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U.S. State Life Tables, 2022

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Abstract

Objectives—This report presents complete period life tables for each of the 50 states and the District of Columbia (D.C.) by sex based on age-specific death rates in 2022.

Methods—Data used to prepare the 2022 state-specific life tables include: 2022 final mortality statistics; July 1, 2022, population estimates based on the Blended Base population estimates produced by the U.S. Census Bureau; and 2022 Medicare data for people ages 66–99. The methodology used to estimate the state-specific life tables is the same as that used to estimate the 2022 national life tables, with some modifications.

Results—Among the 50 states and D.C., Hawaii had the highest life expectancy at birth, 80.0 years in 2022, and West Virginia had the lowest, 72.2 years. From 2021 to 2022, life expectancy increased for 48 states and D.C. and decreased for 2 states. In 2022, life expectancy at age 65 ranged from 16.6 years in West Virginia to 20.5 years in Hawaii. Life expectancy at birth was higher for females in all states and D.C. The difference in life expectancy between females and males ranged from 3.6 years in Utah to 6.9 years in New Mexico.

Keywords: state life expectancy • survival • death rates • National Vital Statistics System (NVSS)

Introduction

This report presents annual complete period life tables for each of the 50 states and the District of Columbia (D.C.) for 2022. Life tables were produced for the total, male, and female populations of each state and D.C. based on age-specific death rates for 2022. The methodology used to estimate the state-specific life tables is the same as that used to estimate the annual U.S. life tables (1), with some minor modifications described in the Technical Notes.

Life tables are of two types: 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 people born in 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. Due to data unavailability or incompleteness (2), constructing cohort life tables based entirely on observed data for real cohorts is usually not feasible. For instance, a life table representation of the mortality experience of a cohort of people born in 1970 would require the use of data projection techniques to estimate deaths into the future (3,4).

The period life table, by contrast, presents what would happen to a hypothetical cohort if it experienced throughout its entire life the mortality conditions of a particular period. For example, a period life table for 2022 assumes a hypothetical cohort that is subject throughout its lifetime to the age-specific death rates prevailing for the actual population in 2022. The period life table could be characterized as producing a snapshot of current mortality experience and showing 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, not to the cohort life table.

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 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 can be combined into 5- or 10-year age groups. U.S. decennial life tables and, beginning in 1997, U.S. annual life tables are complete life tables. This report presents the results for 2022 in a series of annual, complete period state-specific life tables.

Data and Methods

The data used to prepare the U.S. state life tables for 2022 are state-specific final numbers of deaths for 2022; and July 1, 2022, state-specific population estimates based on the Blended Base produced by the U.S. Census Bureau in lieu of the April 1, 2020, decennial population count. The Blended Base consists of the blend of 2020 postcensal population estimates, based on the April 1, 2010, census; 2020 Demographic Analysis estimates; and the 2020 Census Edited File (https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/2020-2022/methods-statement-v2022.pdf). State-specific death and population counts for Medicare beneficiaries ages 66–99 for 2022 from the Centers for Medicare & Medicaid Services are used to supplement vital statistics and census data for those age 66 and older.

The methodology used to estimate the 2022 complete life tables for the 50 states and D.C. presented in this report is the same as that used to estimate the annual U.S. national life tables, with some modifications. For some states, very small age-specific or zero numbers of deaths in childhood ages sometimes required the use of additional smoothing techniques not needed in constructing the national life tables. A modification to the estimation of death rates in the oldest ages was also necessary because of the lack of state-specific census population estimates for ages 85–100. The methodology with modifications used to construct the annual U.S. state life tables is detailed in the Technical Notes.

Explanation of life table columns

Column 1. Age (between x and x + 1)—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)—Shows the probability of dying between ages x and $x + 1$. For example, for males who reach age 20 in Massachusetts, the probability of dying before reaching their 21st birthday is 0.000688 (Table MA–2). This column forms the basis of the life table; all subsequent columns are calculated from it.

Column 3. Number surviving (l_x)—Shows the number of people from the original hypothetical 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 people still alive at the beginning of each age interval. For example, out of 100,000 male babies born alive in Massachusetts in 2022, 99,142 will survive to their 21st birthday (Table MA–2).

Column 4. Number dying (d_x)—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 in Massachusetts in 2022, 68 will die between ages 20 and 21 (Table MA–2). Each figure in column 4 is the difference between two successive figures in column 3.

Column 5. Person-years lived (L_x)—Shows the number of person-years lived by the hypothetical 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. Consequently, the figure 99,176 for males in the age interval 20–21 is the total number of years lived between the 20th and 21st birthdays by the 99,210 males in Massachusetts (column 3) who reached their 20th birthday out of 100,000 males born alive (Table MA–2).

Column 6. Total number of person-years lived (T_x)—Shows the total number of person-years that would be lived after the beginning of the age interval x to $x + 1$ by the hypothetical life table cohort. For example, the figure 5,750,978 is the total number of years lived after reaching age 20 by the 99,210 males reaching that age in Massachusetts (Table MA–2).

Column 7. Expectation of life (e_x)—At any given age, shows the average number of years remaining to be lived by those surviving to that age, based on a given set of age-specific rates of dying. It is calculated by dividing the total person-years that would be lived beyond age x by the number of people who survived to that age interval (T_x/l_x). For example, the average remaining lifetime for males in Massachusetts who reach age 20 is 58.0 years (5,750,978 divided by 99,210) (Table MA–2).

Standard errors of probability of dying and life expectancy

Although based on complete counts of death, the life table functions presented in this report are subject to error. As a result, standard errors of the two most important functions, the probability of dying and life expectancy, are also presented. The mortality data on which state life tables are based are not affected by sampling error because they are based on complete counts of deaths and, as a result, standard errors reflect only stochastic (random) variation. While measurement errors such as age misreporting on death certificates or census data are known to affect mortality estimates, they are not considered in calculating the standard errors of the life table functions. In most cases, standard errors for life expectancy at birth and the probability of dying are small due to large numbers of deaths. However, for some states with small populations, particularly at the youngest ages, the standard errors presented are relatively large.

Results

Complete life tables for 50 states and D.C.

A set of complete period life tables for each state and D.C. is available online from https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/74-12. Table I lists titles for each of these tables. Table numbering is based on the federal information processing standards, or FIPS, alphabetical code for the state combined with a table code. The table codes are 1 for the total population, 2 for males, 3 for females, and 4 for the standard errors of the probability of dying and life expectancy. For example, Table FL–2 refers to the complete period life table for males in Florida.

Life expectancy in 50 states and D.C.

Table A shows life expectancy at birth for the total, male, and female populations for each state, D.C., and the United States. In 2022, among the 50 states and D.C., Hawaii ranked first for the total and female populations, with life expectancies at birth of 80.0 and 83.0 years, respectively. Massachusetts ranked first for males, with a life expectancy at birth of 77.4 years. West Virginia ranked 51st among the 50 states and D.C. for the total and female populations, with life expectancies at birth of 72.2

Table A. Life expectancy at birth, rank, and standard error, by sex: Each state, District of Columbia, and United States, 2022

Area	Total			Male			Female		
	Rank	Life expectancy (years)	Standard error	Rank	Life expectancy (years)	Standard error	Rank	Life expectancy (years)	Standard error
Hawaii	1	80.0	0.120	3	77.1	0.174	1	83.0	0.160
Massachusetts	2	79.8	0.050	1	77.4	0.074	2	82.2	0.065
New Jersey	3	79.6	0.044	4	77.1	0.064	6	82.0	0.057
New York	4	79.5	0.031	6	76.9	0.045	3	82.1	0.041
Connecticut	5	79.4	0.073	7	76.8	0.108	5	82.1	0.094
California	6	79.3	0.022	8	76.7	0.032	4	82.1	0.029
Minnesota	7	79.3	0.058	5	77.0	0.084	8	81.6	0.078
Rhode Island	8	79.2	0.129	9	76.6	0.192	7	81.8	0.163
Utah	9	79.0	0.076	2	77.3	0.111	12	80.9	0.102
New Hampshire	10	78.7	0.115	10	76.5	0.169	9	81.0	0.150
Colorado	11	78.5	0.059	13	76.1	0.086	10	81.0	0.079
Idaho	12	78.4	0.100	11	76.4	0.145	18	80.6	0.136
Washington	13	78.4	0.050	12	76.1	0.072	11	80.9	0.067
Nebraska	14	78.3	0.101	14	76.0	0.144	16	80.7	0.136
Vermont	15	78.3	0.182	15	75.8	0.260	13	80.8	0.250
Wisconsin	16	78.1	0.059	16	75.7	0.086	17	80.7	0.079
North Dakota	17	77.9	0.170	18	75.4	0.240	14	80.8	0.230
Iowa	18	77.9	0.078	17	75.6	0.112	20	80.4	0.106
Florida	19	77.9	0.032	20	75.2	0.046	15	80.7	0.042
Maryland	20	77.8	0.059	22	75.1	0.086	19	80.5	0.077
Oregon	21	77.7	0.069	21	75.2	0.101	21	80.4	0.091
Illinois	22	77.5	0.041	24	74.9	0.059	22	80.3	0.054
United States	…	77.5	…	…	74.8	…	…	80.2	…
Virginia	23	77.5	0.049	23	75.0	0.070	25	79.9	0.065
Pennsylvania	24	77.3	0.040	26	74.7	0.058	24	79.9	0.054
South Dakota	25	77.3	0.162	19	75.2	0.228	30	79.5	0.227
Montana	26	77.3	0.142	25	74.9	0.205	23	80.0	0.190
Texas	27	77.1	0.026	28	74.6	0.038	27	79.8	0.035
Wyoming	28	76.8	0.194	27	74.6	0.280	32	79.3	0.261
Michigan	29	76.8	0.046	29	74.3	0.067	33	79.3	0.062
Arizona	30	76.7	0.056	33	73.7	0.082	26	79.9	0.074
Maine	31	76.6	0.130	32	73.9	0.190	29	79.6	0.172
District of Columbia	32	76.6	0.189	36	73.3	0.275	28	79.6	0.252
Delaware	33	76.5	0.152	35	73.6	0.225	31	79.5	0.198
Kansas	34	76.5	0.085	30	74.1	0.123	35	78.9	0.115
Nevada	35	76.4	0.08	31	74.0	0.115	34	79.1	0.108
Georgia	36	75.9	0.045	37	73.1	0.066	37	78.6	0.059
North Carolina	37	75.9	0.046	38	73.0	0.067	36	78.7	0.061
Alaska	38	75.8	0.181	34	73.7	0.255	39	78.3	0.249
Ohio	39	75.6	0.043	39	73.0	0.063	38	78.3	0.058
Indiana	40	75.4	0.057	40	72.7	0.083	40	78.2	0.077
Missouri	41	75.2	0.061	41	72.5	0.088	43	78.1	0.081
South Carolina	42	75.1	0.067	42	72.2	0.098	41	78.1	0.088
New Mexico	43	74.5	0.112	45	71.2	0.162	42	78.1	0.147
Arkansas	44	73.9	0.087	43	71.3	0.124	47	76.6	0.118
Oklahoma	45	73.8	0.074	44	71.3	0.106	48	76.5	0.101
Tennessee	46	73.8	0.057	47	70.9	0.083	46	76.9	0.075
Alabama	47	73.8	0.067	48	70.8	0.099	45	77.0	0.089
Louisiana	48	73.8	0.073	49	70.6	0.106	44	77.2	0.096
Kentucky	49	73.6	0.070	46	71.1	0.100	49	76.2	0.094
Mississippi	50	72.6	0.091	51	69.5	0.133	50	75.7	0.121
West Virginia	51	72.2	0.117	50	69.5	0.167	51	75.1	0.159

… Category not applicable.

