Abstract

This report presents period life tables for the United States based on age-specific death rates in 2000. Data used to prepare these life tables are 2000 final mortality statistics; July 1, 2000, population estimates based on the 1990 decennial census; and data from the Medicare program. Presented are complete life tables by age, race, and sex. In 2000 the overall expectation of life at birth was 76.9 years, representing an increase of 0.2 years from life expectancy in 1999. Between 1999 and 2000, life expectancy increased for both males and females and for both the white and black populations. Life expectancy increased by 0.4 years for black males (from 67.8 to 68.2) and by 0.2 years for white males (from 74.6 to 74.8). It increased by 0.2 years for black females (from 74.7 to 74.9) and by 0.1 year for white females (from 79.9 to 80.0).

Introduction

There are two types of life tables—the cohort (or generation) life table and the period (or current) life table. The cohort life table presents the mortality experience of a particular birth cohort, all persons born in the year 1900, for example, from the moment of birth through consecutive ages in successive calendar years. Based on age-specific death rates observed through consecutive calendar years, the cohort life table reflects the mortality experience of an actual cohort from birth until no lives remain in the group. To prepare just a single complete cohort life table requires data over many years. It is usually not feasible to construct cohort life tables entirely on the basis of observed data for real cohorts due to data unavailability or incompleteness (1). For example, a life table representation of the mortality experience of a cohort of persons born in 1970 would require the use of data projection techniques to estimate deaths into the future (2,3).

Unlike the cohort life table, the period life table does not represent the mortality experience of an actual birth cohort. Rather, the period life table presents what would happen to a hypothetical (or synthetic) cohort if it experienced throughout its entire life the mortality conditions of a particular period in time. Thus, for example, a period life table for 2000 assumes a hypothetical cohort subject throughout its lifetime to the age-specific death rates prevailing for the actual population in 2000. The period life table may thus be characterized as rendering a “snapshot” of current mortality experience, and shows the long-range implications of a set of age-specific death rates that prevailed in a given year. In this report the term “life table” refers only to the period life table and not to the cohort life table.

Data and Methods

The data used to prepare the U.S. life tables for 2000 are final numbers of deaths for the year 2000; postcensal population estimates for the year 2000; and data from the Medicare program prepared by the Health Care Financing Administration. Population estimates are prepared by the U.S. Census Bureau. They are based on the 1990 decennial census because detailed populations from the 2000 census were not available when this report was prepared. A comparison of 1990 census based estimates and summary 2000 census results show differences for some ethnic and race groups. These differences could result in the underestimation or overestimation of life expectancy (see Technical Notes). Once population estimates based on the 2000 census are available, we will publish another report presenting revised life expectancy estimates. Data from the Medicare program are used to calculate probabilities of dying for ages over 85 years (see Technical Notes).

Life tables can be classified in two ways according to the length of the age interval in which data are presented. A complete life table

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contains data for every single year of age. An abridged life table typically contains data by 5- or 10-year age intervals. A complete life table, of course, can be easily aggregated into 5- or 10-year age groups (see Technical Notes for instructions on how to do this). Other than the decennial life tables, U.S. life tables based on data prior to 1997 are abridged life tables constructed by reference to a “standard” table (4). The 2000 U.S. life tables are complete life tables calculated using a method implemented with the 1997 life tables and are similar to the U.S. Decennial Life Tables (5,6). See Technical Notes for more information on the method used to construct the life tables in this report.

Expectation of life—The most frequently used life table statistic is life expectancy \(e_x\), which is the average number of years of life remaining for persons who have attained a given age \(x\). Life expectancy and other life table values for each age in 2000 are shown for the total population and by race and sex in tables 1–9. Life expectancy is summarized by age, race, and sex in table A.

Life expectancy at birth \(e_0\) for 2000 for the total population was 76.9 years. This represents the average number of years that the members of the hypothetical life table cohort may expect to live at the time of birth (table A).

Survivors to specified ages—Another way of assessing the longevity of the synthetic life table cohort is by determining the proportion who survive to specified ages. The \(L_x\) column of the life table provides the data for computing the proportion. Table B summarizes the number of survivors by age, race, and sex. To illustrate, 51,037 persons out of the original 2000 synthetic life table cohort of 100,000 (or 51.0 percent) were alive at exact age 80. In other words, the probability that a person will survive from birth to age 80, given 2000 age-specific mortality, is 51 percent. Probabilities of survival can be calculated at any age by simply dividing the number of survivors at the terminal age by the number at the beginning age. For example, to calculate the probability of surviving from age 20 to age 85, one would divide the number of survivors at age 85 \((34,959)\) by the number of survivors at age 20 \((98,654)\), which results in a 35.4 percent probability of survival.

