Trends in Breast Cancer by Race and Ethnicity: Update 2006

Carol Smigal, MPH; Ahmedin Jemal, DVM, PhD; Elizabeth Ward, PhD; Vilma Cokkinides, PhD, MSPH; Robert Smith, PhD; Holly L. Howe, PhD; Michael Thun, MD, MS

Ms. Smigal is Epidemiologist, Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA.

Dr. Jemal is Program Director, Cancer Occurrence, Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA.

Dr. Ward is Director, Surveillance Research, Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA.

Dr. Cokkinides is Program Director, Risk Factor Surveillance, Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA.

Dr. Smith is Director of Cancer Screening, American Cancer Society, Atlanta, GA.

Dr. Howe is Executive Director, North American Association of Central Cancer Registries, Springfield, IL.

Dr. Thun is Vice President, Department of Epidemiology and Surveillance Research, American Cancer Society, Atlanta, GA.

This article is available online at http://CAonline.AmCancerSoc.org

ABSTRACT In this article, the American Cancer Society (ACS) provides estimates of new breast cancer cases and deaths in 2006 and describes trends in incidence, mortality, and survival for female breast cancer in the United States. These estimates are based on incidence data from the National Cancer Institute (NCI) and the North American Association of Central Cancer Registries, which includes state data from NCI and the National Program of Cancer Registries of the Centers for Disease Control and Prevention and mortality data from the National Center for Health Statistics for the most recent years available (1975 to 2002). This article also shows trends in screening mammography. Approximately 212,920 new cases of invasive breast cancer, 61,980 in situ cases, and 40,970 deaths are expected to occur among US women in 2006. As previously reported, breast cancer incidence rates increased rapidly among women of all races from 1980 to 1987, a period when there was increasing uptake of mammography by a growing proportion of US women, and then continued to increase, but at a much slower rate, from 1987 to 2002. Trends in incidence vary by age, race, socioeconomic status, and stage. The continuing increase in incidence (all stages combined) is limited to White women age 50 and older; recent trends are stable for African American women age 50 and older and White women under age 50 years and are decreasing for African American women under age 50 years. Although incidence rates (all races combined) are substantially higher for women age 50 and older (375.0 per 100,000 females) compared with women younger than 50 years (42.5 per 100,000 females), approximately 23% of breast cancers are diagnosed in women younger than 50 years because those women represent 73% of the female population. For women age 35 and younger, age-specific incidence rates are slightly higher among African Americans compared with Whites but then cross over so that Whites have substantially higher incidence at all later ages. Among women of all races and ages, breast cancer mortality rates declined at an average rate of 2.3% per year between 1990 and 2002, a trend that reflects progress in both early detection and treatment. However, death rates in African American women remain 37% higher than in Whites, despite lower incidence rates. Although, in national surveys, approximately 70% of women age 40 years and older report having had a mammogram in the past 2 years, rates vary by race/ethnicity and are markedly lower among women with lower levels of education, without health insurance, and in recent immigrants. Furthermore, a recent study suggests that the true percentage of women having regular mammography is lower than reported in survey data. Encouraging patients age 40 years and older to have annual mammography and clinical breast exam is the single most important step that clinicians can take to reduce suffering and death from breast cancer. Clinicians should also ensure that patients at high risk of breast cancer are identified and offered appropriate referrals and treatment. Continued progress in the control of breast cancer will require sustained and increased efforts to provide high-quality screening, diagnosis, and treatment to all segments of the population. (*CA Cancer J Clin 2006;56:168–183.*) *© American Cancer Society, Inc., 2006.*

INTRODUCTION

Breast cancer is among the leading chronic conditions affecting adult women, with considerable resources devoted to research and disease control efforts, notably screening. Excluding skin cancers, breast cancer is the most common

malignancy among women, accounting for nearly one in three cancers diagnosed among women in the United States; it is the second leading cause of cancer death. In this paper, we describe trends in incidence, mortality, and survival for female breast cancer by race and ethnicity in the United States. We also examine incidence rates by age, socioeconomic status, and stage. Estimates of the number of new cases and deaths and trends in the prevalence of screening mammography are also presented. Additional data are available from the biennial publication of *Breast Cancer Facts & Figures*, available at http://www.cancer.org/statistics.