NOTE: Life expectancies shown in the table are rounded, but rankings are based on unrounded life expectancy.

SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

and 75.1, respectively. Mississippi ranked 51st for males, with a life expectancy of 69.5. In comparison, life expectancy at birth for the entire United States was 77.5, 74.8, and 80.2 for the total, male, and female populations, respectively. Figure 1 presents a U.S. map with state-specific life expectancy at birth grouped into quartiles. It shows that states with the lowest life expectancy at birth were mostly Southern states (South Carolina, West Virginia, Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, and Oklahoma) but also included New Mexico, Ohio, Missouri, and Indiana. States with the highest life expectancy at birth were predominantly Western (Hawaii, California, Colorado, Idaho, Utah, and Washington) and Northeastern (New York, New Hampshire, Connecticut, Massachusetts, Rhode Island, and New Jersey) but also included Minnesota.

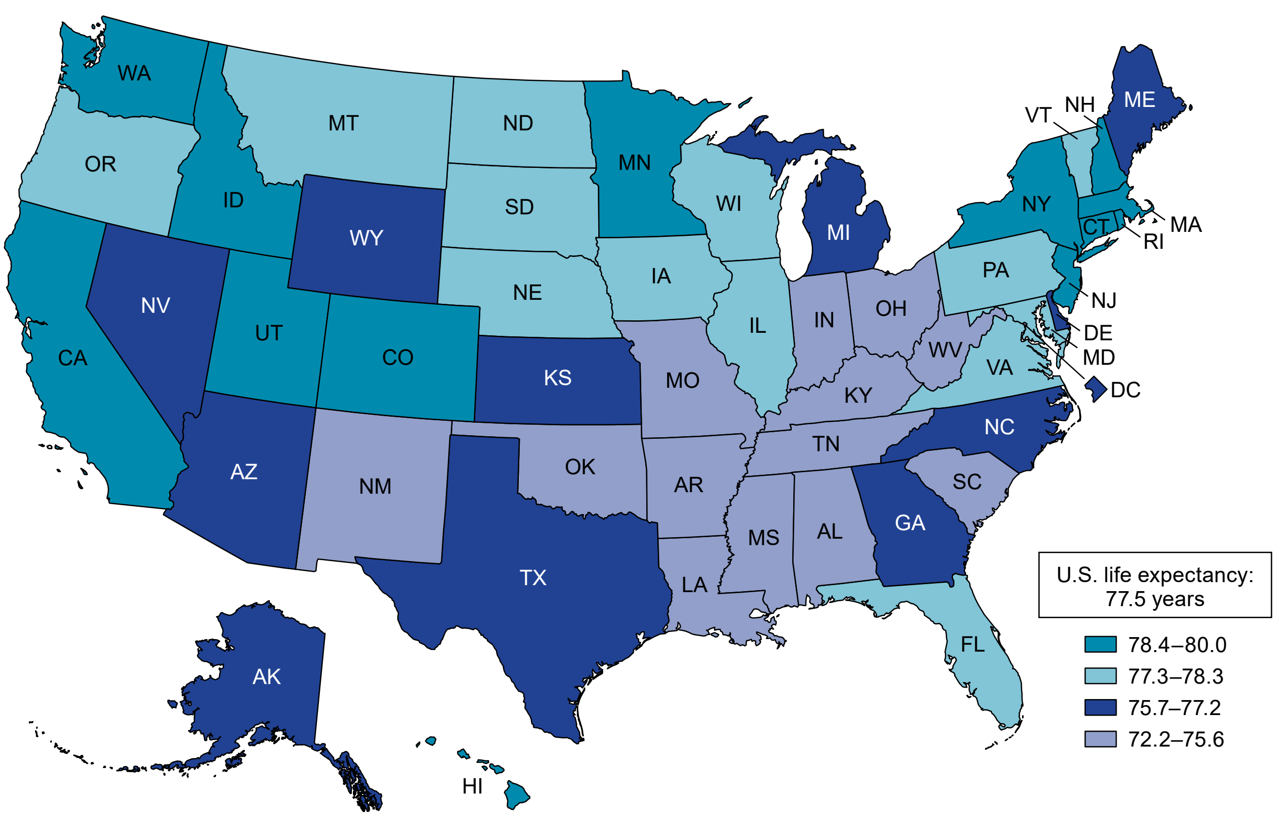
The difference in life expectancy between the sexes in the United States was 5.4 years in 2022, ranging from a high of 6.9 years in New Mexico to a low of 3.6 years in Utah (Figure 2). With a few exceptions, the states with the largest differences by sex are those with lower life expectancy at birth, while the smallest sex differences are found mostly among states with higher life expectancy.

Table B shows life expectancy at age 65 for the total, male, and female populations for the 50 states, D.C., and United States. In 2022, Hawaii ranked first for the total, male, and female populations, with life expectancy at age 65 of 20.5, 18.8, and 22.1 years, respectively. West Virginia ranked 51st, with the lowest life expectancy among the 50 states and D.C. for the total and female populations, with life expectancy at age 65 of 16.6 and 17.7, respectively. Mississippi ranked 51st for males, with life expectancy of 15.3 years. In comparison, life expectancy at age 65 for the entire United States was 18.9, 17.5, and 20.2 for the total, male, and female populations, respectively. Figure 3 shows that states with the lowest life expectancies at age 65 are mostly concentrated in the South, and those with the highest life expectancies are mostly in the West, upper Midwest, and Northeast.

Summary

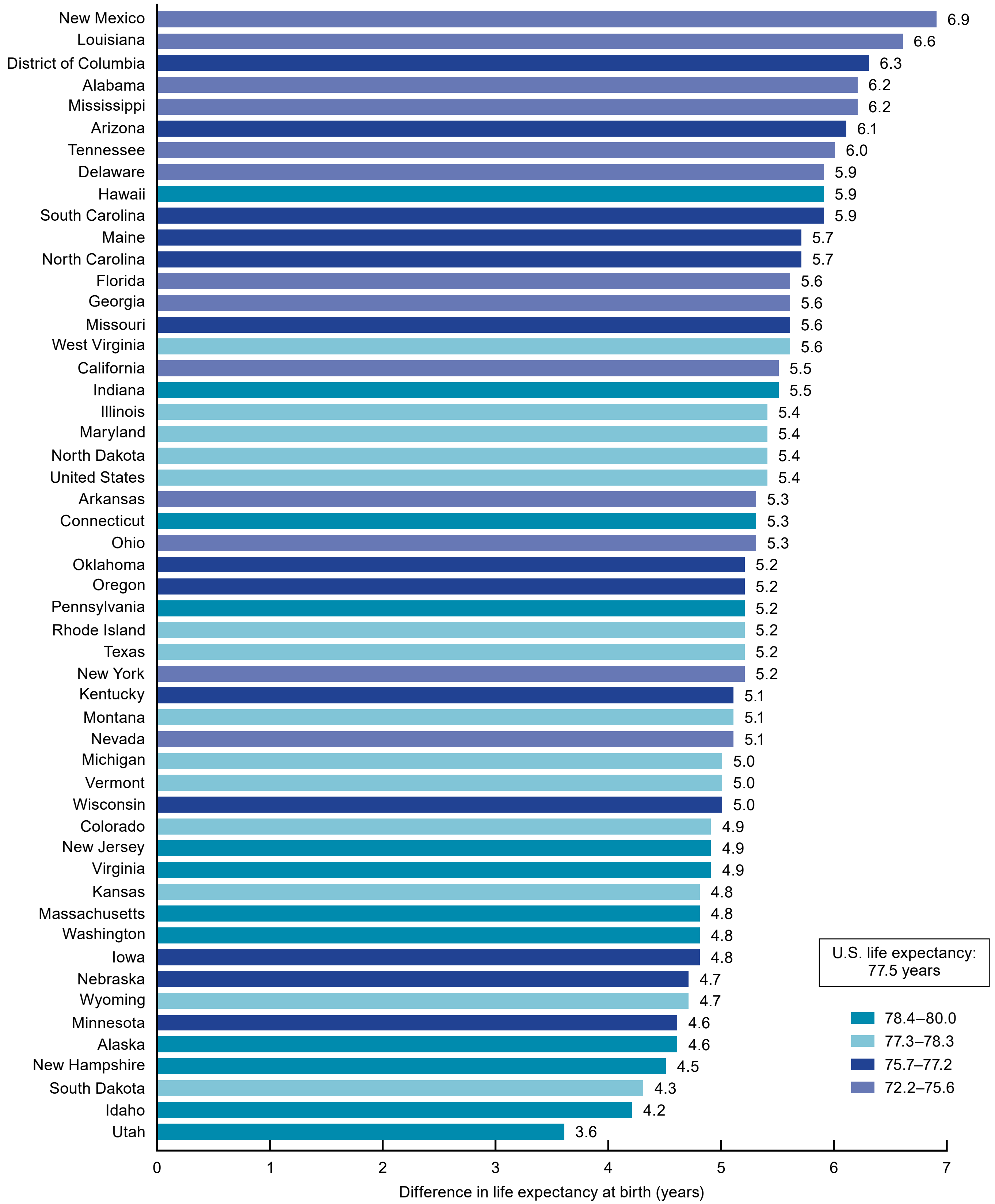
From 2021 to 2022, life expectancy at birth increased for 48 states and D.C. (Table C, Figure 4) (5). The increases ranged from 0.1 to 1.8 years. Life expectancy declined for two states (Maine and Vermont), with a decline of 0.1 year for both. The states with the greatest increases in life expectancy at birth from 2021 to 2022 were mostly in the South (South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and Texas). Other states to experience the greatest increases were Western states: Montana, Wyoming, Arizona, and New Mexico. Overall, life expectancy in the United States increased by 1.1 years from 2021 to 2022. This was the first annual increase following 2 years of large decreases resulting mostly from the COVID-19 pandemic and increases in unintentional injuries (mainly drug overdose deaths) (1).