### Table A. Expectation of life by age, race, and sex: United States, 2000

<table>
<thead>
<tr>
<th>Age</th>
<th>All races</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
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<td>76.9</td>
<td>74.1</td>
<td>79.5</td>
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<td>1</td>
<td>76.4</td>
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<td>5</td>
<td>72.5</td>
<td>69.8</td>
<td>75.1</td>
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<td>10</td>
<td>67.6</td>
<td>64.9</td>
<td>70.1</td>
</tr>
<tr>
<td>15</td>
<td>62.6</td>
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</tr>
<tr>
<td>20</td>
<td>57.8</td>
<td>55.2</td>
<td>60.3</td>
</tr>
<tr>
<td>25</td>
<td>53.1</td>
<td>50.6</td>
<td>55.4</td>
</tr>
<tr>
<td>30</td>
<td>48.3</td>
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<td>40</td>
<td>38.9</td>
<td>36.7</td>
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<td>34.4</td>
<td>32.2</td>
<td>36.3</td>
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<td>25.7</td>
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</tr>
<tr>
<td>100</td>
<td>2.6</td>
<td>2.4</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Explanation of the columns of the life table

**Column 1—Age \((x \text{ to } x + 1)\)**—This column shows the age interval between the two exact ages indicated. For instance, “20–21” means the 1-year interval between the 20th and 21st birthdays.

**Column 2—Probability of dying \((q_x)\)**—This column shows the probability of dying between ages \(x\) and \(x+1\). For example, for males in the age interval 20–21 years, the probability of dying is .001295 (table 2). The “probability of dying” column forms the basis of the life table; all subsequent columns are derived from it.

**Column 3—Number surviving \((L_x)\)**—This column shows the number of persons from the original synthetic cohort of 100,000 live births, who survive to the beginning of each age interval. The \(L_x\) values are computed from the \(q_x\) values, which are successively applied to the remainder of the original 100,000 persons still alive at the beginning of each age interval. Thus out of 100,000 female babies born alive, 99,376 will complete the first year of life and enter the second; 99,189 will reach age 10; 98,909 will reach age 20; and 42,145 will live to age 85 (table 3).

**Column 4—Number dying \((d_x)\)**—This column shows the number dying in each successive age interval out of the original 100,000 live births. For example, out of 100,000 males born alive, 759 will die in the first year of life; 127 between ages 20 and 21; and 864 will die after reaching age 100 (table 2). Each figure in column 4 is the difference between two successive figures in column 3.

**Column 5—Person-years lived \((l_x)\)**—This column shows the number of person-years lived by the synthetic life table cohort within an age interval \(x\) to \(x+1\). Each figure in column 5 represents the total time (in years) lived between two indicated birthdays by all those reaching the earlier birthday. Thus, the figure 98,349 for males in the age interval 20–21 is the total number of years lived between the 20th and 21st birthdays by the 98,413 (column 3) males who reached their 20th birthday out of 100,000 males born alive (table 2).

**Column 6—Total number of person-years lived \((T_x)\)**—This column shows the total number of person-years that would be lived after the
beginning of the age interval \( x \) to \( x+1 \) by the synthetic life table cohort. For example, the figure 5,434,563 is the total number of years lived after attaining age 20 by the 98,413 males reaching that age (table 2).

Column 7—Expectation of life (\( e_x \))—The expectation of life at any given age is the average number of years remaining to be lived by those surviving to that age on the basis of a given set of age-specific rates of dying. It is derived by dividing the total person-years that would be surviving to that age by the 98,413 males reaching that age (98,413 divided by 98,413).

### Results

#### Life expectancy in the United States

Tables 1–9 show complete life tables by race (white and black) and sex for 2000. Tables A and B summarize life expectancy and survival by age, race, and sex. Life expectancy at birth for 2000 represents the average number of years that a group of infants would live if the infants were to experience throughout life the age-specific death rates prevailing in 2000. In 2000 life expectancy at birth was 76.9 years, increasing by 0.2 years from 76.7 years in 1999. This increase is typical of the average yearly changes that occurred during the last 25 years in the United States. Throughout the 20th century, the trend in U.S. life expectancy was one of gradual improvement (7).

Life expectancy was 74.1 years for males, increasing by 0.2 years from 73.9 years in 1999. Life expectancy for females in 2000 was 79.5 years, increasing by 0.1 year from 79.4 years in 1999. The increase in life expectancy between 1999 and 2000 for females was primarily the result of decreases in mortality due to diseases of the heart, cancer, perinatal conditions, and chronic lower respiratory diseases. Increases in life expectancy took place despite increases in mortality due to Alzheimer’s disease, kidney disease, and pneumonitis due to solids and liquids. For males, life expectancy increased as a result of decreases in mortality from heart disease, stroke, cancer, and lower respiratory diseases, which were partly offset by increases in mortality due to kidney disease, Alzheimer’s disease, viral hepatitis, and pneumonitis due to solids and liquids.

