Expected years free of chronic condition-induced activity limitations in the years 2000 and 2006 among white males, white females, black males, and black females aged 25, 45, and 65 are presented in Figures 2–5. The results of our study show that in the year 2000, the average expected years free of chronic condition-induced activity limitations among white males was 42.7 years at age 25, 25.1 years at age 45, and 10.8 years at age 65. By 2006, the average expected years free of chronic condition-induced activity limitations among white males at the same three ages rose to 43.7 years (age 25), 26.0 years (age 45), and 11.8 years (age 65) (Figure 2), indicating an increase of 1.0 year at age 25, 0.9 year at age 45, and 1.0 year at age 65 (Table C).

In the year 2000, the average expected years free of chronic condition-induced activity limitations among white females was 45.2 years at age 25, 27.2 years at age 45, and 12.1 years at age 65. In 2006, the average expected years free of chronic condition-induced activity limitations among the group rose to 46.0 at age 25, 27.9 at age 45, and 13.0 at age 65 (Figure 3). These changes in years free of chronic condition-induced activity limitations show a gain of 0.8 year at age 25, 0.7 year at age 45, and 0.9 year at age 65 (Table C).

During the 7 years, average expected years free of chronic condition-induced activity limitations also increased for black males and black females. In the year 2000, the average expected years free of chronic condition-induced activity limitations among black males was 37.0 years at age 25, 20.4 years at age 45, and 8.7 years at age 65. By 2006, the expected years free of chronic condition-induced activity limitations among black males had increased to 38.4 years at age 25,

Table B. Gains in life expectancy free of chronic condition-induced activity limitations between 2000 and 2006 for males, females, and white and black populations

Age in years	Population group									
	All races and both sexes		Male		Female		White		Black	
	Gain	SE	Gain	SE	Gain	SE	Gain	SE	Gain	SE
0	†0.6	0.2	†0.7	0.2	†0.5	0.2	†0.6	0.2	†0.9	0.4
1	†0.6	0.2	†0.7	0.2	†0.6	0.2	†0.6	0.2	†0.8	0.4
5	†0.6	0.2	†0.8	0.2	†0.6	0.2	†0.6	0.2	†0.9	0.4
15	†0.7	0.2	†1.0	0.2	†0.7	0.2	†0.7	0.2	†1.0	0.4
25	†0.8	0.2	†1.1	0.2	†0.7	0.2	†0.8	0.2	†1.1	0.4
35	†0.8	0.2	†1.1	0.2	†0.7	0.2	†0.8	0.2	†1.1	0.4
45	†0.8	0.2	†1.0	0.2	†0.7	0.2	†0.8	0.2	†1.0	0.4
55	†0.8	0.2	†1.1	0.2	†0.7	0.2	†0.8	0.2	†1.0	0.4
65	†0.9	0.2	†1.0	0.2	†0.8	0.2	†0.8	0.2	†0.9	0.4
75	†0.7	0.2	†0.7	0.2	†0.7	0.2	†0.7	0.2	0.3	0.2
85	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2

†t greater than 1.96.

NOTES: Calculated based on detailed Tables 4–6. SE is standard error.

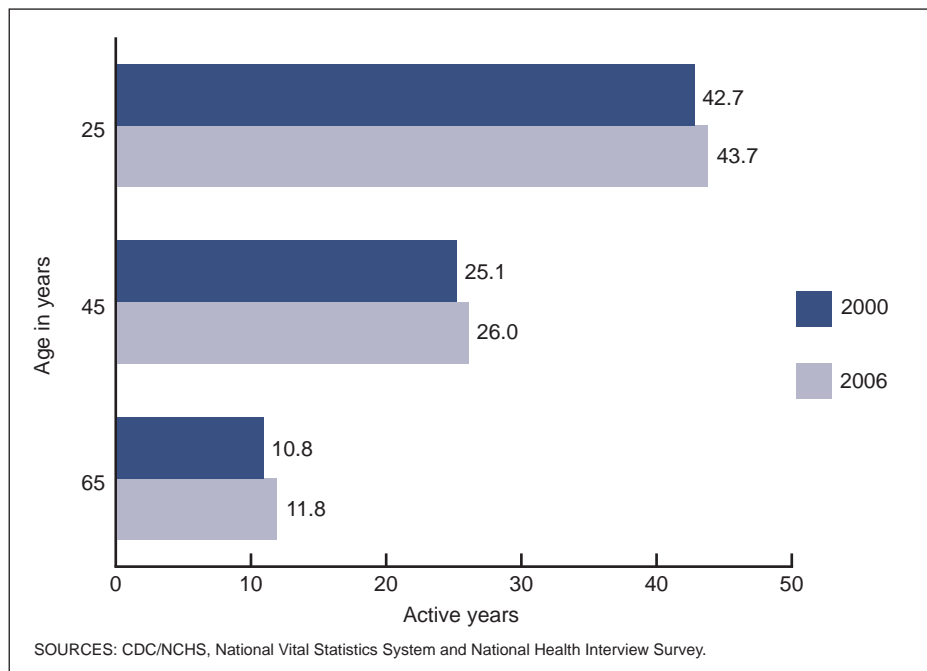


Figure 2. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for white males: United States, 2000 and 2006

21.8 years at age 45, and 9.8 years at age 65 (Figure 4). The increase in expected years free of chronic condition-induced activity limitation among these group was 1.4 years at age 25, 1.2 years at age 45, and 1.1 years at age 65 (Table C).

Among black females, average expected years free of chronic condition-induced activity limitations in the year 2000 was 39.5 years at age 25, 22.2 years at age 45, and 8.9 years at age 65. In 2006, average expected years free of chronic condition-induced activity limitations among black females rose to 40.8 years at age 25, 23.3 years at age 45, and 9.9 years at age 65 (Figure 5). Between the years 2000 and 2006, the gain in expected years free of chronic condition-induced activity limitations was 1.3 years at age 25, 1.1 years at age 45, and 1.0 year at age 65 (Table C). The gains in years free of chronic condition-induced activity

Table C. Gains in life expectancy free of chronic condition-induced activity limitations between 2000 and 2006 for white and black populations, by sex at ages 25, 45, and 65

Age in years	Population subgroup							
	White male		White female		Black male		Black female	
	Gain	SE	Gain	SE	Gain	SE	Gain	SE
25	†1.0	0.2	†0.8	0.2	†1.4	0.5	†1.3	0.5
45	†0.9	0.2	†0.7	0.2	†1.2	0.5	†1.1	0.5
65	†1.0	0.2	†0.9	0.2	†1.1	0.5	†1.0	0.5

†t greater than 1.96.

NOTES: Calculated based on Tables 4–6. SE is standard error.

Conclusion

In the earlier decades of the 20th century, life expectancy was one of the most frequently used indicators of improvement in health. Higher life expectancy implied longer life and by implication was also considered to be a reflection of healthier life (31). At that time, the major causes of death were communicable diseases or acute conditions. Unlike chronic conditions, which are degenerative in nature and are major causes of death among the older population, acute communicable conditions were major killers of the younger population (32). The transition in the major causes of death from acute to chronic conditions coupled with advances in medical technology and the pharmaceutical industry, has increased the number of persons with chronic conditions (33).

