Recent Changes in the Patterns of Breast Cancer as a Proportion of All Deaths According to Race and Ethnicity

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Background: Recent reports suggest that racial differences in breast cancer incidence rates have decreased. We examined whether these findings apply to breast cancer mortality while considering age, period, and cohort influences on both absolute and relative measures of breast cancer mortality.

Methods: Using publicly available datasets (CDC WONDER, Human Mortality Database), we developed an age–period–cohort model of breast cancer mortality and breast cancer deaths as a proportion of all deaths during 1968–2019 among all women and by 5 race/ethnicity groups with sufficient numbers for estimation: Hispanic (all races), American Indian/Alaska Native and Asian/Pacific Islanders (regardless of ethnicity), non-Hispanic Black, and non-Hispanic White.

Results: Initially increasing after 1968, age-adjusted breast cancer mortality rates have decreased among all racial/ethnic groups since 1988. The age-adjusted percent of all deaths due to breast cancer also has been declining for non-Hispanic White women since about 1990 while increasing or holding steady for other race/ethnic groups. In 2019, 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 (4.5%), Hispanic (4.4%), non-Hispanic White (4.1%), and American Indian/Alaska Native women (2.6%).

Conclusions: Breast cancer mortality disparities are now greater on both relative and absolute scales for non-Hispanic Black women, and using the relative scale for Asian/Pacific Islander and Hispanic women, compared with non-Hispanic White women for the first time in 50 years.

Keywords: age–period–cohort modeling; breast cancer; disparities; mortality

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Breast cancer is the second leading cause of cancer death in US women.[1] Breast cancer mortality has decreased by about 40% since 1975 in all racial and ethnic groups combined.[2–4] However, when trends for White women are compared with trends for women of other races and Hispanic ethnicity, long-standing racial disparities in breast cancer mortality are evident through descriptive analyses of surveillance data with greater mortality declines observed for White women.[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 et al[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; their analysis was motivated by the finding that while recent patterns suggested that breast cancer incidence rates for Black women had converged with incidence rates for White women, their modeling projections showed that these incidence rates would diverge after 2015.

Many complex health system 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

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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.

Data are available by download from websites described in references 22 (CDC WONDER Online Databases, http://wonder.cdc.gov) and 24 (Berkely Mortality Database, http://u.demog.berkeley.edu/~bmd/states.html). Model code and output is available by download at https://github.com/rgangnon/NonBreastCancerMortality_by_Race.

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therapy with recommended guidelines.[14] Availability, use, and timing of breast health services differently by racial subgroups reflect structural racism rather than putative underlying biologic differences,[15] and in this study, we observe the definition of race as a social–political construct rather than a reflection of biology or genetics.[16,17]

Studies of breast cancer mortality disparities tend to compare breast cancer mortality rates across racial and ethnic groups on an absolute scale.[18] As an alternative to measuring the mortality burden of breast cancer on the absolute scale, breast cancer mortality can also be measured as a proportion of all deaths. Measured as a fraction of all deaths, the breast cancer proportion reflects the impact of mammography screening and breast cancer treatment as well as progress in the prevention and treatment of competing causes of mortality within each group of interest. When the burden of breast cancer is measured on this relative scale—as a proportion of all deaths—trends reveal whether breast cancer is increasing or decreasing relative to all other causes of mortality which, also, vary by race and ethnicity. In some settings, health outcomes considered within the context of the total mortality burden within each race and ethnic group may be a more salient center of focus than the mortality rates of the total population, the majority population, or the "best off" group.[19]

In 2009, Harper et al[4] used Surveillance, Epidemiology, and End Results 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 et al used age-adjusted population averages for comparisons among women 50 and older. We updated and extended this analysis using age–period–cohort modeling and publicly available mortality data through 2019 to examine progress against racial and ethnic disparities using both an absolute measure (breast cancer mortality rate) and a relative measure, defined as the percent of all deaths due to breast cancer. By considering a relative measure of mortality burden, the breast cancer burden for each race and ethnic group is compared with the overall mortality risks for their own group, providing an alternative to placing non-Hispanic White women as the reference standard.

METHODS

Previously, we estimated the overall proportion of deaths attributable to breast cancer by age and year of death for US women based on data available through 2014[20,21]; this proportion was highest (4.1%–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), American Indian/Alaska Native, 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 eAppendix 1; http://links.lww.com/EDE/B829, we obtained counts of deaths due to malignant neoplasms (ICD-10 C00–C97), malignant breast cancer (ICD-10 C50), disease of the circulatory system (ICD-10 I00–I99), diseases of the respiratory system (ICD-10 J00–J98), and all causes for single years of age 0–99 and populations for single years of age 0–84 for all women, Hispanic women (all races), White women, non-Hispanic White women, Black women, non-Hispanic Black women, American Indian/Alaska Native women, and Asian/Pacific Islander women from the Detailed Mortality file on CDC WONDER for 1999–2019.[22] CDC WONDER is an online national public health data resource providing an ad-hoc query system and downloadable datasets regarding births, population counts, morbidity and mortality, and other health-related topics.[23] Due to small numbers, American Indian/Alaska Native and Asian/Pacific Islander women included both Hispanic and non-Hispanic women. Deaths in women from all malignant neoplasms (ICD-8 140–209, ICD-9 140–208), malignant breast cancer (ICD-8 and -9 174), circulatory system diseases (ICD-8 390–458 and ICD-9 390–459), respiratory diseases (ICD-8 and -9 460–519), and all causes and populations for age groups (<1, 1–4, 5–9, 10–14, 15–19, 20–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75–84) were obtained for all races combined, White women, and Black women from the Compressed Mortality files on CDC WONDER for calendar years 1968–1978 (ICD-8) and 1979–1998 (ICD-9).[22] 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.[24]

