**Recent Changes in the Patterns of the Proportion of Deaths Due to Breast Cancer according to Race and Ethnicity**

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**Running title**: Breast Cancer Mortality by Race/Ethnicity

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**Abstract**

**Background**: Recent reports suggest that breast cancer incidence disparities according to race have decreased. We examined whether these findings apply to breast cancer mortality while considering age, period, and cohort influences on mortality patterns.

**Methods**: Using publicly available datasets (CDC Wonder, Human Mortality Database), we developed an age-period-cohort model of breast cancer mortality and the proportion of deaths due to breast cancer during 1968-2018 among all women and by race/ethnicity in four groups with sufficient numbers for estimation: Hispanic (all races), Asian/Pacific Islanders (regardless of ethnicity), non-Hispanic Black/African American, and non-Hispanic White.

**Results**: Breast cancer mortality rates have decreased over time except among minority women ≥70 years. Before 2004 but not after the percent of deaths due to breast cancer was highest for non-Hispanic White women. In 2018, the age-adjusted percent of deaths due to breast cancer for women was highest for Asian/Pacific Islanders (5.6%) followed by non-Hispanic Black/African American (4.5%), Hispanic (4.4%), and non-Hispanic White women (4.1%).

**Conclusions**: Disparities in breast cancer mortality rates have not changed substantively, whereas the proportion of deaths due to breast cancer has declined more for non-Hispanic White women than for other population subgroups; this proportion is now lowest for non-Hispanic White women for the first time in 50 years.

**Impact**: Racial and ethnic group disparities in breast cancer mortality are unlikely to decrease in the near future since minority women have benefited from screening and treatment innovations at a slower pace than for non-Hispanic White women.

**Introduction**

Breast cancer is the second leading cause of cancer death in U.S. women (1). Breast cancer mortality has decreased by about 40% since 1975 in all racial and ethnic groups combined (2-4). Long-standing racial disparities in breast cancer mortality are evident through descriptive analyses of surveillance data with greater mortality declines observed for White women compared with women of other races and Hispanic ethnicity (4-6). Based on data through 2015, DeSantis (2) suggested that racial-ethnic disparities in mortality rates have stabilized with death rates 39% higher among non-Hispanic Black women compared with non-Hispanic White women. In another analysis of breast cancer incidence rates, Davis Lynn (7) concluded that the Black-White breast cancer mortality disparity is unlikely to worsen since incidence was projected to increase for non-Hispanic White women but decrease for non-Hispanic Black women.

Many complex factors influence breast cancer mortality, and these factors impact women of different races and ethnicities in dissimilar ways. Recent use of mammography screening for the early detection of breast cancer varies by race and ethnicity, ranging from 65% of non-Hispanic Asian women to 79% of Hispanic women (8). Variations in access to breast cancer care by race and ethnicity have been documented in numerous studies farther along the cancer care continuum including follow-up after an abnormal exam (9-11), timeliness of initiation of treatment (12,13), and concordance of therapy with recommended guidelines (14). Use and timing of breast health services differently by racial subgroups reflect social and structural factors rather than putative underlying biologic differences, and in this study we observe the definition of race as a social-political construct rather than a reflection of biology or genetics (15,16).

Studies of breast cancer mortality disparities tend to compare breast cancer mortality rates across racial and ethnic groups on an absolute scale (17). In 2009, Harper (4) used Surveillance, Epidemiology, and End Results (SEER) program data through 2004 to show that absolute racial and ethnic group disparities in breast cancer declined across multiple outcomes—including 5-year breast cancer-specific probability of death and mortality—but relative disparities increased by 17% for 5-year probability of death and by 24% for mortality. Analysis by Harper and colleagues used population averages for comparisons. We updated and extended this analysis using SEER data through 2016 to examine progress against racial and ethnic disparities using both absolute and relative measures of breast cancer mortality. We also employed an age-period-cohort method to more closely examine how differences in the age distribution of women and their patterns of breast cancer mortality vary across racial and ethnic groups over time.

**Methods**

Previously we estimated the overall proportion of deaths attributable to breast cancer by age and year of death for U.S. women based on data available through 2014 (18,19); this proportion was highest (4.1% to 12.9%) for women in their 40s and 50s born during 1900-2000. Here we report an updated model of the percent of all deaths attributable to breast cancer for non-Hispanic Black/African American (hereafter called Black), Asian/Pacific Islander, Hispanic (all races), and non-Hispanic White women. Only publicly-available anonymous data were used; this study was exempt from review as determined by the University of Wisconsin Health Sciences Institutional Review Board.

