Breast Cancer Statistics, 2017, Racial Disparity in Mortality by State

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Abstract: In this article, the American Cancer Society provides an overview of female breast cancer statistics in the United States, including data on incidence, mortality, survival, and screening. Approximately 252,710 new cases of invasive breast cancer and 40,610 breast cancer deaths are expected to occur among US women in 2017. From 2005 to 2014, overall breast cancer incidence rates increased among Asian/Pacific Islander (1.7% per year), non-Hispanic black (NHB) (0.4% per year), and Hispanic (0.3% per year) women but were stable in non-Hispanic white (NHW) and American Indian/Alaska Native (AI/AN) women. The increasing trends were driven by increases in hormone receptor-positive breast cancer, which increased among all racial/ethnic groups, whereas rates of hormone receptor-negative breast cancers decreased. From 1989 to 2015, breast cancer death rates decreased by 39%, which translates to 322,600 averted breast cancer deaths in the United States. During 2006 to 2015, death rates decreased in all racial/ethnic groups, including AI/ANs. However, NHB women continued to have higher breast cancer death rates than NHW women, with rates 39% higher (mortality rate ratio [MRR], 1.39; 95% confidence interval [CI], 1.35-1.43) in NHB women in 2015, although the disparity has ceased to widen since 2011. By state, excess death rates in black women ranged from 20% in Nevada (MRR, 1.20; 95% CI, 1.01-1.42) to 66% in Louisiana (MRR, 1.66; 95% CI, 1.54, 1.79). Notably, breast cancer death rates were not significantly different in NHB and NHW women in 7 states, perhaps reflecting an elimination of disparities and/or a lack of statistical power. Improving access to care for all populations could eliminate the racial disparity in breast cancer mortality and accelerate the reduction in deaths from this malignancy nationwide. CA Cancer J Clin 2017;67:439-448. © 2017 American Cancer Society.

Keywords: breast neoplasms, health disparities, epidemiology

Introduction

Breast cancer is the most common cancer diagnosed among US women (excluding skin cancers) and is the second leading cause of cancer death among women after lung cancer. Every 2 years, the American Cancer Society describes the latest trends in breast cancer incidence, mortality, survival, and screening by race/ethnicity in the United States as well as state variations in these measures. Additional data are available from the biennial publication of *Breast Cancer Facts & Figures* (available at cancer.org/statistics).

Materials and Methods

Data Sources

Population-based cancer incidence data in the United States are collected by the National Cancer Institutes (NCI's) Surveillance, Epidemiology, and End Results (SEER) program and the Centers for Disease Control and Prevention's National Program of Cancer Registries. Long-term incidence and survival trends since 1975 by age and race were based on data from the 9 oldest SEER registries, representing 9% of the US population.[1] Beginning in 1992, data are available for Asians/Pacific Islanders (APIs), American Indians/Alaska Natives (AIs/ANs), and by Hispanic

ethnicity from the SEER 13 registries, representing 13% of the US population, and were used in analyses of incidence trends by race/ethnicity.[2] Data from the entire SEER catchment area (18 SEER registries), covering 28% of the US population, were used in analyses of breast cancer survival in the most recent time period (2007-2013).[3] Combined SEER and National Program of Cancer Registries data, as provided by the North American Association of Central Cancer Registries (NAACCR), were the source of data for projected new breast cancer cases in 2017; incidence rates by race/ethnicity, age, subtype, and state; and analyses of incidence trends by race/ethnicity and hormone receptor (HR) status during 2004 through 2014.[4,5] NAACCR data include all US states except Minnesota, New Mexico, Nevada (2010-2014 analyses), and Kansas (2004-2014 analyses), because these states failed to meet NAACCR high-quality standards for 1 or more years during these periods. Mortality data were obtained from the SEER program's SEER*-Stat database, as provided by the National Center for Health Statistics.[6] Statistics for AIs/ANs are based on data from Contract Health Service Delivery Area counties. Prevalence data on mammography by race/ethnicity and state were obtained from the 2014 Behavioral Risk Factor Surveillance System, an ongoing system of surveys conducted by the state health departments in cooperation with the Centers for Disease Control and Prevention.[7] Mammography prevalence estimates do not distinguish between examinations for screening and diagnosis.

Statistical Analyses

Estimates of the total number of invasive and in situ breast cancer cases and breast cancer deaths for 2017 were published previously.[8] Case estimates by age at diagnosis were calculated by applying the proportion of cases diagnosed in each age group during 2010 through 2014 from the NAACCR analytic file to the total number of estimated cases of invasive and in situ breast cancer in 2017. Similarly, we calculated the estimated number of breast cancer deaths

by age at death by applying the proportion of deaths that occurred in each age group during 2011 through 2015 to the total estimated breast cancer deaths in 2017.

The estimated number of female breast cancer deaths averted because of the reduction in breast cancer death rates was calculated by first estimating the number of cancer deaths that would have occurred if the death rate had remained at its 1989 level. The expected number of deaths was estimated by applying the 5-year age-specific cancer death rates in 1989 to the corresponding age-specific female populations from 1990 through 2015. The total number of breast cancer deaths averted was the sum of the difference between the expected number and recorded cancer deaths in each age group and calendar year.

By using an approach similar to that of Anderson et al,[9] we imputed missing data on estrogen receptor (ER) and progesterone receptor (PR) status, assuming that ER and PR status were missing at random and were conditional on year of diagnosis, age, race/ethnicity, and ER/PR status. Specifically, 2-step imputation was performed based on the joint distribution of ER (positive, negative, and missing) and PR (positive, negative, and missing) status. In the first step, those cases with missing ER or PR (not both) status were allocated to ER/PR positive and negative groups according to the distribution of known ER/PR status in each year, age, race/ethnicity, and ER/PR group. In the second step, those cases with both ER and PR status missing were allocated to HR-positive (either ER-positive or PR-positive) and HR-negative (both ER-negative and PR-negative) groups according to the updated distribution of HR status obtained in step 1.