A comparison of the age patterns of mortality for the years 2000 and 2006 confirms that during the first 7 years of the 21st century, most deaths occurred at the older ages. A comparison of the survival curves for the years 2000 and 2006 also shows an outward expansion (rectangularization) (34,35) of the curves for white and black males (Figure 6) and for white and black females (Figure 7). These two figures also show that during those 7 years, the probabilities of surviving at the older ages have increased more for black males than for white males and for black females than for white females.

Consistent with other studies that focused mainly on racial differences in health in general (36) and active life expectancy in particular (30), this study indicates that during the years 2000–2006, life expectancy increased for the total population and population subgroups (Table A). Between 2000 and 2006, the expected years free of chronic condition-induced activity limitations also increased for the total population as well as population subgroups. Except for the black population at age 75, more than one-half of the gain in life expectancy during the 7-year period was expected to be free of chronic condition-induced activity limitations. However, statistical tests showed that

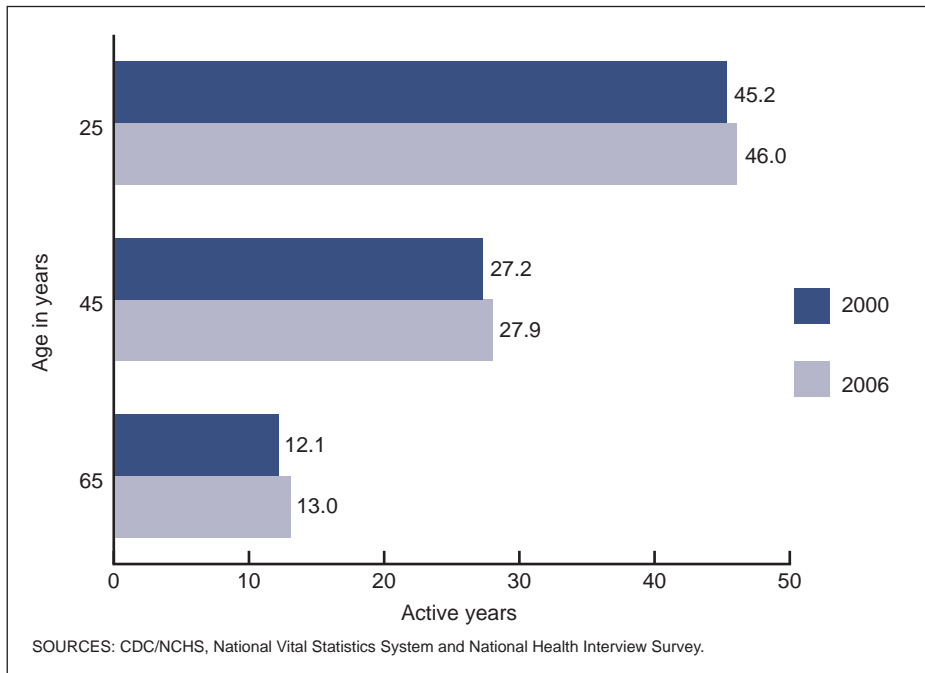


Figure 3. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for white females: United States, 2000 and 2006

limitations during the 7 years were statistically significant for all four population groups (white males, white females, black males, and black females), except for black females at age 65 (Table C). Life expectancies, expected years free of chronic

condition-induced activity limitations, and expected years free of chronic condition-induced activity limitations as percentages of life expectancies at selected ages, are also presented in Tables 1–9.

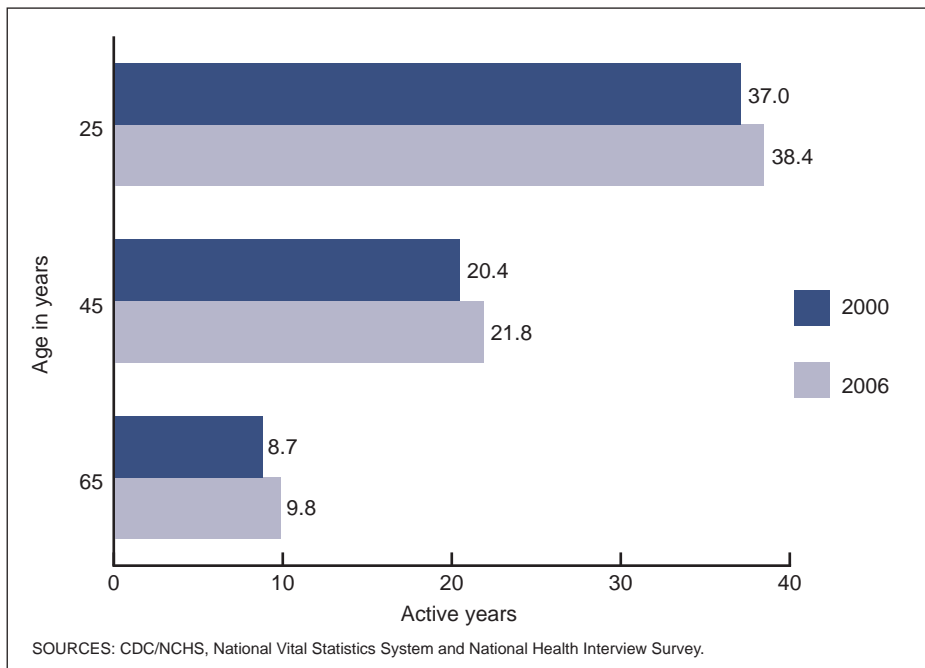


Figure 4. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for black males: United States, 2000 and 2006

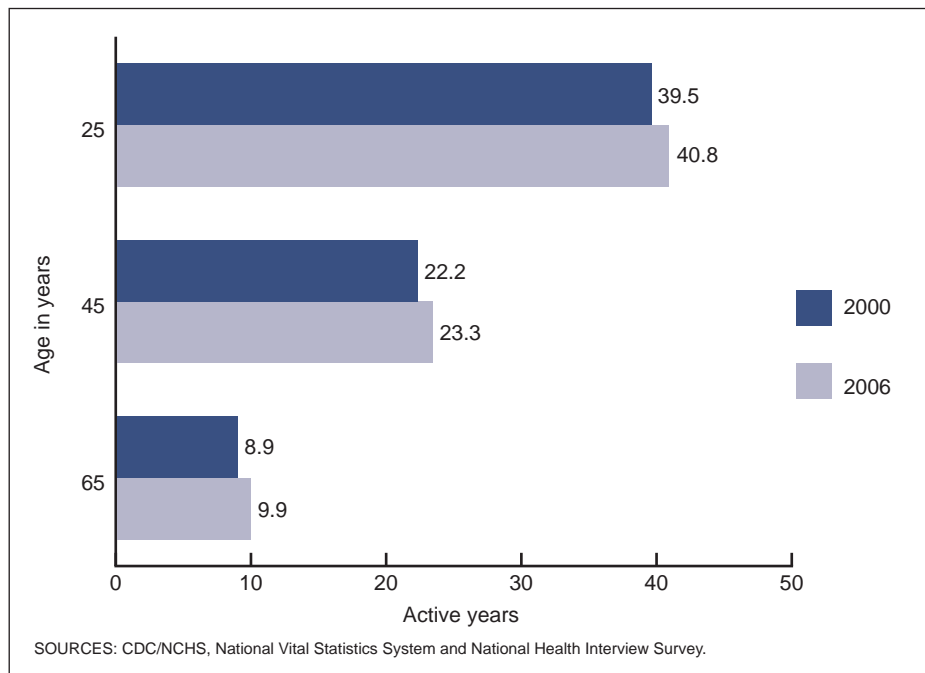


Figure 5. Expected years free of chronic condition-induced activity limitations at ages 25, 45, and 65 for black females: United States, 2000 and 2006

there were no significant differences between the white and the black populations or males and females with respect to gains in expected years free of chronic condition-induced activity limitations during the years 2000–2006.