MATERIALS AND METHODS

Data Sources

Data on incidence, stage at diagnosis, and survival were obtained from the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute (NCI),[1] unless specified otherwise. The SEER program has been collecting clinical, pathological, and demographic information on cancer patients since 1973. Data are available for Whites, African Americans, and all races combined since 1973 and for American Indians/Alaska Natives, Asian Americans/Pacific Islanders, and Hispanics/Latinas since 1992. Breast cancer incidence data adjusted for reporting delay were used for the analysis of long term trends by race and age (all stages combined). Delayed reporting generally affects the most recent 1 to 3 years of incidence data (in this case, 2000 to 2002). The NCI has developed a method to account for expected reporting delays in SEER registries when long term incidence trends are analyzed.[2]

State-specific incidence rates and data for the analysis of age-specific patterns of breast cancer incidence by county poverty level were obtained from the North American Association of Central Cancer Registries (NAACCR) dataset.[3] The NAACCR dataset includes information on newly diagnosed cancer cases in the United States based on data collected by cancer registries participating in the NCI's Surveillance, Epidemiology, and End Results Program (SEER Program), the Centers for Disease Control and Prevention (CDC)'s National Program of Cancer Registries (NPCR), or both. All cancer registries are members of the North American Association of Central Cancer Registries (NAACCR). The dataset covers the period 1995 to 2002 for 38 states and the District of Columbia. Criteria for inclusion of cancer registries in the NAACCR dataset were completeness of reporting $\geq$90%, duplicative records $\leq$0.2%, internal consistency among data items, $\leq$3% unknown or missing for sex, age, and county, $\leq$5% unknown for race, $\leq$5% of all cases registered with information only from death certificates, and agreement by the registries to participate.

Mortality data were obtained from the National Center for Health Statistics (NCHS)[4] and the SEER*Stat database.[5] Beginning in 1969, data are available for Whites and African Americans. Since 1992, data are available on five racial and ethnic groups. Population data and information on county poverty levels were obtained from the US Census Bureau.[6]

The poverty rate is defined as the percentage of the population in a county below the county poverty level in the year 2000, a threshold that varies by size and age composition of the household ($17,050 for a four-person household in 2000). This measure is linked to cancer incidence data using the county of residence of the cancer patient at the time of diagnosis. The poverty rate is categorized into three levels: low ($<$10%), middle (10% to 19.9%), and high ($\geq$20%).[7] We refer to the areas with less than 10% poverty rate as "affluent" and those with a greater than or equal to 20% poverty rate as "poorer."

The prevalence of mammography by age and state was obtained from the CDC's 2004 Behavioral Risk Factor Surveillance System (BRFSS),[8] an ongoing system of surveys conducted by the state health departments in cooperation with the CDC. Data on trends in mammography screening were based on the National Health Interview Survey (NHIS).[9] All screening data are self-reported. Prevalence estimates of mammography screening were calculated using SAS and SUDAAN.[10,11]

Statistical Analyses

Estimated New Cancer Cases and Deaths

The exact number of new breast cancer cases diagnosed in the United States in the current year is unknown because the most recent year for which data are available lags 3 to 4 years from the current year. Therefore, we first estimated the number of new female breast cancer cases occurring annually in the United States from 1979 through 2002 for all races combined and from 1992 to 2002 for each racial and ethnic group. These estimates are then fit to a statistical model which forecasts the numbers of cases that are expected to occur in 2006.[12]

We estimated the number of female breast cancer deaths expected to occur in the United States in the year 2006 using the state-space prediction method.[13] Projections are based on underlying cause-of-death from death certificates as reported to the NCHS. This model projects the number of cancer deaths expected to occur in 2006 based on the number that occurred each year from 1969 to 2003 for all races combined and from 1992 to 2003 for each racial and ethnic subgroup.

Temporal Trends in Incidence, Mortality, and Survival Rates

We examined the long-term temporal trends (1975 to 2002) in breast cancer incidence and mortality rates for women of all races, Whites, and African Americans by using joinpoint regression models.[14] Age-standardized rates were based on the 2000 US standard population. We also present data stratified by age (<50 and ≥ 50 years) and stage (localized, regional, and distant). Joinpoint analysis (JPA) is a model of joined lines (straight lines on a log scale). JPA chooses a model of line segments, such that each is joined at points called a "joinpoint." Each joinpoint denotes a statistically significant change in trend. For JPA, the overall significance was set at $P = 0.05$, with a maximum of three joinpoints and four line segments allowed. An annual percent change was used to describe the trend for each line segment. In describing trends, we use the terms "increase" or "decrease" when the slope of the line segment is statistically different from zero; otherwise, we use the terms "stable" or "level." Trends in incidence and mortality rates from 1992 to 2002 for populations other than Whites and African Americans were abstracted from *SEER Cancer Statistics Review, 1975 to 2002*.[15] We computed the 5-year relative survival rate by stage and race for cases diagnosed during two time periods (1975 to 1979 and 1995 to 2001) using SEER*Stat.[16]

SELECTED FINDINGS

Expected Numbers of New Cases and Deaths

Table 1 shows the estimated number of female breast cancer cases and deaths that are expected to occur in the United States in 2006 by race and ethnicity. Approximately 212,920 new cases of invasive breast cancer and 40,970 deaths are expected among US women in 2006. In addition to invasive breast cancers, about 61,980 new diagnoses of in situ cancer are expected among US women in 2006.