All incidence and death rates were age-standardized to the 2000 US standard population and expressed per 100,000 persons, as calculated by the NCI's SEER*Stat software (version 8.3.4).[10] We examined incidence and mortality trends using the Joinpoint regression program to calculate the average annual percent change.[11] All incidence trends were adjusted for delays in reporting based on SEER delay factors to account for the additional time required for the complete registration

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TABLE 1. Estimated New Female Breast Cancer Cases and Deaths by Age: United States, 2017[a]

AGE, Y	IN SITU CASES		INVASIVE CASES		DEATHS	
	NO.	%	NO.	%	NO.	%
<40	1,610	3%	11,160	4%	990	2%
40-49	12,440	20%	36,920	15%	3,480	9%
50-59	17,680	28%	58,620	23%	7,590	19%
60-69	17,550	28%	68,070	27%	9,420	23%
70-79	10,370	16%	47,860	19%	8,220	20%
80+	3,760	6%	30,080	12%	10,910	27%
All ages	63,410		252,710		40,610	

[a]Estimates are rounded to the nearest 10. Percentages may not sum to 100 due to rounding.

Source: American Cancer Society, Surveillance Research, 2017

TABLE 2. Age-Specific Probabilities of Developing Invasive Breast Cancer for US Women

CURRENT AGE	10-YEAR PROBABILITY:[a]	OR 1 IN:
20	0.1%	1,567
30	0.5%	220
40	1.5%	68
50	2.3%	43
60	3.4%	29
70	3.9%	25
Lifetime risk	12.4%	8

[a]Probability is among those free of cancer at the beginning of each age interval based on patients diagnosed from 2012 through 2014. Percentages and "1 in " numbers may not be numerically equivalent because of rounding.
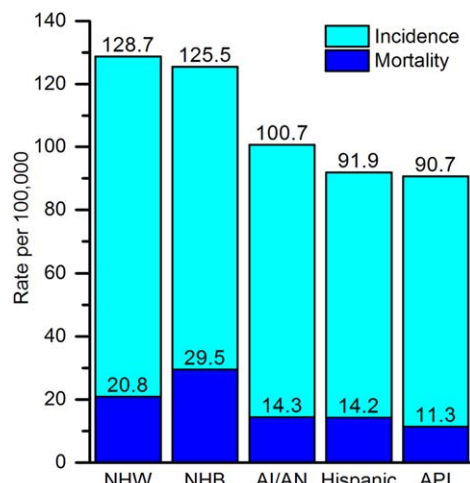

FIGURE 1. Female Breast Cancer Incidence (2010-2014) and Mortality (2011-2015) Rates by Race/Ethnicity, United States.
Rates are age adjusted to the 2000 US standard population.
AI/AN, American Indian/Alaska Native; API, Asian/Pacific Islander; NHB, non-Hispanic black; NHW, non-Hispanic white.
Sources: Incidence: North American Association of Central Cancer Registries, 2017; Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, 2017.

of cases. Probabilities of developing breast cancer were calculated using the NCI's DevCan software (version 6.7.5).[12]

Selected Findings

Estimated Cases and Deaths in 2017

Approximately 252,710 new cases of invasive breast cancer and 63,410 cases of in situ breast carcinoma are expected to be diagnosed among US women in 2017 (Table 1). In addition, 40,610 women are expected to die from this disease in 2017. Eighty-one percent of breast cancers are diagnosed among women ages 50 years and older, and 89% of breast cancer deaths occur in this age group. The median age at diagnosis for women with breast cancer is 62 years; the median age at diagnosis is younger for black women (59 years) than for white women (63 years). The median age at breast cancer death is 68 years overall (70 years for white women and 62 years for black women).[13]

Probability of Developing Invasive Female Breast Cancer

A woman living in the United States has a 12.4%, or a 1 in 8, lifetime risk of being diagnosed with breast cancer (Table 2). Lifetime risk reflects an average woman's risk over an entire lifetime, taking into account the possibility that she may die from another cause before she would have been diagnosed with breast cancer, and does not apply only to women who live to a very old age. Age-specific probabilities
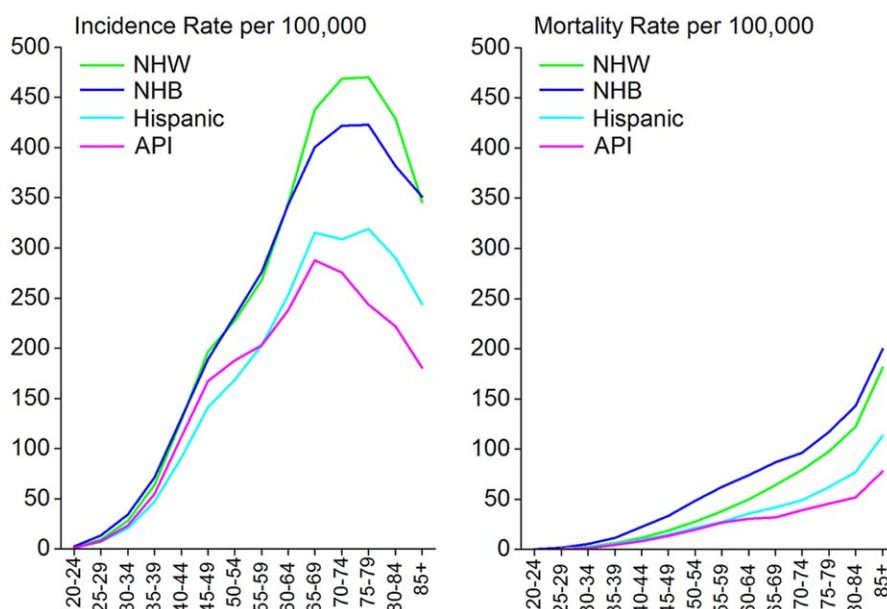

