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Trends in breast cancer mortality by race /ethnicity, age, and U.S. census region, United States — 1999–2020

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Abstract

Background: Breast cancer remains a leading cause of morbidity and mortality among women in the United States. Previous analyses show that breast cancer incidence increased during 1999—2018. The purpose of this paper is to examine trends in breast cancer mortality.

Methods: We analyzed 1999–2020 mortality data from Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS) among women by race/ethnicity, age, and U.S. Census region.

Results: We found that overall breast cancer mortality is decreasing but varies by race/ethnicity, age group, and U.S. Census region. The largest decrease in mortality was observed among non-Hispanic White women, women aged 45–64 years of age, and women living in the Northeast; whereas the smallest decrease in mortality was observed among non-Hispanic Asian or Pacific Islander women, women aged 65 years or older, and women living in the South.

Conclusion: This report provides national estimates of breast cancer mortality during 1999—2020 by race/ethnicity, age group, and U.S. Census region. The decline in breast cancer mortality varies by demographic group. Disparities in breast cancer mortality have remained consistent over the past two decades. Using high quality cancer surveillance data to estimate trends in breast cancer mortality may help healthcare professionals and public health prevention programs tailor screening and diagnostic interventions to address these disparities.

Précis

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We found that overall breast cancer mortality is decreasing but varies by race/ethnicity, age group, and US Census region. Using high quality cancer surveillance data to estimate trends in breast cancer mortality may help healthcare professionals and public health prevention programs tailor screening and diagnostic interventions to address these disparities.

Keywords

breast cancer morality; cancer surveillance; cancer disparities; breast cancer; epidemiology

Background

Breast cancer is the most common cancer diagnosed among women and the second most common cause of cancer deaths among women in the United States (U.S.).[1] Breast cancer is the leading cause of cancer death in some racial and ethnic groups, including non-Hispanic Black women as of the last couple observed data years. A previous study found breast cancer mortality among women in the United States decreased 1.0% per year during 2014–2018.[2] Although breast cancer death rates have been on the decline, beginning in the early 1980s there was a divergence in trends in breast cancer mortality between black women and white women.[3] The divergence has stabilized but death rates are still higher among black women.[4]

A previous study found that despite a lower incidence rate, Black women had a 41% higher death rate.[5] Models show that differences in breast cancer characteristics contribute to differences in breast cancer mortality between black and white women.[6] Insurance status accounts for more than a third of the survival disparity in non-elderly women, more than percentage due to tumor characteristics.[7]

Trends in breast cancer incidence reflect risk factors & screening while mortality trends reflect incidence, screening & treatment.[8] Long-term views in trends in incidence and mortality may better inform our understanding of the changing patterns of disease and ultimately guide in population-based prevention.[8] In recent years breast cancer incidence has increased, with a significant increase observed among Asian or Pacific Islander women and women aged 20–39 years.[3,9] With increasing trends in incidence, examining mortality during the same time-period may be useful in understanding current patterns in screening, diagnosis, and treatment.[8] increasing incidence rates likely reflect changes in reproductive risk factors and (for postmenopausal only) rising obesity, but are also influenced by changes in mammography prevalence, including overdiagnosis. Conversely, mortality rates are less likely to be biased by overdiagnosis, while also reflecting advances in and improved access to early detection and treatment, and thus are the best population-based measure for quantifying progress against breast cancer. To examine trends in breast cancer mortality among women by race/ethnicity, age, U.S. census region, we analyzed mortality data for 1999–2020 from the Centers for Disease Control and Prevention (CDC), National Center for Health Statistics (NCHS).

