

Trends in Cancer and Heart Disease Death Rates Among Adults Aged 45–64: United States, 1999–2017

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Abstract

Objectives—This report presents death rates for cancer and heart disease among adults aged 45–64 in the United States for 1999–2017. Rates for 1999–2017 are presented by sex and race and ethnicity (non-Hispanic white, non-Hispanic black, and Hispanic).

Methods—Mortality statistics in this report are based on information from death certificates filed in all 50 states and the District of Columbia. Cancer deaths are classified by the *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes C00–C97; heart disease deaths are classified with ICD–10 underlying cause-of-death codes I00–I09, I11, I13, and I20–I51. Death rates are calculated per 100,000 population. Trends were evaluated using the National Cancer Institute’s Joinpoint Regression Program.

Results—Cancer death rates for middle-aged adults aged 45–64 declined by 19% from 1999 to 2017 (224.9 deaths per 100,000 to 182.6), whereas heart disease death rates declined by 22% from 1999 (164.3) to 2011 (127.9) and then increased 4% from 2011 to 2017 (133.6). The same trend patterns were observed for both men and women. The cancer death rate was always higher than the heart disease death rate from 1999 to 2017, and was 37% higher in 2017. For non-Hispanic white and non-Hispanic black men and women, cancer death rates declined over the 1999–2017 period, whereas heart disease death rates declined and then increased since 2009 for non-Hispanic white men and women, and since 2011 for non-Hispanic black men and women. Hispanic men and women experienced different trends than their non-Hispanic white and black counterparts—both cancer and heart disease death rates for this group had periods of decline and stability.

Keywords: death certificate • malignant neoplasms • cardiovascular disease

Introduction

Cancer and heart disease are the two leading causes of death for middle-aged adults aged 45–64, comprising 50% of all deaths in this age range (1). These two causes of death, while seemingly disparate, share many similar lifestyle and health-risk factors (e.g., obesity, diabetes, hypertension, tobacco use), suggesting some common, basic molecular pathways and networks (2). This report presents trends in cancer and heart disease death rates from 1999 to 2017 among adults aged 45–64 in the United States. This age group is featured because the recent increase in heart disease death rates was not observed among persons aged 20–44 (whose rate declined and then leveled off) and persons aged 65 and over (whose rate continued to decline) (3). This report will examine this finding by sex, and by race and ethnicity for men and women from 1999 to 2017.

Data Source and Methods

Data

Data in this report are based on information from death certificates filed in the 50 U.S. states and the District of Columbia from 1999 to 2017, as collected and processed by the National Center for Health Statistics through the Vital Statistics Cooperative Program (1). Death certificates are generally completed by funeral directors, attending physicians, medical examiners, and coroners. For more information on the collection of death certificate data, see [Technical Notes](#).

Cancer and heart disease mortality by sex and race and ethnicity

Causes of death are classified according to the *International Classification of Diseases, 10th Revision* (ICD–10) (4). Cancer deaths are identified based on ICD–10 underlying



cause-of-death codes C00–C97, while heart disease deaths are classified by ICD–10 underlying cause-of-death codes I00–I09, I11, I13, and I20–I51. Death rates are presented for persons aged 45–64 overall, by sex, and by race and ethnicity. Age, sex, and race and ethnicity of the decedent are demographic variables on the death certificate that are supplied to the funeral director by the informant, usually the next of kin. See [Technical Notes](#) for more information on the quality of the race and ethnicity data.

Rates and significance testing

Annual death rates are calculated as the number of deaths per 100,000 persons aged 45–64 residing in the United States. Comparisons among rates, unless otherwise specified, are statistically significant at the 0.05 level using the z test statistic. For more detail, see [Technical Notes](#). Trends were evaluated using the National Cancer Institute’s Joinpoint Regression Program (5). The Joinpoint software was used to fit weighted least-squares regression models to the estimated proportions on the logarithmic scale. For more information, see [Technical Notes](#).

Results

Trends in cancer and heart disease death rates

Total

The cancer death rate for adults aged 45–64 declined 19% from 1999 to 2017 (224.9 deaths per 100,000 to 182.6) ([Figure 1](#), [Table A](#)). The decline in the cancer death rate was greater for 1999 to 2007 and 2014 to 2017 (each 1.5% annually) than for 2007 to 2014 (0.5% annually). The heart disease death rate for adults aged 45–64 declined 22% between 1999 (164.3) and 2011 (127.9) and then increased 4% between 2011 and 2017 (133.6). So, the rate in 2017 was 19% lower than the 1999 rate. The heart disease death rate fell 2.5% annually from 1999 to 2007, 1.2% annually from 2007 to 2011, and then increased 0.9% annually from 2011 to 2017. For the 1999 to 2017 period, cancer death rates were always higher than the heart disease death rates, and were 37% higher in 2017.

