

Death Rates by Marital Status for Leading Causes of Death: United States, 2010–2019

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Abstract

Objectives—This report presents age-adjusted death rates by marital status (married, never married, widowed, and divorced) among adults aged 25 and over. Rates for all-cause mortality are presented for 2010–2019 and for the 10 leading causes of death for 2010 and 2019.

Methods—Mortality statistics in this report are based on information from death certificates filed in all 50 states and the District of Columbia. Marital status at the time of death is presented for married, never married, widowed, and divorced adults. Age-adjusted death rates for adults aged 25 and over were computed using the 2000 standard U.S. population. The 10 leading causes of death in 2019 were based on numbers of deaths for each cause for all adults aged 25 and over. Age-adjusted death rates by marital status for the leading causes are compared between 2010 and 2019 and among marital status categories in 2019. Leading causes of death in 2019 within each marital status category are also presented.

Results—The age-adjusted death rate for married adults aged 25 and over declined 11% between 2010 (839.8 per 100,000 standard population) and 2019 (747.0); the rate for never-married and divorced adults declined by 3% (from 1,466.1 to 1,423.2 for never-married adults, and from 1,366.5 to 1,324.0 for divorced adults); whereas the rate for widowed adults increased 4% (from 1,567.2 to 1,627.0). Married adults experienced greater declines than other marital status groups between 2010 and 2019 in age-adjusted death rates due to cancer, chronic lower respiratory diseases, stroke, and kidney disease, and a smaller percent increase in death rates for unintentional injury. Married adults experienced a decline in diabetes death rates between 2010 and 2019, whereas all unmarried groups experienced increases. Rates for all 10 leading causes of death in 2019 were higher among unmarried than married adults.

Keywords: death certificate • marriage • cause of death • National Vital Statistics System

Introduction

Health research has persistently demonstrated lower mortality for married adults compared with unmarried adults (1–3). The mortality advantage for married adults has been attributed to either selectivity in entering marriage (that is, healthier people are more likely to marry) or health-protective effects of marriage, or a combination of the two (1,2). A recent report using vital statistics data for the period 2010–2017 found that in the United States, the mortality advantage for married adults has widened as the death rate for married adults declined more than for the other marital groups over the study period (4). This report adds to previous research by including data through 2019, the latest year for which final data are available, and by presenting age-adjusted death rates by marital status for the 10 leading causes of death overall for 2010 and 2019 and for the 10 leading causes within each marital status category for 2019.

Data Source and Methods

Data

Mortality data are from the National Center for Health Statistics' National Vital Statistics System, 2010–2019 multiple cause-of-death mortality files (5). Data are based on 100% of resident deaths registered in the United States. Marital status at the time of death is collected on the death certificate from an informant, usually the next of kin, and is considered to be of high quality; see Technical Notes and more detail elsewhere (6). The four categories of marital status presented in this report are married (which includes separated), never married, widowed, and divorced. In 2019, less than 1% of death records for persons aged 25 and over (21,637 of 2,794,826) had unknown data on marital status of the decedent. Leading causes of death are classified by the *International Classification of Diseases, 10th*



Revision (7) and are ranked according to the number of deaths assigned to rankable causes. More information on ranking of causes of death is published elsewhere (8) and in Technical Notes. Population data for 2010–2019 are from the U.S. Census Bureau’s 1-year American Community Survey for each year (9).

Rates and significance testing

Age-adjusted death rates were calculated as the number of deaths per 100,000 persons aged 25 and over per the 100,000 U.S. 2000 standard population. Age-specific death rates by marital status for those aged 25 and over were applied to the standard population. Death rates by marital status for the age group 15–24 are not included in the calculation of age-adjusted rates because of their high variability, particularly for the widowed population. Age groups 75–84 and 85 and over are combined because of high variability in death rates for the age group 85 and over, particularly for the never-married population. For more information, see Technical Notes.

Pairwise comparisons in death rates between marital status groups and between 2010 and 2019 for the 10 leading causes of death by marital status use the z test statistic at the 0.05 level of significance. See Technical Notes for more detail on tests of statistical significance.