Methods

Data Source

Mortality.—Data on female breast cancer deaths as underlying cause of death as reported on death certificate during 1999–2020 were analyzed using compiled state mortality data through the National Vital Statistics System, covering 100% of the U.S. population.[10] The underlying cause-of-death is defined by the World Health Organization (WHO) as "the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury." Underlying cause-of-death is selected from the conditions entered on the cause of death section of the death certificate.[10] The *International Classification of Diseases and Related Health Problems, 10th* revision (ICD-10) was used to define death codes attributed to malignant neoplasm of breast (C50.0-C50.9).[11]

Population.—Annual county population estimates by age, gender, bridged-race, and Hispanic origin are from the Vintage 2020 bridged-race series.[12] The population estimates for 2010–2020 are postcensal estimates of the July 1 resident population based on 2010 Census counts, and the population estimates for 1999–2009 are intercensal estimates of the July 1 resident population.[12] The bridged-race population files have estimates for four single-race categories (White, Black, American Indian or Alaska Native, and Asian or Pacific Islander); these categories are derived from the original multiple-race categories in the 2000 and 2010 Censuses.[12] Ethnicity is categorized as Hispanic or non-Hispanic. National, regional, and state estimates were obtained by summing the county estimates.[12]

Race/ethnicity.—Race/ethnicity was examined for five mutually exclusive groups (non-Hispanic American Indian or Alaska Native, non-Hispanic Asian or Pacific Islander, non-Hispanic Black, Hispanic, and non-Hispanic White). Death rates by race and Hispanic origin are based on information from death certificates and on population estimates from the U.S. Census Bureau.[12]

Age groups.—Since case counts were low for females under age 25, age-specific analysis used these grouped categories: 25–44, 45–64, and ≥ 65 years of age. The population for age groups is the population estimate for each age group in the given time period.[12] Only age groups that fall within the age range specified in the query are used to calculate an age-adjusted rate. The "total population" for a query is the sum of the populations of each age group included in that query.[12]

Region.—States were grouped into four regions defined by the U.S. Census Bureau: Northeast, Midwest, South, and West.[13]

Statistical Methods

Death rates.—We obtained deaths attributed to breast cancer during 1999–2020 from the CDC Wide-ranging Online Data for Epidemiologic Research (WONDER) Online Database underlying cause of death module among women during 1999–2020.[12] Annual death rates per 100,000 women were calculated by age groups (25–44, 45–64, and ≥ 65 years) and age

adjusted by the direct method to the 2000 U.S. standard population.[14] Age-adjusted breast cancer rates and trends were examined by racial/ethnic group and Census region.

Trends.—Temporal trends in rates were calculated using Joinpoint regression (version 4.6.00; National Cancer Institute), with a maximum of three joinpoints (up to four-line segments) allowed.[15] Annual percent change (APC) for each segment and average annual percent change (AAPC) for the analysis period 1999–2020 were calculated using the weighted average of the slope coefficients of the underlying joinpoint regression line with weights equal to the length of each segment over the interval. To determine whether APC was significantly different from zero a t-test was used. To determine whether AAPC was significantly different from zero, a t-test was used for zero joinpoints, and a z-test was used for one or more joinpoint. APC and AAPC were considered to be statistically significant if $p<0.05$; otherwise, rates were considered stable.

Results

During 1999–2020, there were 909,488 deaths attributed to breast cancer among women (Table 1). Breast cancer death rates decreased 1.6 percent per year on average during 1999–2020 from 26.6 to 19.1 per 100,000 women; with rates decreasing 1.3 percent per year during 1999–2002, 2.2 percent per year during 2002–2008, and 1.4 percent per year during 2008–2020.

Among non-Hispanic White women breast cancer death rates decreased 1.6 percent per year on average from 1999 (26.6 per 100,000 women) to 2020 (19.4 per 100,000 womens); whereas rates decreased 0.4 percent per year on average among non-Hispanic Asian or Pacific Islander women from 1999 (12.7 per 100,000 women) to 2020 (11.4 per 100,000 females) (Figure 1, Table 1). Compared to women in other racial/ethnic groups, non-Hispanic Black women had the highest breast cancer death rate, 35.7 per 100,000 women during 1999 and 26.4 per 100,000 women during 2020. However, non-Hispanic Black women had the highest absolute change in rate during 1999–2020 (decrease of 9.3%).