As described in greater detail in the Supplementary Technical Appendix, breast cancer (ICD-10 C50) deaths, all-cause deaths and populations for single years of age 0-99 were obtained for all women, Hispanic women (all races), White women, non-Hispanic White women, Black women, non-Hispanic Black women and Asian/Pacific Islander women from the Detailed Mortality file on CDC WONDER for 1999-2018 (20). Due to small numbers, Asian/Pacific Islanders included both Hispanic and non-Hispanic women, and we did not estimate values for American Indian/Native Alaskan women. Invasive female breast cancer (ICD-8 and -9: 174) deaths, all-cause female deaths, and populations for grouped ages were obtained for all races combined, White women and Black women from the Compressed Mortality files on CDC WONDER for calendar years 1968-1998 (20). Female all-cause mortality life tables for single years of age 0-119 were obtained for all races combined from the Berkeley Mortality Database for the 1900-2000 birth cohorts (21).

We used a series of age-period-cohort (APC) models (22) to estimate the proportion of deaths due to breast cancer among all women using binomial logistic regression models (23), for all races combined and for individual race/ethnic groups. Age, period (year of death), and cohort (year of birth) were entered into each model as additive natural cubic splines (24). Race-specific models borrowed strength from the model for all races combined by using estimates from the all races-combined model as an offset term; the model for non-Hispanic Blacks (Whites) borrowed strength from the model for Blacks (Whites) by using estimates from the Black (White) model as an offset term. Similar to the identification strategy of Carstensen (22), age and cohort effects for all races combined were penalized towards linear terms, while the period effect for all races combined and all effects for race- and ethnicity-specific models were penalized towards no effect. Smoothing parameters for the splines were selected using generalized cross validation with a BIC-like penalty to prevent over-fitting (25).

Standard errors for the estimated proportion of deaths due to breast cancer on the logit scale were obtained using the delta method. 95% confidence intervals were obtained on the logit scale using a Wald-type procedure and back-transformed to the proportion scale. Age-adjusted proportions used the number of deaths for females, all races combined in 2018 for ages 18-84.

Similar APC models were used to estimate race- and ethnicity-specific hazard ratios for all-cause mortality. Values were estimated for ages 0-119 and birth cohorts 1900-2000. Breast cancer-specific mortality was calculated by multiplying the proportion of deaths due to breast cancer by all-cause mortality. Standard errors for the estimated mortality rates on the logit scale were obtained using the delta method. 95% confidence intervals were obtained on the log scale using a Wald-type procedure and back-transformed to the rate scale. Age-adjusted rates used the female population for all races combined in 2018 for ages 18-84.

Analyses were conducted using the mgcv (23,24) and ggplot2 (26) packages in R v4.0.2 (27).

**Results**

Breast cancer mortality rates increased with age across all years and racial/ethnic groups (**Figure 1**). Within each age and racial and ethnic group, mortality rates tended to decrease over time for non-Hispanic White women of all ages and for minority women at younger ages (**Table 1**). However, for 70 year-old Asian/Pacific Islanders, 80 year-old Hispanic women, and non-Hispanic Black women ≥70, breast cancer mortality rates increased over time. This increasing trend is not observed in age-adjusted mortality rates, which show a decreasing trend for all four race/ethnicity groups since about 1988 (**Supplementary Table 1**). In 2018, breast cancer mortality rates for 50 year old women were highest for non-Hispanic Black women at 39.6 per 100,000 (95% CI 38.5, 40.8) followed by non-Hispanic White women at 22.9 per 100,000 (95% CI 22.4, 23.3), then equal to 17.5 per 100,000 for both Asian/Pacific Islander women (95% CI 16.9, 18.2) and Hispanic women (95% CI 17.0, 18.0) (**Table 1**).

The proportion of all deaths due to breast cancer within strata of age and race/ethnicity generally decreased over time for non-Hispanic White women and increased for other groups (**Figure 2**). For example, between 1978 and 2018 for 50 year old women (**Table 2**), the percent of deaths due to breast cancer increased for Asian/Pacific Islanders (9.9 to 13.9%), Hispanic women (9.0 to 9.4%) and non-Hispanic Black women (7.0 to 8.6%), but decreased by about 45% for non-Hispanic White women (12.7 to 7.0%).