As is the case with regard to life free of disability in general (37), in both

2000 and 2006 regardless of age, white females were expected to spend more years free of chronic condition-induced activity limitations than white males and black females were expected to spend more years free of chronic condition-induced activity limitations than black males. However, even with the observed

gains in life expectancies by each group during the 7-year period, compared with the white population, the black population was expected to spend a smaller proportion of life expectancy free of chronic condition-induced activity limitations, at the younger as well as the older ages.

The sensitivity of active life estimates with respect to the operational definitions of active life must be noted. As stated earlier, active life can be defined in several different ways depending on the operational definition of the concept. Also, while some studies assess activity limitations in general, this report focused on activity limitations caused by chronic conditions in particular. It is therefore important to note that expected years of life free of chronic condition-induced activity limitation estimates could be sensitive to the operational definitions of either of the two or both nonfatal health outcome measures, chronic conditions, and activity limitations. Also, in order to simplify the trend comparisons, discrete dichotomous measures of activity limitations and expected years with and without limitations were used. Broadly speaking, activity limitation is part of a continuum known as the disablement process (38). Whenever such a continuous measure is transformed into a discrete format, estimates could be sensitive to the cutoff points that are used in the transformed discrete measure. While estimated years of life with and without chronic condition-induced activity limitations could be sensitive to the operational definitions of chronic conditions and/or activity limitations, it is assumed that the effect of such definitions on the comparison of estimates over time is minimal.

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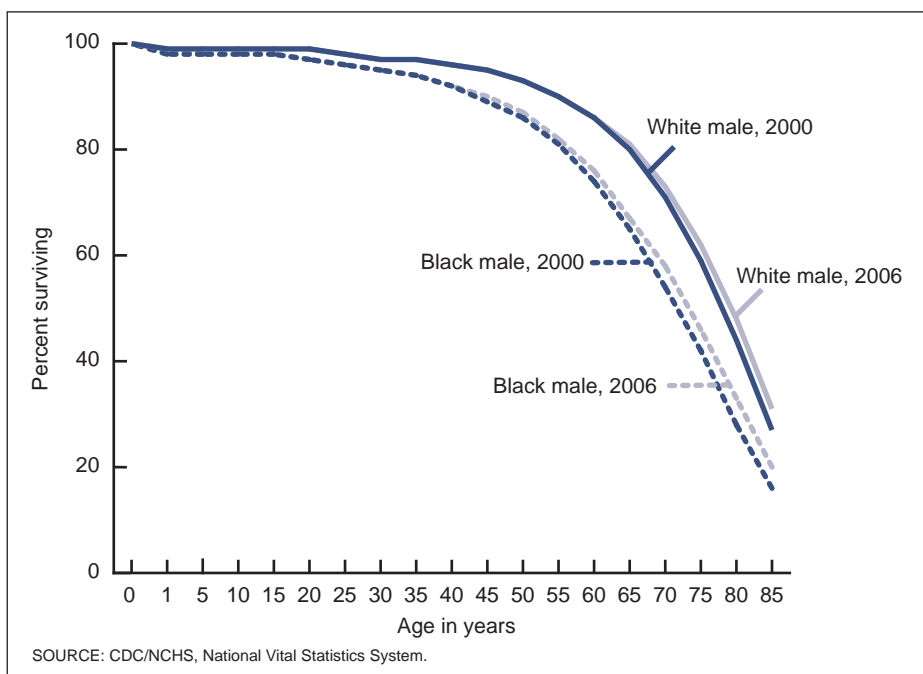


Figure 6. Percentage of males surviving, by age and race: United States, 2000 and 2006

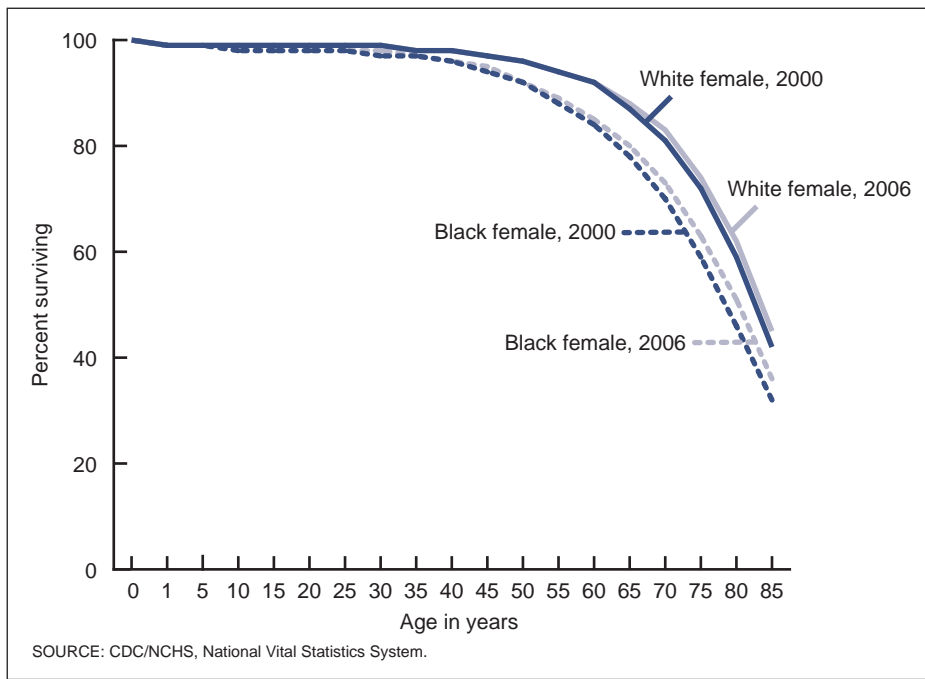


Figure 7. Percentage of females surviving, by age and race: United States, 2000 and 2006

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Table 1. Life expectancy at selected ages, by sex: United States, 2000–2006