Results

Trends in death rates by marital status

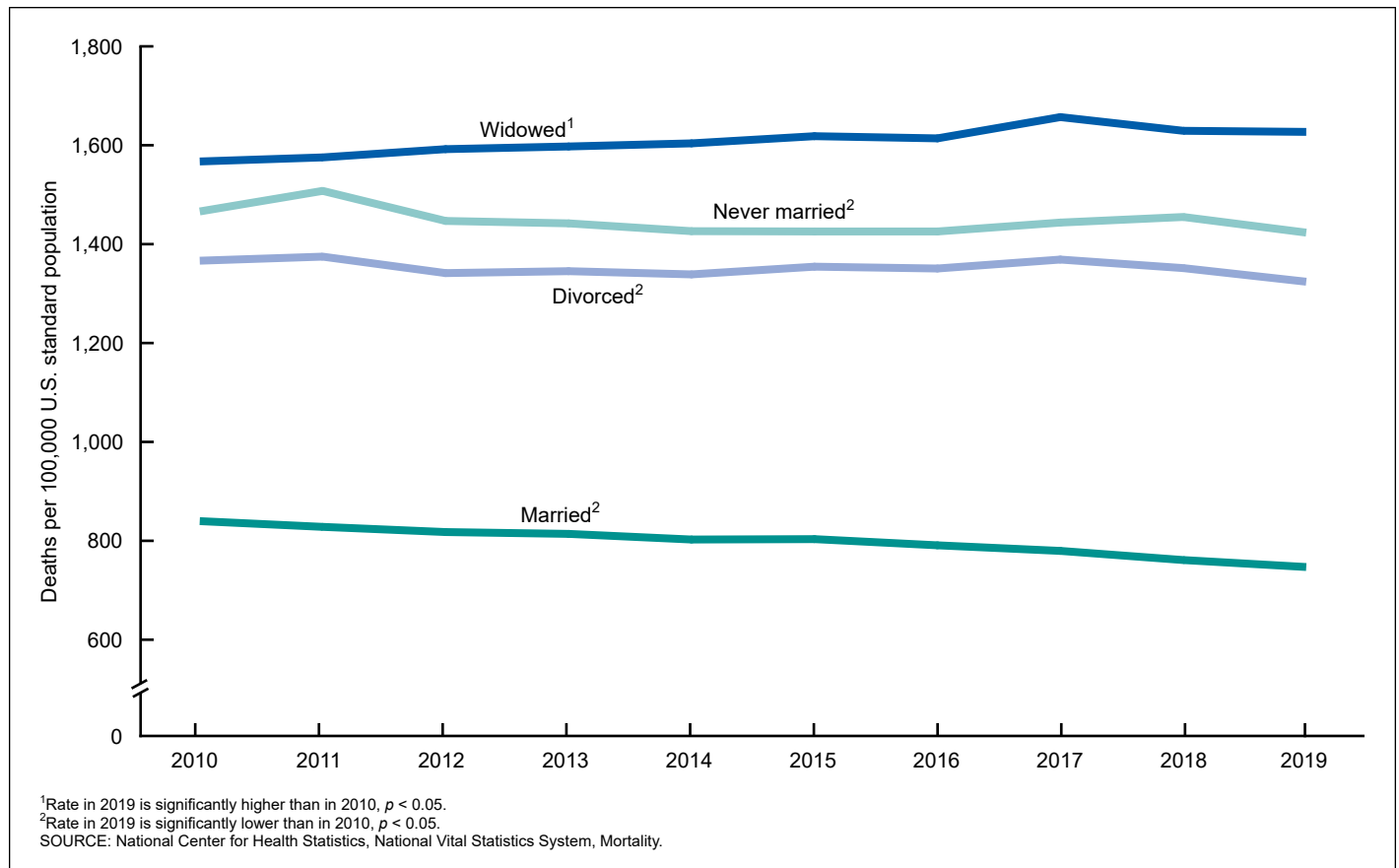
Total

Age-adjusted death rates in 2010 for widowed, never-married, and divorced adults aged 25 and over were higher than rates for married adults (Table 1, Figure 1). The differences widened by 2019 as the rate for married adults declined more than for the other groups, by 11% between 2010 (839.8 per 100,000 standard population) and 2019 (747.0). Age-adjusted death rates for never-married and divorced adults declined 3% (from 1,466.1 to 1,423.2 for never-married adults, and 1,366.5 to 1,324.0 for divorced adults). The age-adjusted death rate for widowed adults was the highest of all marital status groups over the entire period, increasing 4% from 1,567.2 in 2010 to 1,627.0 in 2019. By 2019, the age-adjusted death rate for widowed adults was just over double that of married adults, whereas rates for never-married and divorced adults were 91% and 77% higher, respectively.

By cause of death

Table 1 presents age-adjusted death rates for the 10 leading causes for all adults aged 25 and over, in total and by marital status. The 10 leading causes of death in 2019 were as follows: diseases of heart (heart disease); malignant neoplasms (cancer);

Figure 1. Age-adjusted death rates, by marital status for adults aged 25 and over: United States, 2010–2019



accidents (unintentional injuries); chronic lower respiratory diseases (CLRD); cerebrovascular diseases (stroke); Alzheimer disease; diabetes mellitus; nephritis, nephrotic syndrome and nephrosis (kidney disease); influenza and pneumonia; and chronic liver disease and cirrhosis (liver disease). This ranking was based on the number of deaths in 2019 for all rankable causes for adults aged 25 and over; see Technical Notes.

Rates were lower in 2019 than in 2010 for 6 of the 10 leading causes of death (heart disease, cancer, CLRD, stroke, kidney disease, and influenza and pneumonia) and higher for 4 causes (unintentional injury, Alzheimer disease, diabetes, and liver disease). Of the causes that declined over the period, married adults aged 25 and over had the greatest percent declines of all groups for four of these (cancer, CLRD, stroke, and kidney disease). Divorced adults aged 25 and over experienced the greatest percent decline in heart disease death rates, a 29% decline (from 428.2 in 2010 to 303.6 in 2019), whereas widowed adults had the smallest decline at 2% (from 382.3 to 375.3). Deaths due to influenza and pneumonia declined 24% for never-married adults aged 25 and over (from 38.8 in 2010 to 29.4 in 2019), the largest percent decline of any group, and they declined 15% for widowed adults (from 32.7 to 27.9), the least of any group.

Of the four leading causes of death for adults aged 25 and over that increased during the period, deaths due to unintentional injury, which include unintentional drug overdoses, had the largest percent increase at 37% (from 50.4 in 2010 to 69.1 in 2019). All marital status groups experienced increases between 2010 and 2019 in unintentional injury death rates, with married adults having the smallest increase at 8% (from 33.6 to 36.2), and never-married adults having the greatest increase at 58% (from 72.1 to 114.1). All marital status groups experienced increases in age-adjusted death rates due to Alzheimer disease, with never-married adults experiencing the smallest percent increase that did not reach statistical significance at 3% (from 39.7 to 40.9), and widowed adults experiencing the greatest percent increase at 34% (from 59.1 to 79.4). Death rates due to diabetes for all adults aged 25 and over increased 5% over the 2010–2019 period, from 32.1 to 33.7, but married adults had a 3% decline, from 23.1 in 2010 to 22.5 in 2019 per 100,000 population. All unmarried groups experienced increases of 7%–14%. All marital status groups experienced increases in death rates for liver disease over the period: Married adults had an increase of 25% from 2010 (9.3) to 2019 (11.6) compared with 18%–19% for all unmarried groups.

Rates by marital status and cause of death for 2019

In 2019, age-adjusted rates for all 10 leading causes of death were lower for married adults aged 25 and over than for their unmarried counterparts (Table 1 and Figure 2). The largest disparity in death rates between married adults and unmarried adults was for unintentional injury, where the death rate was about three times higher for the unmarried groups. For never-married adults, the death rate for unintentional injury was 114.1 compared with 36.2 for married adults. The unintentional injury

death rate for divorced persons was 107.8, and it was 99.6 for widowed persons. Death rates for liver disease for all unmarried groups were at least twice those of married persons (26.5 for never married, 27.0 for widowed, 31.5 for divorced, and 11.6 for married). Other noted differences were that CLRD death rates for widowed (95.7) and divorced (89.8) persons were at least twice those of married persons (36.9), as were Alzheimer death rates for widowed persons (79.4 compared with 29.6).