Women aged 45–64 years had the largest decrease of breast cancer death rates with a decrease of 2.0 percent per year on average; decreasing 2.7 percent per year during 2001–2008, and 1.8 percent per year during 2008–2020 (Figure 2, Table 1). Women aged 65 years or older had the smallest decrease in breast cancer death rates from 1999 (116.8 per 100,000 women) to 2020 (88.1 per 100,000 women) with a decrease of 1.4 percent per year on average; decreasing 1.5 percent per year during 1999–2013, and 1.0 percent per year during 2013–2020. Among women aged 25–44 years breast cancer death rates decreased 1.5 percent per year on average; decreasing 3.5 percent per year during 2001–2007 and 1.1 percent per year during 2007–2020.

By U.S. Census region, women who lived in the Northeast at the time of death had the largest decrease in death rates attributed to breast cancer (2.1 percent per year on average) during 1999 (28.3 per 100,000 women) to 2020 (20.8 per 100,000 women); with rates decreasing 2.3 percent per year during 1999–2014, and 1.6 percent per year during 2014–2020 (Figure 3, Table 1). Women who lived in the South at the time of death had the

smallest decrease in death rates attributed to breast cancer (1.4 percent per year on average) during 1999 (26.1 per 100,000 persons) to 2020 (19.8 per 100,000 women); with rates decreasing 1.6 percent per year during 1999–2013, and 1.0 percent per year during 2013–2020.

Discussion

This study examined trends in breast cancer mortality among women by race/ethnicity, age, and U.S. Census region. Deaths attributed to breast cancer declined during 1999–2020 but declines differed by the groups examined in this study. By demographic group, the smallest observed decrease in death rates were among non-Hispanic Asian or Pacific Islander women, women aged 65 years or older, and women living in the South. Observed decrease in death rates may be driven by trends in incidence, improvements in treatment and increased early detection.[8]

Although we found deaths attributed to breast cancer among women decreased during 1999–2020, the decrease observed in recent years (2008–2020) is smaller than previous years (2002–2008). Incidence of breast cancer increased 0.3% per year during 2004–2018.[1] Previous studies have found that the divergence in breast cancer incidence and mortality trends reflect interactions between changes in reproductive patterns, greater longevity, post-menopausal hormone use, and mammographic screening intervals at different time periods based on screening recommendations, proportion of women screened with mammography, and marked improvements in treatment.[8]

Some forms of hormone replacement therapy taken during menopause can raise risk for breast cancer when taken for more than five years.[8] Previous studies have associated the decrease observed in breast cancer incidence, specifically in the early 2000s, to be temporally related to the first report of the Women's Health Initiative (WHI) and the ensuing drop in the use of hormone-replacement therapy among postmenopausal women in the United States.[16] Results from this study indicate that breast cancer death rates decreased the most during 2002–2008 which corresponds to this period. Rapid declines in the early 2000s may, in part, reflect both dissemination of treatment advances and declines in HR+ incidence following the WHI paper. Women who take hormones for more than five years may need to monitor any symptoms and consult with their healthcare provider.[9]

Breast cancer incidence among Asian or Pacific Islander increased during 2005–2018.[9] Additionally, we found that non-Hispanic Asian or Pacific Islander women had the smallest decline in death rates attributed to breast cancer. From 2008 to 2015, breast cancer screening increased slightly among Hispanic women but declined among other groups, declining more than 10% in some groups, including Asian women.[17,] Additional analyses of breast cancer incidence, including stage at diagnosis, and mortality trends among Asian or Pacific Islander women may help explain the slower declines in mortality.

While lung cancer is the leading cause of cancer death among all women combined,[1] this is not true for all racial and ethnic groups. In 2019 and 2020, more Black women died from breast cancer than lung cancer; likewise, more Hispanic women in recent years have

died from breast cancer than lung cancer.[12] Although non-Hispanic Black women had the largest absolute decline, they continue to have the highest mortality rates. A previous study found that before 1980, breast cancer mortality was slightly lower among Black women than among White women.[18] The introduction of new medical interventions was most likely the precipitating factor for the emergence of the racial disparity.[18] Further studies examining the racial disparities in breast cancer mortality may further understanding of disparities in breast cancer rates.