Sex and age in years	Average number of years of life remaining						
	Year						
	2000	2001	2002	2003	2004	2005	2006
All races and both sexes							
0	76.8	76.9	76.9	77.1	77.5	77.4	77.7
1	76.3	76.4	76.5	76.6	77.0	77.0	77.2
5	72.4	72.5	72.6	72.7	73.1	73.1	73.3
15	62.5	62.6	62.7	62.8	63.2	63.2	63.4
25	53.0	53.1	53.2	53.3	53.7	53.6	53.9
35	43.5	43.6	43.7	43.8	44.2	44.2	44.4
45	34.2	34.4	34.4	34.6	34.9	34.9	35.2
55	25.5	25.6	25.7	25.9	26.2	26.2	26.5
65	17.6	17.7	17.8	17.9	18.2	18.2	18.5
75	11.0	11.1	11.0	11.1	11.4	11.3	11.6
85 and over	6.1	6.1	6.1	6.1	6.3	6.2	6.4
Male							
0	74.1	74.2	74.3	74.5	74.9	74.9	75.1
1	73.6	73.8	73.9	74.0	74.4	74.4	74.7
5	69.7	69.9	70.0	70.1	70.5	70.5	70.8
15	59.9	60.0	60.1	60.3	60.7	60.6	60.9
25	50.5	50.6	50.7	50.9	51.3	51.3	51.5
35	41.1	41.3	41.4	41.6	41.9	42.0	42.2
45	32.1	32.2	32.3	32.5	32.8	32.8	33.1
55	23.6	23.8	23.8	24.0	24.4	24.4	24.7
65	16.0	16.2	16.2	16.4	16.7	16.8	17.0
75	9.8	9.9	9.9	10.0	10.3	10.2	10.5
85 and over	5.4	5.5	5.4	5.5	5.6	5.6	5.7
Female							
0	79.3	79.4	79.5	79.6	79.9	79.9	80.2
1	78.8	78.9	79.0	79.1	79.4	79.4	79.7
5	74.9	75.0	75.1	75.2	75.5	75.5	75.8
15	65.0	65.1	65.2	65.3	65.6	65.6	65.9
25	55.3	55.4	55.4	55.5	55.9	55.9	56.1
35	45.6	45.7	45.8	45.9	46.2	46.2	46.4
45	36.2	36.3	36.4	36.4	36.8	36.8	37.0
55	27.2	27.3	27.4	27.5	27.8	27.8	28.0
65	19.0	19.0	19.1	19.2	19.5	19.5	19.7
75	11.8	11.9	11.9	11.9	12.2	12.1	12.3
85 and over	6.5	6.5	6.5	6.5	6.7	6.6	6.8

SOURCES: CDC/NCHS, National Vital Statistics System and U.S. Census Bureau.

Table 2. Life expectancy for white persons at selected ages, by sex: United States, 2000–2006

Sex and age in years	Average number of years of life remaining						
	Year						
	2000	2001	2002	2003	2004	2005	2006
White, both sexes							
0	77.3	77.4	74.9	77.6	77.9	77.9	78.2
1	76.8	76.8	74.4	77.0	77.4	77.4	77.6
5	72.9	72.9	70.4	73.1	73.5	73.4	73.7
15	63.0	63.0	60.6	63.2	63.6	63.5	63.8
25	53.4	53.5	51.2	53.7	54.0	54.0	54.2
35	43.8	43.9	41.8	44.1	44.5	44.5	44.7
45	34.5	34.7	32.6	34.8	35.2	35.2	35.4
55	25.7	25.8	24.1	26.0	26.4	26.4	26.6
65	17.7	17.8	16.3	18.0	18.3	18.3	18.6
75	11.0	11.1	9.9	11.1	11.4	11.4	11.5
85 and over	6.1	6.1	5.4	6.1	6.3	6.2	6.3
White male							
0	74.7	74.8	74.9	75.0	75.4	75.4	75.7
1	74.2	74.3	74.4	74.5	74.9	74.9	75.1
5	70.3	70.4	70.4	70.6	71.0	71.0	71.2
15	60.4	60.5	60.6	60.7	61.1	61.1	61.3
25	51.0	51.1	51.2	51.3	51.7	51.7	51.9
35	41.6	41.7	41.8	41.9	42.3	42.3	42.6
45	32.4	32.6	32.6	32.8	33.1	33.2	33.4
55	23.8	24.0	24.1	24.2	24.6	24.6	24.9
65	16.1	16.3	16.3	16.5	16.8	16.9	17.1
75	9.8	9.9	9.9	10.0	10.3	10.3	10.5
85 and over	5.3	5.4	5.4	5.4	5.6	5.5	5.7
White female							
0	79.9	79.9	79.9	80.0	80.4	80.4	80.6
1	79.3	79.3	79.4	79.4	79.8	79.8	80.0
5	75.3	75.4	75.4	75.5	75.9	75.8	76.1
15	65.4	65.5	65.5	65.6	65.9	65.9	66.1
25	55.7	55.7	55.8	55.9	56.2	56.2	56.4
35	46.0	46.0	46.1	46.2	46.5	46.5	46.7
45	36.5	36.6	36.6	36.7	37.0	37.0	37.2
55	27.4	27.5	27.5	27.6	27.9	27.9	28.2
65	19.1	19.1	19.2	19.3	19.5	19.5	19.8
75	11.9	11.9	11.9	11.9	12.2	12.1	12.3
85 and over	6.5	6.5	6.4	6.5	6.6	6.6	6.7

SOURCES: CDC/NCHS, National Vital Statistics System and U.S. Census Bureau.

Table 3. Life expectancy for black persons at selected ages, by sex: United States, 2000–2006

Sex and age in years	Average number of years of life remaining						
	Year						
	2000	2001	2002	2003	2004	2005	2006
Black, both sexes							
0	71.8	72.0	72.1	72.3	72.8	72.8	73.2
1	71.8	72.0	72.2	72.3	72.8	72.9	73.2
5	67.9	68.1	68.3	68.5	68.9	69.0	69.4
15	58.1	58.3	58.5	58.6	59.1	59.1	59.5
25	48.7	48.9	49.1	49.2	49.7	49.7	50.1
35	39.6	39.7	39.9	40.0	40.5	40.5	40.9
45	30.8	31.0	31.1	31.2	31.6	31.7	32.0
55	22.9	23.0	23.2	23.3	23.7	23.7	24.1
65	16.1	16.2	16.3	16.4	16.7	16.8	17.1
75	10.4	10.5	10.5	10.6	10.8	10.8	11.1
85 and over	6.3	6.3	6.3	6.4	6.5	6.5	6.7
Black male							
0	68.2	68.4	68.6	68.8	69.3	69.3	69.7
1	68.3	68.5	68.7	68.9	69.3	69.4	69.7
5	64.4	64.6	64.8	65.0	65.5	65.5	65.8
15	54.6	54.8	55.0	55.2	55.6	55.7	56.0
25	45.5	45.7	45.9	46.0	46.5	46.5	46.8
35	36.6	36.8	36.9	37.1	37.5	37.6	37.9
45	28.0	28.2	28.3	28.5	28.8	28.9	29.2
55	20.5	20.7	20.8	20.9	21.2	21.3	21.6
65	14.1	14.2	14.4	14.5	14.8	14.9	15.1
75	9.0	9.1	9.2	9.3	9.5	9.5	9.8
85 and over	5.5	5.6	5.5	5.7	5.7	5.7	5.9
Black female							
0	75.1	75.2	75.4	75.6	76.0	76.1	76.5
1	75.0	75.2	75.4	75.5	75.9	76.0	76.5
5	71.2	71.3	71.5	71.6	72.0	72.2	72.6
15	61.3	61.4	61.6	61.8	62.2	62.3	62.7
25	51.6	51.7	51.9	52.1	52.5	52.6	53.0
35	42.2	42.3	42.5	42.6	43.0	43.1	43.5
45	33.2	33.3	33.5	33.6	34.0	34.0	34.5
55	24.9	25.0	25.2	25.3	25.7	25.7	26.1
65	17.5	17.6	17.7	17.9	18.2	18.2	18.6
75	11.3	11.4	11.4	11.5	11.7	11.7	12.0
85 and over	6.7	6.7	6.7	6.8	6.9	6.9	7.1

SOURCES: CDC/NCHS, National Vital Statistics System and U.S. Census Bureau.