Incidence Rates

Female breast cancer incidence rates vary by race/ethnicity. From 1998 to 2002, the average annual female breast cancer incidence rate was highest in White women (141.1 cases per 100,000 females), followed by African Americans (119.4), Asian Americans/Pacific Islanders (96.6), Hispanics/Latinas (89.9), and American Indians/Alaska Natives (54.8).[15] Figure 1 shows temporal trends in female breast cancer incidence rates by race and ethnicity. The increase in the incidence rate through 1987 is thought to largely reflect the increased participation in mammography screening which detects occult cases of breast cancer in a preclinical stage. Without screening, these breast cancers would not be diagnosed until at least 1 year later. Subsequently, incidence rates have continued to increase more slowly in White women (0.5% per year from 1987 to 2002), but have stabilized in African Ameri-

TABLE **1** Estimated Female Breast Cancer Cases and Deaths by Race/Ethnicity, United States, 2006

Race/Ethnicity	In Situ Cases*	Invasive Cases*	Deaths*
All Races	**61,980**	**212,920**	**40,970**
White	49,150	182,130	34,320
African American	4,700	19,620	5,670
Hispanic/Latina	2,730	12,450	1,950
Asian American/Pacific Islander	2,790	7,200	870
American Indian/Alaska Native	200	560	160

*Rounding to the nearest ten. Hispanic/Latinas are not mutually exclusive from Whites, African Americans, Asian Americans and Pacific Islanders, and American Indians and Alaska Natives.
Note: The estimates for all races combined may not equal the combined total of the estimates for each race/ethnicity because Hispanic/Latinas are not mutually exclusive from other defined racial groups and the time intervals used to estimate the number of cases/deaths for all races combined are different from the time intervals used for each racial and ethnic group.