Across all years and ages, the proportion of all deaths attributable to breast cancer for non-Hispanic White women peaked at 14.4% (95% CI 14.4, 14.7) for age 44 in 1989 (**Table 3**). The peak occurred at the same age (44) for non-Hispanic Black women in 1991 (10.1%, 95% CI 9.8, 10.4) and Asian/Pacific Islanders in 1992 (14.9%, 95% CI 14.2, 15.7). Breast cancer as a percentage of all deaths peaked at age 43 in 1990 for Hispanic women at 12.7% (95% CI 12.3, 13.2). By 2018 non-Hispanic White women had a lower fraction of deaths due to breast cancer than non-Hispanic Black women at all ages, Hispanic women under age 68, and Asian/Pacific Islander women under age 75.

After age-adjustment, the percent of deaths due to breast cancer in 2018 was highest for Asian/Pacific Islanders (5.6%) followed by non-Hispanic Black (4.5%), Hispanic (4.4%), and non-Hispanic White women (4.1%). The fact that non-Hispanic White women have the lowest percent of deaths due to breast cancer is a recent phenomenon, with the fraction of deaths due to breast cancer for non-Hispanic White women first surpassed by Asian/Pacific Islander women in 2005, followed by non-Hispanic Black women in 2012 and then ultimately Hispanic women in 2015 (**Supplementary Figure 2**).

**Discussion**

Our results agree and extend findings by Harper (4) that absolute racial and ethnic group disparities in breast cancer have declined modestly but relative disparities for mortality have increased over the past several decades. Mortality rates on an absolute scale including the rank-order by race and ethnicity have maintained similar patterns for over 50 years, with breast cancer mortality rates for non-Hispanic Black and White women across all ages exceeding breast cancer mortality rates for Hispanic women and Asian/Pacific Islanders. Conversely, relative disparities have re-ordered dramatically with the proportion of non-Hispanic White women dying from breast cancer going from the largest to the smallest proportion during 1985 to 2015. Harper used population-weighted summary measures while we used a modeling approach that captured the inter-dependent trends represented by birth cohort, age, and year of death. While we included women of all ages (<120) in our analysis, Harper (4) limited their study to women aged ≥50 y due to their focus on mammography screening. Since the average age at breast cancer diagnosis for Black, Hispanic and Asian/Pacific Islander breast cancer cases tends to be younger than for non-Hispanic White women, a wide age range is important to consider when making comparisons across racial and ethnic groups. This point is underscored by the observation that older (≥70y) non-Hispanic White women have benefited from decreasing breast cancer mortality rates but rates have actually increased for older Asian/Pacific Islander, Hispanic, and non-Hispanic Black women.

While calculations would be trivial to forecast breast cancer mortality rates into the future using the APC models developing in this study, these predictions would be surrounded by large error for at least two reasons. First, the coronavirus disease 2019 (COVID-19) pandemic has dramatically increased deaths from flu-like illness worldwide. Deaths reported to the US Centers for Disease Control by May 23, 2020 due to COVID-19 among females (44,823) exceeded the expected total number of deaths due to breast cancer among females in the US for the entire year (42,170) (1,28). Delays in breast cancer diagnosis and treatment due to COVID-19-related closures and reallocation of health care personnel and resources are predicted to lead to over 5,300 breast cancer deaths by the year 2030 (29); these predictions are based on hypothesized impacts on breast cancer care (e.g., 75% reduction in mammography screening for 6 months) since nationally representative empirical data will not be available for some time. Second, and conversely, emerging advances in breast cancer screening and treatment are expected to continue to improve survival after a breast cancer diagnosis. Increased efforts will be necessary to ensure that new approaches, for example, abbreviated magnetic resonance imaging for breast cancer screening and molecularly-targeted breast cancer therapies, benefit women of all racial and ethnic groups.

This study extends work by our group and others that describe breast cancer mortality rates by age, period and cohort, for the purpose of facilitating identification of etiologic factors and healthcare interventions influencing disease burden (18,30). Unlike these previous studies, the current work describes patterns by race/ethnicity rather than for all racial and ethnic groups combined. However, our analysis is limited by the data available for women from historically disenfranchised populations, which are subject to political, social, and cultural changes in definitions of racial and ethnicity categories and data reporting practices (31). Because of the smaller number of deaths that would make confidence intervals very wide and rate estimates uninformative, we did not estimate values for Asian/Pacific Islanders according to Hispanic ethnicity or for American Indian/Native Alaskan women. Minority women are more likely to be under-counted and misclassified by race and ethnicity (32,33,34). Our study is also limited since we did not examine molecular subtypes of breast cancer; distributions of breast cancer subtypes vary across racial/ethnic subgroups and are associated with different mortality patterns due to the availability of targeted treatments. Racial and ethnicity comparisons are critical for identifying population subgroups that experience inappropriate variation in care or comparatively poor health outcomes. However, differences between race and ethnic groups should not be assumed to reflect inherent biological distinctions or divert resources away from addressing the structural reasons for these differences (35).