Cancer deaths rates generally had the smallest disparity between married and unmarried adults aged 25 and over, with rates in 2019 for the unmarried groups 29%–38% higher compared with married adults: 251.8 for never married, 277.9 for widowed, 269.2 for divorced, and 194.9 for married.

Leading causes of death within marital status categories

The following Table and Table 2 present the 10 leading causes of death within each marital status category. Unlike the ranking in Table 1, which was based on the number of deaths for specific causes for all adults aged 25 and over, these rankings are based on the number of deaths within each marital status group. Because the numbers are not age adjusted, they reflect to some extent the differences in age distributions among the groups. For example, for the never-married category, all three injury-type deaths (unintentional, suicide, and homicide) are among the leading causes, partly reflecting the fact that injury deaths typically comprise a greater proportion of deaths for younger persons. Alzheimer disease is ranked third for widowed persons, the highest ranking of all groups, and reflects to some extent the generally older population for this marital status group compared with the others.

Five causes were among the leading 10 for all groups: heart disease, cancer, unintentional injury, CLRD, and stroke. Cancer was the leading cause for married persons but the second leading cause for the other groups, after heart disease. Unintentional injury deaths were ranked third for never-married persons, the highest ranking of this cause for all marital status groups. CLRD was ranked third for married and divorced persons, fifth for widowed persons, and seventh for never-married persons.

Several causes were not in the leading 10 for all groups. Parkinson disease was the ninth leading cause of death for married persons but was not among the leading causes for the other groups. Similarly, only never-married persons had homicide among the 10 leading causes, ranked ninth. Suicide was among the 10 leading causes for never-married (sixth) and divorced (ninth) persons but not among the leading causes for married and widowed persons. Widowed persons were the only group for whom hypertension was among the leading causes, ranked 10th.

Discussion

The findings in this report are consistent with prior research showing a mortality advantage for married adults compared with unmarried adults, as age-adjusted death rates were lower for married persons throughout the period. In addition, the advantage

Figure 2. Age-adjusted death rates for adults aged 25 and over for the 10 leading causes of death, by marital status: United States, 2019

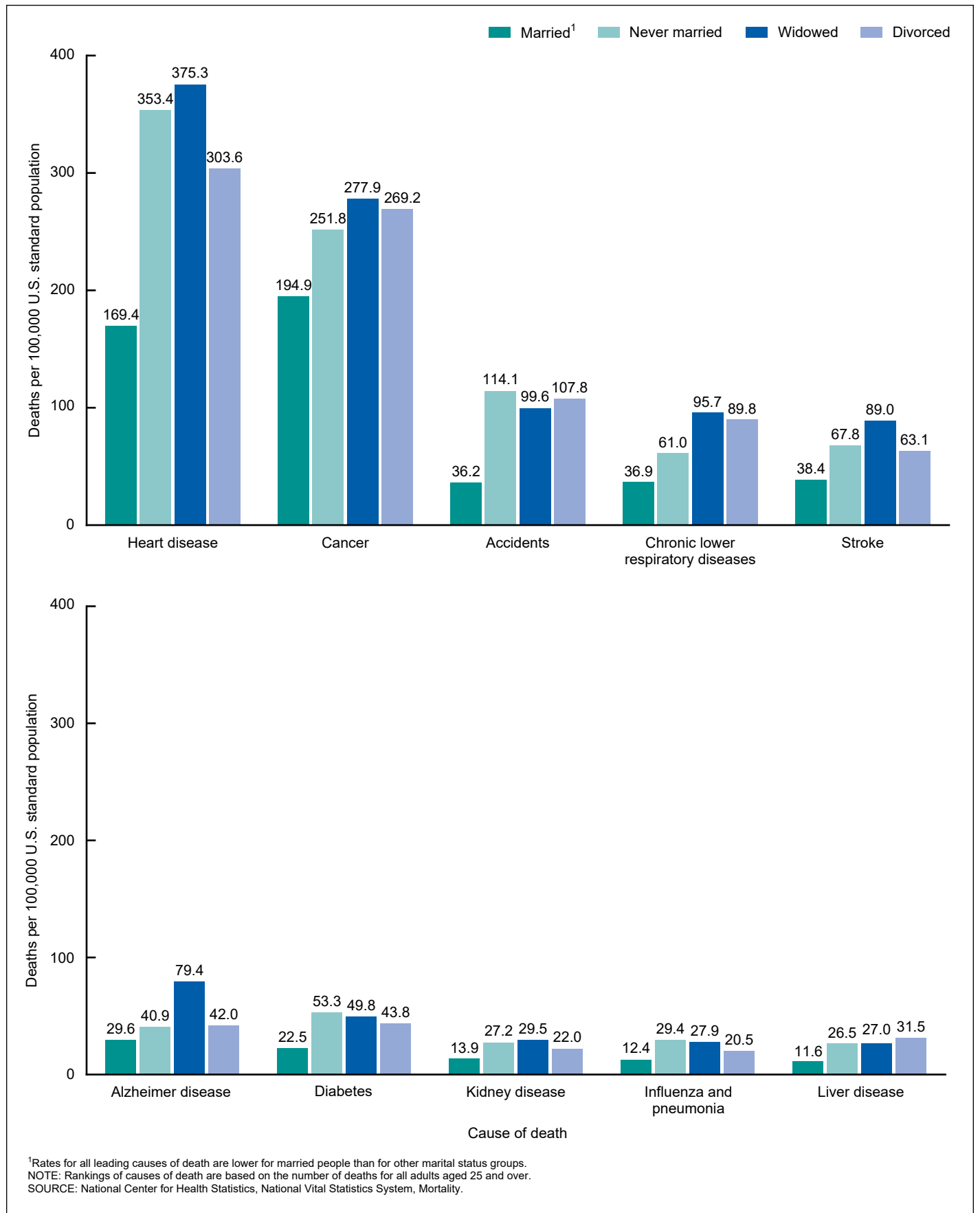


Table. Ranking for the 10 leading causes of death, by marital status for adults aged 25 and over: United States, 2019