By sex

The cancer death rate for men aged 45–64 declined at varying rates over the period: 1.6% annually from 1999 to 2006, 0.4% annually from 2006 to 2014, and 2.2% annually from 2014 to 2017. The rate was down from 247.0 per 100,000 in 1999 to 197.4 in 2017, a 20% decline ([Figure 2](#), [Table A](#)). The heart disease death rate for men aged 45–64 declined 22% from 1999 (235.7) to 2011 (183.5) but then increased 3% from 2011 to 2017 (189.8).

The cancer death rate for women aged 45–64 declined 17% from 1999 (204.1) to 2017 (168.5), with greater declines in the average annual percentage for 1999 to 2008 (1.5% annually) than for 2008 to 2017 (0.5% annually). The heart disease death rate for women aged 45–64 declined 23% from 1999 (96.8) to 2011 (74.9) but then increased 7% in 2017 (80.1).

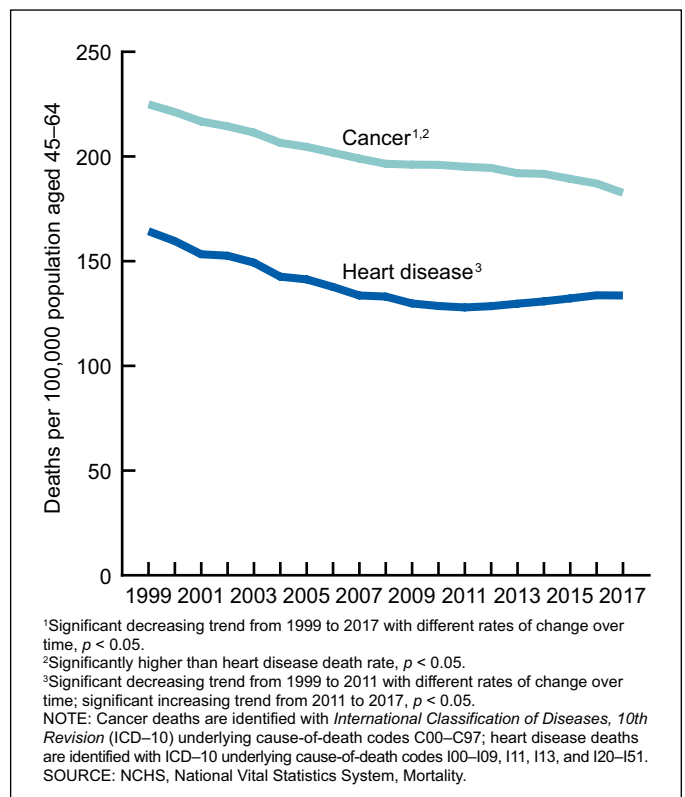


Figure 1. Death rates for cancer and heart disease among adults aged 45–64: United States, 1999–2017