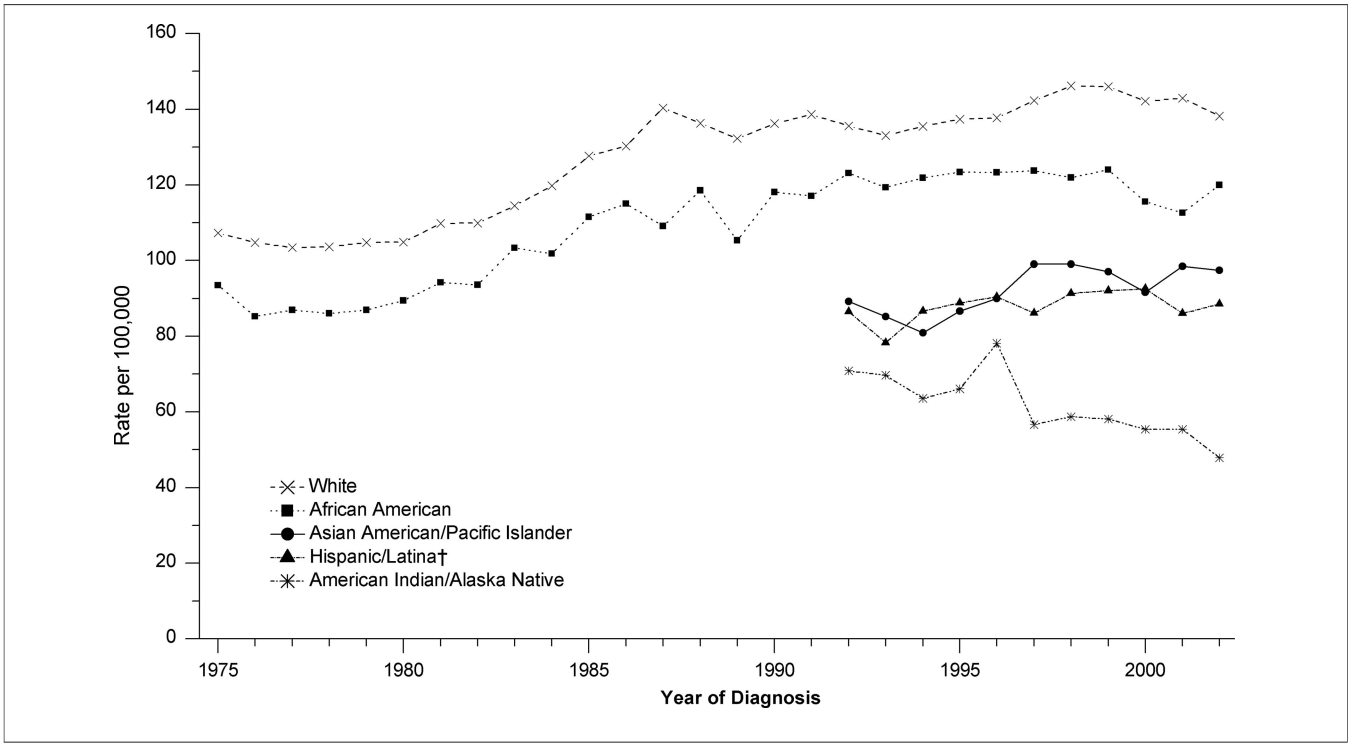

FIGURE **1** Female Breast Cancer Incidence Rates* by Race and Ethnicity, United States (SEER), 1975 to 2002.
*Rates are age-adjusted to the 2000 US Standard population.
†Incidence data do not include cases from Detroit, Hawaii, Alaska Native Registry, and rural Georgia.
Source: Surveillance, Epidemiology, and End Results Program, 1973–2002. Division of Cancer Control and Population Science, National Cancer Institute, 2005.

can women since 1992. In other racial and ethnic groups, from 1992 through 2002, rates increased among Asian Americans/Pacific Islanders (by 1.5% per year), decreased among American Indians/Alaska Natives (by 3.5% per year), and did not change significantly among Hispanics/Latinas.[15] The decrease in breast cancer among American Indian/Alaska Native women should be interpreted with caution. Cancer incidence rates among the American Indian population have been monitored more systematically in the Southwest than in other geographic regions and may not reflect the cancer experience of American Indians or Alaska Natives residing elsewhere. Moreover, trends for racial and ethnic subgroups other than Whites and African Americans are not corrected for delay in reporting.

Female breast cancer incidence trends are presented by age for White and African American women in Figure 2 and by stage in Table 2. The increase in incidence among White women since 1987 is confined to women age 50 and older; rates have been stable among African American women in this age group since 1993. Among women under age 50, breast cancer (all stages combined) incidence rates are stable in Whites since 1986 and have decreased since 1991 in African Americans. During the most recent time period, incidence rates for regional stage disease increased among White women in both age groups. A long-term increase in distant stage disease occurred in White women under age 50. Incidence rates of unstaged tumors have decreased sharply among White and African American women in all age groups (data not shown).

It is not clear why breast cancer (all stages combined) incidence rates in women age 50 and older have increased among White, but not African American, women. Although trends in risk factors that are most likely to effect recent incidence (eg, mammography use and obesity) appear to be similar between White and African American women, one possible explanation is that hormone replacement therapy (HRT) use, which has been associated with an increased risk for developing breast cancer,[17] is less common in African American than in White women.[18]

The decrease in breast cancer incidence rates in younger women (though statistically significant only in African Americans) is unexpected in view of the continued increase in age at first birth.[19] This decreasing trend in incidence, however, may in part be related to the increasing prevalence of obesity.[20] Although obesity, and more specifically weight gain, is associated with increased risk of breast cancer in postmenopausal women,[21] it is associated with decreased risk among premenopausal women.[22,23] The mechanism for reduction of breast cancer risk in premenopausal obese women is thought to be through anovulatory menstrual cycles and lower levels of circulating steroid hormones.[24]

The recent leveling-off of incidence rates for localized disease in both White and African American women age 50 and older may reflect delays in reporting new cases to cancer registries because stage-specific trends cannot be adjusted for delay in reporting. Among White women, the decrease in regional stage disease in both age groups between the mid-1980s and early 1990s likely reflects a stage shift from regional to localized disease due to the increased prevalence of screening and earlier reporting of symptomatic breast cancer. The increase in regional stage disease since 1993 may reflect more accurate classification of stage due to the introduction and increased use of more sensitive technologies for detecting lymph node metastases.[25,26] The increase among White women age 50 and older may also be related to HRT use,[27,28] which has been associated with increased risk of developing larger and more advanced breast tumors.[17] If use of HRT has contributed to the increase in regional stage disease among women over age 50, we should see a change in this trend in the near future because prescription rates for HRT fell rapidly following publication of Women's Health Initiative study results in 2002 that linked HRT use with breast cancer.[18]

The decrease in breast cancer incidence rates for distant stage disease in White women age 50 and older may reflect a shift toward earlier stage at diagnosis, whereas the long-term increase of distant stage disease in younger White women may reflect true occurrence of aggressive tumors that are less likely to be detected by screening and are more common in younger women.[29]

Figure 3 presents the pattern of incidence by age during three time periods: 1975 to 1979, 1985 to 1989, and 1998 to 2002. Before 1980, incidence rates increased continuously with age. In the intervals 1985 to 1989 and 1998 to 2002, incidence rates increased steeply, peaked at ages 75 to 79 years, and declined at age 80 and older. This shift in the peak of age-specific incidence rates probably reflects increased mammographic detection of slow growing tumors in women age 50 to 79 years and low rates of mammography screening in women age 80 and older.[30,31] Figure 3 also shows that age-specific breast cancer incidence rates among African Americans compared with Whites are higher before age 35 years, but lower at age 35 and older. The differences in age-specific rates