Figure 1. Life expectancy at birth: Each state, District of Columbia, and United States, 2022



SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure 2. Difference between male and female life expectancy at birth: Each state, District of Columbia, and United States, 2022



NOTE: The color key reflects age ranges of life expectancy at birth for total population.
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Table B. Life expectancy at age 65, rank, and standard error, by sex: Each state, District of Columbia, and United States, 2022

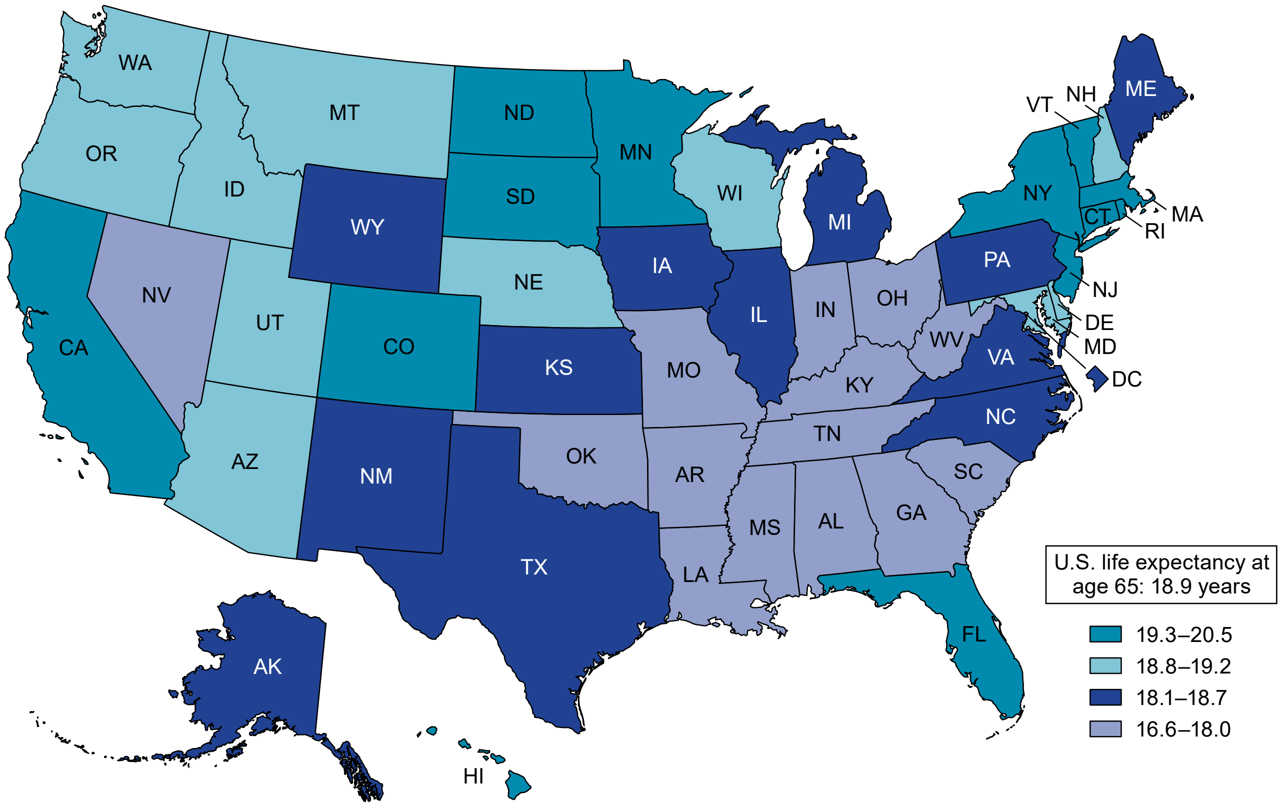
Area	Total			Male			Female		
	Rank	Life expectancy (years)	Standard error	Rank	Life expectancy (years)	Standard error	Rank	Life expectancy (years)	Standard error
Hawaii	1	20.5	0.063	1	18.8	0.088	1	22.1	0.087
Connecticut	2	19.8	0.037	2	18.4	0.052	3	21.0	0.052
New York	3	19.8	0.017	6	18.3	0.024	2	21.1	0.023
Massachusetts	4	19.7	0.027	3	18.4	0.038	7	20.8	0.038
California	5	19.7	0.013	7	18.3	0.018	4	21.0	0.017
Minnesota	6	19.6	0.030	4	18.3	0.042	9	20.7	0.043
New Jersey	7	19.6	0.024	9	18.1	0.034	8	20.8	0.033
North Dakota	8	19.5	0.087	10	18.1	0.119	5	20.9	0.123
Vermont	9	19.5	0.081	12	18.1	0.114	6	20.9	0.113
South Dakota	10	19.4	0.075	11	18.1	0.103	10	20.7	0.106
Colorado	11	19.4	0.031	5	18.3	0.044	13	20.4	0.043
Rhode Island	12	19.4	0.068	14	18.0	0.094	12	20.6	0.094
Florida	13	19.4	0.015	15	17.9	0.022	11	20.7	0.021
New Hampshire	14	19.1	0.055	13	18.0	0.078	20	20.1	0.077
Washington	15	19.1	0.027	17	17.9	0.038	16	20.3	0.037
Montana	16	19.1	0.064	18	17.9	0.091	14	20.3	0.087
Wisconsin	17	19.1	0.029	19	17.8	0.040	15	20.3	0.040
Utah	18	19.0	0.045	8	18.2	0.064	30	19.8	0.062
Maryland	19	19.0	0.030	22	17.5	0.043	18	20.2	0.042
Idaho	20	19.0	0.052	16	17.9	0.073	22	20.0	0.072
Nebraska	21	18.9	0.053	21	17.6	0.074	19	20.2	0.074
United States	…	18.9	…	…	17.5	…	…	20.2	…
Arizona	22	18.8	0.028	25	17.5	0.040	21	20.1	0.038
Oregon	23	18.8	0.035	24	17.5	0.050	23	20.0	0.048
Delaware	24	18.8	0.067	26	17.5	0.096	27	19.9	0.091
District of Columbia	25	18.7	0.117	35	16.9	0.167	17	20.2	0.160
Maine	26	18.7	0.054	23	17.5	0.077	29	19.9	0.075
Illinois	27	18.7	0.021	30	17.3	0.029	25	19.9	0.029
Iowa	28	18.7	0.041	29	17.4	0.056	24	19.9	0.058
New Mexico	29	18.7	0.050	28	17.4	0.072	28	19.9	0.069
Pennsylvania	30	18.7	0.020	31	17.2	0.027	26	19.9	0.027
Alaska	31	18.6	0.089	20	17.6	0.123	33	19.6	0.126
Virginia	32	18.5	0.025	32	17.2	0.036	31	19.7	0.035
Wyoming	33	18.5	0.090	27	17.5	0.125	32	19.6	0.126
Michigan	34	18.4	0.022	33	17.1	0.031	34	19.5	0.031
Texas	35	18.3	0.015	36	16.9	0.021	35	19.5	0.021
North Carolina	36	18.1	0.022	37	16.8	0.032	36	19.3	0.031
Kansas	37	18.1	0.043	34	16.9	0.061	39	19.2	0.061
South Carolina	38	18.0	0.031	38	16.6	0.044	37	19.3	0.042
Nevada	39	17.9	0.042	39	16.5	0.059	38	19.3	0.058
Georgia	40	17.9	0.023	42	16.4	0.033	40	19.1	0.032
Ohio	41	17.8	0.021	40	16.5	0.029	41	19.0	0.029
Missouri	42	17.8	0.029	41	16.5	0.041	42	19.0	0.041
Indiana	43	17.7	0.028	43	16.4	0.040	43	18.9	0.040
Louisiana	44	17.5	0.034	44	16.1	0.048	44	18.8	0.048
Tennessee	45	17.2	0.027	45	15.8	0.039	45	18.3	0.038
Alabama	46	17.1	0.032	46	15.7	0.045	46	18.3	0.044
Arkansas	47	17.0	0.042	47	15.6	0.059	47	18.2	0.059
Oklahoma	48	16.8	0.038	49	15.6	0.052	48	18.0	0.053
Kentucky	49	16.8	0.034	48	15.6	0.047	50	17.8	0.047
Mississippi	50	16.7	0.043	51	15.3	0.060	49	17.9	0.060
West Virginia	51	16.6	0.051	50	15.4	0.071	51	17.7	0.072

… Category not applicable.

NOTE: Life expectancies shown in the table are rounded, but rankings are based on unrounded life expectancy.

SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure 3. Life expectancy at age 65: Each state, District of Columbia, and United States, 2022



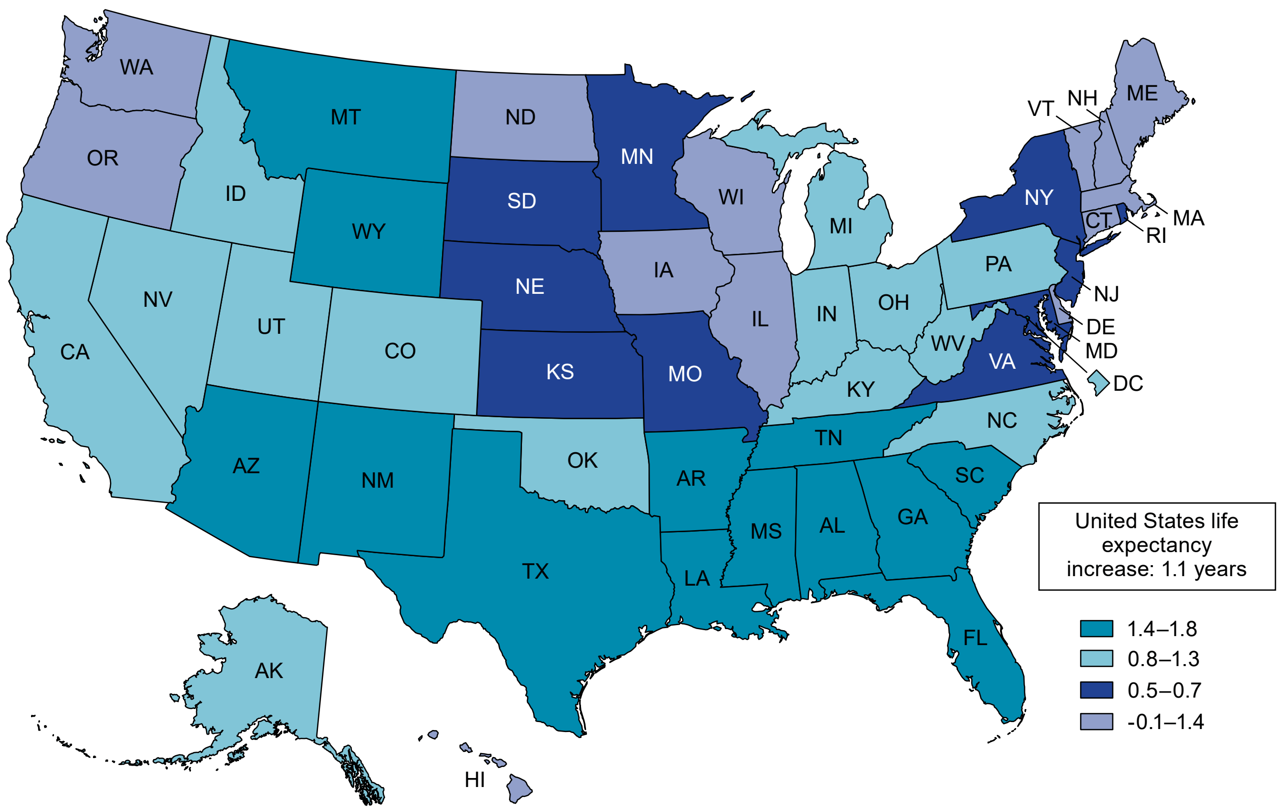
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Table C. Change in life expectancy at birth: Each state, District of Columbia, and United States, from 2021 to 2022