We used a series of age–period–cohort (APC) models[25] to estimate the proportion of deaths due to breast cancer among all women using binomial logistic regression models,[26] 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.[27] 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 Black (White) women borrowed strength from the model for Black (White) women by using estimates from the Black (White) model as an offset term. Similar to the identification strategy of Carstensen,[25] 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 Bayesian information criterion-like penalty to prevent over-fitting.[28]

Standard errors for the estimated proportion of deaths due to breast cancer on the logit scale were obtained using the delta method. The 95% confidence intervals (CI) were

obtained on the logit scale using a Wald-type procedure and back-transformed to the proportion scale.

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. The 95% CIs were obtained on the log scale using a Wald-type procedure and back-transformed to the rate scale.

Age-adjusted rates and proportions used the female population for all races combined in 2019 for ages 18–84. We conducted analyses using the mgcv[26,27] and ggplot2[29] packages in R v4.0.2.[30]

RESULTS

Age-adjusted death rates have been decreasing over the entire time frame of the analysis (1968–2019) from all causes combined (eFigure 1; http://links.lww.com/EDE/B829) as well as circulatory diseases (eFigure 2; http://links.lww.com/EDE/B829). Cancer mortality rates for all types combined other than breast cancer have decreased for the 5 race/ethnicity groups over the past 3 decades (eFigure 3; http://links.lww.com/EDE/B829). Age-adjusted respiratory disease mortality rates through 2019 have varied but remained fairly stable year to year (eFigure 4; http://links.lww.com/EDE/B829). Within age, race, and ethnicity groups, all-cause mortality rates in 2019 are lower than rates in 1979 except for 30- and 40-year-old non-Hispanic White women (increasing from 54 to 81 per 100,000 and 148 to 161 per 100,000, respectively) and 30-year-old American Indian/Alaska Native women (79–100 per 100,000) (eTable 1; http://links.lww.com/EDE/B829).

Age-adjusted breast cancer mortality rates decreased for all 5 race/ethnicity groups since about 1988 (Figure 1). Within each race and ethnicity group, breast cancer mortality rates increased by age across all years of birth (birth cohorts) (Figure 2) and years of death (Figure 3). Breast cancer mortality rates decreased over time for non-Hispanic White women of all ages and for women of other races and Hispanic ethnicity at younger ages (Table 1). However, for 80-year-old Asian/Pacific Islander, Hispanic, and non-Hispanic Black women, breast cancer mortality rates were higher in 2019 than in 1979. In 2019, breast cancer mortality rates for 50-year-old women were highest for non-Hispanic Black women at 39 per 100,000 (95% CI, 38, 40) followed by non-Hispanic White women at 22 per 100,000 (95% CI, 22, 23), 18 per 100,000 (95% CI, 17, 18) for both Asian/Pacific Islander women and Hispanic women, and 13 per 100,000 (95% CI, 12, 14) for American Indian/Alaska Native women.

After age-adjustment, the percent of deaths due to breast cancer in 2019 was highest for Asian/Pacific Islander women (5.6%) followed by non-Hispanic Black (4.5%), Hispanic (4.4%), non-Hispanic White (4.1%), and American Indian/Alaska Native women (2.6%) (Figure 4). The fact that non-Hispanic White women have a lower percent of deaths due to breast cancer than Hispanic, non-Hispanic Black, and Asian/Pacific Islander women 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.

Plots for the proportion of all deaths due to breast cancer within strata of age and race/ethnicity reflect the patterns in the age-adjusted figure with proportions generally decreasing over the past 3 decades for non-Hispanic White and American Indian/Alaska Native women and increasing or staying level