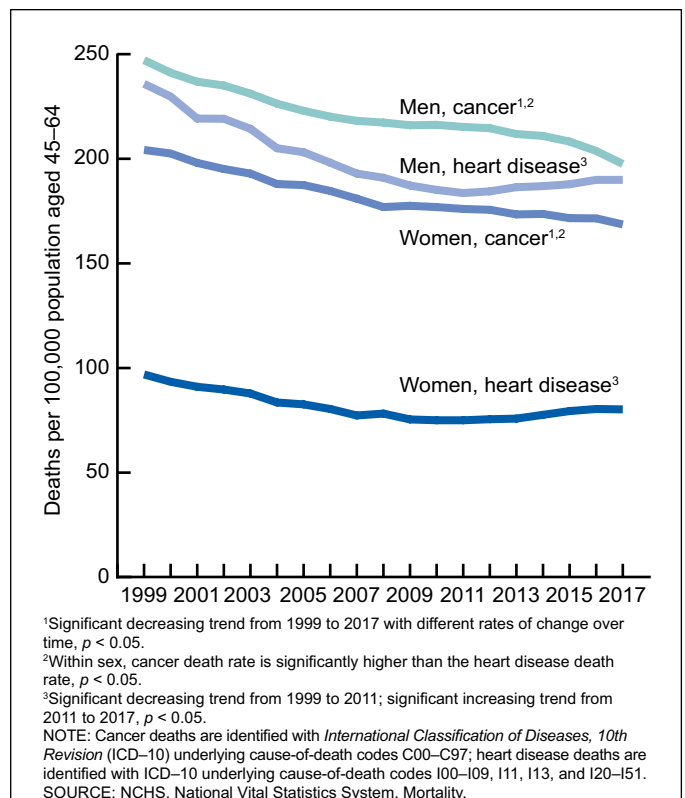


Figure 2. Death rates for cancer and heart disease among adults aged 45–64, by sex: United States, 1999–2017

Table A. Death rates for cancer and heart disease among adults aged 45–64, by sex: United States, 1999–2017

[Rates per 100,000 population enumerated as of April 1 for 2000 and 2010, and estimated as of July 1 for all other years]

| Year | Total | | Men | | Women | |
|------|--------|---------------|--------|---------------|--------|---------------|
| | Cancer | Heart disease | Cancer | Heart disease | Cancer | Heart disease |
| 1999 | 224.9 | 164.3 | 247.0 | 235.7 | 204.1 | 96.8 |
| 2000 | 221.2 | 159.6 | 241.0 | 229.6 | 202.4 | 93.3 |
| 2001 | 216.7 | 153.3 | 236.7 | 219.1 | 197.9 | 90.9 |
| 2002 | 214.4 | 152.6 | 234.9 | 219.0 | 195.0 | 89.6 |
| 2003 | 211.4 | 149.3 | 231.0 | 214.2 | 192.8 | 87.7 |
| 2004 | 206.5 | 142.6 | 226.2 | 204.9 | 187.8 | 83.4 |
| 2005 | 204.6 | 141.3 | 222.8 | 203.0 | 187.3 | 82.5 |
| 2006 | 201.8 | 137.7 | 220.0 | 198.0 | 184.5 | 80.3 |
| 2007 | 199.0 | 133.6 | 218.0 | 192.8 | 180.8 | 77.2 |
| 2008 | 196.5 | 133.1 | 217.2 | 190.8 | 176.8 | 78.1 |
| 2009 | 196.1 | 129.8 | 215.9 | 187.1 | 177.4 | 75.3 |
| 2010 | 196.0 | 128.6 | 216.1 | 185.0 | 176.8 | 74.9 |
| 2011 | 195.1 | 127.9 | 215.1 | 183.5 | 175.9 | 74.9 |
| 2012 | 194.5 | 128.5 | 214.5 | 184.3 | 175.5 | 75.4 |
| 2013 | 192.0 | 129.7 | 211.7 | 186.3 | 173.3 | 75.7 |
| 2014 | 191.7 | 130.8 | 210.8 | 186.8 | 173.5 | 77.5 |
| 2015 | 189.3 | 132.2 | 208.1 | 187.7 | 171.5 | 79.3 |
| 2016 | 187.1 | 133.7 | 203.6 | 189.8 | 171.4 | 80.3 |
| 2017 | 182.6 | 133.6 | 197.4 | 189.8 | 168.5 | 80.1 |

NOTE: Cancer deaths are identified with *International Classification of Diseases, 10th Revision (ICD–10)* underlying cause-of-death codes C00–C97; heart disease deaths are identified with ICD–10 codes I00–I09, I11, I13, and I20–I51 (see reference 4 in this report).

SOURCE: NCHS, National Vital Statistics System, Mortality.

For both men and women aged 45–64, cancer death rates were higher than heart disease death rates for the 1999–2017 period. The difference between rates was greater for women, where death rates due to cancer were more than twice those of heart disease every year from 1999 to 2017. The 1999 cancer death rate for men was 5% higher than the heart disease death rate, and grew to 17% higher by 2011. The rates for men have converged since 2011, and the cancer death rate in 2017 (197.4) was 4% higher than the comparable heart disease death rate (189.8).