Area	2022	2021	Change in life expectancy from 2021 to 2022
Vermont	78.3	78.4	-0.1
Maine	76.6	76.7	-0.1
Hawaii	80.0	79.9	0.1
New Hampshire	78.7	78.5	0.2
Washington	78.4	78.2	0.2
Delaware	76.5	76.3	0.2
Massachusetts	79.8	79.6	0.2
Iowa	77.9	77.7	0.2
Connecticut	79.4	79.2	0.2
Oregon	77.7	77.4	0.3
Wisconsin	78.1	77.8	0.3
North Dakota	77.9	77.6	0.3
Illinois	77.5	77.1	0.4
Minnesota	79.3	78.8	0.5
Kansas	76.5	76.0	0.5
Nebraska	78.3	77.8	0.5
New York	79.5	79.0	0.5
New Jersey	79.6	79.0	0.6
Maryland	77.8	77.2	0.6
Missouri	75.2	74.6	0.6
South Dakota	77.3	76.6	0.7
Virginia	77.5	76.8	0.7
Rhode Island	79.2	78.5	0.7
Colorado	78.5	77.7	0.8
Utah	79.0	78.2	0.8
Indiana	75.4	74.6	0.8
Pennsylvania	77.3	76.4	0.9
North Carolina	75.9	74.9	1.0
California	79.3	78.3	1.0
United States	77.5	76.4	1.1
Ohio	75.6	74.5	1.1
Oklahoma	73.8	72.7	1.1
Michigan	76.8	75.7	1.1
West Virginia	72.2	71.0	1.2
Idaho	78.4	77.2	1.2
Kentucky	73.6	72.3	1.3
District of Columbia	76.6	75.3	1.3
Alaska	75.8	74.5	1.3
Nevada	76.4	75.1	1.3
Tennessee	73.8	72.4	1.4
Arkansas	73.9	72.5	1.4
Montana	77.3	75.8	1.5
New Mexico	74.5	73.0	1.5
Louisiana	73.8	72.2	1.6
South Carolina	75.1	73.5	1.6
Georgia	75.9	74.3	1.6
Mississippi	72.6	70.9	1.7
Texas	77.1	75.4	1.7
Arizona	76.7	75.0	1.7
Alabama	73.8	72.0	1.8
Wyoming	76.8	75.0	1.8
Florida	77.9	76.1	1.8

SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure 4. Change in life expectancy at birth from 2021 to 2022: Each state, District of Columbia, and United States, 2022



SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

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Technical Notes

The methods used to estimate the 2022 complete life tables for the 50 states and the District of Columbia (D.C.) are the same as those used to estimate the U.S. annual life tables, with two modifications (1). First, for states with zero death counts at single ages 1–4 years, linear interpolation was used to replace those zero death counts. For a few states, linear interpolation was also used to replace zero and negative death counts resulting from application of the Beers' smoothing technique to very small death counts for ages 6–12 years. Second, a modification was made to the estimation of the age-specific death rates for ages 66–99. Because state age-specific census population estimates for ages 85–100 are not available, the age range needed to be modified where vital and Medicare death rates are blended and where Medicare data are used exclusively. Details of the methodology and modifications follow.

Data for calculating life table functions

The data used to prepare the U.S. state life tables (Table I) include state-specific final death counts from the National Vital Statistics System (NVSS), state-specific population estimates from the U.S. Census Bureau, and state-specific death and population counts for Medicare beneficiaries ages 66–99 from the Centers for Medicare & Medicaid Services (CMS).

Vital statistics data

Death counts used for computing the life tables presented in this report are state-specific final numbers of deaths for 2022 collected from death certificates filed in state vital statistics offices and reported to the National Center for Health Statistics (NCHS) as part of NVSS.

Census population data

The population data used to estimate the life tables shown in this report are postcensal population estimates based on the Blended Base created by the U.S. Census Bureau to produce post-2020 census population estimates. The Blended Base consists of the blend of Vintage 2020 postcensal population estimates, based on the April 1, 2010, decennial census; 2020 Demographic Analysis estimates; and the 2020 Census Edited File. (https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/2020-2022/methods-statement-v2022.pdf)

Medicare data

Data from the Medicare program are used to supplement vital statistics and census data for ages 66–99 for the total population and by sex for each state and D.C.

Medicare data are considered more accurate than vital statistics and census data at the oldest ages because Medicare enrollees must have proof of age to enroll (6). However, the reliability of Medicare data beyond age 100 declines because of the small percentage of people who enrolled at the start of the

Table I. Complete period life tables: 50 states and the District of Columbia, 2022

Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/74-12/

Table title	
AK–1.	Life table for the total population: Alaska, 2022
AK–2.	Life table for males: Alaska, 2022
AK–3.	Life table for females: Alaska, 2022
AK–4.	Standard errors of the probability of dying and life expectancy: Alaska, 2022
AL–1.	Life table for the total population: Alabama, 2022
AL–2.	Life table for males: Alabama, 2022
AL–3.	Life table for females: Alabama, 2022
AL–4.	Standard errors of the probability of dying and life expectancy: Alabama, 2022
AR–1.	Life table for the total population: Arkansas, 2022
AR–2.	Life table for males: Arkansas, 2022
AR–3.	Life table for females: Arkansas, 2022
AR–4.	Standard errors of the probability of dying and life expectancy: Arkansas, 2022
AZ–1.	Life table for the total population: Arizona, 2022
AZ–2.	Life table for males: Arizona, 2022
AZ–3.	Life table for females: Arizona, 2022
AZ–4.	Standard errors of the probability of dying and life expectancy: Arizona, 2022
CA–1.	Life table for the total population: California, 2022
CA–2.	Life table for males: California, 2022
CA–3.	Life table for females: California, 2022
CA–4.	Standard errors of the probability of dying and life expectancy: California, 2022
CO–1.	Life table for the total population: Colorado, 2022
CO–2.	Life table for males: Colorado, 2022
CO–3.	Life table for females: Colorado, 2022
CO–4.	Standard errors of the probability of dying and life expectancy: Colorado, 2022
CT–1.	Life table for the total population: Connecticut, 2022
CT–2.	Life table for males: Connecticut, 2022
CT–3.	Life table for females: Connecticut, 2022
CT–4.	Standard errors of the probability of dying and life expectancy: Connecticut, 2022
DC–1.	Life table for the total population: District of Columbia, 2022
DC–2.	Life table for males: District of Columbia, 2022
DC–3.	Life table for females: District of Columbia, 2022
DC–4.	Standard errors of the probability of dying and life expectancy: District of Columbia, 2022
DE–1.	Life table for the total population: Delaware, 2022
DE–2.	Life table for males: Delaware, 2022
DE–3.	Life table for females: Delaware, 2022
DE–4.	Standard errors of the probability of dying and life expectancy: Delaware, 2022
FL–1.	Life table for the total population: Florida, 2022
FL–2.	Life table for males: Florida, 2022
FL–3.	Life table for females: Florida, 2022
FL–4.	Standard errors of the probability of dying and life expectancy: Florida, 2022
GA–1.	Life table for the total population: Georgia, 2022
GA–2.	Life table for males: Georgia, 2022
GA–3.	Life table for females: Georgia, 2022
GA–4.	Standard errors of the probability of dying and life expectancy: Georgia, 2022
HI–1.	Life table for the total population: Hawaii, 2022
HI–2.	Life table for males: Hawaii, 2022
HI–3.	Life table for females: Hawaii, 2022
HI–4.	Standard errors of the probability of dying and life expectancy: Hawaii, 2022
IA–1.	Life table for the total population: Iowa, 2022
IA–2.	Life table for males: Iowa, 2022
IA–3.	Life table for females: Iowa, 2022

See footnote at end of table.

Table I. Complete period life tables: 50 states and the District of Columbia, 2022—Con.

Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/74-12/

	Table title
IA–4.	Standard errors of the probability of dying and life expectancy: Iowa, 2022
ID–1.	Life table for the total population: Idaho, 2022
ID–2.	Life table for males: Idaho, 2022
ID–3.	Life table for females: Idaho, 2022
ID–4.	Standard errors of the probability of dying and life expectancy: Idaho, 2022
IL–1.	Life table for the total population: Illinois, 2022
IL–2.	Life table for males: Illinois, 2022
IL–3.	Life table for females: Illinois, 2022
IL–4.	Standard errors of the probability of dying and life expectancy: Illinois, 2022
IN–1.	Life table for the total population: Indiana, 2022
IN–2.	Life table for males: Indiana, 2022
IN–3.	Life table for females: Indiana, 2022
IN–4.	Standard errors of the probability of dying and life expectancy: Indiana, 2022
KS–1.	Life table for the total population: Kansas, 2022
KS–2.	Life table for males: Kansas, 2022
KS–3.	Life table for females: Kansas, 2022
KS–4.	Standard errors of the probability of dying and life expectancy: Kansas, 2022
KY–1.	Life table for the total population: Kentucky, 2022
KY–2.	Life table for males: Kentucky, 2022
KY–3.	Life table for females: Kentucky, 2022
KY–4.	Standard errors of the probability of dying and life expectancy: Kentucky, 2022
LA–1.	Life table for the total population: Louisiana, 2022
LA–2.	Life table for males: Louisiana, 2022
LA–3.	Life table for females: Louisiana, 2022
LA–4.	Standard errors of the probability of dying and life expectancy: Louisiana, 2022
MA–1.	Life table for the total population: Massachusetts, 2022
MA–2.	Life table for males: Massachusetts, 2022
MA–3.	Life table for females: Massachusetts, 2022
MA–4.	Standard errors of the probability of dying and life expectancy: Massachusetts, 2022
MD–1.	Life table for the total population: Maryland, 2022
MD–2.	Life table for males: Maryland, 2022
MD–3.	Life table for females: Maryland, 2022
MD–4.	Standard errors of the probability of dying and life expectancy: Maryland, 2022
ME–1.	Life table for the total population: Maine, 2022
ME–2.	Life table for males: Maine, 2022
ME–3.	Life table for females: Maine, 2022
ME–4.	Standard errors of the probability of dying and life expectancy: Maine, 2022
MI–1.	Life table for the total population: Michigan, 2022
MI–2.	Life table for males: Michigan, 2022
MI–3.	Life table for females: Michigan, 2022
MI–4.	Standard errors of the probability of dying and life expectancy: Michigan, 2022
MN–1.	Life table for the total population: Minnesota, 2022
MN–2.	Life table for males: Minnesota, 2022
MN–3.	Life table for females: Minnesota, 2022
MN–4.	Standard errors of the probability of dying and life expectancy: Minnesota, 2022
MO–1.	Life table for the total population: Missouri, 2022
MO–2.	Life table for males: Missouri, 2022
MO–3.	Life table for females: Missouri, 2022
MO–4.	Standard errors of the probability of dying and life expectancy: Missouri, 2022
MS–1.	Life table for the total population: Mississippi, 2022
MS–2.	Life table for males: Mississippi, 2022
MS–3.	Life table for females: Mississippi, 2022
MS–4.	Standard errors of the probability of dying and life expectancy: Mississippi, 2022
MT–1.	Life table for the total population: Montana, 2022
MT–2.	Life table for males: Montana, 2022
MT–3.	Life table for females: Montana, 2022
MT–4.	Standard errors of the probability of dying and life expectancy: Montana, 2022
NC–1.	Life table for the total population: North Carolina, 2022
NC–2.	Life table for males: North Carolina, 2022
NC–3.	Life table for females: North Carolina, 2022
NC–4.	Standard errors of the probability of dying and life expectancy: North Carolina, 2022
ND–1.	Life table for the total population: North Dakota, 2022
ND–2.	Life table for males: North Dakota, 2022
ND–3.	Life table for females: North Dakota, 2022
ND–4.	Standard errors of the probability of dying and life expectancy: North Dakota, 2022
NE–1.	Life table for the total population: Nebraska, 2022
NE–2.	Life table for males: Nebraska, 2022
NE–3.	Life table for females: Nebraska, 2022
NE–4.	Standard errors of the probability of dying and life expectancy: Nebraska, 2022
NH–1.	Life table for the total population: New Hampshire, 2022
NH–2.	Life table for males: New Hampshire, 2022
NH–3.	Life table for females: New Hampshire, 2022
NH–4.	Standard errors of the probability of dying and life expectancy: New Hampshire, 2022
NJ–1.	Life table for the total population: New Jersey, 2022
NJ–2.	Life table for males: New Jersey, 2022
NJ–3.	Life table for females: New Jersey, 2022
NJ–4.	Standard errors of the probability of dying and life expectancy: New Jersey, 2022
NM–1.	Life table for the total population: New Mexico, 2022
NM–2.	Life table for males: New Mexico, 2022
NM–3.	Life table for females: New Mexico, 2022
NM–4.	Standard errors of the probability of dying and life expectancy: New Mexico, 2022
NV–1.	Life table for the total population: Nevada, 2022
NV–2.	Life table for males: Nevada, 2022
NV–3.	Life table for females: Nevada, 2022
NV–4.	Standard errors of the probability of dying and life expectancy: Nevada, 2022
NY–1.	Life table for the total population: New York, 2022
NY–2.	Life table for males: New York, 2022
NY–3.	Life table for females: New York, 2022
NY–4.	Standard errors of the probability of dying and life expectancy: New York, 2022
OH–1.	Life table for the total population: Ohio, 2022
OH–2.	Life table for males: Ohio, 2022
OH–3.	Life table for females: Ohio, 2022
OH–4.	Standard errors of the probability of dying and life expectancy: Ohio, 2022
OK–1.	Life table for the total population: Oklahoma, 2022
OK–2.	Life table for males: Oklahoma, 2022
OK–3.	Life table for females: Oklahoma, 2022
OK–4.	Standard errors of the probability of dying and life expectancy: Oklahoma, 2022
OR–1.	Life table for the total population: Oregon, 2022
OR–2.	Life table for males: Oregon, 2022
OR–3.	Life table for females: Oregon, 2022
OR–4.	Standard errors of the probability of dying and life expectancy: Oregon, 2022
PA–1.	Life table for the total population: Pennsylvania, 2022
PA–2.	Life table for males: Pennsylvania, 2022
PA–3.	Life table for females: Pennsylvania, 2022

See footnote at end of table.

Table I. Complete period life tables: 50 states and the District of Columbia, 2022—Con.

Available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/74-12/

	Table title
PA–4.	Standard errors of the probability of dying and life expectancy: Pennsylvania, 2022
RI–1.	Life table for the total population: Rhode Island, 2022
RI–2.	Life table for males: Rhode Island, 2022
RI–3.	Life table for females: Rhode Island, 2022
RI–4.	Standard errors of the probability of dying and life expectancy: Rhode Island, 2022
SC–1.	Life table for the total population: South Carolina, 2022
SC–2.	Life table for males: South Carolina, 2022
SC–3.	Life table for females: South Carolina, 2022
SC–4.	Standard errors of the probability of dying and life expectancy: South Carolina, 2022
SD–1.	Life table for the total population: South Dakota, 2022
SD–2.	Life table for males: South Dakota, 2022
SD–3.	Life table for females: South Dakota, 2022
SD–4.	Standard errors of the probability of dying and life expectancy: South Dakota, 2022
TN–1.	Life table for the total population: Tennessee, 2022
TN–2.	Life table for males: Tennessee, 2022
TN–3.	Life table for females: Tennessee, 2022
TN–4.	Standard errors of the probability of dying and life expectancy: Tennessee, 2022
TX–1.	Life table for the total population: Texas, 2022
TX–2.	Life table for males: Texas, 2022
TX–3.	Life table for females: Texas, 2022
TX–4.	Standard errors of the probability of dying and life expectancy: Texas, 2022
UT–1.	Life table for the total population: Utah, 2022
UT–2.	Life table for males: Utah, 2022
UT–3.	Life table for females: Utah, 2022
UT–4.	Standard errors of the probability of dying and life expectancy: Utah, 2022
VA–1.	Life table for the total population: Virginia, 2022
VA–2.	Life table for males: Virginia, 2022
VA–3.	Life table for females: Virginia, 2022
VA–4.	Standard errors of the probability of dying and life expectancy: Virginia, 2022
VT–1.	Life table for the total population: Vermont, 2022
VT–2.	Life table for males: Vermont, 2022
VT–3.	Life table for females: Vermont, 2022
VT–4.	Standard errors of the probability of dying and life expectancy: Vermont, 2022
WA–1.	Life table for the total population: Washington, 2022
WA–2.	Life table for males: Washington, 2022
WA–3.	Life table for females: Washington, 2022
WA–4.	Standard errors of the probability of dying and life expectancy: Washington, 2022
WI–1.	Life table for the total population: Wisconsin, 2022
WI–2.	Life table for males: Wisconsin, 2022
WI–3.	Life table for females: Wisconsin, 2022
WI–4.	Standard errors of the probability of dying and life expectancy: Wisconsin, 2022
WV–1.	Life table for the total population: West Virginia, 2022
WV–2.	Life table for males: West Virginia, 2022
WV–3.	Life table for females: West Virginia, 2022
WV–4.	Standard errors of the probability of dying and life expectancy: West Virginia, 2022
WY–1.	Life table for the total population: Wyoming, 2022
WY–2.	Life table for males: Wyoming, 2022
WY–3.	Life table for females: Wyoming, 2022
WY–4.	Standard errors of the probability of dying and life expectancy: Wyoming, 2022

SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Medicare program in 1965 for whom it was not possible to verify exact age (6).

To estimate death rates for the state-specific Medicare populations in 2022, sex- and age-specific numbers of deaths and population counts were used for the population ages 66–99 in each state and D.C. from the 2022 Medicare file. The data file, created by CMS for the Social Security Administration, is shared with NCHS under a special agreement. The 2022 file contains state-specific 2022 midyear Medicare population counts (as of June 30, 2022) and calendar-year Medicare death counts (for January 1 through December 31, 2022). Age for both death and midyear population counts is calculated as age at last birthday.

Preliminary adjustment of data

Adjustments for unknown age

An adjustment is made to account for the small proportion of deaths each year for which age is not reported on the death certificate. The number of deaths in each age category is adjusted proportionally to account for those with not-stated age. An adjustment factor (F) is used to distribute deaths with nonstated ages. F is calculated for the total population and by sex for each state and D.C. as:

$$F = \frac{D}{D^a} \quad [1]$$

where D is the total number of deaths and D^a is the total number of deaths for which age is stated. F is then applied by multiplying it by the number of deaths in each age group.

Interpolation of P_x and D_x

Anomalies—both random and those associated with reporting age at death—can be problematic when using vital statistics and census data by single years of age to estimate the probability of death (2,7). Graduation techniques are often used to eliminate these anomalies and to derive a smooth curve by age. Beers' ordinary minimized fifth difference formula is used to obtain smoothed values of population counts (P_x) and death counts (D_x) from 5-year age groupings of ${}_nP_x$ from ages 0–99 and ${}_nD_x$ from ages 5–99, and where ${}_nD_x$ has first been adjusted for not-reported age on the death certificate (see reference 8 for details on the application of Beers' method). Beers' interpolation is not applied to deaths at ages 0–4.

For states with zero death counts in the age range 1–4 years, those counts needed to be replaced using linear interpolation; otherwise, zero death counts would have resulted in discontinuation of the age-specific mortality distribution. In a few other cases, application of Beers' interpolation of deaths in the age range 6–10 resulted in zero or negative death counts because of very small numbers of deaths, so linear interpolation was also applied. The assumption of linearity is warranted because mortality declines somewhat linearly between ages 1 and 10 or so, and the results led to smooth age patterns of mortality (see Table II for a list of states and ages where linear interpolation was used).