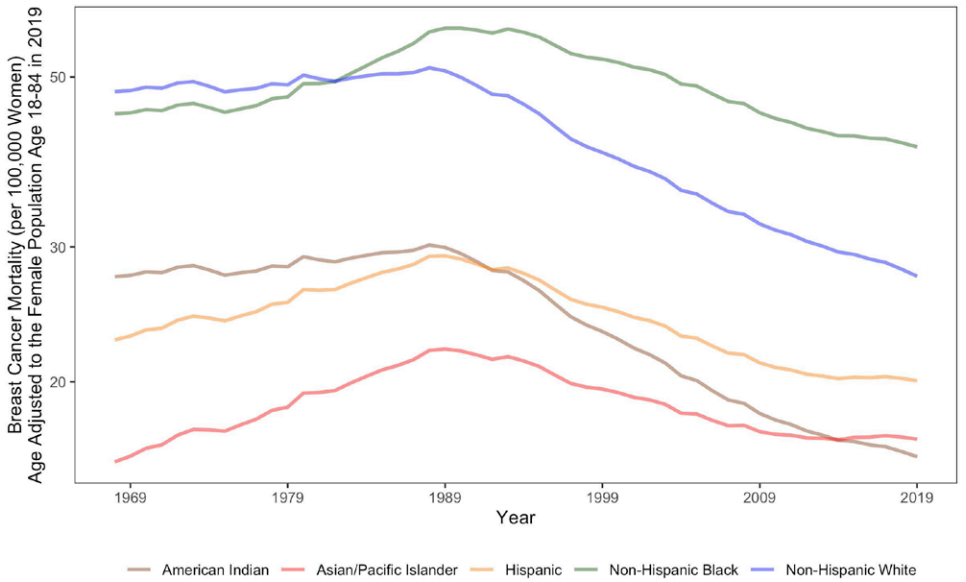

FIGURE 1. Age-adjusted breast cancer mortality rates per 100,000 women according to year of death and race/ethnicity, 1968–2019, United States.

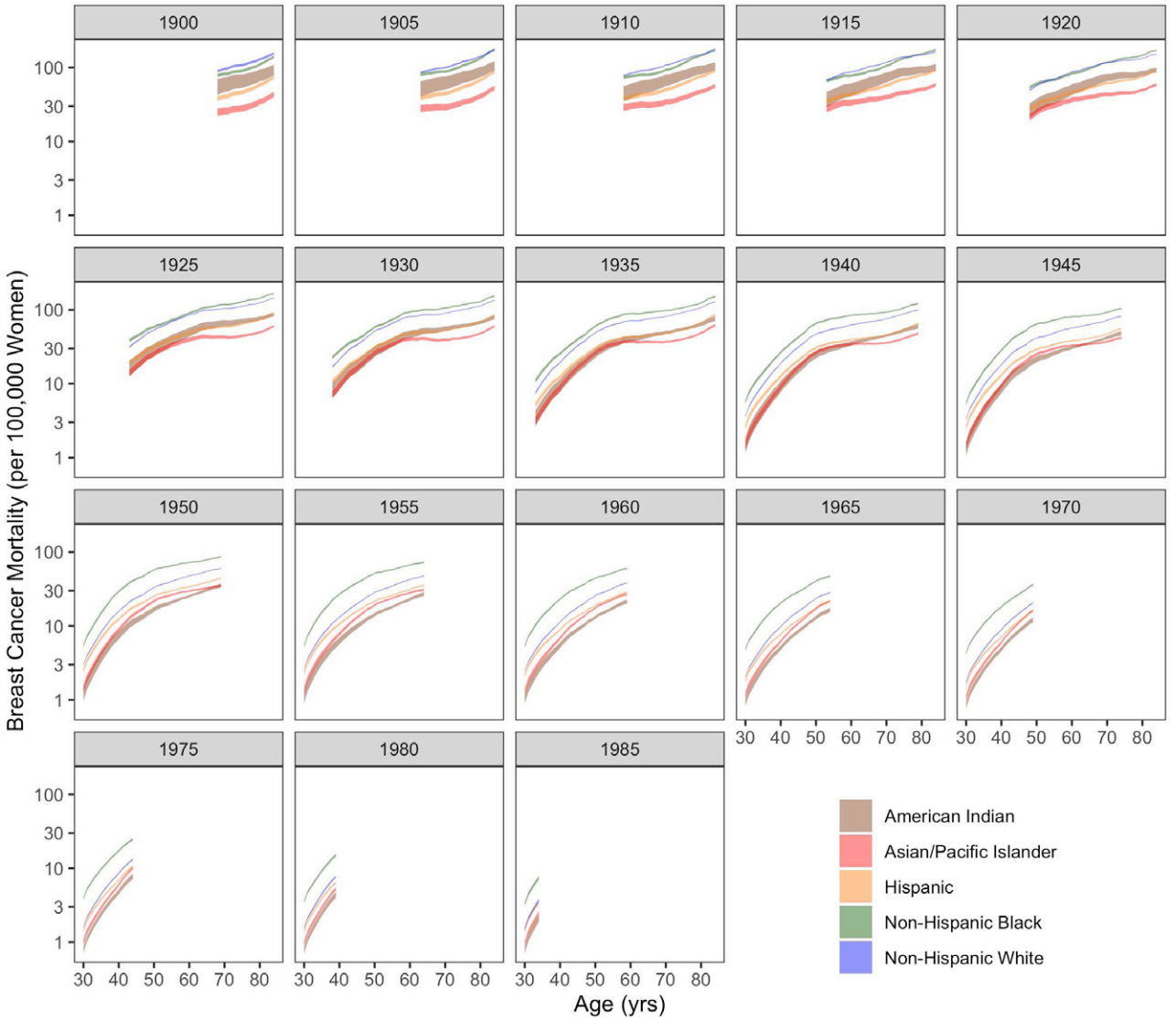

FIGURE 2. Breast cancer mortality rates per 100,000 women according to year of birth, age, and race/ethnicity, 1900–1985, United States for 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950, 1955, 1960, 1965, 1970, 1975, 1980, and 1985. Shaded regions show 95% CIs.

for other three groups (Figure 5). For example, between 1979 and 2019 for 50-year-old women (Table 2), the percent of all deaths due to breast cancer increased for Asian/Pacific Islanders (10.2%–14.1%), Hispanic women (9.2%–9.5%), and non-Hispanic Black women (7.1%–8.7%) but decreased for American Indian/Alaska Native women (5.0%–3.7%) and non-Hispanic White women (12.8%–6.9%).