By race and ethnicity

From 1999 to 2017, the death rate for cancer declined 34% for non-Hispanic black men aged 45–64, from 387.2 in 1999 to 254.5 in 2017 (Figure 3, Table B). The rate declined more in the last part of the period (4.2% annually from 2015 to 2017) than the first part (2.7% annually from 1999 to 2006), and least in the middle (1.3% annually from 2006 to 2015). The heart disease death rate for non-Hispanic black men declined 28%, from 408.0 in 1999 to 293.9 in 2011, and then rose 7% to 314.9 in 2017.

Similar to the findings for non-Hispanic black men, the cancer death rate for non-Hispanic white men aged 45–64 declined more during the last part of the period (2.3% annually from 2015 to 2017) than during the first (1.3% annually from 1999 to 2006), and least during the middle (0.1% annually from 2006 to 2015). The overall decline for non-Hispanic white men aged 45–64 was 14% from 1999 (244.2) to 2017 (210.6). The heart disease death rate for non-Hispanic white men declined 19% between 1999 (226.6) and 2009 (184.2) and then increased 4% between 2009 and 2017 (192.3).

Cancer death rates for Hispanic men aged 45–64 declined 1.8% annually from 1999 to 2007, stabilized from 2007 to 2012,

and then declined 1.7% annually from 2012 to 2017. In total, the cancer death rate was 23% lower in 2017 (114.6) than in 1999 (147.8). Similar to the findings for non-Hispanic white and black men, the heart disease death rate for Hispanic men declined by 32% between 1999 (154.2) and 2011 (104.9). However, the rate then stabilized from 2011 to 2017 (107.2).

The heart disease death rate for non-Hispanic black men aged 45–64 was higher than the cancer death rate from 1999 to 2007, not significantly different from 2008 to 2011, and higher from 2012 to 2017. In 2017, the heart disease death rate (314.9) was 24% higher than the cancer death rate (254.5).

From 1999 to 2017, the cancer death rate for non-Hispanic white men was higher than the heart disease death rate, with the difference increasing from 8% higher in 1999 to 21% higher in 2010. The difference narrowed from 2010 to 2017 and, in 2017, the cancer death rate (210.6) was 10% higher than the heart disease death rate (192.3).

The cancer and heart disease death rates for Hispanic men were essentially the same from 2000 to 2005, and then the cancer death rate was higher from 2006 to 2017. In 2017, the cancer death rate (114.6) was 7% higher than the heart disease death rate (107.2).

For non-Hispanic black women aged 45–64, cancer death rates declined by 18%, from 264.9 in 1999 to 216.5 in 2017, with the pace of decline greater from 1999 to 2008 (1.5% annually) than from 2008 to 2017 (0.5% annually) (Figure 4, Table B). Heart disease death rates declined 30% from 1999 (210.1) to 2011 (147.4) and then increased 6% from 2011 to 2017 (156.7).