Table 4. Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006

Sex and age in years	Expected years of active life ¹						
	Year						
	2000	2001	2002	2003	2004	2005	2006
Both sexes							
0	66.1	65.9	65.7	65.9	66.3	66.5	66.7
1	65.6	65.4	65.1	65.3	65.8	66.0	66.2
5	61.8	61.6	61.4	61.6	62.0	62.3	62.5
15	52.6	52.8	52.3	52.5	53.0	53.1	53.4
25	43.5	43.8	43.2	43.4	43.9	44.1	44.3
35	34.4	34.6	34.1	34.3	34.8	34.9	35.2
45	25.7	26.0	25.6	25.7	26.2	26.3	26.5
55	17.9	18.2	17.9	17.9	18.4	18.4	18.7
65	11.3	11.7	11.4	11.5	11.7	11.8	12.2
75	5.8	6.2	5.8	6.0	6.2	6.2	6.5
85 and over	2.2	2.7	2.3	2.2	2.5	2.5	2.5
Male							
0	64.4	64.2	64.6	64.5	64.8	65.1	65.1
1	63.9	63.7	64.1	64.0	64.3	64.6	64.6
5	60.1	59.9	60.3	60.3	60.6	61.0	60.9
15	51.1	51.1	51.5	51.4	51.8	52.1	52.1
25	42.2	42.2	42.7	42.5	42.9	43.3	43.3
35	33.2	33.2	33.7	33.5	33.9	34.3	34.3
45	24.6	24.7	25.3	25.0	25.3	25.7	25.6
55	16.9	17.1	17.2	17.4	17.7	18.1	18.0
65	10.6	10.8	10.9	11.1	11.3	11.4	11.6
75	5.5	5.7	5.7	5.8	6.0	6.0	6.2
85 and over	2.2	2.4	2.4	2.2	2.6	2.2	2.5
Female							
0	67.9	67.5	67.2	67.3	67.8	68.1	68.4
1	67.3	66.9	66.6	66.7	67.3	67.5	67.9
5	63.5	63.1	62.8	62.9	63.5	63.7	64.1
15	54.1	53.7	53.5	53.6	54.2	54.3	54.8
25	44.7	44.4	44.2	44.3	44.8	45.0	45.4
35	35.4	35.2	35.0	35.1	35.7	35.7	36.1
45	26.7	26.5	26.3	26.4	26.9	27.0	27.4
55	18.7	18.6	18.5	18.5	18.9	18.9	19.4
65	11.8	11.8	11.8	11.8	12.1	12.1	12.6
75	6.1	6.1	5.9	6.1	6.3	6.3	6.8
85 and over	2.2	2.3	2.1	2.1	2.4	2.6	2.5

¹Average number of years free of chronic condition-induced activity limitations.

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Table 5. Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006

Sex and age in years	Expected years of active life ¹						
	Year						
	2000	2001	2002	2003	2004	2005	2006
White, both sexes							
0	66.7	66.4	66.2	66.5	66.9	66.9	67.3
1	66.1	65.8	65.6	65.9	66.3	66.4	66.7
5	62.3	62.0	61.8	62.1	62.6	62.6	62.9
15	53.1	52.9	52.8	53.0	53.5	53.5	53.8
25	44.0	43.9	43.7	43.9	44.4	44.4	44.8
35	34.8	34.7	34.5	34.8	35.3	35.3	35.6
45	26.1	26.1	25.9	26.2	26.6	26.6	26.9
55	18.2	18.2	18.2	18.3	18.7	18.6	19.0
65	11.5	11.6	11.6	11.7	11.9	11.9	12.3
75	5.9	6.0	5.9	6.1	6.3	6.3	6.6
85 and over	2.3	2.3	2.3	2.2	2.5	2.5	2.6
White male							
0	65.0	64.7	64.7	65.2	65.5	65.5	65.7
1	64.4	64.2	64.1	64.6	64.9	65.0	65.1
5	60.7	60.4	60.4	60.9	61.2	61.3	61.4
15	51.7	51.6	51.6	52.0	52.4	52.4	52.6
25	42.7	42.7	42.7	43.1	43.4	43.5	43.7
35	33.7	33.7	33.7	34.1	34.4	34.5	34.7
45	25.1	25.1	25.2	25.5	25.8	25.9	26.0
55	17.2	17.3	17.5	17.8	18.0	18.1	18.3
65	10.8	11.0	11.1	11.3	11.5	11.6	11.8
75	5.5	5.7	5.8	6.0	6.1	6.1	6.3
85 and over	2.2	2.4	2.6	2.3	2.6	2.3	2.6
White female							
0	68.5	68.3	68.2	68.0	68.6	68.6	69.1
1	67.8	67.7	67.5	67.4	68.0	67.9	68.5
5	64.0	63.8	63.7	63.6	64.2	64.1	64.6
15	54.6	54.5	54.4	54.3	54.8	54.8	55.3
25	45.2	45.1	45.1	45.0	45.5	45.5	46.0
35	36.0	35.9	35.8	35.8	36.3	36.2	36.7
45	27.2	27.1	27.1	27.0	27.6	27.4	27.9
55	19.1	19.1	19.2	19.0	19.5	19.2	19.9
65	12.1	12.2	12.5	12.2	12.5	12.3	13.0
75	6.2	6.3	6.5	6.4	6.5	6.5	7.1
85 and over	2.3	2.4	2.8	2.3	2.6	2.7	2.7

¹Average number of years free of chronic condition-induced activity limitations.

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Table 6. Expected years of life free of chronic condition-induced activity limitations at selected ages, by sex: United States, 2000–2006

Sex and age in years	Expected years of active life ¹						
	Year						
	2000	2001	2002	2003	2004	2005	2006
Black, both sexes							
0	60.3	59.5	60.0	59.6	60.1	61.1	61.2
1	60.2	59.3	59.9	59.5	59.9	61.0	61.0
5	56.5	55.7	56.2	55.7	56.2	57.3	57.4
15	47.4	46.6	47.4	46.7	47.4	48.4	48.4
25	38.4	37.8	38.5	37.8	38.5	39.4	39.5
35	29.6	29.0	29.8	29.0	29.7	30.5	30.7
45	21.4	20.8	21.6	20.8	21.4	22.3	22.4
55	14.3	14.2	14.7	13.7	14.5	15.4	15.3
65	8.8	8.8	9.2	8.5	9.2	9.9	9.7
75	4.6	4.8	4.7	4.2	4.8	5.3	4.9
85 and over	1.5	2.7	1.8	1.7	2.1	2.3	1.8
Black male							
0	58.3	57.7	58.3	58.0	58.5	58.9	59.3
1	58.2	57.7	58.3	57.9	58.4	58.9	59.2
5	54.6	54.0	54.6	54.2	54.7	55.3	55.6
15	45.7	45.2	46.0	45.4	46.2	46.7	46.9
25	37.0	36.8	37.6	36.9	37.6	38.0	38.4
35	28.4	28.1	29.1	28.4	28.9	29.5	29.8
45	20.4	20.0	21.1	20.3	20.7	21.4	21.8
55	13.7	13.6	14.5	13.3	14.0	14.9	14.7
65	8.7	8.4	9.2	8.4	9.0	9.6	9.8
75	4.6	4.7	5.2	4.7	5.2	5.4	5.5
85 and over	1.7	2.7	3.1	3.0	2.8	2.4	2.3
Black female							
0	62.2	61.4	63.1	61.5	61.8	63.5	63.4
1	62.0	61.2	63.0	61.3	61.6	63.3	63.2
5	58.3	57.5	59.3	57.6	57.9	59.5	59.4
15	49.0	48.2	50.1	48.3	48.7	50.2	50.1
25	39.5	39.0	40.9	38.9	39.5	40.9	40.8
35	30.6	30.1	31.8	29.9	30.6	31.8	31.8
45	22.2	21.8	23.5	21.6	22.1	23.5	23.3
55	14.9	14.9	16.6	14.4	15.0	16.2	16.0
65	8.9	9.4	10.9	8.8	9.4	10.3	9.9
75	4.5	5.0	6.7	4.1	4.7	5.6	4.9
85 and over	1.5	2.5	3.2	1.5	1.7	2.6	1.9

¹Average number of years free of chronic condition-induced activity limitations.