Across all years and ages, the proportion of all deaths attributable to breast cancer for non-Hispanic White women peaked at 14.3% for women 44 years of age in 1989 (Table 3). The peak occurred at the same age (44) for non-Hispanic Black women in 1991 (10.1%). Breast cancer as a percentage of all deaths peaked at age 43 in 1990 for Hispanic women at 12.7% and at age 45 for Asian/Pacific Islander women in 1992 (14.9%). This peak percentage occurred at the oldest age (49) and the lowest level (5.8%) for American Indian/Alaska Native women in 1991. By 2019 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. In 2019, American Indian/Alaska Native women had a lower fraction of deaths due to breast cancer than all other groups for ages under 84—the age at which Asian Pacific Islander had the lowest fraction of all groups through age 99.

DISCUSSION

Our results agree and extend findings by Harper[4] that relative racial and ethnic disparities for breast cancer mortality

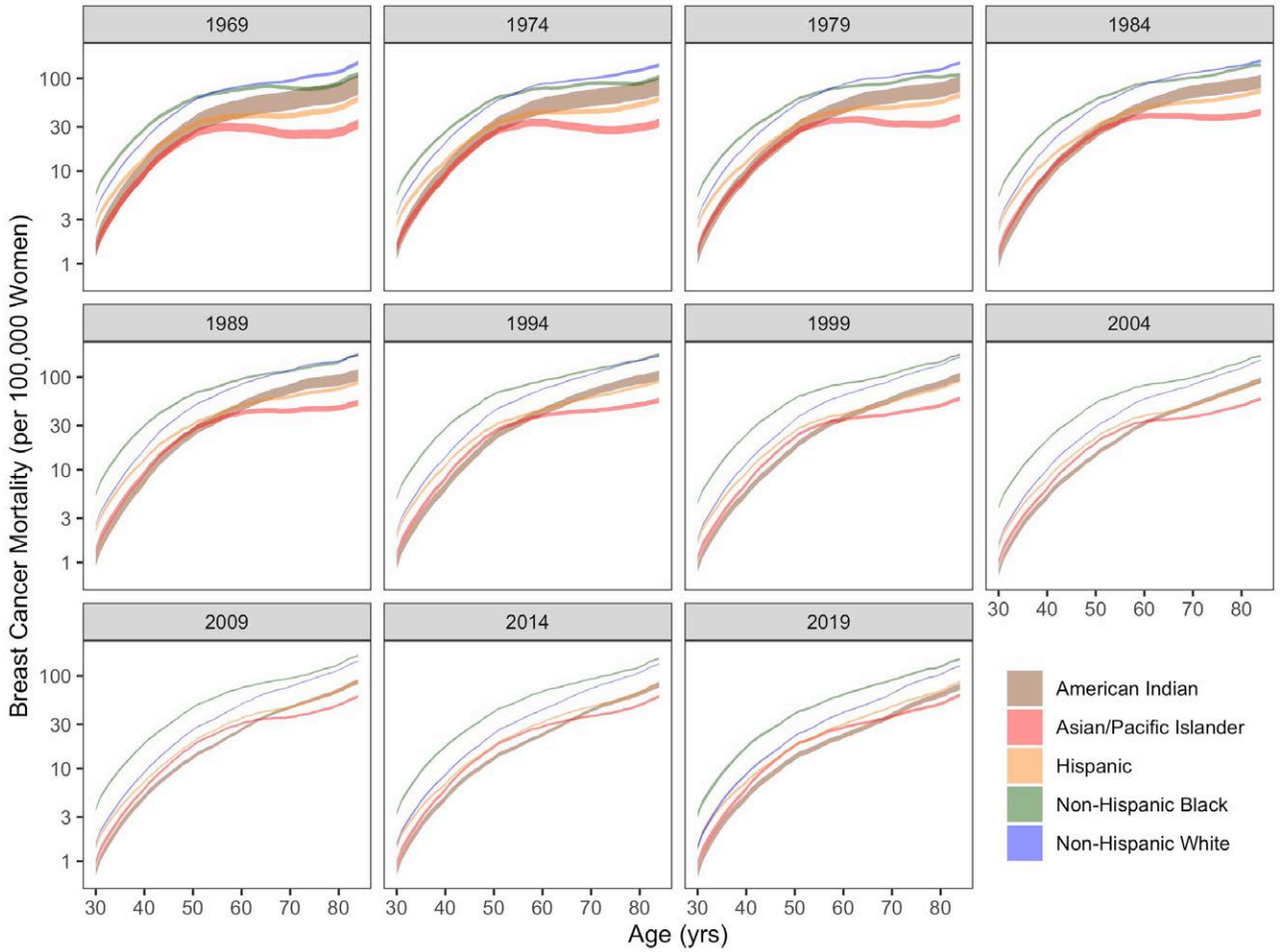

FIGURE 3. Breast cancer mortality rates per 100,000 women according to year of death, age, and race/ethnicity, 1969–2019, United States for 1969, 1974, 1979, 1984, 1989, 1994, 1999, 2004, 2009, 2014, and 2019. Shaded regions show 95% CIs.

have increased over the past several decades. Mortality rates on an absolute scale, including the rank order by race and ethnicity, have maintained a similar pattern 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 proportion before 2005 to the smallest proportion after 2015. Harper used population-weighted summary measures while we leveraged an age–period–cohort model for all races combined to stabilize the estimates for the racial/ethnic subgroups and to capture the inter-dependent trends represented by birth cohort, age, and year of death. We included women of all ages (<120 y) in our analysis, whereas Harper[4] limited their study to women ≥50 years of age 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 (≥70 y) 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. These trends are occurring in the context of declining mortality rates for all causes combined as well as for circulatory diseases, and increasing life expectancy, for all racial and ethnic groups.