FIGURE 2. Age-Specific Female Breast Cancer Incidence (2010-2014) and Mortality (2011-2015) Rates by Race/Ethnicity.
Rates are age adjusted to the 2000 US standard population. API, Asian/Pacific Islander; NHB, non-Hispanic black; NHW, non-Hispanic white.
Sources: Incidence: North American Association of Central Cancer Registries, 2017; Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, 2017.

for developing cancer over a 10-year period are also provided in Table 2. For example, the risk for a 50-year-old, cancer-free woman being diagnosed with breast cancer over the next 10 years is 2.3%. Equivalently, 1 in 43 cancer-free women who are 50 years old will be diagnosed with breast cancer by the age of 60 years.

Cancer Occurrence in the Most Recent Time Period

Incidence and mortality rates

Female breast cancer incidence and mortality rates vary substantially by race/ethnicity in the United States (Fig. 1). Non-Hispanic white (NHW) and non-Hispanic black (NHB) women have higher breast cancer incidence and death rates than women of other race/ethnicities; API women have the lowest incidence and death rates. Although the overall breast cancer incidence rate during 2010 through 2014 was slightly (2%) lower in NHB women (125.5 per 100,000) than in NHW women (128.7 per 100,000), the breast cancer death rate during 2011 through 2015 was 42% higher in NHB women (29.5 per 100,000) than in NHW women (20.8 per 100,000). Racial differences in breast cancer incidence rates vary by age (Fig. 2). Compared with NHW women, NHB women have higher breast cancer incidence rates before age 40 years but lower rates at ages 65 to 84 years. NHB women are more likely to die from breast cancer at every age.

Figure 3 shows racial/ethnic variation in incidence rates by breast cancer subtype. Gene expression profiling techniques have allowed researchers to identify at least 5 different molecular subtypes (luminal A, luminal B, human epidermal
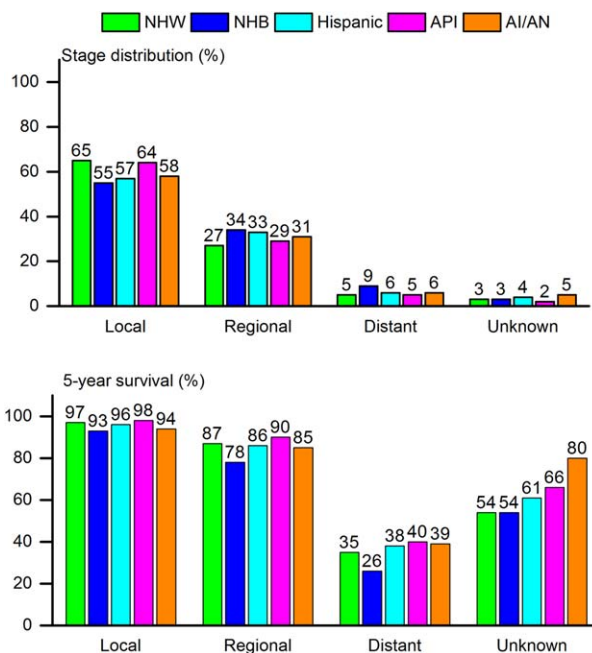
FIGURE 4. Breast Cancer Stage Distribution and 5-Year Cause-Specific Survival by Race/Ethnicity.
Note that patients were diagnosed from 2007 to 2013 and were followed through 2014. AI/AN, American Indian/Alaska Native; API, Asian/Pacific Islander; NHB, non-Hispanic black; NHW, non-Hispanic white.
Sources: Stage Distribution: North American Association of Central Cancer Registries, 2017; Survival: Surveillance, Epidemiology, and End Results program.

growth factor receptor 2 [HER2] overexpression, basal, and normal-like tumors), which are biologically variable in presentation, response to treatment, and outcomes and may be associated with distinct etiology.[14,15] These molecular subtypes are approximated using routinely evaluated immunohistochemical markers, including the presence or absence of HRs (ER or PR); (HR-positive/HR-negative) and expression of the HER2 (HER2-positive/HER2 negative) protein.[16] The HR-positive/HER2 negative (luminal A) breast cancers are the most common subtype in each racial/ethnic group; however, rates range from 53 cases per 100,000 in Hispanics to 82 cases per 100,000 in NHW. Lower overall breast cancer incidence rates in AI/AN, Hispanic, and API women are primarily driven by lower rates of the HR-positive/HER2-negative subtype. In contrast, incidence rates for triple-negative breast cancers (HR-negative/HER2-negative), most of which are the basal subtype, are twice as high in NHB women (24 per 100,000) compared with NHW women (12 per 100,000), which is the racial/ethnic group with the second highest rate. Importantly, studies suggest that the distribution of breast cancer subtypes may also vary within the broad racial/ethnic groups described here. For example, although overall rates of HR-negative/HER2-positive breast cancers in API women are similar to the rates in other groups, an analysis of California women by Asian ethnic subgroup reported that Korean, Filipina, Chinese, and Southeast Asian women had a higher risk of HR-negative/HER2-positive
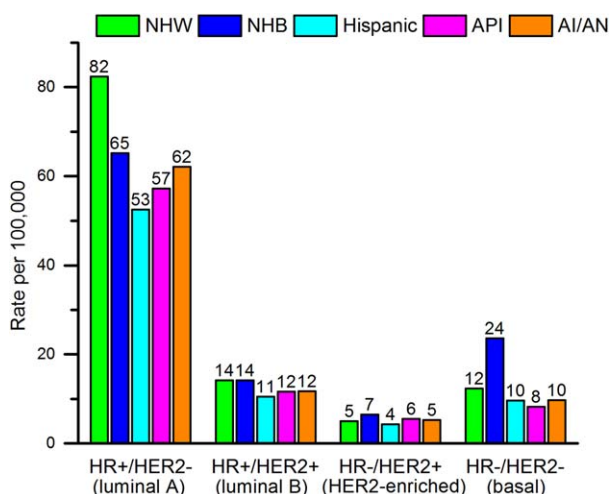