Declines in overall breast cancer mortality rates reflect that improvements in breast cancer screening and treatment have impacted the population-level burden of breast cancer, but that racial and ethnic minority women have benefited at a slower pace than non-Hispanic White women especially among the oldest age groups. These results also underscore that progress in reducing the burden of breast cancer depends on how this burden is measured, since a relative measure of breast cancer mortality described by the proportion of all deaths attributable to breast cancer show that this proportion is now lowest for non-Hispanic White women for the first time in 50 years.

**Data Availability Statement**

Model code and output is available by download at .

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**Table 1**. Breast cancer mortality rates per 100,000 women by age, race/ethnicity, and calendar year of death

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 1978 | | |  | 1998 | | |  | 2018 | | |
| Age | **Race/Ethnicitya** | **Rate** | **95% CI** | |  | **Rate** | **95% CI** | |  | **Rate** | **95% CI** | |
| 30 | Asian/Pacific Islander | 1.4 | 1.3 | 1.6 |  | 1.1 | 1.0 | 1.2 |  | 0.9 | 0.8 | 1.0 |
| Hispanic | 2.6 | 2.4 | 2.8 |  | 1.7 | 1.6 | 1.8 |  | 1.4 | 1.3 | 1.5 |
| Non-Hispanic Black | 5.4 | 5.2 | 5.7 |  | 4.5 | 4.3 | 4.7 |  | 3.2 | 3.0 | 3.4 |
| Non-Hispanic White | 3.1 | 3.0 | 3.2 |  | 1.8 | 1.8 | 1.9 |  | 1.4 | 1.3 | 1.5 |
| 40 | Asian/Pacific Islander | 8.9 | 8.2 | 9.8 |  | 7.1 | 6.8 | 7.5 |  | 6.1 | 5.8 | 6.4 |
| Hispanic | 12.5 | 11.8 | 13.2 |  | 9.4 | 9.2 | 9.7 |  | 7.0 | 6.7 | 7.2 |
| Non-Hispanic Black | 25.9 | 24.9 | 27.0 |  | 24.4 | 23.8 | 25.1 |  | 17.1 | 16.5 | 17.8 |
| Non-Hispanic White | 18.9 | 18.4 | 19.3 |  | 11.8 | 11.6 | 12.0 |  | 8.6 | 8.4 | 8.9 |
| 50 | Asian/Pacific Islander | 25.6 | 23.6 | 27.8 |  | 22.7 | 21.8 | 23.7 |  | 17.5 | 16.9 | 18.2 |
| Hispanic | 31.3 | 29.7 | 33.0 |  | 26.5 | 25.8 | 27.2 |  | 17.5 | 17.0 | 18.0 |
| Non-Hispanic Black | 58.0 | 55.9 | 60.2 |  | 59.6 | 58.3 | 60.9 |  | 39.6 | 38.5 | 40.8 |
| Non-Hispanic White | 52.0 | 51.1 | 52.9 |  | 36.0 | 35.5 | 36.5 |  | 22.9 | 22.4 | 23.3 |
| 60 | Asian/Pacific Islander | 34.9 | 31.9 | 38.0 |  | 34.8 | 33.4 | 36.3 |  | 27.8 | 26.9 | 28.8 |
| Hispanic | 44.7 | 42.3 | 47.3 |  | 40.1 | 39.0 | 41.2 |  | 30.2 | 29.5 | 31.0 |
| Non-Hispanic Black | 79.3 | 76.4 | 82.2 |  | 84.9 | 83.1 | 86.7 |  | 64.2 | 62.7 | 65.8 |
| Non-Hispanic White | 86.8 | 85.3 | 88.3 |  | 64.9 | 64.1 | 65.8 |  | 41.1 | 40.5 | 41.8 |
| 70 | Asian/Pacific Islander | 31.5 | 28.7 | 34.6 |  | 40.5 | 38.7 | 42.3 |  | 37.0 | 35.6 | 38.4 |
| Hispanic | 48.2 | 45.4 | 51.2 |  | 55.0 | 53.5 | 56.6 |  | 47.2 | 46.0 | 48.4 |
| Non-Hispanic Black | 89.8 | 86.3 | 93.4 |  | 110.2 | 107.9 | 112.6 |  | 91.8 | 89.5 | 94.1 |
| Non-Hispanic White | 103.0 | 100.7 | 105.2 |  | 94.7 | 93.6 | 95.8 |  | 67.0 | 66.0 | 67.9 |
| 80 | Asian/Pacific Islander | 32.0 | 29.0 | 35.3 |  | 49.4 | 47.0 | 51.9 |  | 50.1 | 48.1 | 52.2 |
| Hispanic | 56.3 | 52.8 | 59.9 |  | 76.2 | 73.9 | 78.5 |  | 68.7 | 66.9 | 70.5 |
| Non-Hispanic Black | 99.5 | 95.2 | 104.0 |  | 146.3 | 142.9 | 149.8 |  | 126.1 | 122.8 | 129.5 |
| Non-Hispanic White | 123.0 | 118.5 | 127.7 |  | 137.2 | 135.5 | 138.9 |  | 105.2 | 103.6 | 106.7 |