While calculations to forecast breast cancer mortality rates into the future using the APC models developed in this study would be trivial, 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

TABLE 1. Breast Cancer Mortality Rates per 100,000 Women by Age, Race/Ethnicity, and Calendar Year of Death for 1979, 1999, and 2019

	1979		1999		2019	
Age, Race, and Ethnicity	**Rate**	**(95% CI)**	**Rate**	**(95% CI)**	**Rate**	**(95% CI)**
Age 30						
American Indian/Alaska Native[a]	1	(1, 1)	1	(1, 1)	1	(1, 1)
Asian/Pacific Islander[a]	1	(1, 2)	1	(1, 1)	1	(1, 1)
Hispanic[b]	2	(2, 3)	2	(2, 2)	1	(1, 2)
Non-Hispanic Black	5	(5, 6)	4	(4, 5)	3	(3, 3)
Non-Hispanic White	3	(3, 3)	2	(2, 2)	1	(1, 1)
Age 40						
American Indian/Alaska Native	9	(8, 11)	6	(5, 6)	5	(5, 5)
Asian/Pacific Islander	9	(8, 10)	7	(7, 7)	6	(6, 6)
Hispanic	12	(12, 13)	9	(9, 9)	7	(7, 7)
Non-Hispanic Black	26	(25, 27)	24	(23, 24)	17	(16, 18)
Non-Hispanic White	19	(18, 19)	12	(11, 12)	9	(8, 9)
Age 50						
American Indian/Alaska Native	27	(23, 32)	18	(16, 19)	13	(12, 14)
Asian/Pacific Islander	26	(24, 28)	22	(22, 23)	18	(17, 18)
Hispanic	31	(29, 32)	26	(25, 27)	18	(17, 18)
Non-Hispanic Black	58	(56, 60)	59	(58, 60)	39	(38, 40)
Non-Hispanic White	51	(50, 52)	35	(34, 35)	22	(22, 23)
Age 60						
American Indian/Alaska Native	49	(42, 59)	36	(34, 39)	22	(21, 24)
Asian/Pacific Islander	35	(33, 38)	35	(33, 36)	28	(27, 29)
Hispanic	45	(42, 47)	40	(39, 41)	30	(29, 31)
Non-Hispanic Black	80	(77, 83)	85	(83, 87)	63	(61, 65)
Non-Hispanic White	86	(85, 88)	64	(63, 65)	40	(40, 41)
Age 70						
American Indian/Alaska Native	65	(54, 78)	58	(54, 62)	38	(36, 40)
Asian/Pacific Islander	32	(30, 35)	40	(39, 42)	37	(35, 38)
Hispanic	48	(46, 51)	54	(53, 56)	47	(46, 48)
Non-Hispanic Black	90	(86, 93)	109	(107, 111)	90	(88, 93)
Non-Hispanic White	104	(102, 106)	93	(92, 94)	65	(64, 66)
Age 80						
American Indian/Alaska Native	75	(62, 91)	85	(78, 92)	63	(58, 67)
Asian/Pacific Islander	33	(30, 36)	50	(47, 52)	50	(48, 52)
Hispanic	56	(53, 59)	76	(74, 78)	69	(67, 71)
Non-Hispanic Black	103	(99, 107)	147	(143, 150)	126	(123, 130)
Non-Hispanic White	125	(120, 129)	135	(134, 137)	104	(103, 106)

[a]Due to smaller numbers, American Indian/Alaska Native and Asian/Pacific Islander include both Hispanic and non-Hispanic.
[b]Includes all races.