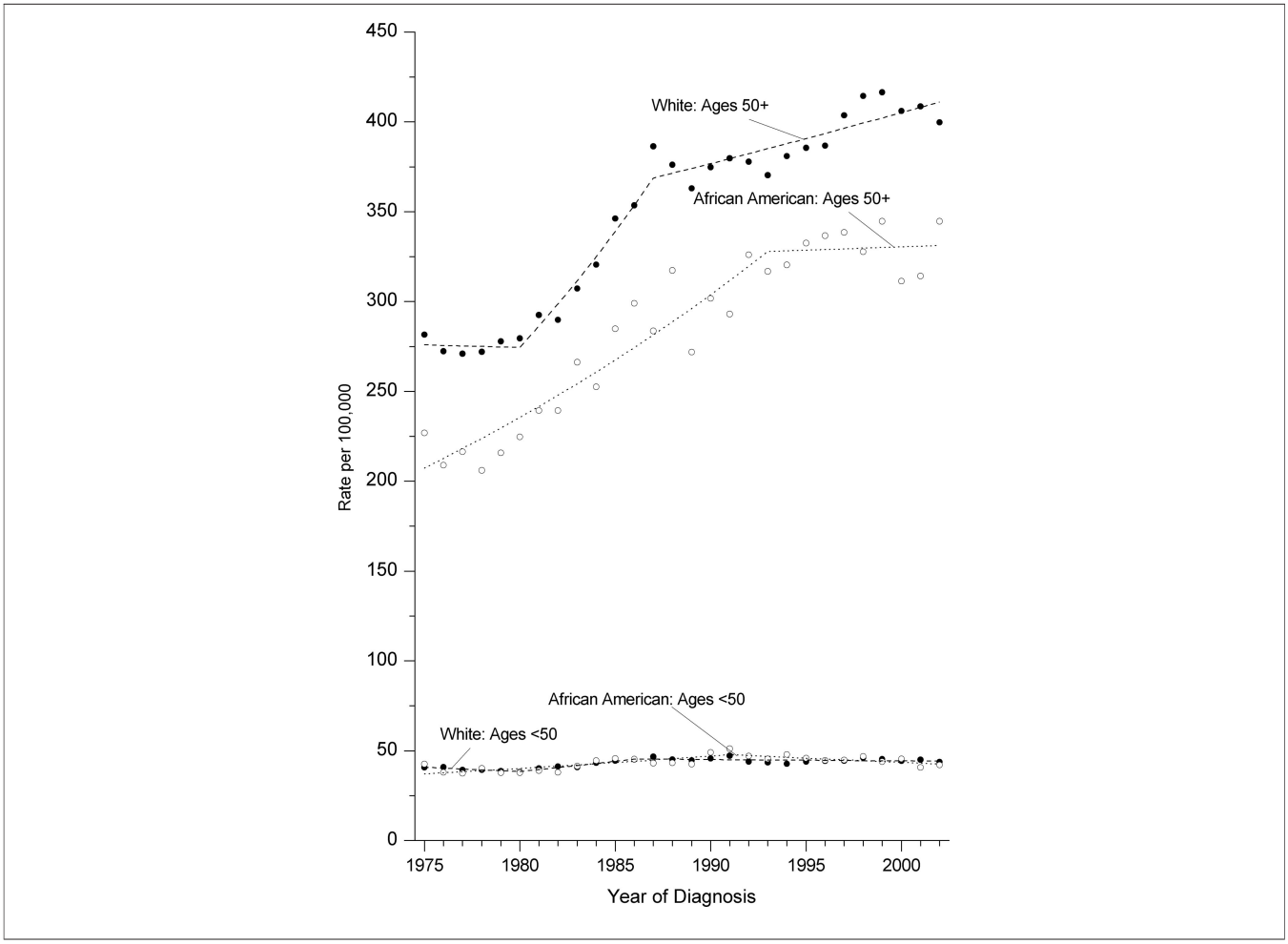

FIGURE **2** Trends in Female Breast Cancer Incidence Rates for Whites and African Americans by Age, US (SEER), 1975–2002.
*Rates are age-adjusted to the 2000 US Standard Population.
Source: Surveillance, Epidemiology, and End Results Program, 1973–2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005.

between African American and White women at younger ages have diminished over time. Although incidence rates (all races combined) are substantially higher for women age 50 and older (375.0 per 100,000 females) compared with women under age 50 (42.5 per 100,000 females), approximately 23% of breast cancers are diagnosed in women under age 50 because these women represent 73% of the female population.