The difference in life expectancy between the sexes was 5.4 years in 2000, a slight narrowing from the difference (5.5) in the previous year. From 1900 to 1975, the difference in life expectancy between the sexes increased from 2.8 years to 7.8 years. The increasing gap during these years is attributed to increases in male mortality due to ischemic heart disease and lung cancer, both of which increased largely as the result of men’s early and widespread adoption of cigarette smoking (7,8).

From 1979 to 1997, the difference in life expectancy between the sexes has narrowed from 7.8 years to 5.4 years, reflecting proportionately greater increases in lung cancer mortality for women than for men and proportionately larger decreases in heart disease mortality among men (7,8).

Between 1999 and 2000, life expectancy for the black population rose 0.3 years to 71.7 years. For the white population life expectancy rose by 0.1 year to 77.4 years. The difference in life expectancy between the white and black populations was 5.7 years in 2000, returning to its record low level first observed in 1982. The white-black difference in life expectancy narrowed from 15.8 years in 1990 to 5.7 years in 1982, but increased to 7.1 years in 1993 before declining from 1994 (7.0 years) to 2000 (5.7 years). The increase in the gap from 1983 to 1993 was largely the result of increases in mortality among the black male population due to HIV infection and homicide (7,9).

Among the four race-sex groups (figure 1), white females continued to have the highest life expectancy at birth (80.0 years), followed by black females (74.9 years), white males (74.8 years), and black males (68.2 years). Between 1999 and 2000, life expectancy increased 0.4 years for black males (from 67.8 in 1999 to 68.2 in 2000). Black males experienced an unprecedented decline in life expectancy every year for 1984–88 (8), but annual increases in 1990–92 and 1994–2000. From 1999 to 2000, life expectancy for black females increased from
74.7 years to 74.9 years, an increase of 0.2 years. Life expectancy for white males rose 0.2 years, from 74.6 years in 1999 to 74.8 years in 2000. White female life expectancy increased during the same period by 0.1 year from 79.9 to 80.0 years. Overall, gains in life expectancy between 1980 and 2000 were 4.4 years for black males, 4.1 years for white males, 2.4 years for black females, and 1.9 years for white females (table 12).

The 2000 life table may be used to compare life expectancy at any age from birth onward. On the basis of mortality experienced in 2000, a person aged 65 years could expect to live an average of 17.9 more years for a total of 82.9 years, and a person age 100 years could expect to live an additional 2.6 years on average (table A). Life expectancy at 100 years of age, particularly for the black population, should be interpreted with caution as these figures may be affected somewhat by age misreporting (5,10,11).

Survivorship in the United States

Table B summarizes the number of survivors out of 100,000 persons born alive \( (l_x) \) by age, race, and sex. Table 10 shows trends in survivorship from 1900 to 2000. In 2000, 99.3 percent of all infants born in the United States survived the first year of life. In contrast, only 87.6 percent of infants born in 1900 survived the first year. Fifty-one percent of the 2000 synthetic life table cohort survived to age 80, and about 1.8 percent survived to age 100. In 1900 the median age at death was 58 and only 0.03 percent survived to age 100.

Among the four race-sex groups (figure 2, table B), white females have the highest median age at death with 50 percent surviving to age 83. Of the original hypothetical cohort of 100,000 infant white females, 99.0 percent survive to age 20, 87.4 percent survive to age 65, and 43.1 percent survive to age 85. For white males and black females, the pattern of survival by age is similar. These groups have approximately
Figure 2. Percent surviving by age, race, and sex: United States, 2000

Figure 3. Percent surviving by age: Death-registration States, 1900–1902, and United States, 1949–51 and 2000

References


List of Detailed Tables

1. Life table for the total population: United States, 2000 ............. 7
2. Life table for males: United States, 2000 .......................... 9
4. Life table for the white population: United States, 2000 ............ 13
5. Life table for white males: United States, 2000 ................. 15
7. Life table for the black population: United States, 2000 .......... 19
8. Life table for black males: United States, 2000 ................. 21
10. Survivorship by age, race, and sex: Death-registration States, 1900–1902 to 1919–21, and United States, 1929–31 to 2000 ................................................. 25
11. Life expectancy by age, race, and sex: Death-registration States, 1900–1902 to 1919–21, and United States, 1929–31 to 2000 .................................................. 29