expected total number of deaths due to breast cancer among females in the US for the entire year (42,170)[1,31]; racial and ethnic groups have not experienced illness and deaths due to COVID-19 equally, either from the virus itself or its impacts on the prevention, diagnosis, and treatment of other health conditions including breast cancer. Second, and conversely, emerging advances in breast cancer screening and treatment are expected to continue to increase 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, equally 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.[20,32] Unlike these previous studies, the current work describes patterns by race/ethnicity rather than for all racial and ethnic groups combined. We have also focused on the percent of all deaths due to breast cancer, which is affected by uneven progress in reducing mortality from non-breast cancer

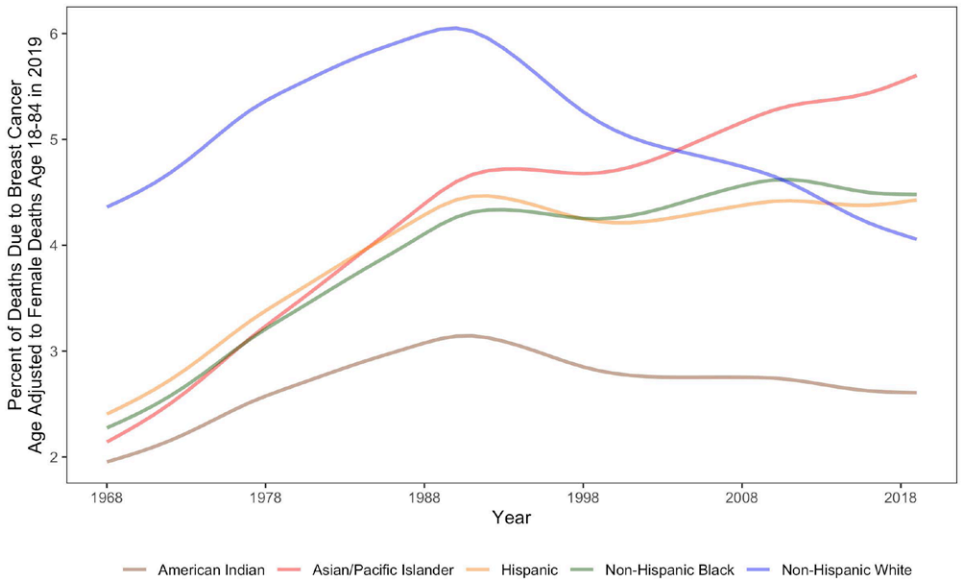

FIGURE 4. Age-adjusted percent of all deaths due to breast cancer according to year and race/ethnicity, 1968–2019.