a Due to smaller numbers, Asian/Pacific Islander includes both Hispanic and non-Hispanic

Abbreviation: CI, confidence interval

**Table 2**. The proportion (%) of all deaths due to breast cancer in women according to age, race/ethnicity, and calendar year of death

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 1978 | | |  | 1998 | | |  | 2018 | | |
| Age | **Race/Ethnicity** a | **%** | **95% CI** | |  | **%** | **95% CI** | |  | **%** | **95% CI** | |
| 30 | Asian/Pacific Islander | 3.9 | 3.4 | 4.3 |  | 3.9 | 3.6 | 4.3 |  | 3.7 | 3.4 | 4.1 |
| Hispanic | 4.5 | 4.2 | 4.8 |  | 3.9 | 3.7 | 4.1 |  | 3.2 | 3.0 | 3.4 |
| Non-Hispanic Black | 3.4 | 3.2 | 3.6 |  | 3.6 | 3.5 | 3.7 |  | 3.1 | 2.9 | 3.3 |
| Non-Hispanic White | 5.7 | 5.5 | 5.8 |  | 3.3 | 3.2 | 3.4 |  | 1.7 | 1.6 | 1.8 |
| 40 | Asian/Pacific Islander | 9.8 | 9.0 | 10.6 |  | 11.4 | 10.9 | 11.9 |  | 11.9 | 11.4 | 12.4 |
| Hispanic | 9.5 | 9.0 | 10.0 |  | 9.5 | 9.3 | 9.8 |  | 8.6 | 8.3 | 8.8 |
| Non-Hispanic Black | 7.0 | 6.8 | 7.3 |  | 8.0 | 7.8 | 8.2 |  | 7.8 | 7.6 | 8.1 |
| Non-Hispanic White | 12.5 | 12.3 | 12.8 |  | 9.1 | 8.9 | 9.2 |  | 5.4 | 5.2 | 5.6 |
| 50 | Asian/Pacific Islander | 9.9 | 9.1 | 10.7 |  | 14.2 | 13.7 | 14.7 |  | 13.9 | 13.5 | 14.4 |
| Hispanic | 9.0 | 8.6 | 9.5 |  | 11.2 | 10.9 | 11.5 |  | 9.4 | 9.2 | 9.7 |
| Non-Hispanic Black | 7.0 | 6.7 | 7.2 |  | 9.5 | 9.3 | 9.7 |  | 8.6 | 8.4 | 8.8 |
| Non-Hispanic White | 12.7 | 12.5 | 12.9 |  | 12.0 | 11.9 | 12.1 |  | 7.0 | 6.8 | 7.1 |
| 60 | Asian/Pacific Islander | 5.7 | 5.3 | 6.2 |  | 8.2 | 7.9 | 8.6 |  | 9.3 | 9.0 | 9.6 |
| Hispanic | 5.5 | 5.3 | 5.8 |  | 6.8 | 6.6 | 7.0 |  | 6.6 | 6.5 | 6.8 |
| Non-Hispanic Black | 4.8 | 4.6 | 4.9 |  | 6.3 | 6.2 | 6.5 |  | 6.2 | 6.0 | 6.3 |
| Non-Hispanic White | 8.5 | 8.4 | 8.7 |  | 8.4 | 8.3 | 8.5 |  | 5.8 | 5.7 | 5.9 |
| 70 | Asian/Pacific Islander | 2.3 | 2.1 | 2.5 |  | 3.6 | 3.5 | 3.8 |  | 5.2 | 5.0 | 5.3 |
| Hispanic | 2.7 | 2.6 | 2.8 |  | 3.6 | 3.5 | 3.7 |  | 4.4 | 4.3 | 4.5 |
| Non-Hispanic Black | 2.8 | 2.7 | 2.9 |  | 3.8 | 3.8 | 3.9 |  | 4.5 | 4.4 | 4.6 |
| Non-Hispanic White | 4.7 | 4.6 | 4.8 |  | 5.0 | 4.9 | 5.0 |  | 4.5 | 4.5 | 4.6 |
| 80 | Asian/Pacific Islander | 0.9 | 0.8 | 0.9 |  | 1.5 | 1.5 | 1.6 |  | 2.2 | 2.1 | 2.2 |
| Hispanic | 1.2 | 1.2 | 1.3 |  | 1.9 | 1.8 | 1.9 |  | 2.3 | 2.2 | 2.3 |
| Non-Hispanic Black | 1.8 | 1.7 | 1.8 |  | 2.4 | 2.4 | 2.5 |  | 2.7 | 2.7 | 2.8 |
| Non-Hispanic White | 2.4 | 2.3 | 2.4 |  | 2.7 | 2.6 | 2.7 |  | 2.5 | 2.5 | 2.6 |