Figure 4 shows age-specific breast cancer rates by race and county poverty level in the period 1998 to 2002. Incidence rates are higher for White women residing in affluent compared with poorer areas at every age: ranging from 10% higher among women age 85 and older to 24% higher for ages 60 to 64 years. Incidence rates are also higher among White than African American women irrespective of county poverty level at age 50 and older. The lowest incidence is in African American women living in poorer areas. Differences in breast cancer incidence by socioeconomic status and race may reflect differential patterns in screening,[32] as well as in risk factors such as age at first birth[19] and HRT use.[27] It should also be stressed that differences by county poverty level are only a crude indicator of socioeconomic status because of the variability of poverty levels within counties.

Although African American, Hispanic/Latina, Asian American/Pacific Islander, and American Indian/Alaska Native women have lower inci-

TABLE **2** Trends in Female Breast Cancer Incidence According to Joinpoint Analyses by Race, Age, and Stage, 1975–2002

		Trend 1		Trend 2		Trend 3		Trend 4	
	Incidence Rate 1998-2002	Years	Annual Change (%)	Years	Annual Change (%)	Years	Annual Change (%)	Years	Annual Change (%)
All races									
All ages									
All stages*	134.4	1975–1980	−0.4	1980–1987	3.7†	1987–2002	0.4†		
Localized	84.3	1975–1982	0.4	1982–1987	8.4†	1987–1998	1.5†	1998–2002	−1.4
Regional	39.9	1975–1986	1.2†	1986–1993	−3.2†	1993–2002	1.4†		
Distant	7.4	1975–2002	0.0						
White									
All ages									
All stages*	141.1	1975–1980	−0.3	1980–1987	3.8†	1987–2002	0.5†		
Localized	89.6	1975–1982	0.4	1982–1987	8.7†	1987–1999	1.4†	1999–2002	−2.0
Regional	41.3	1975–1986	1.3†	1986–1993	−3.3†	1993–2002	1.5†		
Distant	7.4	1975–2002	−0.1						
Age ≥50 years									
All stages*	397.3	1975–1980	−0.1	1980–1987	4.3†	1987–2002	0.7†		
Localized	261.5	1975–1982	0.9	1982–1987	9.9†	1987–1999	1.7†	1999–2002	−1.9
Regional	106.5	1975–1981	2.3†	1981–1987	0.0	1987–1993	−3.7†	1993–2002	1.7†
Distant	21.1	1975–2002	−0.3†						
Age <50 years									
All stages*	43.2	1975–1980	−1.2	1980–1986	2.8†	1986–2002	−0.2		
Localized	24.0	1975–1982	−0.7	1982–1987	5.5†	1987–2002	−0.1		
Regional	16.5	1975–1986	1.4†	1986–1993	−2.7†	1993–2002	1.0†		
Distant	2.2	1975–2002	0.8†						
African American									
All ages									
All stages*	119.4	1975–1992	2.3†	1992–2002	−0.1				
Localized	64.4	1975–1995	3.9†	1995–2002	−1.4				
Regional	40.5	1975–1977	−8.7	1977–1986	2.9†	1986–1989	−4.9	1989–2002	0.1
Distant	10.5	1975–2002	0.2						
Age ≥50 years									
All stages*	322.7	1975–1993	2.6†	1993–2002	0.1				
Localized	181.8	1975–1995	4.7†	1995–2002	−1.0				
Regional	101.1	1975–2002	0.0						
Distant	28.5	1975–2002	0.1						
Age <50 years									
All stages*	41.7	1975–1991	1.6†	1991–2002	−1.0†				
Localized	19.6	1975–1995	1.9†	1995–2002	−3.0†				
Regional	17.4	1975–1993	0.8†	1993–1996	−7.6	1996–2000	5.1	2000–2002	−9.1
Distant	3.6	1975–2002	0.4						

*Trends are based on incidence rates that have been adjusted for delayed reporting.
†The annual percentage change is statistically significantly different from zero (two-sided $P < 0.05$).
Annual percent change is based on rates age-adjusted to the 2000 US standard population and is determined by Joinpoint Regression Program version 3.0 (National Cancer Institute/US National Institutes of Health, Bethesda, MD).
Source: Incidence rates are based upon data from 1998 to 2002 from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program, 13 SEER areas. Trends are based upon data from 1975 to 2002 from the nine oldest SEER registries.

dence rates than Whites, they are more likely to be diagnosed at regional/distant stage, when survival rates are poorer. During the interval 1995 to 2001, the proportion of cases diagnosed at regional and distant stages combined was 43% among African American women, 43% in American Indian/Alaska Natives, 42% in Hispanic/Latinas, 34% in Asian Americans/Pacific Islanders, and 33% among White women. Factors that may contribute to later stage at diagnosis among minority women are less frequent mammography,[32] delays from time of abnormal mammographic findings to diagnostic confirmation and treatment,[33] more limited access to health care,[34] and more aggressive tumor characteristics.[35]