Rank	Married	Never married	Widowed	Divorced
1.	Cancer	Heart disease	Heart disease	Heart disease
2.	Heart disease	Cancer	Cancer	Cancer
3.	Chronic lower respiratory diseases	Unintentional injuries	Alzheimer disease	Chronic lower respiratory diseases
4.	Stroke	Stroke	Stroke	Unintentional injuries
5.	Unintentional injuries	Diabetes mellitus	Chronic lower respiratory diseases	Stroke
6.	Alzheimer disease	Suicide	Unintentional injuries	Diabetes mellitus
7.	Diabetes mellitus	Chronic lower respiratory diseases	Diabetes mellitus	Alzheimer disease
8.	Kidney disease	Liver disease	Influenza and pneumonia	Liver disease
9.	Parkinson disease	Assault (homicide)	Kidney disease	Suicide
10.	Liver disease	Influenza and pneumonia	Hypertension	Kidney disease

NOTE: The ranking of causes of death is based on the number of deaths within each marital status group for all adults aged 25 and over.
 SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

widened from 2010 to 2019 as the rates for married adults declined 11%, the rates for never-married and divorced adults declined by 3%, and rates for widowed adults increased by 4%. Age-adjusted death rates were higher for unmarried adults than for married adults for all 10 leading causes of death. Unintentional injury death rates in 2019 for unmarried adults aged 25 and over were about three times those for married adults, the greatest difference in cause of death between these groups. Between 2010 and 2019, married adults had greater percent declines than unmarried adults in death rates due to cancer, CLRD, stroke, and kidney disease. In addition, unmarried groups had increases of 7%–14% in diabetes death rates, and married adults had a 3% decline. All groups experienced increases between 2010 and 2019 in death rates for unintentional injury, Alzheimer disease, and chronic liver disease and cirrhosis, with married adults having the smallest percent increases for unintentional injury but the largest for chronic liver disease and cirrhosis.

A limitation of using death certificate data to examine mortality trends by marital status is that the information is only for marital status at the time of death, with no detailed marital histories of the decedents. In addition, the death certificate does not capture information on cohabitation, which has increased over the last several decades and may be a substitute for marriage for some adults in the unmarried groups (10). Despite this limitation, this report has shown that an apparent mortality advantage for married adults continues to widen and is broad, applying to all 10 leading causes of death.

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Table 1. Number of deaths and age-adjusted death rates for all causes and the 10 leading causes of death, by marital status for adults aged 25 and over: United States, 2010 and 2019

Cause of death based on <i>International Classification of Diseases, 10th Revision (ICD-10)</i>	2010		2019		Percent change from 2010 to 2019	Ratio of rate to married rate
	Number	Rate ¹	Number	Rate ¹		
All causes ²	2,404,577	1,122.1	2,794,826	1,074.3	-4	...
Married	931,503	839.8	1,035,082	747.0	-11	...
Never married	237,130	1,466.1	342,952	1,423.2	-3	1.91
Widowed	880,212	1,567.2	917,514	1,627.0	4	2.18
Divorced	342,445	1,366.5	477,773	1,324.0	-3	1.77
Rank in 2019						
1. Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51) ²	595,960	276.1	657,552	258.8	-6	...
Married	225,112	209.0	227,810	169.4	-19	...
Never married	66,234	462.7	69,945	353.4	-24	2.09
Widowed	246,360	382.3	244,521	375.3	-2	2.22
Divorced	102,582	428.2	109,397	303.6	-29	1.79
2. Malignant neoplasms (cancer) (C00-C97) ²	571,810	265.7	597,086	226.7	-15	...
Married	288,399	242.1	291,720	194.9	-19	...
Never married	44,962	287.1	56,263	251.8	-12	0.13
Widowed	149,704	307.5	142,102	277.9	-10	1.43
Divorced	86,459	315.9	105,462	269.2	-15	1.38
3. Accidents (unintentional injuries) (V01-X59,Y85-Y86) ²	104,355	50.4	157,364	69.1	37	...
Married	38,462	33.6	47,036	36.2	8	...
Never married	22,948	72.1	49,315	114.1	58	3.15
Widowed	21,027	69.7	27,156	99.6	43	2.75
Divorced	20,992	79.7	31,590	107.8	35	2.98
4. Chronic lower respiratory diseases (J40-J47) ²	137,706	65.1	156,607	60.0	-8	...
Married	49,228	46.0	51,318	36.9	-20	...
Never married	8,239	65.8	11,970	61.0	-7	1.66
Widowed	55,828	94.1	57,948	95.7	2	2.60
Divorced	23,607	99.4	34,057	89.8	-10	2.44
5. Cerebrovascular diseases (stroke) (I60-I69) ²	129,014	60.3	149,603	59.4	-1	...
Married	45,703	43.8	51,074	38.4	-12	...
Never married	9,297	71.9	12,741	67.8	-6	1.76
Widowed	58,726	86.5	62,779	89.0	3	2.32
Divorced	14,820	65.4	22,174	63.1	-4	1.64
6. Alzheimer disease (G30) ²	83,494	38.8	121,499	49.6	28	...
Married	23,987	26.1	35,956	29.6	14	...
Never married	3,607	39.7	5,014	40.9	†3	1.38
Widowed	49,747	59.1	67,597	79.4	34	2.68
Divorced	5,993	35.6	12,622	42.0	18	1.42
7. Diabetes mellitus (E10-E14) ²	68,873	32.1	87,368	33.7	5	...
Married	26,725	23.1	32,819	22.5	-3	...
Never married	7,585	46.5	12,819	53.3	14	2.37
Widowed	23,334	46.0	23,922	49.8	8	2.21
Divorced	10,792	40.8	16,968	43.8	7	1.95
8. Nephritis, nephrotic syndrome and nephrosis (kidney disease) (N00-N07,N17-N19,N25-N27) ²	50,267	23.5	51,419	20.1	-14	...
Married	18,547	17.6	19,073	13.9	-21	...
Never married	4,271	31.6	5,756	27.2	-14	1.95
Widowed	21,250	33.5	18,202	29.5	-12	2.21
Divorced	5,980	25.2	8,062	22.0	-13	1.58
9. Influenza and pneumonia (J09-J18) ²	49,557	23.1	49,204	19.5	-16	...
Married	15,892	15.7	16,736	12.4	-21	...
Never married	4,983	38.8	6,066	29.4	-24	2.37
Widowed	22,889	32.7	18,660	27.9	-15	2.24
Divorced	5,489	25.2	7,340	20.5	-19	1.65
10. Chronic liver disease and cirrhosis (liver disease) (K70,K73-K74) ²	31,860	14.5	44,318	17.5	21	...
Married	12,578	9.3	15,300	11.6	25	...
Never married	5,411	22.2	8,604	26.5	19	2.28
Widowed	4,285	22.6	5,504	27.0	19	2.33
Divorced	9,204	26.7	12,604	31.5	18	2.72

See footnotes at end of table.