FIGURE 3. Female Breast Cancer Incidence Rates by Subtype and Race/Ethnicity, 2010 to 2014.
Rates are age adjusted to the 2000 US standard population. −, negative; +, positive; AI/AN, American Indian/Alaska Native; API, Asian/Pacific Islander; HER2, human epidermal growth factor receptor 2; HR, hormone receptor (estrogen and progesterone receptors); NHB, non-Hispanic black; NHW, non-Hispanic white.
Source: North American Association of Central Cancer Registries, 2017.

breast cancers compared with NHW women, whereas Japanese and American Indian women had lower risk for this subtype.[17] Racial and ethnic differences in breast cancer subtypes may reflect variation in the prevalence of breast cancer risk factors, particularly reproductive factors, which are most strongly associated with HR-positive breast cancers[15,18] but also appear to reflect ancestry-related genetic variations.[19–21]

Stage distribution and survival

Racial and ethnic variations in breast cancer stage at diagnosis and 5-year cause specific survival are shown in Figure 4. NHW and API women have the highest proportions of localized breast cancers (range, 65%-67%) and the lowest proportions of regional (range, 27%-30%) stage disease. In contrast, NHB and Hispanic women have lower proportions of localized breast cancers (range, 57%-59%) and higher proportions of regional (35%) stage disease. Distant-stage disease represented 9% of diagnoses among NHB women, compared with 5% to 6% of diagnoses in other racial/ethnic groups.

Cause-specific survival (ie, the probability of not dying of breast cancer within a specified number of years after diagnosis) is used instead of relative survival to describe survival in racial and ethnic minorities, because reliable estimates of life expectancy are not available for some racial/ethnic groups. For each known stage of disease, 5-year breast cancer survival is highest for API women and lowest for NHB women (Fig. 4). Racial/ethnic differences in survival in part reflect the variation in the distribution of breast cancer subtypes (Fig. 3).

Temporal Trends

Incidence

Much of the historic increase in breast cancer incidence rates reflect changes in reproductive patterns, such as delayed childbearing and having fewer children, which are recognized risk factors for breast cancer.[22,23] Incidence rates

FIGURE 6. Trends in Female Breast Cancer Incidence Rates by Race/Ethnicity, United States.

Rates are per 100,000 females, age adjusted to the 2000 US standard population, and adjusted for reporting delay. Rates for Hispanics and Asians/Pacific Islanders (APIs) are 3-year moving averages. Data are not shown for American Indians/Alaska Natives because the rates were unstable, reflecting small case numbers. For Hispanics, incidence data do not include cases from the Alaska Native Registry.
Source: Surveillance, Epidemiology, and End Results program.

of in situ and invasive breast cancer rose rapidly during the 1980s and 1990s (Fig. 5), largely because of increased use of mammography screening in the United States. The widespread uptake of mammography screening inflated the incidence rate, because cancers were being diagnosed 1 to 3 years earlier than they would have been in the absence of screening, and screening also may have led to the detection of indolent cases. Invasive breast cancer rates stabilized between 1987 and 1994, followed by a slower increase
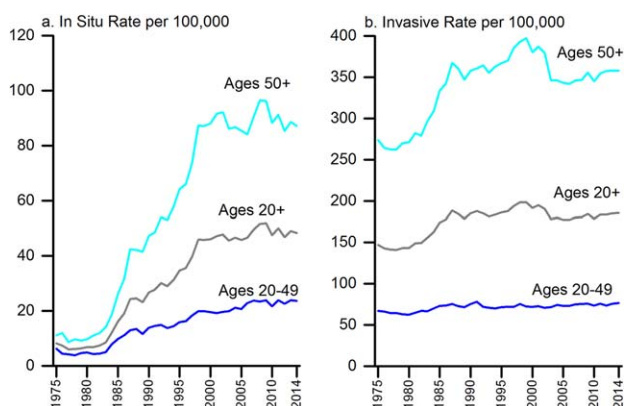

FIGURE 5. Trends in Female Breast Cancer Incidence Rates by Age: United States, 1975 to 2014.