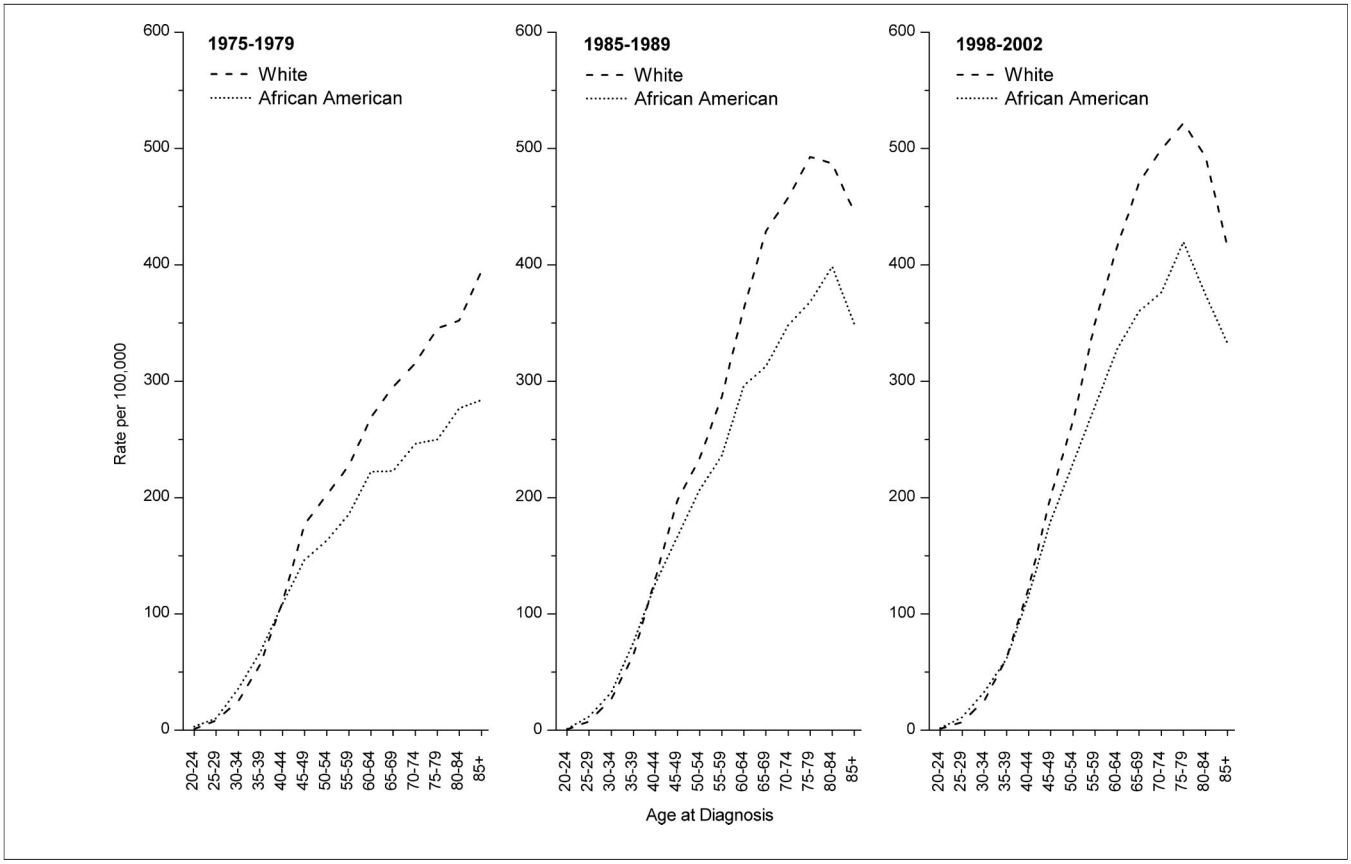

FIGURE **3** Age-Specific Breast Cancer Incidence Rates among White and African American Women during Three Time Periods, US (SEER).
Source: Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institue, 2005.

Survival

Figure 5 shows 5-year relative survival from breast cancer for White and African American females by stage for cases diagnosed during the intervals 1975 to 1979 and 1995 to 2001. Relative survival is consistently lower in African American than in White women, although it has improved over time in both, except for distant stage disease among African American women. For White women, 5-year relative survival increased from 90.7% to 98.5% for localized disease, 68.8% to 82.9% for regional stage disease, and from 18.0% to 27.7% for distant stage disease. Among African Americans, relative survival increased from 84.8% to 92.2% for localized disease, and 55.1% to 68.3% for regional stage disease, but there was minimal improvement (15.1% to 16.3%) for distant stage disease. Five-year relative survival cannot be estimated for other racial and ethnic groups due to the lack of data to estimate expected survival. However, a comparison of deaths from breast cancer among women diagnosed in SEER areas during the interval 1992 to 2000 showed increased odds of breast cancer death for Hispanic Whites (relative risk [RR] = 1.22; 95% confidence interval [CI] = 1.16-1.28), African Americans (RR = 1.75; CI = 1.68-1.82), and American Indians/Alaska Natives (RR = 1.55; CI = 1.32-1.81) relative to non-Hispanic Whites in analyses adjusted for age and tumor stage.[36]