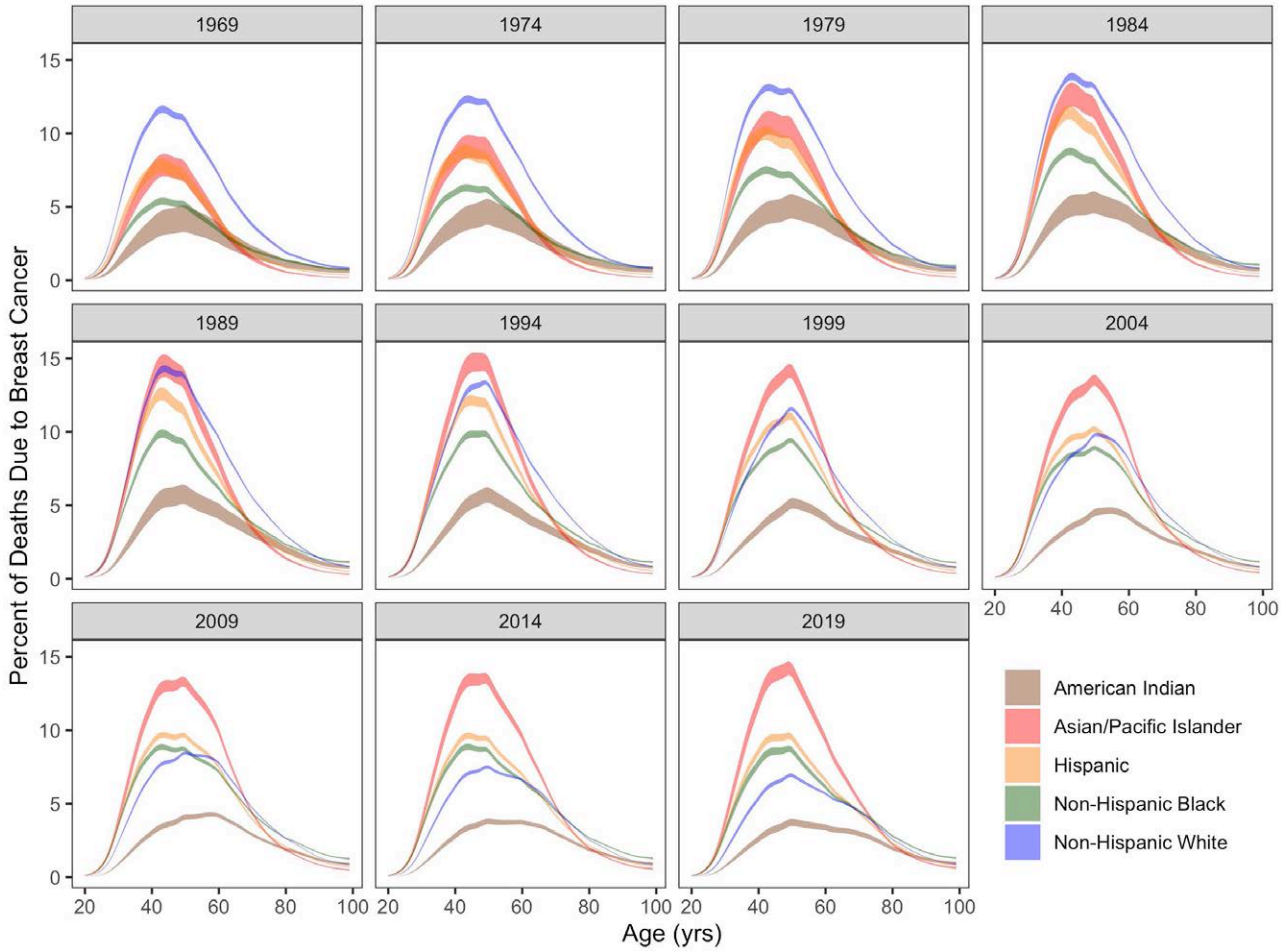

FIGURE 5. Proportion of deaths due to breast cancer in women by race/ethnicity according to year of death, 1968–2019, United States for 1969, 1974, 1979, 1984, 1989, 1994, 1999, 2004, 2009, 2014, and 2019. Shaded regions show corresponding 95% CIs.

TABLE 2. The Proportion (%) of All Deaths due to Breast Cancer in Women According to Age, Race/Ethnicity, and Calendar Year of Death for 1979, 1999, and 2019

	1979		1999		2019	
Age, Race, and Ethnicity	**%**	**(95% CI)**	**%**	**(95% CI)**	**%**	**(95% CI)**
Age 30						
American Indian/Alaska Native[a]	1.5	(1.2, 1.8)	1.1	(1.0, 1.2)	0.7	(0.7, 0.8)
Asian/Pacific Islander[a]	3.9	(3.5, 4.4)	3.8	(3.5, 4.2)	3.7	(3.4, 4.1)
Hispanic[b]	4.6	(4.3, 4.9)	3.8	(3.7, 4.0)	3.2	(3.0, 3.4)
Non-Hispanic Black	3.4	(3.3, 3.6)	3.6	(3.5, 3.7)	3.1	(2.8, 3.3)
Non-Hispanic White	5.5	(5.4, 5.6)	3.1	(3.1, 3.2)	1.7	(1.6, 1.8)
Age 40						
American Indian/Alaska Native	4.2	(3.5, 4.9)	3.3	(3.1, 3.6)	2.6	(2.4, 2.8)
Asian/Pacific Islander	10.2	(9.4, 11.0)	11.2	(10.7, 11.7)	11.9	(11.4, 12.4)
Hispanic	9.8	(9.4, 10.3)	9.3	(9.1, 9.6)	8.6	(8.3, 8.8)
Non-Hispanic Black	7.3	(7.1, 7.6)	7.9	(7.7, 8.1)	7.8	(7.5, 8.0)
Non-Hispanic White	12.6	(12.4, 12.8)	8.6	(8.5, 8.7)	5.4	(5.2, 5.5)
Age 50						
American Indian/Alaska Native	5.0	(4.2, 5.9)	5.1	(4.8, 5.5)	3.7	(3.5, 4.0)
Asian/Pacific Islander	10.2	(9.5, 11.0)	14.1	(13.6, 14.6)	14.1	(13.6, 14.5)
Hispanic	9.2	(8.8, 9.6)	11.0	(10.8, 11.3)	9.5	(9.3, 9.7)
Non-Hispanic Black	7.1	(6.9, 7.3)	9.4	(9.2, 9.6)	8.7	(8.4, 8.9)
Non-Hispanic White	12.8	(12.6, 13.0)	11.6	(11.5, 11.7)	6.9	(6.8, 7.1)
Age 60						
American Indian/Alaska Native	4.0	(3.4, 4.8)	4.1	(3.9, 4.4)	3.4	(3.2, 3.6)
Asian/Pacific Islander	6.0	(5.6, 6.5)	8.4	(8.1, 8.7)	9.4	(9.1, 9.7)
Hispanic	5.7	(5.4, 6.0)	6.9	(6.7, 7.0)	6.6	(6.5, 6.7)
Non-Hispanic Black	4.9	(4.8, 5.1)	6.4	(6.3, 6.5)	6.1	(6.0, 6.3)
Non-Hispanic White	8.7	(8.6, 8.8)	8.3	(8.2, 8.4)	5.7	(5.6, 5.8)
Age 70						
American Indian/Alaska Native	2.6	(2.2, 3.1)	2.8	(2.6, 3.0)	3.0	(2.8, 3.1)
Asian/Pacific Islander	2.4	(2.3, 2.6)	3.6	(3.5, 3.8)	5.2	(5.0, 5.4)
Hispanic	2.8	(2.7, 2.9)	3.6	(3.5, 3.6)	4.4	(4.3, 4.5)
Non-Hispanic Black	2.9	(2.8, 3.0)	3.8	(3.7, 3.9)	4.5	(4.4, 4.6)
Non-Hispanic White	4.9	(4.8, 4.9)	4.9	(4.8, 4.9)	4.5	(4.4, 4.5)
Age 80						
American Indian/Alaska Native	1.5	(1.3, 1.8)	1.9	(1.7, 2.0)	1.9	(1.8, 2.1)
Asian/Pacific Islander	0.9	(0.8, 1.0)	1.5	(1.5, 1.6)	2.2	(2.1, 2.3)
Hispanic	1.3	(1.2, 1.4)	1.9	(1.8, 1.9)	2.3	(2.3, 2.4)
Non-Hispanic Black	1.8	(1.7, 1.9)	2.4	(2.4, 2.5)	2.8	(2.7, 2.9)
Non-Hispanic White	2.4	(2.3, 2.5)	2.6	(2.6, 2.7)	2.6	(2.5, 2.6)