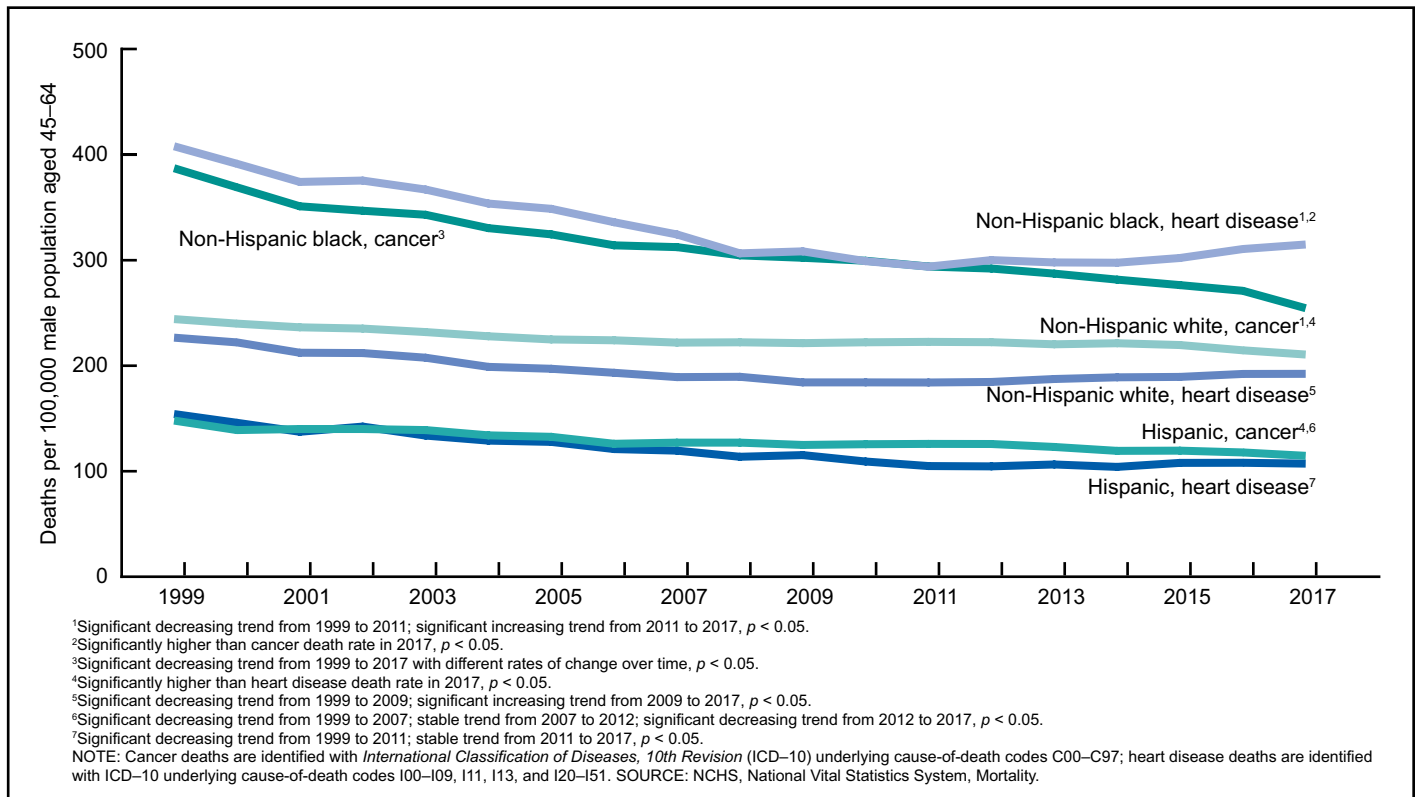


Figure 3. Death rates for cancer and heart disease among men aged 45-64, by race and ethnicity: United States, 1999-2017