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Table 7. Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006

Sex and age in years	Active life as a percent of life expectancy						
	Year						
	2000	2001	2002	2003	2004	2005	2006
Both sexes							
0	86.1	85.7	85.3	85.5	85.6	85.9	85.9
1	86.0	85.6	85.2	85.3	85.4	85.7	85.7
5	85.4	85.0	84.6	84.7	84.9	85.2	85.2
15	84.2	84.3	83.5	83.5	83.8	84.1	84.2
25	82.1	82.5	81.4	81.5	81.8	82.1	82.3
35	79.1	79.5	78.2	78.4	78.9	79.1	79.2
45	75.1	75.7	74.3	74.4	74.9	75.3	75.4
55	70.1	70.9	69.6	69.4	70.1	70.3	70.8
65	64.0	65.8	64.1	63.9	64.3	64.8	65.7
75	53.3	56.3	52.9	53.8	54.3	54.8	56.6
85 and over	36.3	43.9	36.9	35.5	39.3	39.7	39.1
Male							
0	86.9	86.5	86.9	86.6	86.5	87.0	86.6
1	86.7	86.3	86.7	86.4	86.4	86.8	86.5
5	86.2	85.7	86.2	85.9	85.9	86.5	86.0
15	85.4	85.1	85.7	85.2	85.4	86.0	85.5
25	83.6	83.4	84.2	83.5	83.6	84.3	83.9
35	80.7	80.4	81.5	80.7	80.8	81.8	81.1
45	76.9	76.7	78.2	77.0	77.1	78.4	77.4
55	71.9	71.9	72.1	72.3	72.5	74.1	73.1
65	66.5	66.9	67.2	67.4	67.4	68.3	68.4
75	56.1	57.2	58.0	58.4	58.8	59.0	59.5
85 and over	40.5	43.9	45.1	41.0	45.7	40.1	44.4
Female							
0	85.5	85.0	84.6	84.5	84.8	85.2	85.3
1	85.4	84.8	84.4	84.3	84.7	85.0	85.2
5	84.7	84.1	83.7	83.7	84.0	84.3	84.5
15	83.1	82.5	82.1	82.1	82.5	82.8	83.1
25	80.8	80.2	79.7	79.7	80.2	80.6	81.0
35	77.7	77.0	76.4	76.5	77.2	77.3	77.8
45	73.7	72.9	72.4	72.3	73.2	73.3	73.9
55	68.7	68.1	67.6	67.2	68.2	68.1	69.1
65	62.3	62.0	61.9	61.4	62.2	62.3	63.9
75	51.5	51.1	49.7	51.1	51.5	52.3	55.0
85 and over	34.4	35.4	32.5	32.7	36.0	39.5	36.6

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Table 8. Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006

Sex and age in years	Active life as a percent of life expectancy						
	Year						
	2000	2001	2002	2003	2004	2005	2006
White, both sexes							
0	86.3	85.8	85.5	85.7	85.9	85.9	86.1
1	86.1	85.6	85.3	85.6	85.7	85.8	85.9
5	85.5	85.0	84.7	85.0	85.2	85.3	85.4
15	84.4	84.0	83.6	83.9	84.1	84.2	84.4
25	82.4	82.0	81.6	81.9	82.2	82.3	82.6
35	79.5	79.0	78.5	79.0	79.3	79.3	79.6
45	75.7	75.2	74.7	75.1	75.6	75.5	75.9
55	70.9	70.4	70.1	70.4	70.8	70.5	71.5
65	64.8	64.7	64.8	65.1	65.2	65.1	66.5
75	53.8	54.0	53.6	55.0	55.0	55.1	57.6
85 and over	37.2	38.0	37.8	36.1	39.8	39.7	41.3
White male							
0	87.0	86.5	86.4	86.9	86.8	86.9	86.8
1	86.8	86.4	86.3	86.7	86.7	86.7	86.7
5	86.3	85.8	85.8	86.3	86.2	86.4	86.2
15	85.5	85.3	85.1	85.7	85.7	85.8	85.7
25	83.8	83.6	83.5	84.0	84.0	84.1	84.2
35	81.0	80.7	80.6	81.3	81.4	81.5	81.4
45	77.4	77.1	77.1	77.7	77.8	78.1	77.9
55	72.5	72.2	72.6	73.4	73.4	73.5	73.7
65	66.8	67.5	67.9	68.7	68.4	68.8	69.0
75	56.2	57.8	58.8	59.6	59.9	59.8	60.2
85 and over	41.3	44.0	47.8	41.6	47.2	41.7	45.3
White female							
0	85.8	85.5	85.3	85.0	85.4	85.4	85.7
1	85.6	85.3	85.1	84.8	85.2	85.2	85.6
5	84.9	84.6	84.5	84.2	84.6	84.6	85.0
15	83.4	83.1	83.0	82.7	83.2	83.1	83.7
25	81.2	81.0	80.8	80.5	81.0	81.0	81.6
35	78.2	77.9	77.7	77.5	78.2	77.8	78.6
45	74.4	74.2	74.1	73.6	74.4	73.9	75.0
55	69.7	69.5	69.8	68.9	69.7	68.8	70.5
65	63.4	63.6	65.1	63.4	64.0	63.2	65.8
75	52.3	52.9	54.6	53.7	53.7	53.3	57.6
85 and over	35.3	36.6	44.1	36.0	39.0	40.6	40.3

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Table 9. Expected years of active life free of chronic condition-induced activity limitations as a percentage of life expectancy at selected ages, by sex: United States, 2000–2006