Table II. Application of linear interpolation, by area, sex, and age

Area	Male	Female
	Age (years)	
Alaska	1,4	…
Connecticut	3	…
District of Columbia	3	4
Delaware	4	…
Hawaii	…	4
Idaho	…	4
Massachusetts	…	3
Maine	3,4	…
Montana	4	2,3
Nebraska	3	1,4
New Hampshire	…	4
New Jersey	…	4
New Mexico	4	3
Rhode Island	3,4	1,4
South Dakota	3	…
Vermont	2	1,3,4
Wyoming		2,3

… Category not applicable

SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Calculation of probability of dying (q_x)

The first step in the calculation of a complete period life table is estimation of the age-specific probability of dying, q_x, which is derived from the age-specific death rate, m_x (2,4). In the life table cohort,

$$m_x = \frac{d_x}{L_x}$$

where d_x is the number of deaths occurring between ages x and $x+1$, and L_x is the number of person-years lived by the life table cohort between ages x and $x + 1$. The conversion of the age-specific death rate, m_x, to the age-specific probability of death, q_x, is:

$$q_x = \frac{m_x}{1+(1-a_x)m_x} \quad [2]$$

where a_x is the fraction of the number of person-years lived in the age interval by members of the life table cohort who died in the interval. When the age interval is 1 year, except at infancy, a_x = 1/2; in other words, deaths occur on average midway through the age interval. As a result,

$$q_x = \frac{m_x}{1+\frac{1}{2}m_x} \quad [3]$$

Because the complete period life table is based on the age-specific death rates of a current population observed for a specific calendar year, the life table death rate is equivalent to the observed death rate of the current population:

$$m_x = \frac{d_x}{L_x} = M_x = \frac{D_x}{P_x}$$

where D_x is the Beers' smoothed (or linearly interpolated) number of deaths adjusted for not-stated age and P_x is the Beers' smoothed population at risk of dying between ages x and $x + 1$. Then,

$$q_x = \frac{M_x}{1+\frac{1}{2}M_x} = \frac{D_x}{P_x+\frac{1}{2}D_x} \quad [4]$$

This procedure is used to estimate vital statistics age-specific probabilities of death for ages 1–84.

Calculation of q_x at age 0

The higher mortality observed in infancy is associated with a high concentration of deaths occurring at the beginning of the age interval rather than in the middle. Consequently, assigning deaths to the appropriate birth cohorts is best whenever possible. As a result, the probability of death at birth, q_0, is calculated using a birth cohort method that uses a separation factor (f) defined as the proportion of infant deaths in year t occurring to infants born in the previous year ($t-1$). The value f is estimated by categorizing infant deaths by date of birth. The probability of death is then calculated as:

$$q_0 = \frac{D_0(1-f)}{B^t} + \frac{D_0(f)}{B^{t-1}} \quad [5]$$

where D_0 is the number of infant deaths adjusted for not-stated age in 2022, B^t is the number of live births in 2022, and B^{t-1} is the number of live births in 2021.

Probabilities of dying at oldest ages

Medicare data are used to supplement vital statistics data for the estimation of q_x at the oldest ages because these data are more accurate, given that proof of age is required for enrollment in the Medicare program. Medicare data are used here to estimate the probability of dying for ages 66–99.

For this method, these steps are followed: First, vital statistics and Medicare death rates are blended in the age range 66–99. Second, a logistic model is used to smooth the blended death rates in the age range 85–99 and to predict death rates for ages 100–120. Third, final resulting death rates, M_x, are converted to probabilities of dying, q_x.

For the national life tables, vital statistics, M_x^V, and Medicare, M_x^M, death rates are blended in the age range 66–94 with a weighting process that gives gradually declining weight to vital statistics data and gradually increasing weight to Medicare data. For ages 95–99, M_x^M is used exclusively. Due to the unavailability of census state population estimates for ages 85–100, calculating M_x^V for this age span is not possible. As a result, the blending technique was modified such that M_x^V and M_x^M are blended in the age range 66–84, and M_x^M is used exclusively in the age range 85–99. Blended M_x is obtained as:

$$M_x = \frac{1}{20}[(85-x)M_x^V + (x-65)M_x^M] \quad [6]$$

when $x = 66,\ldots,84$ and

$$M_x = M_x^M$$

when $x = 85,\ldots,99$. M_x^M is estimated as:

$$M_x^M = \frac{D_x^M}{P_x^M}$$

where D_x^M is the age-specific Medicare death count, and P_x^M is the age-specific Medicare midyear population count.

The exclusive use of Medicare death rates beginning at age 85 for the state life tables is expected to have a negligible biasing effect on mortality at older ages in the life tables compared with the national life tables. As Figures I–III show, while large differences are found between Medicare and vital statistics death rates at ages 85 and older for the U.S. population, blended Medicare and vital statistics death rates are very similar to Medicare death rates for ages 85 and older.

A logistic model proposed by Kannisto is then used to smooth M_x in the age range 85–99 and to predict M_x in the age range 100–120 (8). The start of the modeled age range varies by sex because it is a function of the age at which the rate of change in the age-specific death rates peaks. In current times, the rate of change in the age-specific death rate rises steadily up to about ages 80–85 and then begins to decline. As a result, modeling a large age span such as 65–100 with one simple model is difficult without oversmoothing and, consequently, altering the underlying mortality pattern observed in the population of interest (9). Further, the observed data for the age range 65–85 or so is reliable and robust, as indicated by the very close similarity between vital statistics and Medicare death rates, making it unnecessary to model, or smooth, the entire age span (65–100).

The Kannisto model is a simple form of a logistic model in which the logit of u_x (or the natural log of the odds of u_x) is a linear function of age x (8). It is expressed as:

$$\ln[\frac{u_x}{1-u_x}] = \ln(\alpha) + \beta x \qquad [7]$$

where u_x, the force of mortality (or the instantaneous death rate), is defined as:

$$u_x = \frac{\alpha e^{\beta x}}{1+\alpha e^{\beta x}}$$

Because u_x is not directly observed but is closely approximated by m and $m_x = M_x$, then the logit of M_x is modeled instead. A maximum-likelihood generalized linear model estimation procedure is used to fit the following model in the age range 85–99:

$$\ln[\frac{M_x}{1-M_x}] = \ln(\alpha) + \beta x \qquad [8]$$

Then, the estimated parameters are used to predict $\overline{M}_x$ as:

$$\overline{M}_x = \frac{e^a e^{bx}}{1+e^a e^{bx}} \text{ or, equivalently, } \overline{M}_x = \frac{e^{a+bx}}{1+e^{a+bx}} \qquad [9]$$

where a and b are the predicted values of parameters $\ln(\alpha)$ and β, respectively, given by fitting model 8.

Finally, the predicted probability of death, $\overline{q}_x$, for ages 85–120 is estimated by converting $\overline{M}_x$ as:

$$\overline{q}_x = \frac{\overline{M}_x}{1+\frac{1}{2}\overline{M}_x} \qquad [10]$$

The probability of death is extrapolated to age 120 to estimate the life table population until no survivors remain. This information is then used to estimate L_x for ages 100–120, which is used to close the table with the age category 100 and older, combined (see following discussion).

Figures IV–VI show the age-specific probability of dying, q_x, estimates for each of the 50 states and D.C. compared with the values for the United States in 2022. The observed probabilities for the states and D.C. are shown as circles, which appear as vertical bars where they overlap, and the U.S. probabilities are shown as an intersecting connected line. The state estimates fall about the U.S. values as expected, with a few outliers in the youngest childhood ages. These few cases are predominantly the result of a very small number of deaths, consistent with very low mortality in this age range, combined with very small populations in states such as Vermont, Wyoming, and North Dakota. Overall, age-specific estimates for the 50 states and D.C. follow the expected age pattern of mortality and are consistent with the mortality pattern observed for the entire United States.

Calculation of remaining life table functions for all groups

Survivor function (l_x)

The life table radix, l_0, is set at 100,000. For ages older than 0, the number of survivors remaining at exact age x is calculated as:

$$l_x = l_{x-1}(1-q_{x-1}) \qquad [11]$$

Decrement function (d_x)

The number of deaths occurring between ages x and $x + 1$ is calculated from the survivor function:

$$d_x = l_x - l_{x+1} = l_x q_x \qquad [12]$$

Note that ${}_{\infty}d_{100} = {}_{\infty}l_{100}$ because ${}_{\infty}q_{100} = 1.0$

Person-years lived (L_x)

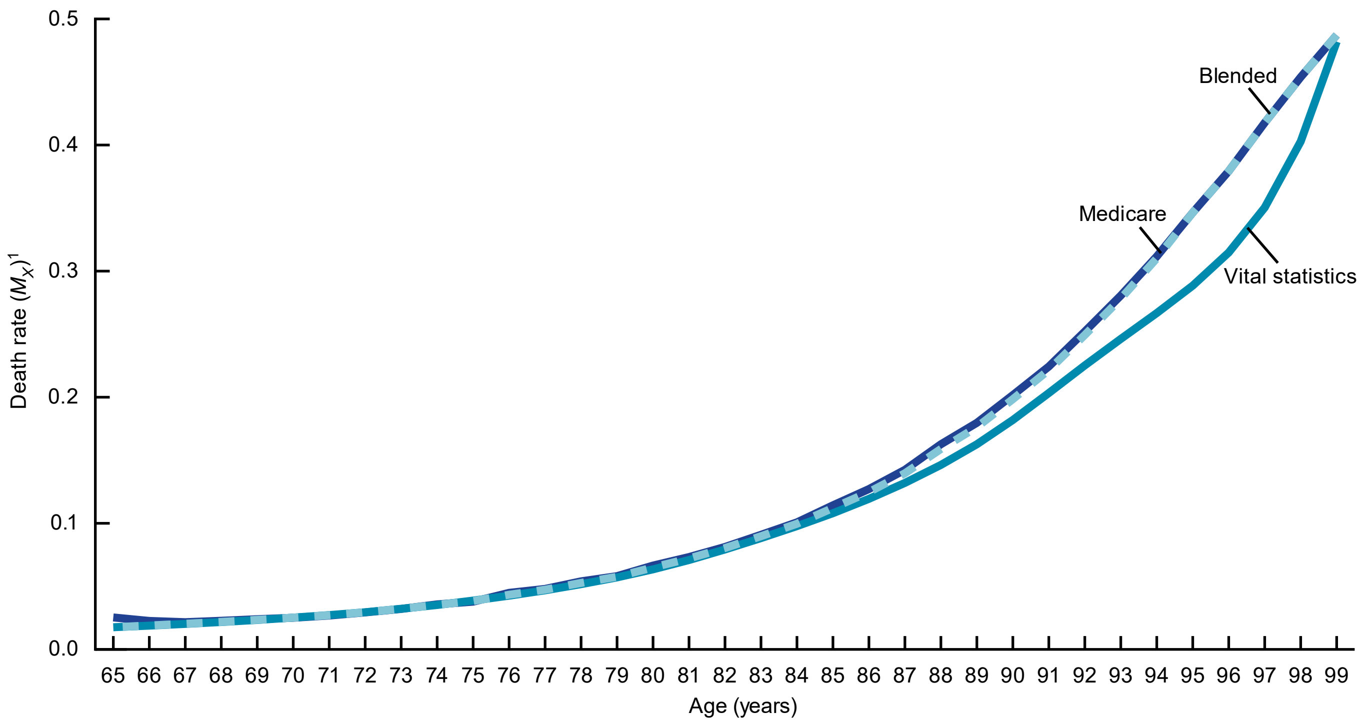
Person-years lived for ages 1–99 are calculated assuming that the survivor function declines linearly between ages x and $x + 1$. This gives the formula:

$$L_x = \frac{1}{2}(l_x + l_{x+1}) = l_x - \frac{1}{2}d_x \qquad [13]$$

For $x = 0$, the separation factor f is used to calculate L_0:

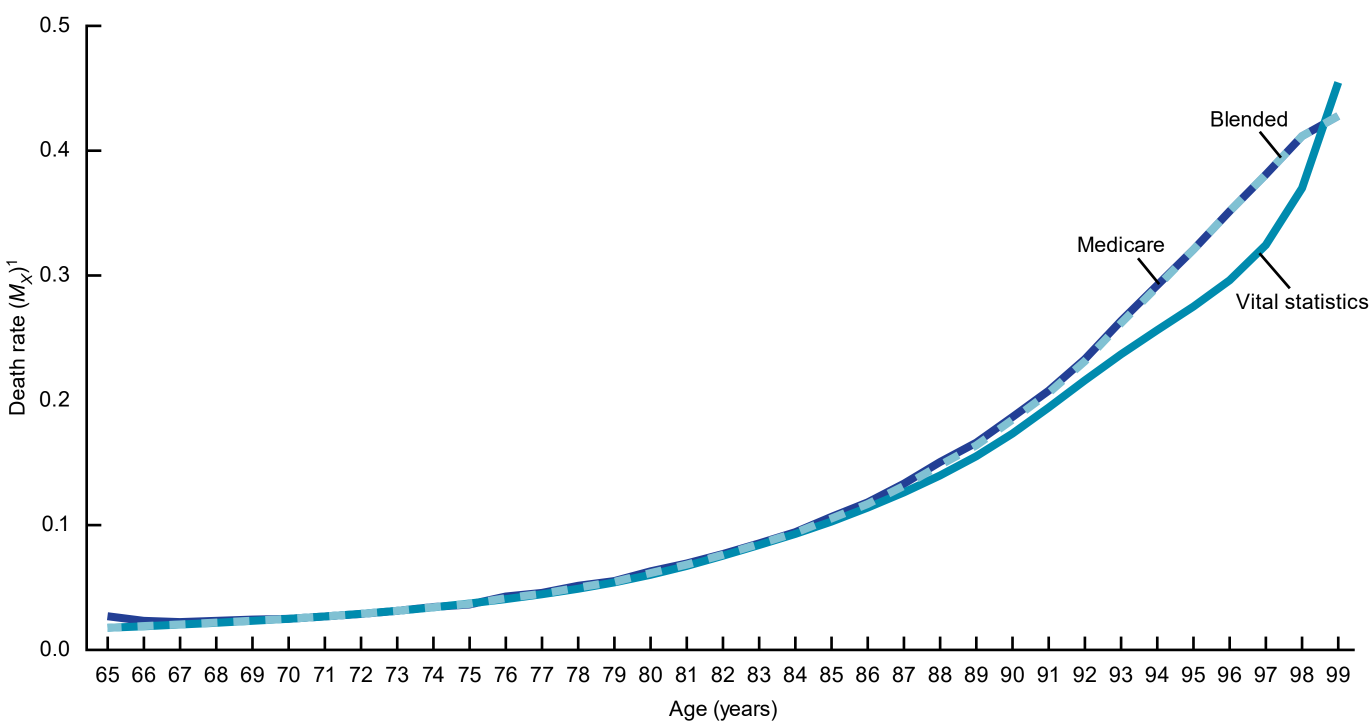
$$L_0 = fl_0 + (1-f)\, l_1 \qquad [14]$$

Figure I. Age-specific vital statistics, Medicare, and blended death rates for the total population: United States, 2022



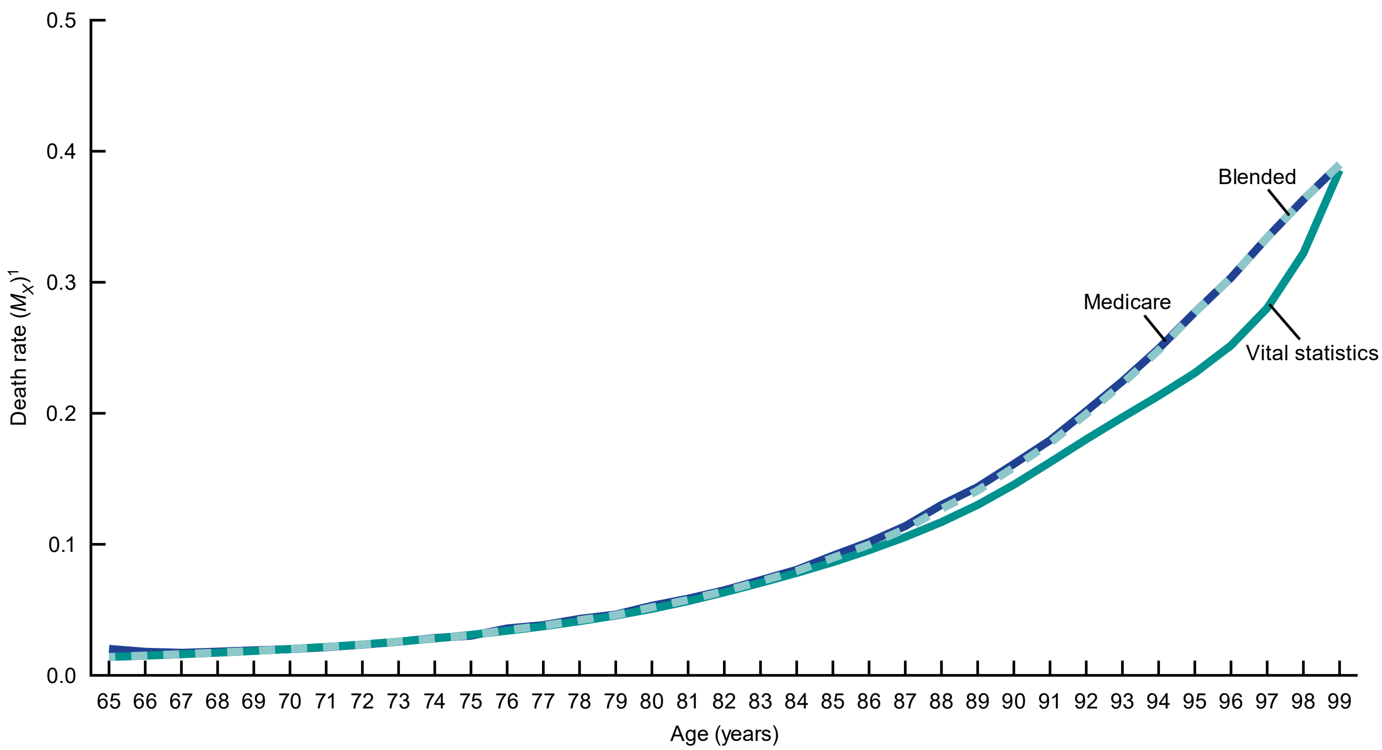
[1]Rate (M_X) is defined as the number of deaths during the year divided by the midyear population (D_X/P_X).
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure II. Age-specific vital statistics, Medicare, and blended death rates for male population: United States, 2022



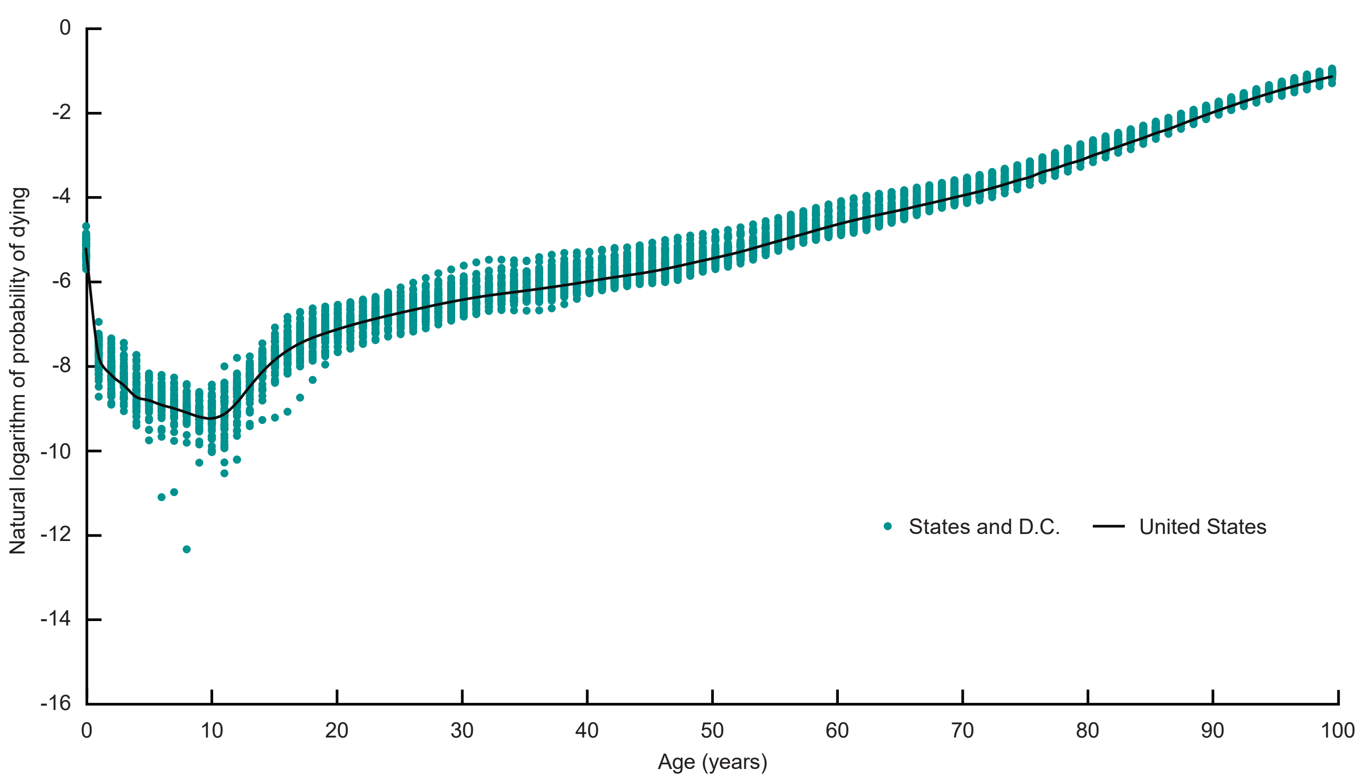
[1]Rate (M_X) is defined as the number of deaths during the year divided by the midyear population (D_X/P_X).
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure III. Age-specific vital statistics, Medicare, and blended death rates for female population: United States, 2022