Table 1. Number of deaths and age-adjusted death rates for all causes and the 10 leading causes of death, by marital status for adults aged 25 and over: United States, 2010 and 2019—Con.

... Category not applicable.

† Change from 2010 to 2019 is not statistically significant, $p < 0.05$.

¹Deaths per 100,000 U.S. 2000 standard population.

²Includes marital status not stated.

NOTE: Ranking is based on the number of deaths in 2019.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

Table 2. Number and percentage of deaths from all causes and the 10 leading causes of death, by marital status among adults aged 25 and over: United States, 2019

Rank ¹	Cause of death based on <i>International Classification of Diseases, 10th Revision (ICD-10)</i>	Number	Percent of total deaths
...	Total, all causes ²	2,794,826	100.0
1	Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51)	657,552	23.5
2	Malignant neoplasms (cancer) (C00-C97)	597,086	21.4
3	Accidents (unintentional injuries) (V01-X59,Y85-Y86)	157,364	5.6
4	Chronic lower respiratory diseases (J40-J47)	156,607	5.6
5	Cerebrovascular diseases (stroke) (I60-I69)	149,603	5.4
6	Alzheimer disease (G30)	121,499	4.3
7	Diabetes mellitus (E10-E14)	87,368	3.1
8	Nephritis, nephrotic syndrome and nephrosis (kidney disease) (N00-N07,N17-N19,N25-N27)	51,419	1.8
9	Influenza and pneumonia (J09-J18)	49,204	1.8
10	Chronic liver disease and cirrhosis (liver disease) (K70, K73-K74)	44,318	1.6
...	All other causes (residual)	722,806	25.9
...	Married, all causes	1,035,082	100.0
1	Malignant neoplasms (cancer) (C00-C97)	288,104	27.8
2	Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51)	227,810	22.0
3	Chronic lower respiratory diseases (J40-J47)	51,318	5.0
4	Cerebrovascular diseases (stroke) (I60-I69)	51,074	4.9
5	Accidents (unintentional injuries) (V01-X59,Y85-Y86)	47,036	4.5
6	Alzheimer disease (G30)	35,956	3.5
7	Diabetes mellitus (E10-E14)	32,819	3.2
8	Nephritis, nephrotic syndrome and nephrosis (kidney disease) (N00-N07,N17-N19,N25-N27)	19,073	1.8
9	Influenza and pneumonia (J09-J18)	17,875	1.7
10	Chronic liver disease and cirrhosis (liver disease) (K70, K73-K74)	17,017	1.6
...	All other causes (residual)	247,000	23.9
...	Never married, all causes	342,952	100.0
1	Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51)	69,945	20.4
2	Malignant neoplasms (cancer) (C00-C97)	57,322	16.7
3	Accidents (unintentional injuries) (V01-X59,Y85-Y86)	49,315	14.4
4	Cerebrovascular diseases (stroke) (I60-I69)	12,822	3.7
5	Diabetes mellitus (E10-E14)	12,819	3.7
6	Intentional self-harm (suicide) (*U03,X60-X84,Y87.0)	12,439	3.6
7	Chronic lower respiratory diseases (J40-J47)	11,970	3.5
8	Chronic liver disease and cirrhosis (liver disease) (K70, K73-K74)	8,604	2.5
9	Assault (homicide) (*U01-*U02,X85-Y09,Y87.1)	7,627	2.2
10	Influenza and pneumonia (J09-J18)	6,066	1.8
...	All other causes (residual)	94,023	27.4
...	Widowed, all causes	917,514	100.0
1	Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51)	244,521	26.7
2	Malignant neoplasms (cancer) (C00-C97)	141,547	15.4
3	Alzheimer disease (G30)	67,597	7.4
4	Cerebrovascular diseases (stroke) (I60-I69)	62,779	6.8
5	Chronic lower respiratory diseases (J40-J47)	57,948	6.3
6	Accidents (unintentional injuries) (V01-X59,Y85-Y86)	27,156	3.0
7	Diabetes mellitus (E10-E14)	23,922	2.6
8	Influenza and pneumonia (J09-J18)	18,660	2.0
9	Nephritis, nephrotic syndrome and nephrosis (kidney disease) (N00-N07,N17-N19,N25-N27)	18,202	2.0
10	Essential hypertension and hypertensive renal disease (hypertension) (I10,I12,I15)	14,896	1.6
...	All other causes (residual)	240,286	26.2
...	Divorced, all causes	477,773	100.0
1	Diseases of heart (heart disease) (I00-I09,I11,I13,I20-I51)	109,397	22.9
2	Malignant neoplasms (cancer) (C00-C97)	106,784	22.4
3	Chronic lower respiratory diseases (J40-J47)	34,057	7.1
4	Accidents (unintentional injuries) (V01-X59,Y85-Y86)	31,590	6.6
5	Cerebrovascular diseases (stroke) (I60-I69)	22,174	4.6
6	Diabetes mellitus (E10-E14)	16,968	3.6
7	Alzheimer disease (G30)	12,622	2.6
8	Chronic liver disease and cirrhosis (liver disease) (K70, K73-K74)	12,604	2.6
9	Intentional self-harm (suicide) (*U03,X60-X84,Y87.0)	9,994	2.1
10	Nephritis, nephrotic syndrome and nephrosis (kidney disease) (N00-N07,N17-N19,N25-N27)	8,062	1.7
...	All other causes (residual)	113,521	23.8

See footnotes at end of table.

Table 2. Number and percentage of deaths from all causes and the 10 leading causes of death, by marital status among adults aged 25 and over: United States, 2019—Con.

... Category not applicable.

¹Based on number of deaths.

²Includes marital status not stated.