[a]Due to smaller numbers, Asian/Pacific Islander includes both Hispanic and non-Hispanic.
[b]Includes all races.

health conditions for women of different races and Hispanic ethnicity. Our analysis is limited by the data available for women from disenfranchised populations, which are subject to political, social, and cultural changes in definitions of racial and ethnicity categories and data-reporting practices.[33] Because of the smaller number of deaths that would make CIs very wide and rate estimates uninformative, and also due to data unavailability, we did not estimate values for Hispanic Black women, Asian/Pacific Islanders according to Hispanic ethnicity, or for Asian and Hispanic women according to country of origin. Black, Hispanic, and indigenous women are more likely to be under-counted and misclassified by race and ethnicity.[34–36] Breast cancer incidence and mortality for women in the US varies according to specific Asian, Central American, and South American countries of origin,[37,38] reflecting the need to better characterize the breast cancer mortality burden by subgroups within these larger racial and ethnic categories. Our study is also limited since we did not examine differences in stages at diagnosis, patterns of breast cancer care, or molecular subtypes of breast cancer across racial and ethnic subgroups; distributions of breast cancer subtypes vary across racial/ethnic subgroups and are associated with

TABLE 3. Ages and Years That Breast Cancer Peaked as a Proportion of All Causes of Death by Race/Ethnicity Among Females, 1968–2019

Year	Race/Ethnicity[a]	Age at Peak	Proportion at Peak	95% CI
1979	American Indian/Alaska Native	50	5.0	(4.2, 5.9)
	Asian/Pacific Islander	43	10.7	(9.9, 11.6)
	Hispanic	42	10.0	(9.6, 10.5)
	Non-Hispanic Black	42	7.5	(7.2, 7.8)
	Non-Hispanic White	43	13.1	(12.9, 13.4)
1999	American Indian/Alaska Native	50	5.1	(4.8, 5.5)
	Asian/Pacific Islander	49	14.2	(13.7, 14.7)
	Hispanic	49	11.1	(10.8, 11.3)
	Non-Hispanic Black	49	9.4	(9.2, 9.6)
	Non-Hispanic White	50	11.6	(11.5, 11.7)
2019	American Indian/Alaska Native	50	3.7	(3.5, 4.0)
	Asian/Pacific Islander	49	14.2	(13.8, 14.7)
	Hispanic	49	9.6	(9.4, 9.9)
	Non-Hispanic Black	49	8.7	(8.5, 9.0)
	Non-Hispanic White	50	6.9	(6.8, 7.1)
1968–2019	American Indian/Alaska Native	49 (in 1991)	5.8	(5.2, 6.5)
	Asian/Pacific Islander	45 (in 1992)	14.9	(14.2, 15.6)
	Hispanic	43 (in 1990)	12.7	(12.3, 13.1)
	Non-Hispanic Black	44 (in 1991)	10.1	(9.8, 10.4)
	Non-Hispanic White	44 (in 1989)	14.3	(14.1, 14.5)

[a]Due to smaller numbers, Asian/Pacific Islander includes both Hispanic and non-Hispanic. Hispanic includes all races.

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, which are often the result of structural racism.[15] Strategies to eliminate racial disparities in breast cancer outcomes are more likely to be effective if they consider multiple stakeholders with influence over structural factors, including clinicians, community organizations, public health departments, and healthcare institutions.[39] Furthermore, interventions and health system that redesign efforts to address structural racism and health disparities need to jointly consider both race and ethnicity.[40] Differences in health outcomes between race and ethnic groups, for example, the high percentage of triple-negative breast cancer and worse survival after breast cancer among Black as compared with White women, should not be assumed to simply reflect inherent biologic distinctions or divert resources away from addressing the structural reasons for these differences.[41]

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 been excluded from benefiting at the same pace or degree as 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 greater for non-Hispanic Black, Asian/Pacific Islander, and Hispanic women than for non-Hispanic White women for the first time in 50 years.

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