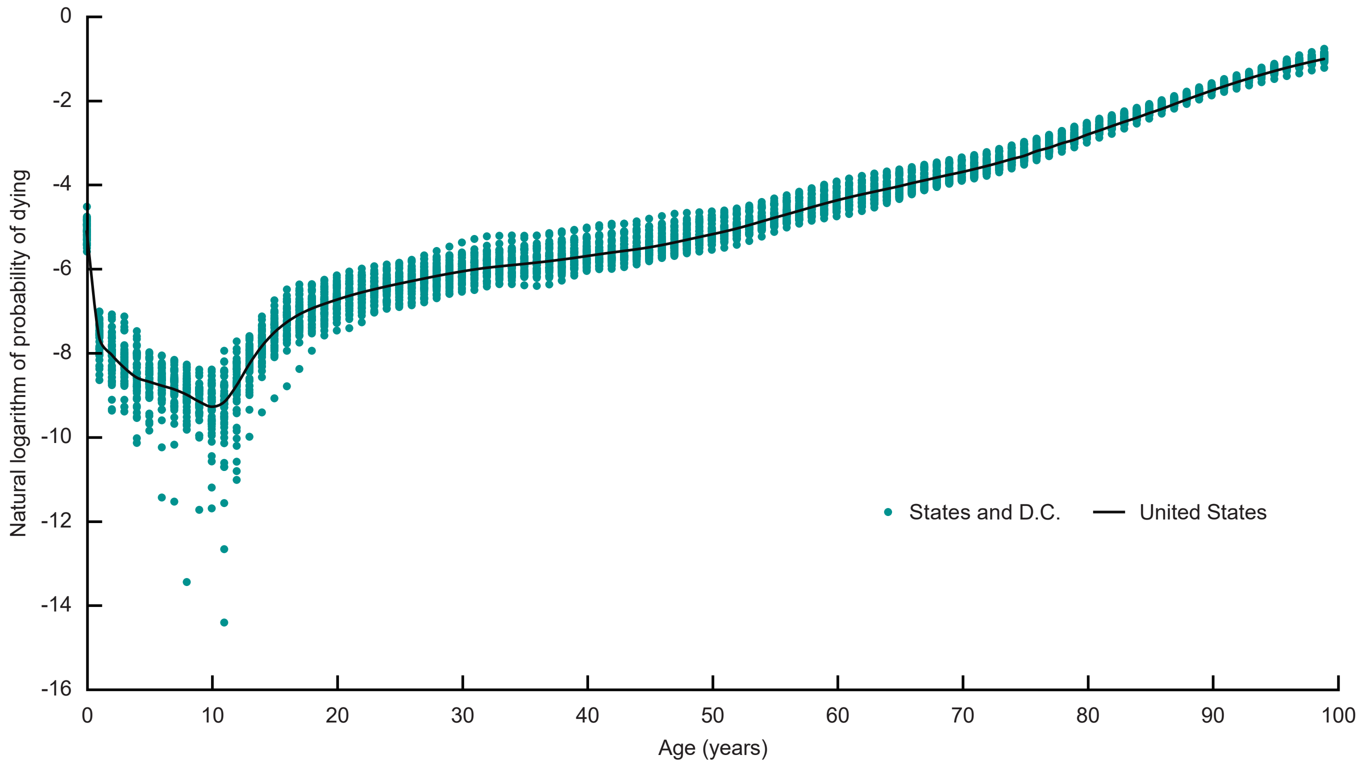
[1]Rate (M_X) is defined as the number of deaths during the year divided by the midyear population (D_X/P_X).
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure IV. Age patterns of mortality for states and District of Columbia compared with United States, 2022



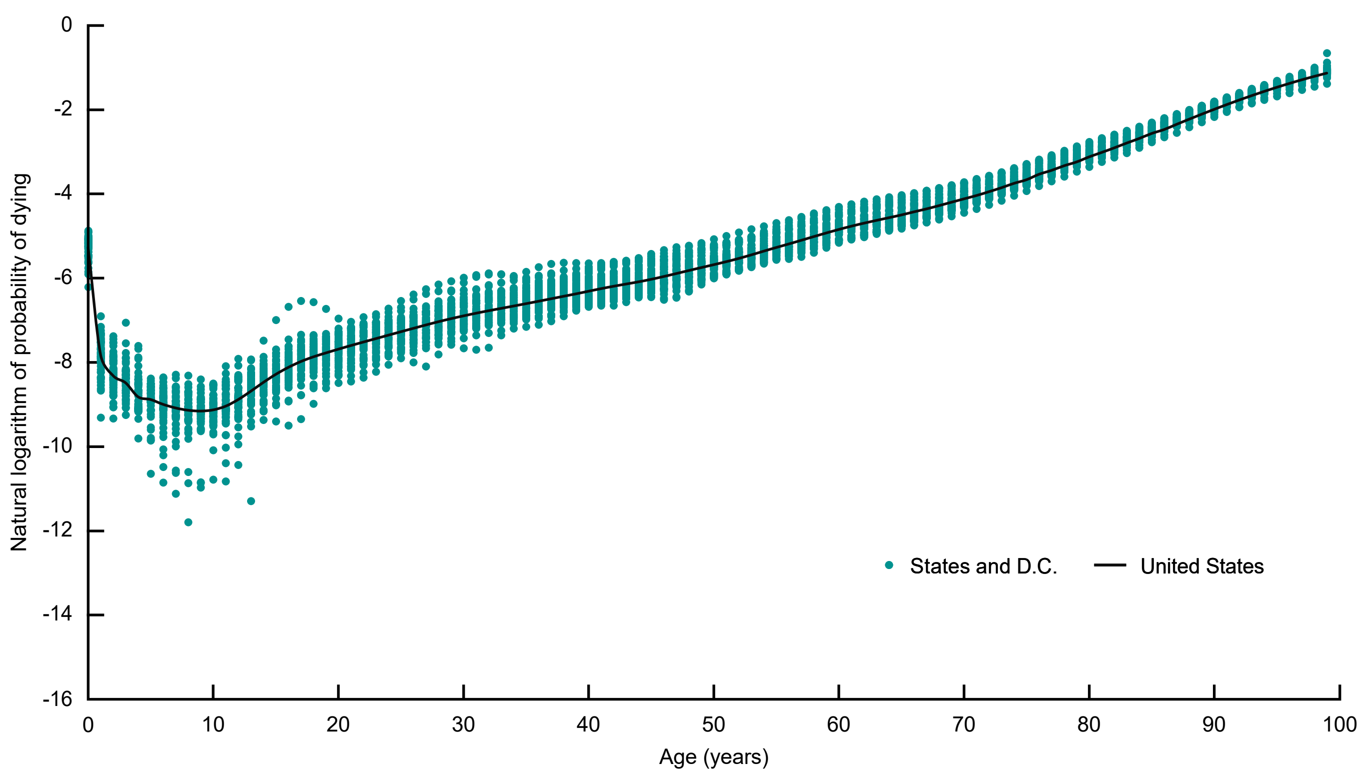
SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure V. Male age patterns of mortality for states and District of Columbia compared with United States, 2022



SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Figure VI. Female age patterns of mortality for states and District of Columbia compared with United States, 2022



SOURCE: National Center for Health Statistics, National Vital Statistics System, mortality data file.

Finally, ${}_{\infty}L_{100}$ is estimated as the sum of the extrapolated L_x values for ages 100–120.

Person-years lived at age *x* and older (T_x)

T_x is calculated by summing L_x values at age *x* and older:

$$T_x = \sum_{x=0}^{\infty} L_x \qquad [15]$$

Life expectancy at age *x* (e_x)

Life expectancy at exact age *x* is calculated as:

$$e_x = \frac{T_x}{l_x} \qquad [16]$$

Variances and standard errors of probability of dying and life expectancy

The mortality data on which the life tables are based are not affected by sampling error because the data are based on complete counts of deaths, and, as a result, variances and standard errors reflect only random variation. While measurement errors such as age misreporting are known to affect mortality estimates, they are not considered in the calculation of the variances or standard errors of the life table functions. Because the state life tables presented in this report are based on relatively large numbers of deaths, the variances and standard errors presented are rather small.

The methods used to estimate the variances of q_x and e_x are based on Chiang (10) with some necessary modifications due to the use of statistical modeling for smoothing and prediction of older-age death rates. Based on the assumption that deaths are binomially distributed, Chiang proposed the following equation for the variance of q_x:

$$Var\,(q_x) = \frac{q_x^2(1-q_x)}{D_x} \qquad [17]$$

where D_x is the age-specific death count. This equation is used to estimate $Var\,(q_x)$ throughout the age span with a modification where, for ages younger than 66, D_x is the deaths from vital statistics data, smoothed by interpolation and adjusted for the number of deaths with age not stated. For ages 66 and older, D_x is obtained by treating the population as a cohort population and calculated from q_x because blended vital statistics and Medicare data were used for estimation (11):

$$P_x = \frac{(P_{x-1} - 0.5D_{x-1})(2 - q_x)}{2}$$

$$D_x = \frac{q_x P_x}{1 - 0.5q_x}$$

Standard error of q_x

The standard error of q_x is calculated as:

$$SE\,(q_x) = \sqrt{Var\,(q_x)} \qquad [18]$$

Variances of the life expectancies for ages 0–99 are estimated using Chiang's equation:

$$Var(e_x) = \frac{\sum_{x=0}^{x=99} l_x^2 \bullet [(1-0.5) + e_x]^2 \bullet Var\,(q_x)}{l_x^2} \qquad [19]$$

Chiang assumed that because $q_{100+} = 1.00$, then $Var\,(q_{100+}) = 0$, and as a result, $Var\,(e_{100+}) = 0$. Silcocks et al. proposed that in the final age group, life expectancy is dependent on the mean length of survival and not on the probability of survival, and consequently, the assumption of no variance is incorrect. $Var\,(e_{100+})$ can be approximated as (12):

$$Var\left(e_{100+}\right) \approx \left[\frac{l_{100+}^2}{M_{100+}^4} \bullet Var\left(M_{100+}\right)\right] / \, l_{100+}^2 \qquad [20]$$

Standard error of e_x

The standard error of e_x is calculated as:

$$SE\,(e_x) = \sqrt{Var\,(e_x)} \qquad [21]$$

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Contents

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