Sex and age in years	Active life as a percent of life expectancy						
	Year						
	2000	2001	2002	2003	2004	2005	2006
Black, both sexes							
0	84.0	82.6	83.3	82.4	82.6	83.9	83.6
1	83.9	82.4	83.0	82.2	82.4	83.7	83.4
5	83.2	81.7	82.3	81.4	81.6	83.1	82.7
15	81.6	80.1	81.0	79.7	80.3	81.8	81.3
25	78.7	77.4	78.6	76.8	77.6	79.2	78.8
35	74.8	73.1	74.6	72.6	73.4	75.4	75.0
45	69.5	67.3	69.4	66.7	67.7	70.6	70.0
55	62.6	61.7	63.6	58.9	61.2	65.0	63.4
65	55.0	54.7	56.4	51.8	54.8	58.7	56.6
75	43.8	45.6	45.0	39.3	44.5	48.9	44.5
85 and over	24.5	42.0	28.5	27.3	32.4	35.5	26.6
Black male							
0	85.5	84.4	85.0	84.3	84.4	85.0	85.1
1	85.3	84.2	84.8	84.1	84.2	84.8	85.0
5	84.7	83.5	84.2	83.3	83.6	84.4	84.5
15	83.8	82.6	83.7	82.3	83.1	83.9	83.9
25	81.3	80.4	82.0	80.1	80.9	81.7	82.0
35	77.8	76.5	78.8	76.6	77.0	78.4	78.6
45	73.0	71.0	74.5	71.4	71.9	74.1	74.6
55	66.7	66.0	69.6	63.6	66.1	69.8	68.4
65	61.9	59.0	64.0	58.0	60.6	64.5	65.0
75	51.5	51.2	56.9	50.5	54.5	56.8	56.6
85 and over	31.4	49.0	57.3	52.4	48.7	41.8	39.1
Black female							
0	82.9	81.6	83.8	81.4	81.4	83.5	82.8
1	82.7	81.4	83.6	81.2	81.2	83.2	82.6
5	81.9	80.6	82.9	80.4	80.3	82.5	81.8
15	79.9	78.5	81.3	78.3	78.3	80.6	79.9
25	76.6	75.4	78.8	74.8	75.3	77.7	77.0
35	72.4	71.1	74.9	70.3	71.0	73.8	73.1
45	66.8	65.4	70.2	64.2	65.1	68.9	67.6
55	59.7	59.6	65.8	56.8	58.4	62.9	61.2
65	50.7	53.2	61.8	49.4	52.0	56.8	53.1
75	39.5	44.1	58.5	35.6	40.1	47.5	40.7
85 and over	21.7	37.7	47.5	22.2	25.0	38.2	26.4

SOURCES: CDC/NCHS, National Vital Statistics System, National Health Interview Survey, and U.S. Census Bureau.

Appendix I. NHIS Questions on Chronic Condition-induced Activity Limitations

Questions on Activity Limitations

(1) {Are/Is} (person < 5 years old) limited in the kind or amount of play activities{he/she/they} can do because of a physical, mental, or emotional problem? {Limited in kind/amount play} (AGE < 5; Persons < 5 years)

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(2) Do any of the children under 18 in this family receive Special Educational or Early Intervention Services? {Does -- receive Spec Ed or EIS?}{AGE <18; Persons <18 years}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(3) Because of a physical, mental, or emotional problem, {do/does} {person} need the help of other persons with PERSONAL CARE NEEDS, such as eating, bathing, dressing, or getting around inside this home? {Does -- need help w/ADL} {AGE >=3; All person 3+ years}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(4) Because of a physical, mental, or emotional problem, {do/does} {person} need the help of other persons in handling ROUTINE NEEDS, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes? {Need help

with IADL}{AGE > = 18; Persons 18+ years}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(5) Does a physical, mental, or emotional problem NOW keep {PERSON 18+} from working at a job or business? {Is -- unable to work due to health problem?} {Age >=18; Persons 18+ years}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(6) Are {you/any of these family members (Other than the persons mentioned)} limited in the kind OR amount of work {you/they} can do because of a physical, mental or emotional problem? {Limited in kind/amt of work} {AGE = 18+; Persons 18+ years}

- 0 Unable to work
- 1 Limited in work
- 2 Not limited in work
- 7 Refused
- 8 Not ascertained
- 9 Don't know
- <Blank: Not in Universe>

(7) Because of a health problem, {do/does} {person} have difficulty walking without using any special equipment? {Difficulty walking w/o equipment} {AGE = All; All persons}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know

(8) {Are/Is} {person} LIMITED IN ANY WAY because of difficulty

remembering or because {you/they} experience periods of confusion? {Limited by difficulty remembering} {AGE = All; All persons}

- 1 Yes
- 2 No
- 7 Refused
- 8 Not ascertained
- 9 Don't know

(9) Are {person} LIMITED IN ANY WAY in any activities because of physical, mental or emotional problems? {Is -- limited in ANY (other) WAY?} {AGE = All; All persons}

- 0 Limitation previously mentioned
- 1 Yes, limited in some other way
- 2 Not limited in any way
- 7 Refused
- 8 Not ascertained
- 9 Don't know

Questions on Chronic Conditions as Causes of Activity Limitations

- (1) What conditions or health problems cause [person's] limitations?
- (2) How long has [person] had condition?

Appendix II. Technical Notes

Estimating Expected Years of Life

The life table is a demographic model used to calculate the expected number of years to be lived, if a group of people, currently age x , lived the rest of their lives experiencing current mortality conditions for the rest of their lives. The estimation of the life table values begins with the calculation of age-specific death rates for a given time interval such as a year based on the midyear population and the number of deaths in that year. These data can be analyzed in single years of age or 5- or 10-year age groups. The same method can be used to construct a life table at the national, state, or local level.

In an abridged life table, the average death rate (${}_nM_x$) is calculated by dividing the number of deaths observed in each age group ${}_nD_x$ by the midyear population ${}_nP_x$ of the age group. That is,

$${}_nM_x = {}_nD_x / {}_nP_x. \quad [1]$$

The conditional probability of dying within a given age group ${}_nq_x$ is the proportion of people in the age group alive at the beginning of the age interval that dies before reaching the next age group. Whereas ${}_nM_x$ is an annual death rate, ${}_nq_x$ is a conditional probability of dying, this probability is estimated as:

$${}_nq_x = [n \times {}_nM_x] / [1 + n(1 - a_x){}_nM_x], \quad [2]$$

where a_x is the average proportion of years lived by those who died in this age interval. The conditional probability of dying is assumed to be 1 for the open (oldest age) interval. If n is 5 years, then the conditional probability of dying is given by the following equation:

$${}_5q_x = [5 \times {}_5M_x] / [1 + 5(1 - a_x){}_5M_x].$$

The values for a_x are constants derived from a complete life table. For single-year life table value calculations, a_x may be assumed to be 0.5.

Having calculated the conditional probability of dying, one can now calculate the probability of surviving to an exact age at the beginning of each age interval. In the life table, this is

expressed as the number of persons surviving to exact age (or the exact age at the beginning of an age interval when group data are used), starting with an assumed cohort population (l_0) frequently expressed as 100,000 at birth.

For any other age x , the number of survivors at that age l_x can be calculated. Hence, the number alive at exact age $x + n$, (l_{x+n}) is calculated by multiplying the number of survivors at exact age x (l_x) by the probability of surviving from age x to $x + n$, ($1 - {}_nq_x$) or:

$$l_{x+n} = l_x (1 - {}_nq_x). \quad [3]$$

The total number of person-years lived for those people who were alive at the beginning of the age interval x to $x + n$ is then the sum of the total number of years lived by individuals surviving to the end of the age interval plus the total number of years lived by those who died in the age interval. Mathematically, this is presented as follows:

$${}_nL_x = n[l_{x+n} + a_x(l_x - l_{x+n})]. \quad [4]$$

In the example presented here, $n = 5$ and the value of ${}_5L_x$ is given by

$${}_5L_x = 5[l_{x+5} + a_x(l_x - l_{x+5})].$$

The total number of person-years remaining starting at age x , T_x is the total of all the person-years for age x and all subsequent ages and is presented mathematically as follows:

$$T_x = \sum_{i=x}^{\infty} {}_nL_i, \quad [5]$$

where ∞ is the open interval that represents the oldest age group.