Rates are per 100,000 females and are age adjusted to the 2000 US standard population. Invasive incidence rates were adjusted for reporting delay. Source: Surveillance, Epidemiology, and End Results program.
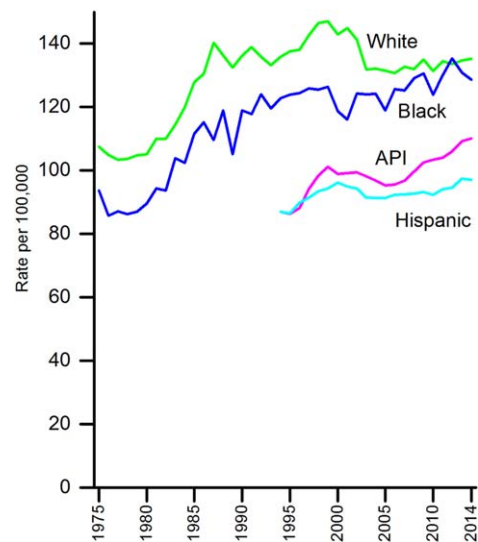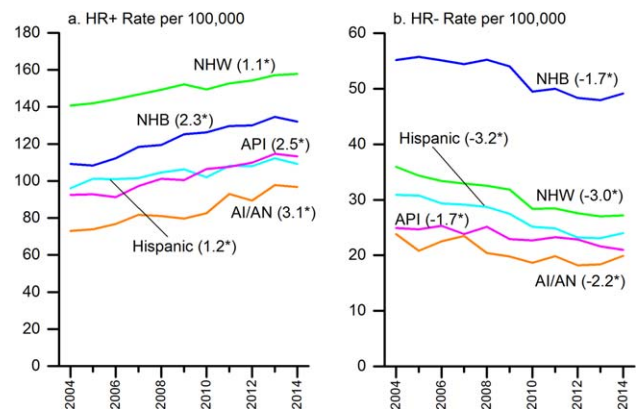

FIGURE 7. Trends in Female Breast Cancer Incidence Rates by Hormone Receptor Status and Race/Ethnicity: United States, 2004 to 2014.

Rates are per 100,000 females, age adjusted to the 2000 US standard population, and adjusted for reporting delay. Average annual percent change (AAPC) during 2004 to 2014 shown in parentheses. *Indicates AAPC is significantly different from zero, $P < 0.05$. AI/AN, American Indian/Alaska Native; API, Asian/Pacific Islander; HR, hormone receptor (estrogen and progesterone receptors); NHB, non-Hispanic black; NHW, non-Hispanic white. Source: North American Association of Central Cancer Registries, 2017.
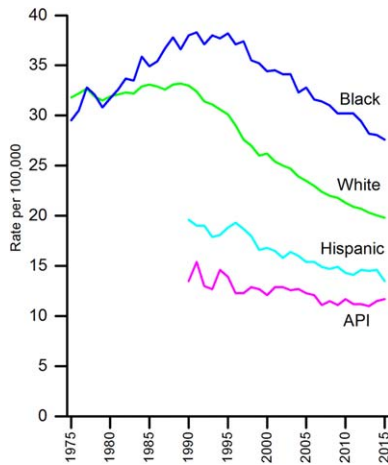
FIGURE 8. Trends in Female Breast Cancer Mortality Rates by Race/Ethnicity, United States.
Rates are per 100,000 females and are age adjusted to the 2000 US standard population. Data are not shown for American Indians/Alaska Natives because of unstable rates, reflecting small numbers of deaths. API, Asian/Pacific Islander. Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2017.

during the late 1990s. The continued increase particularly among older women may reflect rising rates of obesity and the use of menopausal hormones, both of which increase the risk of postmenopausal breast cancer, as well as further increases in the prevalence of mammography screening.[24] Around the year 2000, incidence rates began to decline among women ages 50 years and older; and, between 2002 and 2003, breast cancer rates decreased nearly 7%, likely because of the decreased use of menopausal hormones after publication of the Women's Health Initiative randomized

trial results linking the use of estrogen plus progesterone menopausal hormone therapy to breast cancer and heart disease.[25–27] The decline occurred primarily in white women and in those who had HR-positive disease.[26,28] The drop in incidence may also reflect in part the small declines in mammography screening since 2000. The percentage of women aged 40 years and older who reported having a mammogram within the past 2 years increased from 29% in 1987 to 70% in 2000 and dropped to 64% in 2015.[29]

Trends in breast cancer incidence rates by race/ethnicity are shown in Figure 6. During 2005 through 2014 (the most recent 10 years of data available), overall breast cancer incidence rates increased among API (1.7% per year), NHB (0.4% per year), and Hispanic (0.3% per year) women but were stable among NHW and AI/AN women. Incidence rates for AI/AN women are less stable than for other racial and ethnic groups, because high-quality data for this group are only available from limited geographic areas. We further examined breast cancer incidence trends by HR status for the 5 major US racial/ethnic groups during 2004 through 2014 (Fig. 7). In all racial/ethnic groups, incidence rates increased for HR-positive (ER-positive or PR-positive) breast cancers and decreased for HR-negative tumors.