NOTE: An asterisk (*) preceding a cause-of-death code indicates that the code is not included in ICD-10.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

Technical Notes

Nature and sources of data

Data in this report are based on information from all death certificates filed in the 50 states and the District of Columbia and are processed by the National Center for Health Statistics (NCHS). Death certificates are completed by funeral directors, attending physicians, medical examiners, coroners, or other persons legally authorized to certify deaths. The U.S. Standard Certificate of Death, which the states use as a model, was revised in 2003. Mortality statistics are based on information submitted by the jurisdictions and coded by NCHS through the Vital Statistics Cooperative Program. Data for the entire United States refer to events occurring within the United States and exclude deaths of nonresidents of the United States. More detail on mortality data and the Vital Statistics Cooperative Program are published elsewhere (6).

Cause-of-death classification

The mortality statistics presented in this report were compiled according to World Health Organization (WHO) regulations, which specify that member countries classify and code causes of death according to the current revision of the *International Classification of Diseases* (ICD). ICD provides the basic guidance used in virtually all countries to code and classify causes of death. Starting with deaths occurring in 1999, the United States began using the 10th revision of this classification (ICD-10) (7). ICD includes rules for selecting the underlying cause of death and regulations on the use of ICD.

In this report, tabulations of cause-of-death statistics are based solely on the underlying cause of death. The underlying cause is defined by WHO as “the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury.” The underlying cause is selected from the conditions entered by the medical certifier in the cause-of-death section of the death certificate. When more than one cause or condition is entered by the medical certifier, the underlying cause is determined by the sequence of conditions on the certificate, provisions of ICD, and associated selection rules and modifications.

Ranking causes of death

The procedures used by NCHS for ranking causes of death are consistent with the recommendations of the 1951 Public Health Conference on Records and Statistics. Causes are ranked according to the number of deaths assigned to rankable causes.

The list of rankable causes developed for use with ICD-10, the “List of 113 Selected Causes of Death and Enterocolitis due to *Clostridium difficile*” shown in [Table I](#), is used to select 51 rankable causes from which the 10 leading causes presented in this report are obtained. In this report, 10 leading causes were selected from the rankable causes for adults aged 25 and over, in total and within the marital status groups.

Selection of the 51 rankable causes was guided by some basic principles. Consistent with previous methods, vaguely defined categories were excluded from selection as rankable causes. These included the category “Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified” and all categories beginning with the words “other,” “all other,” “certain other,” or “unspecified.” Among the remaining cause-of-death categories, the causes of death selected as rankable were those considered most useful from a public health perspective, with the following condition: The rankable causes must be mutually exclusive. If a category containing subcategories (such as Tuberculosis or Malignant neoplasms) is selected as a rankable cause, its component parts are not selected as rankable. More details on the history of ranking causes of death and on the current procedures are published elsewhere (8).

Marital status

Information on marital status in this report was obtained from the marital status item on death certificates from both the 2003 U.S. Standard Certificate of Death and the 1989 U.S. Standard Certificate of Death. The 2003 certificate revision was first implemented in the 2003 data year and was gradually phased in by states and the District of Columbia, replacing the 1989 revision. In 2010, the beginning year of the study period for this report, 34 states and the District of Columbia had implemented the 2003 standard, and all states had begun using this version by 2018. Consequently, for data years 2010–2017, a combination of data on marital status from the 1989 certificate and the 2003 certificate was used. The marital status item differed between these two versions of the death certificate, but the data are comparable. On the 1989 certificate, the marital status item was open-ended but was coded to four categories: Married (including separated), Never married, Widowed, or Divorced ([Figure I](#)). On the 2003 certificate, a checkbox format was used ([Figure II](#)). In this analysis, the two categories “Married” and “Married, but separated” on the 2003 certificate were combined into a single “married” group, consistent with the handling of the “separated” response on the 1989 certificate, which was coded to “married.” More information on the implementation of the 2003 revision is published elsewhere (6).

Less than 1% of death records for adults aged 25 and over had unknown marital status (21,637 of 2,794,826 records in 2019). A study of death certificate data using the 1986 National Mortality Followback Survey showed a high level of consistency (95%) between the death certificate marital status item and the

Figure I. Marital Status item from the 1989 U.S. Standard Certificate of Death

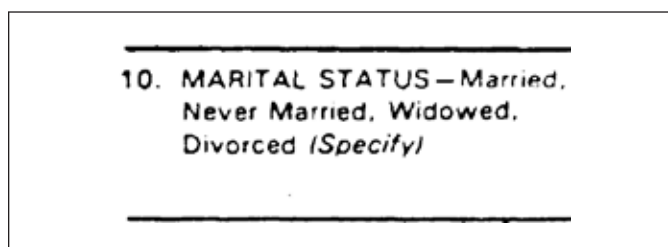


Figure II. Marital Status item from the 2003 U.S. Standard Certificate of Death

9. MARITAL STATUS AT TIME OF DEATH		
<input type="checkbox"/> Married	<input type="checkbox"/> Married, but separated	<input type="checkbox"/> Widowed
<input type="checkbox"/> Divorced	<input type="checkbox"/> Never Married	<input type="checkbox"/> Unknown

survey questionnaire (11). However, the consistency varied by the marital status selected on the death certificate: from 98.4% for decedents classified as married on the death certificate to 87.1% of decedents classified as divorced. Consistency also varied by race of the decedent and the death certificate informant.

Population bases for computing rates

Population estimates used to compute death rates in this report are based on the U.S. Census Bureau American Community Survey (ACS). ACS estimates represent the entire U.S. population and are based on a 4.5 million-person sample of the U.S. population, including all households (civilian and military) and the institutionalized population (persons living in group quarters). Table II contains the ACS populations by marital status and age group for 2010 and 2019 as well as the standard errors.

Computing rates

Rates presented in this report were age adjusted based on the standard year 2000 population per 100,000 estimated U.S. population. Comparisons in the text between rates, unless otherwise specified, are statistically significant at the 0.05 level of significance. Lack of comment in this report about any two rates does not mean that the difference was tested and found not to be significant at this level.