Deaths attributed to breast cancer decreased among women of all ages in this study, which is consistent with other analyses.[4,6] However, there has been a decline in the observed decrease in death attributed to breast cancer in recent years. A previous study found that breast cancer incidence increased among women aged 20–39 years of age and decline or stabilized among women aged 40 years or older.[1] In this study, we found that breast cancer mortality decreased among this age group.

The largest decline in breast cancer death rates occurred in the Northeast region. A previous study found differences in observed breast cancer death rates by city.[19, 20] Some differences by state and race have previously been noted.[21] We found breast cancer mortality rates were highest in the northeast in 1999, but highest in the south in 2020. Further examinations of death rates by U.S. census region, by state, changing overall geographic burden and other demographic factors may allow for further understanding of disparities in breast cancer death rates. A previous study examining breast cancer and colorectal cancer screening among women living in urban and rural areas found lower colorectal cancer screening adherence among rural-dwelling women compared with urban-dwelling women, but equal prevalence of screening adherence to breast cancer screening.[22] Data indicated that mammography screening differed by race.

This study has several limitations. First, analyses may be biased if race or ethnicity were misclassified. Reporting of race and ethnicity uses data from death certificates, which might be inaccurate in some cases. Studies have examined the cause of race misclassification on death certificates, and have found greater degrees of misclassification for non-White populations and especially American Indian and Alaska Native individuals.[23] Second, analysis by census region do not capture state-level differences in health care access.

Due to the COVID-19 pandemic, access to care services in general were disrupted due to the pandemic an early analysis show breast cancer screening has declined.[24] The effect that this may have on future breast cancer death rates is not yet known. Using high quality cancer surveillance data to examine trends in breast cancer mortality may help healthcare professionals and public health prevention programs tailor screening interventions to population needs; and further address co-morbidities such as obesity, diabetes, adherence to treatment and other social determinants of health to help address these disparities.

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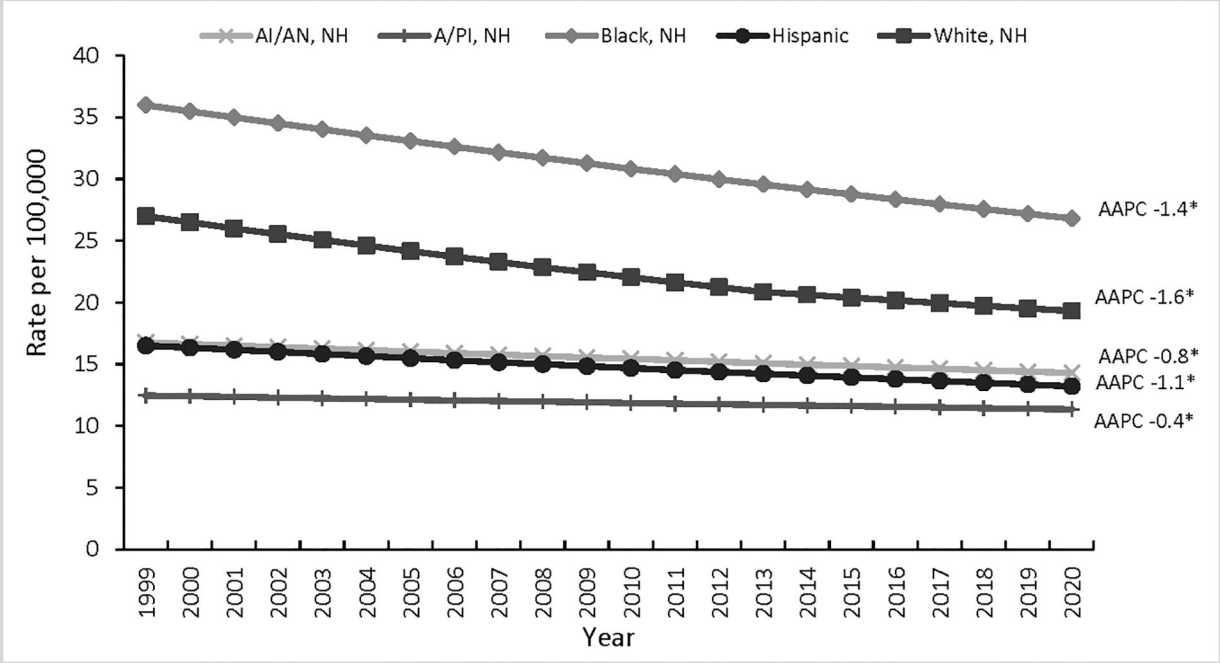