Mortality

Overall breast cancer death rates increased by 0.4% per year from 1975 to 1989 but since have decreased rapidly, for a total decline of 39% through 2015. As a result of this decline, 322,600 breast cancer deaths have been averted in
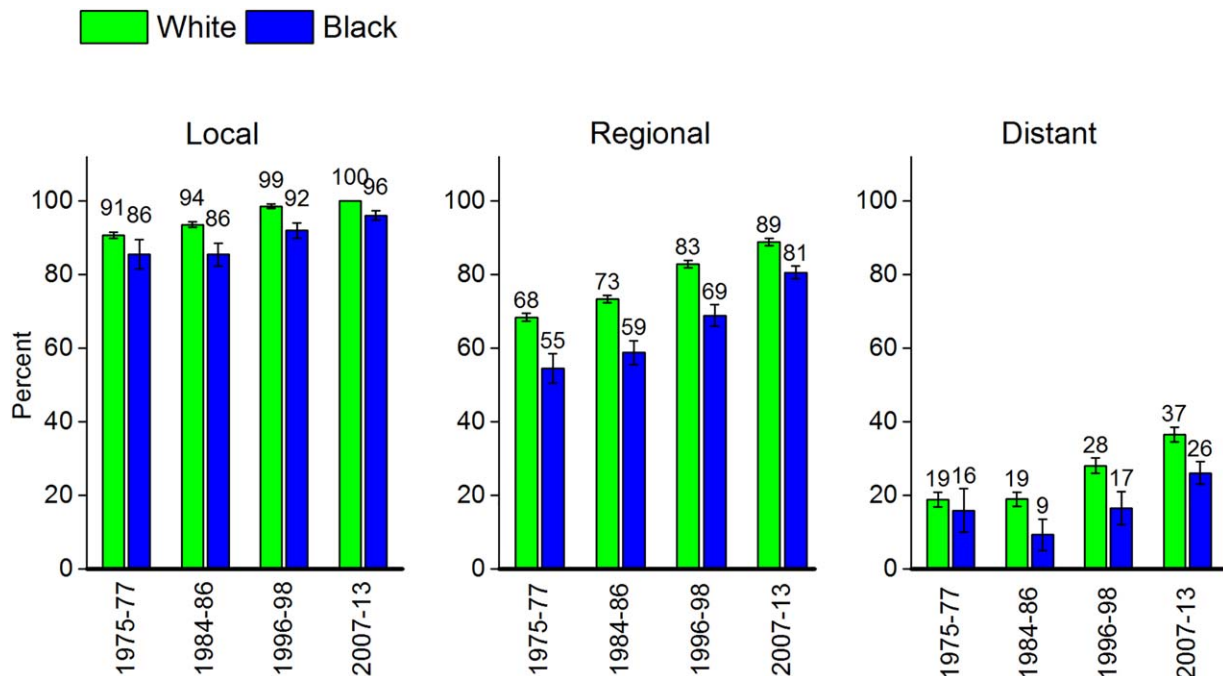

FIGURE 9. Trends in 5-Year Breast Cancer Relative Survival (%) by Race and Stage at Diagnosis (1975-1977 to 2007-2013).
Source: Surveillance, Epidemiology, and End Results program.

TABLE 3. State Variation in Female Breast Cancer Incidence and Mortality Rates and Mammography Use by Race/Ethnicity

STATE	NON-HISPANIC WHITE				NON-HISPANIC BLACK				BLACK:WHITE RATE RATIO	
	MAMMOGRAM IN PAST 2 YEARS: AGES ≥40 Y, 2014	INCIDENCE 2010-2014		MORTALITY RATE 2011-2015	MAMMOGRAM IN PAST 2 YEARS: AGES ≥40 Y, 2014	INCIDENCE 2010-2014		MORTALITY RATE 2011-2015	INCIDENCE 2010-2014	MORTALITY 2011-2015
		% IN SITU	INVASIVE OVERALL RATE			% IN SITU	INVASIVE OVERALL RATE			
Alabama	71	18%	118.2	20.0	80	18%	124.9	28.5	1.06*	1.42*
Alaska	62	22%	125.9	20.0	†	†	133.7	†	1.06	†
Arizona	72	18%	120.5	20.3	74	20%	107.8	26.2	0.89*	1.29*
Arkansas	65	18%	110.5	20.5	66	19%	114.2	30.3	1.03	1.48*
California	77	18%	139.0	23.1	89	19%	129.0	31.9	0.93*	1.38*
Colorado	69	19%	127.1	19.3	86	19%	119.1	25.5	0.94	1.32*
Connecticut	80	23%	143.3	18.9	82	26%	122.9	20.8	0.86*	1.10
Delaware	80	22%	135.8	21.2	78	25%	130.6	26.0	0.96	1.22
Dist. of Columbia	72	24%	157.6	22.6	79	21%	141.6	34.4	0.90*	1.52*
Florida	74	18%	121.3	20.1	79	20%	108.3	25.8	0.89*	1.29*
Georgia	73	19%	125.2	20.1	81	20%	126.3	29.2	1.01	1.45*
Hawaii	76	18%	143.3	21.4	†	†	120.5	†	0.84	†
Idaho	63	16%	121.9	21.3	†	†	†	†	†	†
Illinois	72	20%	135.7	22.5	79	22%	131.8	31.2	0.97*	1.39*
Indiana	67	18%	120.9	21.0	74	22%	130.6	29.6	1.08*	1.41*
Iowa	76	18%	124.7	19.3	†	24%	105.1	21.4	0.84*	1.11
Kansas	72	16%	124.4	19.9	75	19%	126.2	30.1	1.01	1.51*
Kentucky	74	17%	124.3	21.4	78	20%	127.0	28.5	1.02	1.33*
Louisiana	74	17%	121.8	20.2	77	17%	132.5	33.6	1.09*	1.66*
Maine	79	19%	126.5	18.0	†	†	†	†	†	†
Maryland	78	20%	135.2	21.2	84	22%	132.4	28.1	0.98	1.32*
Massachusetts	83	23%	141.8	19.1	75	26%	114.7	20.6	0.81*	1.08
Michigan	76	21%	122.0	21.0	80	22%	127.1	29.8	1.04*	1.42*
Minnesota	77	19%	131.5	18.8	75	19%	103.1	23.0	0.78*	1.22
Mississippi	67	17%	113.4	19.5	71	18%	121.0	31.5	1.07*	1.62*
Missouri	67	17%	126.0	21.3	77	21%	133.4	32.6	1.06*	1.53*
Montana	69	18%	122.6	20.4	†	†	†	†	†	†
Nebraska	71	17%	123.7	20.3	69	16%	127.8	27.8	1.03	1.37
Nevada	69		121.3	24.5	54		108.1	29.4	0.89*	1.20*
New Hampshire	79	20%	142.3	20.2	†	†	†	†	†	†
New Jersey	74	23%	142.3	23.0	75	22%	125.9	32.3	0.89*	1.40*
New Mexico	67	16%	123.2	21.2	†	†	98.8	32.4	0.80*	1.53*
New York	74	24%	139.6	20.2	78	24%	119.5	26.8	0.86*	1.33*
North Carolina	77	18%	130.3	19.7	78	19%	134.1	29.1	1.03*	1.48*
North Dakota	73	18%	122.2	17.5	†	†	†	†	†	†
Ohio	71	18%	123.7	22.2	82	20%	123.8	31.0	1.00	1.40*
Oklahoma	66	15%	114.8	23.0	67	16%	122.9	33.6	1.07	1.46*
Oregon	71	18%	128.5	20.8	†	25%	127.1	30.0	0.99	1.44*
Pennsylvania	73	20%	131.8	21.2	77	23%	130.8	31.7	0.99	1.49*
Rhode Island	81	21%	135.6	18.8	78	22%	113.4	26.9	0.84*	1.44
South Carolina	71	20%	128.8	20.5	77	20%	125.7	29.0	0.98	1.42*
South Dakota	75	19%	132.1	20.2	†	†	†	†	†	†
Tennessee	72	18%	121.8	20.7	78	18%	126.3	31.5	1.04	1.52*
Texas	71	17%	122.5	20.6	76	19%	120.3	30.4	0.98	1.48*
Utah	67	17%	116.8	20.9	†	†	90.3	†	0.77	†
Vermont	75	20%	130.5	19.0	†	†	†	†	†	†
Virginia	74	22%	130.0	21.0	84	22%	134.3	29.5	1.03*	1.40*
Washington	72	20%	139.3	20.9	72	25%	125.7	25.6	0.90*	1.23*
West Virginia	72	16%	115.1	22.2	71	11%	120.1	30.5	1.04	1.37*
Wisconsin	75	20%	129.1	19.8	67	23%	133.5	31.6	1.03	1.60*
Wyoming	66	15%	116.1	19.4	†	†	†	†	†	†
United States	72	19%	128.7	21.2	77	21%	125.5	30.0	0.98*	1.41*
Range	62-83	15%-24%	110.5-156.6	17.5-24.5	54-89	14%-26%	90.3-141.6	20.6-34.4	0.77-1.09	1.08-1.66