The average expected years of life (also called life expectancy or remaining years of life), is derived by dividing the total person-years (T_x) by the number of persons surviving to the beginning of the age interval l_x , and given by

$$e_x = T_x / l_x. \quad [6]$$

Estimating Expected Years of Active Life (or Active Life Expectancy)

The life table technique is a powerful tool for estimating the remaining years of life that a group of

persons would be expected to live once they had reached a certain age. Regardless of their age, the remaining years of life might be lived in optimal health or in a health state that is considered less than optimal or in a health state that could be a combination of both states of health.

The traditional life table technique cannot be used to estimate the part of life that is expected to be spent in a health state that is considered to be optimal and the part in a less than optimal health state. The total number of expected years of life is partitioned into years with optimal health and years with a health state considered to be less than optimal using health status data. Health status data from a health survey or a clinical study are used to calculate the prevalence of different health states. Individuals in a survey or a clinical study are then categorized into groups based on their health status at the time of the survey or the clinical study. Prevalence rates may be calculated for those individuals with optimal health state and those with less than optimal health state or for more groups of individuals if a multidimensional scaling is used to describe more than two health states.

In this report, the prevalence of chronic condition-induced activity limitations (${}_n\pi_x$) is calculated. Because ${}_n\pi_x$ represents the prevalence of chronic condition-induced activity limitations, $(1 - {}_n\pi_x)$ represents the prevalence of a health state free of chronic condition-induced activity limitations.

Because ${}_nL_x$ is the total number of person-years lived for the population in age interval x to $x + n$ (equation 4), the proportion of these years lived in a state free of chronic condition-induced activity limitations (${}_nL'_x$) is given by

$${}_nL'_x = (1 - {}_n\pi_x){}_nL_x. \quad [7]$$

One of the following two equations can be used to determine active life expectancy (ALE). ALE or active life (e'_x) at age x is defined as the remaining years of life that are free of chronic condition-induced activity limitations:

$$e'_x = \frac{1}{l_x} \sum_{i=x}^{\omega} {}_nL'_i, \quad [8]$$

or

$$e'_x = \frac{1}{l_x} \sum_{i=x}^{\omega} (1 - {}_n\pi_i) {}_nL_i, \quad [9]$$

where

e'_x is the remaining years free of chronic condition-induced activity limitations for persons who have reached age x ;

l_x is the number of survivors at age x ;
 $(1 - {}_n\pi_x)$ represents the age-specific prevalence of a health state free of chronic condition-induced activity limitations;

${}_nL_x$ is the total number of years lived by a cohort in the age interval $(x, x + n)$;
 and ω is the oldest age category.

The expected years of life with chronic condition-induced activity limitations is $e - e'_x$. However, if multiple health states are described, the prevalence for each of those states must be calculated. Equation 8 or 9 can be used to estimate separately the expected years of life in those health states.

Formulas for Variance of Active Life and Z-score Test

The variance of expected years free of chronic condition-induced active life is estimated based on formula 10 below (39). S^2 and ${}_n\pi_i$ are calculated using SUDAAN (40) to account for sample design effect:

$$VAR(e'_x) = \frac{1}{l_x^2} \sum_{i=x}^{\omega} [{}_nL_i^2 S^2 (1 - {}_n\pi_i)]. \quad [10]$$

An illustrative example of variance estimation using the formula is presented in a statistical report published by the National Center for Health Statistics (41). Expected gains for the white and black populations at age 25, 45, and 65 are presented in Table C. Group differences in gains of expected years free of chronic condition-induced

activity limitation during the 7-year period were tested using the following z-score equation:

$$Z = \frac{[e'_{06} - e'_{00}] - [e'_{06} - e'_{00}]}{\sqrt{[\sqrt{(s_{06}^i)^2 + (s_{00}^i)^2}]^2 + [\sqrt{(s_{06}^j)^2 + (s_{00}^j)^2}]^2}}$$

[11]

where

e' represents the expected years of life free of chronic condition-induced activity limitations; s is the standard error of the expected years of life free of chronic condition-induced activity limitations;

i and j represent population subgroups; and 00 and 06 stand for the years 2000 and 2006.

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- Series 13. **Data From the National Health Care Survey**—This type of report contains statistics on health resources and the public's use of health care resources including ambulatory, hospital, and long-term care services based on data collected directly from health care providers and provider records.
- Series 20. **Data on Mortality**—This type of report contains statistics on mortality that are not included in regular, annual, or monthly reports. Special analyses by cause of death, age, other demographic variables, and geographic and trend analyses are included.
- Series 21. **Data on Natality, Marriage, and Divorce**—This type of report contains statistics on natality, marriage, and divorce that are not included in regular, annual, or monthly reports. Special analyses by health and demographic variables and geographic and trend analyses are included.
- Series 23. **Data From the National Survey of Family Growth**—These reports contain statistics on factors that affect birth rates, including contraception and infertility; factors affecting the formation and dissolution of families, including cohabitation, marriage, divorce, and remarriage; and behavior related to the risk of HIV and other sexually transmitted diseases. These statistics are based on national surveys of women and men of childbearing age.

DISCONTINUED SERIES

- Series 4. **Documents and Committee Reports**—These are final reports of major committees concerned with vital and health statistics and documents. The last Series 4 report was published in 2002. As of 2009, this type of report is included in Series 2 or another appropriate series, depending on the report topic.
- Series 5. **International Vital and Health Statistics Reports**—This type of report compares U.S. vital and health statistics with those of other countries or presents other international data of relevance to the health statistics system of the United States. The last Series 5 report was published in 2003. As of 2009, this type of report is included in Series 3 or another series, depending on the report topic.
- Series 6. **Cognition and Survey Measurement**—This type of report uses methods of cognitive science to design, evaluate, and test survey instruments. The last Series 6 report was published in 1999. As of 2009, this type of report is included in Series 2.
- Series 12. **Data From the Institutionalized Population Surveys**—The last Series 12 report was published in 1974. Reports from these surveys are included in Series 13.
- Series 14. **Data on Health Resources: Manpower and Facilities**—The last Series 14 report was published in 1989. Reports on health resources are included in Series 13.
- Series 15. **Data From Special Surveys**—This type of report contains statistics on health and health-related topics collected in special surveys that are not part of the continuing data systems of the National Center for Health Statistics. The last Series 15 report was published in 2002. As of 2009, reports based on these surveys are included in Series 3.
- Series 16. **Compilations of Advance Data From Vital and Health Statistics**—The last Series 16 report was published in 1996. All reports are available online, and so compilations of Advance Data reports are no longer needed.
- Series 22. **Data From the National Mortality and Natality Surveys**—The last Series 22 report was published in 1973. Reports from these sample surveys, based on vital records, are published in Series 20 or 21.
- Series 24. **Compilations of Data on Natality, Mortality, Marriage, and Divorce**—The last Series 24 report was published in 1996. All reports are available online, and so compilations of reports are no longer needed.

For answers to questions about this report or for a list of reports published in these series, contact:

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