Figure 1.

Trends in female breast cancer mortality[a] by race/ethnicity[b], United States[c] — 1999–2020

Abbreviations: AI/AN = American Indians or Alaska Natives; A/PI = Asian or Pacific Islander; NH = non-Hispanic; AAPC = average annual percent change.

[a] Per 100,000 women; overall rates were age-adjusted to the 2000 U.S. standard population. AAPC were calculated using joinpoint regression, which allowed different slopes for four periods; the year at which slopes changed could vary by race/ethnicity.

[b] Mutually exclusive racial/ethnic groups are based on information about race/ethnicity that was collected separately and combined for this report. Race/ethnicity were grouped as non-Hispanic American Indian or Alaska Native, non-Hispanic Asian or Pacific Islander, non-Hispanic Black, Hispanic, and non-Hispanic White. Hispanic persons can be any race.

[c] Cancer mortality data cover 100% of the population.

* AAPC is significantly different from zero at the alpha = 0.05 level.

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Jan 19, 2022 2:57:19 PM

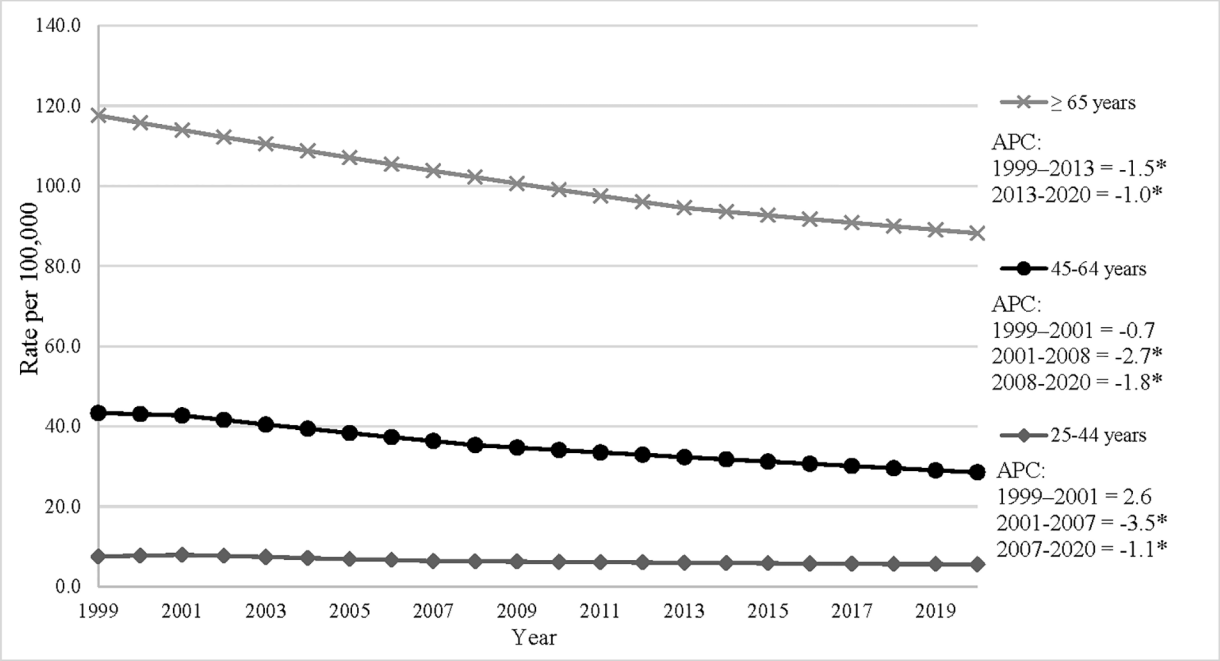

Figure 2.