Age-adjusted rates were used to compare relative mortality risks among marital status groups and between 2010 and 2019. However, they should be viewed as relative indexes rather than as actual measures of mortality risk. They were computed by the direct method—that is, by applying age-specific death rates to the U.S. standard population age distribution. All age-adjusted rates shown in this report are based on the 2000 U.S. standard population for the population aged 25 and over. See Table III for the standard 2000 population used in this report.

Using the same standard population, death rates for the total population and for each marital status group were adjusted separately. The age-adjusted rates are based on 10-year age groups for adults aged 25 and over. Age-adjusted death rates are not comparable with crude rates.

Statistical tests

The mortality data presented in this report are not subject to sampling error. Mortality data, even based on complete counts, may be affected by random variation—that is, the number of deaths that actually occurred may be considered as one of a large series of possible results that could have arisen under

the same circumstances. However, the ACS populations used to compute the rates are subject to sampling error because the ACS estimates are adjusted to resident control totals by the Census Bureau. The sampling errors for the ACS populations, and the random error, are reflected in the standard errors shown in Table II. All of the ACS estimates, by marital status and age, have relative standard errors of less than 1%, meaning that the standard error is less than 1% of the estimate. Consequently, the effect of the denominator sampling error on the overall standard error of the rates is minimal.

When the number of deaths is greater than 100, a normal approximation may be used in calculating tests of statistical significance. All of the rates in this report are based on numbers of deaths that are greater than 100, so the normal approximation is used to test for statistical significance.

Availability of mortality data

Mortality data used in this report are available in electronic products as described on the NCHS mortality website: <https://www.cdc.gov/nchs/deaths.htm>. The marital status variable can be obtained from the mortality public-use data set issued each data year. Since 1968, the data set has been available through NCHS in ASCII format and can now be downloaded: https://www.cdc.gov/nchs/data_access/Vitalstatsonline.htm.

Definition of term

Age-adjusted death rate—The death rate used to make comparisons of relative mortality risks across groups and over time. This rate should be viewed as a construct or an index rather than a direct or actual measure of mortality risk. Statistically, it is a weighted average of age-specific death rates, where the weights represent the fixed population proportions by age.

Table I. List of 113 selected causes of death and Enterocolitis due to *Clostridium difficile*

Number ¹	Cause of death based on <i>International Classification of Diseases, 10th Revision (ICD-10)</i>
1#	Salmonella infections (A01–A02)
2#	Shigellosis and amebiasis (A03, A06)
3	Certain other intestinal infections. (A04, A07–A09)
#	Tuberculosis. (A16–A19)
4	Respiratory tuberculosis. (A16)
5	Other tuberculosis (A17–A19)
6#	Whooping cough (A37)
7#	Scarlet fever and erysipelas (A38, A46)
8#	Meningococcal infection (A39)
9#	Septicemia (A40–A41)
10#	Syphilis (A50–A53)
11#	Acute poliomyelitis. (A80)
12#	Arthropod-borne viral encephalitis. (A83–A84, A85.2)
13#	Measles (B05)
14#	Viral hepatitis. (B15–B19)
15#	Human immunodeficiency virus (HIV) disease (B20–B24)
16#	Malaria (B50–B54)
17	Other and unspecified infectious and parasitic diseases and their sequelae (A00, A05, A20–A36, A42–A44, A48–A49, A54–A79, A81–A82, A85.0–A85.1, A85.8, A86–B04, B06–B09, B25–B49, B55–B99)
#	Malignant neoplasms. (C00–C97)
18	Malignant neoplasms of lip, oral cavity and pharynx (C00–C14)
19	Malignant neoplasm of esophagus. (C15)
20	Malignant neoplasm of stomach. (C16)
21	Malignant neoplasms of colon, rectum and anus (C18–C21)
22	Malignant neoplasms of liver and intrahepatic bile ducts (C22)
23	Malignant neoplasm of pancreas (C25)
24	Malignant neoplasm of larynx (C32)
25	Malignant neoplasms of trachea, bronchus and lung (C33–C34)
26	Malignant melanoma of skin. (C43)
27	Malignant neoplasm of breast (C50)
28	Malignant neoplasm of cervix uteri. (C53)
29	Malignant neoplasms of corpus uteri and uterus, part unspecified (C54–C55)
30	Malignant neoplasm of ovary (C56)
31	Malignant neoplasm of prostate (C61)
32	Malignant neoplasms of kidney and renal pelvis (C64–C65)
33	Malignant neoplasm of bladder (C67)
34	Malignant neoplasms of meninges, brain and other parts of central nervous system (C70–C72)
	Malignant neoplasms of lymphoid, hematopoietic and related tissue. (C81–C96)
35	Hodgkin disease (C81)
36	Non-Hodgkin lymphoma. (C82–C85)
37	Leukemia (C91–C95)
38	Multiple myeloma and immunoproliferative neoplasms (C88, C90)
39	Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue (C96)
40	All other and unspecified malignant neoplasms (C17, C23–C24, C26–C31, C37–C41, C44–C49, C51–C52, C57–C60, C62–C63, C66, C68–C69, C73–C80, C97)
41#	In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behavior. (D00–D48)
42#	Anemias. (D50–D64)
43#	Diabetes mellitus (E10–E14)
#	Nutritional deficiencies. (E40–E64)
44	Malnutrition (E40–E46)
45	Other nutritional deficiencies (E50–E64)
46#	Meningitis (G00, G03)
47#	Parkinson disease (G20–G21)
48#	Alzheimer disease (G30)
#	Major cardiovascular diseases. (I00–I78)
	Diseases of heart (I00–I09, I11, I13, I20–I51)
49	Acute rheumatic fever and chronic rheumatic heart diseases (I00–I09)
50	Hypertensive heart disease (I11)
51	Hypertensive heart and renal disease (I13)
	Ischemic heart diseases (I20–I25)
52	Acute myocardial infarction (I21–I22)
53	Other acute ischemic heart diseases (I24)
	Other forms of chronic ischemic heart disease (I20, I25)
54	Atherosclerotic cardiovascular disease, so described (I25.0)
55	All other forms of chronic ischemic heart disease (I20, I25.1–I25.9)

See footnotes at end of table.

Table I. List of 113 selected causes of death and Enterocolitis due to *Clostridium difficile*—Con.