a Due to smaller numbers, Asian/Pacific Islander includes both Hispanic and non-Hispanic

Abbreviation: CI, confidence interval

**Table 3**. Ages and years that breast cancer peaked as a proportion of all causes of death by race/ethnicity among females, 1968-2018

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Race/Ethnicitya | Age at Peak | Proportion at Peak | 95% CI | |
| 1978 | Asian/Pacific Islander | 43 | 10.3 | 9.5 | 11.2 |
| Hispanic | 42 | 9.7 | 9.2 | 10.2 |
| Non-Hispanic Black | 42 | 7.2 | 7.0 | 7.5 |
| Non-Hispanic White | 43 | 13.0 | 12.8 | 13.3 |
| 1998 | Asian/Pacific Islander | 49 | 14.3 | 13.8 | 14.8 |
| Hispanic | 49 | 11.3 | 11.0 | 11.6 |
| Non-Hispanic Black | 49 | 9.6 | 9.4 | 9.8 |
| Non-Hispanic White | 50 | 12.0 | 11.9 | 12.1 |
| 2018 | Asian/Pacific Islander | 49 | 14.1 | 13.6 | 14.6 |
| Hispanic | 49 | 9.6 | 9.4 | 9.8 |
| Non-Hispanic Black | 49 | 8.7 | 8.5 | 9.0 |
| Non-Hispanic White | 50 | 7.0 | 6.8 | 7.1 |
| 1968-2018 | Asian/Pacific Islander | 44 (in 1992) | 14.9 | 14.2 | 15.7 |
| Hispanic | 43 (in 1990) | 12.7 | 12.3 | 13.2 |
| Non-Hispanic Black | 44 (in 1991) | 10.1 | 9.8 | 10.4 |
| Non-Hispanic White | 44 (in 1989) | 14.4 | 14.2 | 14.7 |

a Due to smaller numbers, Asian/Pacific Islander includes both Hispanic and non-Hispanic

Abbreviation: CI, confidence interval

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**Figure 1.** Breast cancer mortality rates per 100,000 women according to year of death, age and race/ethnicity, 1965 to 2015, United States for (A) 1968, (B) 1973, (C) 1978, (D) 1983, (E) 1988, (F) 1993, (G) 1998, (H) 2003, (I) 2008, (J) 2013, and (K) 2018. Shaded regions show 95% confidence intervals.

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**Figure 2**. Proportion of deaths due to breast cancer in women by race/ethnicity according to year of death, 1968 to 2018, United States for (A) 1968, (B) 1973, (C) 1978, (D) 1983, (E) 1988, (F) 1993, (G) 1998, (H) 2003, (I) 2008, (J) 2013, and (K) 2018. Shaded regions show corresponding 95% confidence intervals.



**Supplementary Figure 1**. Age-adjusted breast cancer mortality rates per 100,000 women according to year and race/ethnicity, 1968-2018.



**Supplementary Figure 2**. Age-adjusted percent of deaths due to breast cancer according to year and race/ethnicity, 1968-2018.

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