Trends in female breast cancer mortality[a] by age group, United States[b]— 1999–2020

[a] Per 100,000 women; overall rates were age-adjusted to the 2000 U.S. standard population. APC were calculated using joinpoint regression, which allowed different slopes for four periods; the year at which slopes changed could vary by age.

[b] Cancer mortality data cover 100% of the population.

* APC is significantly different from zero at the alpha = 0.05 level.

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Jan 19, 2022 2:57:19 PM

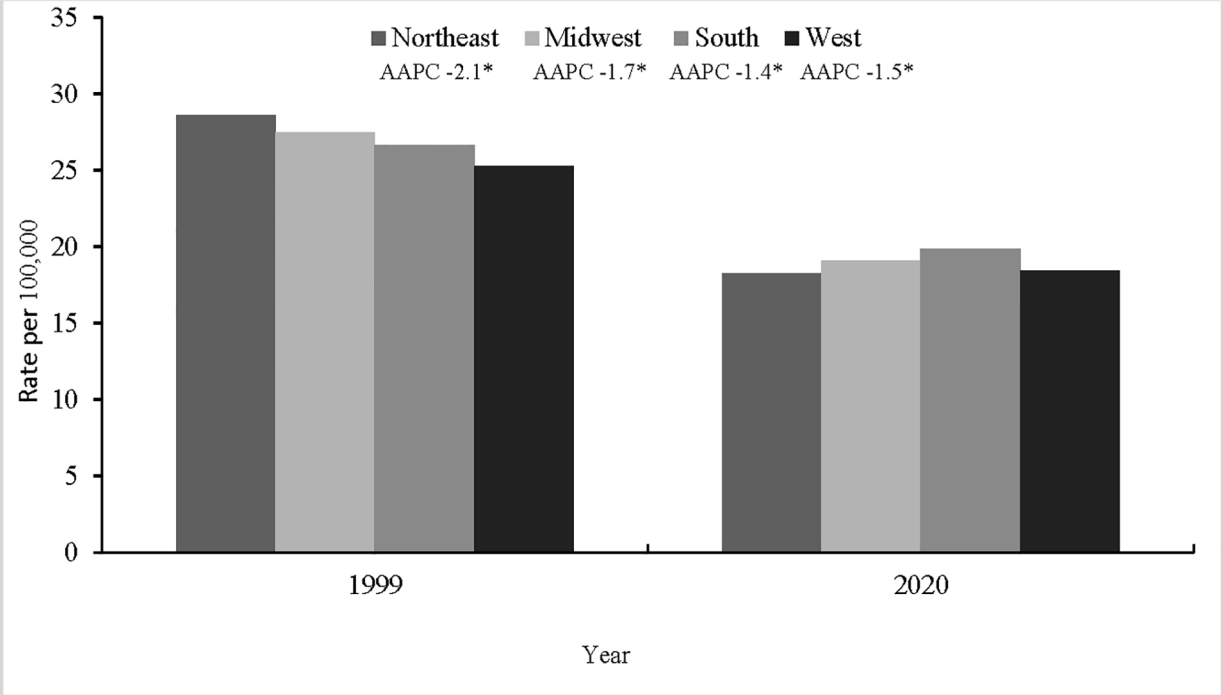

Figure 3.

Trends in female breast cancer mortality[a] by U.S. census region, United States[b]— 1999–2020

[a] Per 100,000 women; overall rates were age-adjusted to the 2000 U.S. standard population. AAPC and APC were calculated using joinpoint regression, which allowed different slopes for four periods.