*The black:white rate ratio is significantly different from 1.00 ($P < 0.05$).

†This statistic could not be calculated; for the Behavioral Risk Factor Surveillance System (BRFSS) estimate of mammography screening, the percentage was not calculated if there were fewer than 50 respondents; for incidence and mortality, statistics were not calculated if there were 25 or fewer cases or deaths. Data on stage distribution were not available for Nevada.

All rates are per 100,000 and age-adjusted to 2000 US Standard population.

Sources: Mammography: BRFSS 2014, Centers for Disease Control and Prevention. Incidence: North American Association of Central Cancer Registries, 2017. Overall US incidence data do not include data from Minnesota, Nevada, and New Mexico. Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention.

US women through 2015. The decrease occurred in both younger and older women but has slowed among women younger than 50 years since 2007. Declines in breast cancer mortality rates have been attributed to both improvements in treatment (eg, adjuvant chemotherapy and hormonal therapy in the 1980s and targeted therapies in the 1990s) and early detection by mammography.[30,31]

Not all women have benefited equally from these improvements, as evidenced by variation in mortality trends by race/ethnicity (Fig. 8). A striking divergence in long-term breast cancer mortality trends between black and white women emerged in the early 1980s and continued to widen over the last several decades, but recent data suggest that the racial disparity may be stabilizing. The mortality gap that developed more than 30 years ago may reflect the unmasking of differences in tumor phenotype distribution between blacks and whites. Outcome improvements resulting from endocrine therapy with tamoxifen (which was approved by the US Food and Drug Administration in 1977) were being realized during that timeframe but to a lesser degree among black women because of their lower rates of HR-positive disease. In 2011, the disparity peaked with death rates 44% higher in NHBs than in NHWs (mortality rate ratio [MRR], 1.44; 95% confidence interval [CI], 1.40-1.48). The racial disparity has been relatively constant over the past several years; in 2015, breast cancer death rates were 39% higher in black women than in white women (MRR, 1.39; 95% CI, 1.35-1.43). In addition, the most recent data indicate that breast cancer mortality rates have decreased in all major racial/ethnic groups in the United States. From 2006 through 2015, breast cancer death rates declined annually by 2.6% in AI/ANs, 1.8% in NHWs, 1.5% in NHBs, 1.4% in Hispanics, and 0.9% in APIs. Notably, the decline among AI/AN women began in 2005, more than a decade later than other racial and ethnic groups.