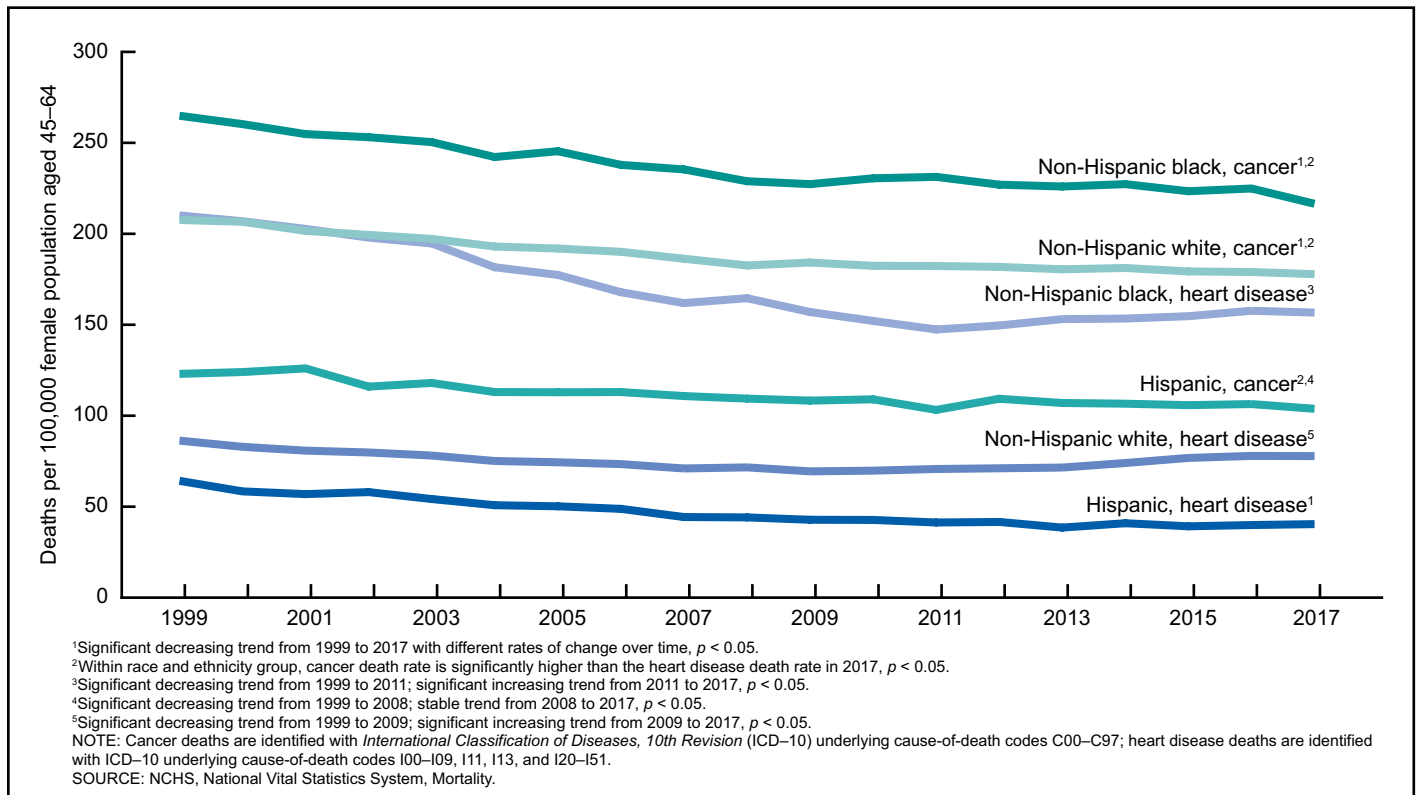


Figure 4. Death rates for cancer and heart disease among women aged 45-64, by race and ethnicity: United States, 1999-2017

Table B. Death rates for cancer and heart disease among adults aged 45–64, by sex and race and ethnicity: United States, 1999–2017

[Rates per 100,000 population enumerated as of April 1 for 2000 and 2010, and estimated as of July 1 for all other years]

| Year | Men | | | | | | Women | | | | | |
|------|--------------------|---------------|--------------------|---------------|----------|---------------|--------------------|---------------|--------------------|---------------|----------|---------------|
| | Non-Hispanic white | | Non-Hispanic black | | Hispanic | | Non-Hispanic white | | Non-Hispanic black | | Hispanic | |
| | Cancer | Heart disease | Cancer | Heart disease | Cancer | Heart disease | Cancer | Heart disease | Cancer | Heart disease | Cancer | Heart disease |
| 1999 | 244.2 | 226.6 | 387.2 | 408.0 | 147.8 | 154.2 | 207.6 | 86.3 | 264.9 | 210.1 | 122.5 | 64.2 |
| 2000 | 239.9 | 222.1 | 369.1 | 391.4 | 138.7 | 145.9 | 206.6 | 82.9 | 260.3 | 206.9 | 124.0 | 58.4 |
| 2001 | 236.4 | 212.3 | 351.1 | 374.2 | 140.3 | 137.4 | 201.6 | 80.8 | 254.8 | 202.7 | 125.5 | 56.9 |
| 2002 | 235.2 | 212.0 | 346.9 | 375.5 | 140.3 | 142.3 | 199.4 | 79.8 | 253.1 | 197.9 | 115.8 | 58.0 |
| 2003 | 231.9 | 207.6 | 343.1 | 367.0 | 138.6 | 133.8 | 197.2 | 78.1 | 250.4 | 194.7 | 118.3 | 54.2 |
| 2004 | 227.9 | 198.9 | 330.4 | 353.7 | 133.8 | 129.0 | 193.0 | 75.1 | 242.2 | 181.6 | 112.8 | 50.8 |
| 2005 | 224.9 | 197.1 | 324.5 | 348.7 | 132.6 | 127.8 | 191.9 | 74.4 | 245.4 | 177.4 | 112.9 | 50.2 |
| 2006 | 224.1 | 193.3 | 314.1 | 336.0 | 126.2 | 121.0 | 190.1 | 73.4 | 237.9 | 167.9 | 112.5 | 48.8 |
| 2007 | 221.9 | 189.2 | 312.4 | 324.4 | 127.1 | 119.5 | 186.3 | 71.0 | 235.4 | 161.9 | 110.8 | 44.3 |
| 2008 | 222.2 | 189.5 | 304.6 | 306.5 | 127.1 | 113.7 | 182.6 | 71.6 | 228.9 | 164.6 | 109.4 | 44.1 |
| 2009 | 221.4 | 184.2 | 302.3 | 308.4 | 124.9 | 115.3 | 184.2 | 69.4 | 227.3 | 157.0 | 108.3 | 42.8 |
| 2010 | 222.2 | 184.2 | 299.5 | 299.1 | 125.6 | 109.2 | 182.4 | 69.8 | 230.5 | 152.1 | 109.0 | 42.7 |
| 2011 | 222.6 | 184.1 | 294.0 | 293.9 | 125.9 | 104.9 | 182.3 | 70.7 | 231.3 | 147.4 | 103.2 | 41.3 |
| 2012 | 222.3 | 184.6 | 292.1 | 300.1 | 125.8 | 104.6 | 181.8 | 71.1 | 227.0 | 149.6 | 109.3 | 41.6 |
| 2013 | 220.3 | 187.4 | 287.3 | 297.9 | 123.0 | 106.4 | 180.5 | 71.5 | 226.0 | 153.1 | 107.0 | 38.5 |
| 2014 | 221.3 | 189.0 | 281.6 | 297.6 | 119.3 | 104.1 | 181.2 | 74.0 | 227.3 | 153.4 | 106.6 | 40.9 |
| 2015 | 219.6 | 189.4 | 276.4 | 302.1 | 119.5 | 107.9 | 179.3 | 76.8 | 223.4 | 154.7 | 105.8 | 39.2 |
| 2016 | 214.6 | 192.2 | 271.0 | 310.6 | 117.8 | 108.0 | 179.0 | 77.9 | 224.9 | 157.7 | 106.4 | 39.9 |
| 2017 | 210.6 | 192.3 | 254.5 | 314.9 | 114.6 | 107.2 | 177.8 | 77.8 | 216.5 | 156.7 | 103.8 | 40.4 |