Number ¹	Cause of death based on <i>International Classification of Diseases, 10th Revision (ICD-10)</i>
#	Assault (homicide) (*U01-*U02,X85-Y09,Y87.1)
107	Assault (homicide) by discharge of firearms (*U01.4,X93-X95)
108	Assault (homicide) by other and unspecified means and their sequelae (*U01.0-*U01.3,*U01.5-*U01.9,*U02,X85-X92,X96-Y09,Y87.1)
109#	Legal intervention (Y35,Y89.0)
	Events of undetermined intent (Y10-Y34,Y87.2,Y89.9)
110	Discharge of firearms, undetermined intent (Y22-Y24)
111	Other and unspecified events of undetermined intent and their sequelae (Y10-Y21,Y25-Y34,Y87.2,Y89.9)
112#	Operations of war and their sequelae (Y36,Y89.1)
113#	Complications of medical and surgical care (Y40-Y84,Y88)
#	Enterocolitis due to <i>Clostridium difficile</i> (A04.7) ²

¹Causes labeled # are ranked to determine leading causes of death for specified population groups. Only mutually exclusive categories are numbered.

²Included in "Certain other intestinal infections (A04,A07-A09)" shown above.

NOTE: An asterisk (*) preceding a cause-of-death code indicates that the code is not included in ICD-10.

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

Table II. Estimated population and standard errors for persons aged 15 and over, by marital status and 10-year age groups, 2010 and 2019

[Population estimates are from the American Community Survey, based on 2010 postcensal estimates as of July 1, 2010. Population estimates shown in this table may differ from population estimates based on the 2010 census as of April 1; see Technical Notes in this report. Standard errors are shown in parentheses]

Marital status	15 and over	15–24	25–34	35–44	45–54	55–64	65–74	75 and over
2010.	248,055,935 (126,777)	43,767,020 (42,606)	40,972,085 (55,903)	41,192,320 (57,714)	44,929,030 (50,339)	36,761,960 (49,531)	21,854,035 (38,461)	18,579,485 (36,530)
Never married.	79,640,005 (67,886)	40,525,130 (37,114)	19,288,305 (37,352)	8,501,630 (28,119)	6,251,265 (23,306)	3,158,825 (17,503)	1,115,295 (10,735)	799,555 (8,967)
Ever married.	168,415,930 (107,070)	3,241,890 (20,924)	21,683,780 (41,594)	32,690,690 (50,401)	38,677,765 (44,619)	33,603,135 (46,336)	20,738,740 (36,932)	17,779,930 (35,412)
Married.	126,445,850 (88,076)	3,016,790 (20,138)	19,140,500 (38,036)	27,060,975 (43,681)	29,905,065 (34,896)	24,928,225 (36,749)	14,211,580 (29,250)	8,182,715 (23,947)
Widowed.	14,944,345 (33,741)	19,825 (1,596)	92,540 (3,201)	290,640 (5,639)	921,945 (9,212)	2,038,015 (14,030)	3,438,990 (15,849)	8,142,390 (23,684)
Divorced.	27,025,735 (50,676)	205,275 (5,455)	2,450,740 (16,525)	5,339,075 (24,503)	7,850,755 (26,234)	6,636,895 (24,489)	3,088,170 (16,039)	1,454,825 (10,939)
2019.	267,720,790 (141,648)	42,822,210 (39,590)	45,578,475 (63,393)	41,914,845 (64,012)	40,863,110 (54,080)	42,468,110 (57,902)	31,575,560 (48,406)	22,498,480 (41,956)
Never married.	90,772,665 (77,328)	40,345,175 (34,684)	25,276,090 (43,171)	10,656,815 (35,909)	6,298,005 (26,874)	4,907,160 (23,857)	2,265,915 (15,026)	1,023,505 (10,310)
Ever married.	176,948,125 (118,679)	2,477,035 (19,089)	20,302,385 (46,421)	31,258,030 (52,991)	34,565,105 (46,930)	37,560,950 (52,758)	29,309,645 (46,015)	21,474,975 (40,670)
Married.	132,351,800 (96,381)	2,324,400 (18,481)	18,285,215 (42,997)	26,398,850 (45,749)	27,033,645 (36,513)	27,586,965 (41,435)	20,034,595 (35,463)	10,688,130 (26,427)
Widowed.	15,307,085 (38,187)	20,220 (1,810)	94,270 (3,801)	265,095 (6,275)	710,290 (10,134)	2,083,605 (14,803)	3,942,565 (19,398)	8,191,040 (26,515)
Divorced.	29,289,240 (57,767)	132,415 (4,422)	1,922,900 (17,079)	4,594,085 (25,995)	6,821,170 (27,687)	7,890,380 (29,111)	5,332,485 (21,987)	2,595,805 (15,892)

SOURCE: Population estimates are based on unpublished tabulations prepared by the U.S. Census Bureau, American Community Survey, 2010 and 2019 1-year.

Table III. U.S. 2000 standard population for ages 25 and over

Age group	Population
25 and over	177,593,760
25-34	37,233,437
35-44	44,659,185
45-54	37,030,152
55-64	23,961,506
65-74	18,135,514
75 and over	16,573,966

SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.

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National Vital Statistics Reports, Vol. 70, No. 10, October 5, 2021

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Acknowledgments

This report was prepared in the Division of Vital Statistics (DVS) under the direction of Steven Schwartz, DVS Director; Andrés A. Berruti, DVS Acting Associate Director for Science; Robert N. Anderson, Mortality Statistics Branch (MSB) Chief; and Elizabeth Arias, MSB Statistical Analysis and Research Team Leader. Brigham Bastian helped with the cause-of-death analysis. Registration Methods staff and Data Acquisition, Classification, and Evaluation Branch staff provided consultation to state vital statistics offices regarding collection of the death certificate data on which this report is based. The National Center for Health Statistics Office of Information Services, Information Design and Publishing Staff edited and produced this report: editor Danielle Taylor, and typesetter and graphic artist Ebony Davis.

Suggested citation

Curtin SC, Tejada-Vera B, Anderson RN. Death rates by marital status for leading causes of death: United States, 2010–2019. National Vital Statistics Reports; vol 70 no 10. Hyattsville, MD: National Center for Health Statistics. 2021. DOI: <https://dx.doi.org/10.15620/cdc:109161>.

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