Survival

More than 3.5 million US women with a history of breast cancer were alive on January 1, 2016.[32] Figure 9 present trends in 5-year relative survival for breast cancer by race and stage at diagnosis from 1975 through 1977 to 2007 through 2013. There were significant survival gains for each stage of disease among both black women and white women. The largest improvement in survival was for those with regional-stage disease, which increased from 68% to 89% for white women and from 55% to 81% for black women. Survival gains for distant-stage disease were larger for white women (19% to 37%) than for black women (16% to 26%). Improvements in breast cancer stage-specific survival reflect treatment advances as well as decreases in tumor size within each stage of disease.[33,34]
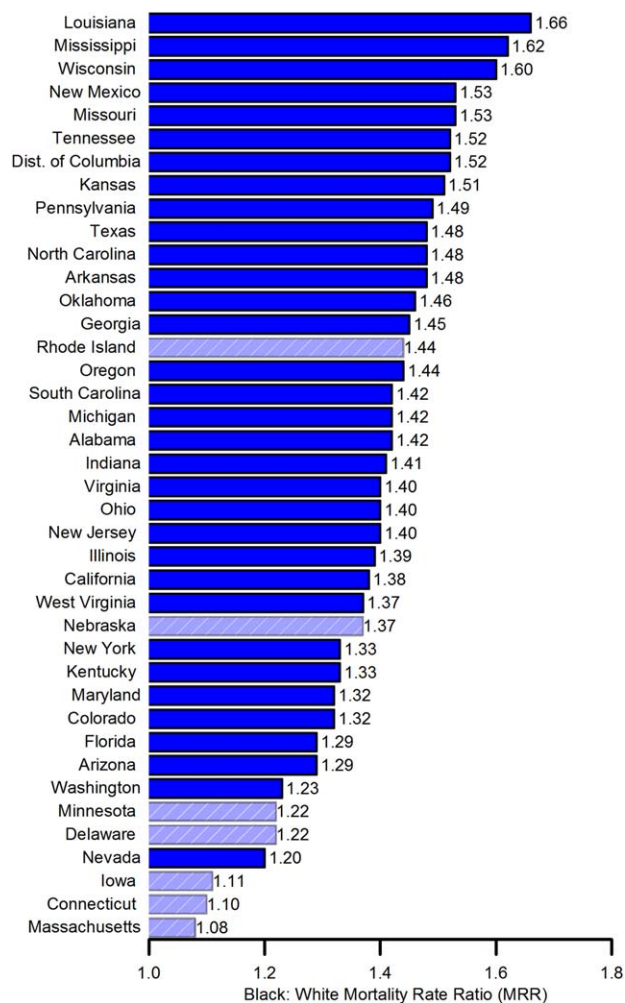

FIGURE 10. Mortality Rate Ratios Comparing Breast Cancer Deaths Rates in Black Women Versus White Women by State, 2011 to 2015.

Note: Lighter shaded bars indicate that mortality rates between black and white women were not statistically different ($P < .05$).

Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2017.

Geographic variations in incidence, mortality, and mammography

State variations in mammography screening prevalence, breast cancer incidence and mortality rates and rate ratios, and the proportion of in situ breast cancer diagnoses are presented in Table 3. In 2014, the reported rates of mammography within the past 2 years among white women ages 40 years and older ranged from 62% in Alaska to 83% in Massachusetts. Thirty-six states had sample sizes large enough to estimate the prevalence of recent mammography screening among black women ages 40 years and older, which ranged from 54% in Nevada to 89% in California.

Historically, breast cancer incidence rates were higher in white women than in black women; however, incidence rates converged for women living in the SEER 9 registry areas in 2012. Furthermore, among 43 states and the District of Columbia with data on incidence rates for both blacks and

whites, rates were significantly higher for black women living in 8 mostly Southern states (Alabama, Indiana, Louisiana, Michigan, Mississippi, Missouri, North Carolina, and Virginia) and were not significantly different in 20 other states (Table 3). In 15 states and the District of Columbia, incidence rates remained lower in NHB women compared with white women. When comparing incidence rates among states, it is important to consider that incidence rates reflect the intensity of screening as well as disease occurrence. The percentage of in situ breast cancers, an indicator of mammography utilization, varied from 15% in Wyoming and Oklahoma to 24% in the District of Columbia and New York among whites and from 11% in West Virginia to 26% in Connecticut and Massachusetts among blacks.

In every US state, breast cancer death rates are higher in NHB women than in NHW women. Breast cancer death rates ranged from 17.5 to 24.5 per 100,000 in North Dakota and Nevada, respectively, among white women and from 20.6 to 34.4 per 100,000 in Massachusetts and the District of Columbia, respectively, among NHB women. The excess death rate in blacks, as measured by the MRR, also varies widely in the United States, ranging from 20% in Nevada (MRR, 1.20; 95% CI, 1.01-1.42) to 66% in Louisiana (MRR, 1.66; 95% CI, 1.54, 1.79) (Fig. 10). Notably, in 7 states, breast cancer death rates were not statistically different between NHB and NHW women, although this may reflect a lack of statistical power (small numbers of breast cancer deaths among black women), except for Massachusetts (MRR, 1.08; 95% CI, 0.94-1.24), Connecticut (MRR,

1.10; 95% CI, 0.94-1.28), and perhaps Delaware (MRR, 1.22; 95% CI, 1.00-1.49). Furthermore, Connecticut and Massachusetts are the states with the lowest breast cancer death rates and the highest proportions of in situ diagnoses among NHB women.

Conclusion

A large body of research suggests that the black-white breast cancer disparity results from a complex interaction of biologic and nonbiologic factors, including differences in stage at diagnosis, tumor characteristics, obesity, and comorbidities as well as access, adherence, and response to treatments.[35] NHB women are disproportionately burdened with triple-negative breast cancer, an aggressive subtype associated with poorer survival.[21,36] In addition, studies have documented that racial disparities in survival are greatest for women with HR-positive/luminal breast cancers.[37–39] However, the substantial geographic variation in breast cancer death rates and trends confirms the contribution of social and structural factors.[40–43] An analysis of breast cancer mortality trends by county identified 4 US counties that achieved optimal and equitable breast cancer outcomes for black women.[42] Similar death rates among NHB and NHW women in Massachusetts, Delaware, and Connecticut likely reflect achievements in equitable access to health care in these states.[42–44] Increasing access to health care in all states can further progress the elimination of breast cancer disparities. ■

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