NOTE: Cancer deaths are identified with *International Classification of Diseases, 10th Revision* (ICD–10) underlying cause-of-death codes C00–C97; heart disease deaths are identified with ICD–10 codes I00–I09, I11, I13, and I20–I51 (see reference 4 in this report).

SOURCE: NCHS, National Vital Statistics System, Mortality.

For non-Hispanic white women, cancer death rates declined 14% from 1999 (207.6) to 2017 (177.8). Similar to the findings for non-Hispanic black women, the pace of decline was greater from 1999 to 2008 (1.4% annually) than from 2008 to 2017 (0.3% annually). Heart disease death rates declined 20% from 1999 (86.3) to 2009 (69.4) and then increased 12% from 2009 to 2017 (77.8).

The cancer death rate for Hispanic women aged 45–64 declined from 1999 (122.5) to 2008 (109.4), and then stabilized from 2008 to 2017. Unlike the trends for non-Hispanic white and black women, heart disease death rates for Hispanic women declined by 37% from 1999 (64.2) to 2017 (40.4). The pace of decline was greater from 1999 to 2009 (3.9% annually) than from 2009 to 2017 (0.9% annually).

For non-Hispanic black, non-Hispanic white, and Hispanic women aged 45–64, cancer death rates were always higher than heart disease death rates during the 1999–2017 period. Non-Hispanic black women had the smallest difference between cancer and heart disease death rates, ranging between 26% and 57% higher during the period. In 2017, the cancer death rate for non-Hispanic black women (216.5) was 38% higher than the heart disease death rate (156.7); the difference in rates grew between 1999 and 2011 and has since narrowed. For non-Hispanic white women, cancer death rates were more than twice the heart disease death rates. In 2017, the cancer death rate for non-Hispanic white women (177.8) was 129% higher than the heart disease death rate (77.8); the difference between rates grew between 1999 and 2009 and has since narrowed. For Hispanic women, the difference in the rates has grown generally since 1999. The cancer death rate in 2017 (103.8) was 157% higher than the heart disease death rate (40.4).

Discussion

During 1999–2017, different trends were observed in death rates for cancer and heart disease, the two leading causes of death among middle-aged adults aged 45–64 (1). Cancer death rates declined from 1999 to 2017, although with greater annual percentage declines in the first and last parts of the period compared with the middle. In contrast, heart disease death rates declined from 1999 to 2011 and then increased from 2011 to 2017. This recent increase in heart disease death rates for middle-aged adults was not observed for either younger or older adults—heart disease death rates for adults aged 20–44 declined and then leveled off, whereas rates for adults aged 65 and over declined through the entire 1999–2017 period (3).