[b] Cancer mortality data cover 100% of the population.

* APC is significantly different from zero at the alpha = 0.05 level.

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999–2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999–2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Jan 19, 2022 2:57:19 PM

Table 1.

Trends in female breast cancer mortality[a] by race/ethnicity[b], age, and U.S. census region, United States[c] —1999–2020

Characteristics	No.	1999 Rate* (SE)	2020 Rate* (SE)	Absolute change in rate	Joinpoint year range	APC		AAPC 1999–2020	
					1999–2002	−1.3	*		**
Overall	909,488	26.6 (0.1)	19.1 (0.1)	−7.5	2002–2008	−2.2	*	−1.6	
					2008–2020	−1.4	*		
Race/Ethnicity									
AI/AN, NH	3,679	17.0 (1.6)	13.7 (1.0)	−3.3	1999–2020	−0.8	*	−0.8	**
A/PI, NH	21,154	12.7 (0.6)	11.4 (0.3)	−1.3	1999–2020	−0.4	*	−0.4	**
Black, NH	130,148	35.7 (0.5)	26.4 (0.3)	−9.3	1999–2020	−1.4	*	−1.4	**
Hispanic	51,990	16.4 (0.4)	13.1 (0.2)	−3.3	1999–2020	−1.1	*	−1.1	**
White, NH	700,704	26.6 (0.1)	19.4 (0.1)	−7.2	1999–2013	−1.8	*	−1.6	**
					2013–2020	−1.1	*		
Age (yrs)									
					1999–2001	2.6			**
25–44	57,081	7.5 (0.1)	5.4 (0.1)	−2.2	2001–2007	−3.5	*	−1.5	
					2007–2020	−1.1	*		
					1999–2001	−0.7			**
45–64	313,663	43.2 (0.4)	28.8 (0.3)	−14.5	2001–2008	−2.7	*	−2.0	
					2008–2020	−1.8	*		
≥ 65	538,489	116.8 (0.7)	88.1 (0.5)	−28.7	1999–2013	−1.5	*	−1.4	**
					2013–2020	−1.0	*		
U.S. Census Region									
Northeast	180,766	28.3 (0.3)	20.8 (0.2)	−7.5	1999–2014	−2.3	*	−2.1	**
					2014–2020	−1.6	*		
Midwest	208,702	27.5 (0.3)	19.4 (0.2)	−8.1	1999–2020	−1.7	*	−1.7	**
South	336,465	26.1 (0.2)	19.8 (0.2)	−6.3	1999–2013	−1.6	*	−1.4	**
					2013–2020	−1.0	*		
West	183,555	24.9 (0.3)	18.4 (0.2)	−6.5	1999–2008	−1.9	*	−1.5	**
					2008–2020	−1.2	*		

Abbreviations: AI/AN = American Indians or Alaska Natives; A/PI = Asian or Pacific Islander; AAPC = average annual percent change; APC = annual percent change; NH = non-Hispanic; SE = Standard Error

[a] Per 100,000 women; overall rates were age-adjusted to the 2000 U.S. standard population. AAPC and APC were calculated using joinpoint regression, which allowed different slopes for four periods.

[b] Mutually exclusive racial/ethnic groups are based on information about race/ethnicity that was collected separately and combined for this report. Race/ethnicity were grouped as non-Hispanic American Indian or Alaska Native, non-Hispanic Asian or Pacific Islander, non-Hispanic Black, Hispanic, and non-Hispanic White. Hispanic persons can be any race.

[c] Cancer mortality data cover 100% of the population.

* APC is significantly different from zero at the alpha = 0.05 level.

** AAPC is significantly different from zero at the alpha = 0.05 level.

Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999−2020 on CDC WONDER Online Database, released in 2021. Data are from the Multiple Cause of Death Files, 1999−2020, as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. Accessed at http://wonder.cdc.gov/ucd-icd10.html on Jan 19, 2022 2:57:19 PM