Trends in cancer and heart disease death rates for both men and women aged 45–64 exhibited the same general pattern: a general decline for cancer compared with a decline and then a recent increase for heart disease. The cancer death rate was higher than the heart disease death rate for both men and women. Non-Hispanic white and black men and women exhibited the overall pattern of declines in cancer death rates and recent increases for heart disease death rates. Non-Hispanic white women had the greatest percentage increase in heart disease death rates of all groups (12%). In contrast, Hispanic women experienced general declines in heart disease death rates during

the entire 1999–2017 period, and Hispanic men experienced an initial decline and a recent leveling off.

Disparate trends in cancer and heart disease death rates occurred despite the fact that these two causes of death share many common risk factors (2). A recent study indicated that these two diseases are becoming increasingly interrelated as cancer treatments can contribute to subsequent heart disease for the growing number of cancer survivors (6). The findings in this report can inform research and prevention efforts for these two leading causes of death.

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Technical Notes

Data

Mortality statistics in this report are based on death certificate information filed in the 50 states and the District of Columbia and processed by the National Center for Health Statistics through the Vital Statistics Cooperative Program. This report includes data for states using either the 1989 or 2003 revision of the U.S. Standard Certificate of Death from 1999 to 2017. In 2003, only five jurisdictions had implemented the 2003 revision of the death certificate, but by 2017, all states and the District of Columbia had transitioned, although West Virginia continued to use the 1989 revision for part of the year. Although there are differences between revisions in wording and format for a few items, the items presented in this report are largely comparable. Consequently, data from West Virginia from the 1989 certificate are combined with the data from the rest of the states. More than 99% of deaths occurring in the United States are represented in the vital statistics data. Only deaths occurring to U.S. residents are included in this report.

Cause of death

Causes of death are classified according to the *International Classification of Diseases, 10th Revision (ICD-10)* (4). Cause-of-death statistics presented are based on the underlying cause of death. The underlying cause is “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” (4). The manner of death describes the circumstances under which the death occurred, including intent, and is classified as natural, accident (unintentional injury), suicide, homicide, or undetermined. Both cause and manner of death are reflected in the coding of underlying cause of death (4). Cancer and heart disease data in this report are identified using ICD-10 codes C00–C97 and I00–I09, I11, I13, and I20–I51, respectively.

Race and Hispanic origin

Race and Hispanic origin are two distinct attributes and are reported separately on the death certificate. Therefore, the data shown in this report by Hispanic origin and race are based on a combination of the two attributes for the non-Hispanic population. Data shown for the Hispanic population include persons of any race. Hispanic origin is not imputed if it is not reported.

Death rates for Hispanic persons should be interpreted with caution because of inconsistencies in reporting Hispanic origin on the death certificate compared with censuses, surveys, and birth certificates. Studies have shown underreporting on death certificates of Hispanic decedents, most recently by 3% overall, and 6% for age groups 45–54 and 55–64 (7,8). More information is available elsewhere (9).

Rates and significance tests

Comparisons among rates, unless otherwise specified, are statistically significant at the 0.05 level of significance. Tests of statistical significance are described elsewhere (9). The mortality data presented in this report are not subject to sampling error. However, mortality data 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 (9). When there are fewer than 100 deaths, random variation tends to be relatively large. When there are 100 deaths or more, a normal approximation is used to calculate statistical tests. Most of the comparisons in this report are based on death rates where the number of deaths is greater than 100, and so, the normal distribution and the *z* test statistic were used to compute statistical significance. Rates are not computed if the number of deaths is less than 20, below which they are considered to be statistically unreliable for presentation (9). Trends shown in [Figures 1–4](#) were evaluated using the Joinpoint Regression Program (5). The Joinpoint software was used to fit weighted least-squares regression models to the estimated proportions on the logarithmic scale. The default settings allowed for as few as three observed time points in the beginning, ending, and middle line segments, including the join points. Using these settings, a maximum of two join points were searched for using the grid search algorithm and permutation test and an overall alpha level of 0.05.

Death rates for each year were calculated as the number of deaths per 100,000 population residing in the United States. Bridged-race estimates of the U.S. resident population were used to compute death rates in this report. For 1999, the populations are July 1 intercensal estimates; for 2001–2009, they are July 1 intercensal estimates; for 2011–2017, they are July 1 postcensal estimates based on the 2010, census; and for 2000 and 2010, they are April 1 census counts (10–14).

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