The modest improvements in stage-specific relative survival over the last 20 years are thought to result from a combination of advances in treatment (adjuvant chemotherapy, radiation, hormonal, and targeted therapies), better characterization of prognostic factors, and a shift toward smaller tumor sizes within stage groups.[37] Not all segments of the popu-

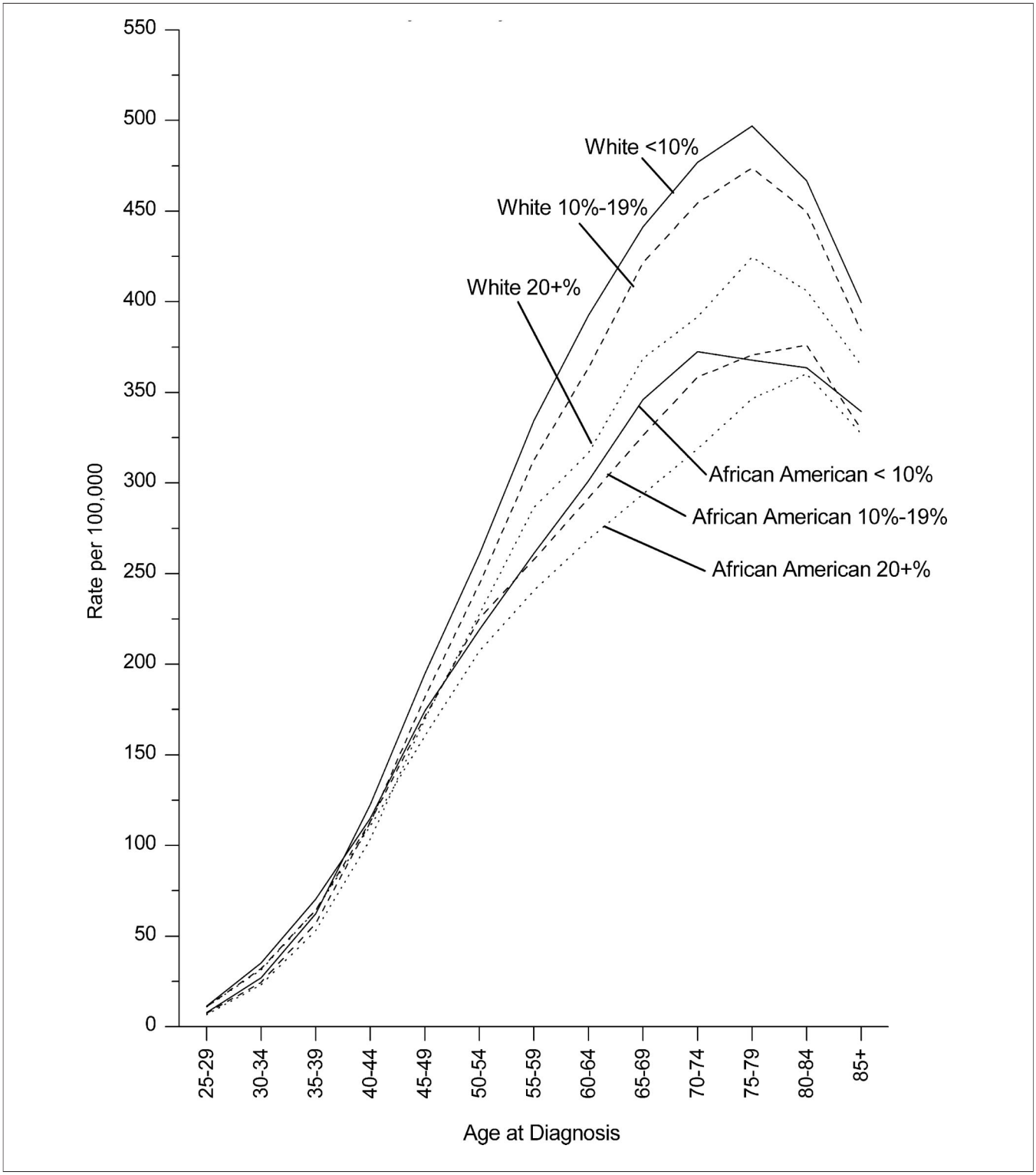

FIGURE **4** Age-Specific Female Breast Cancer Incidence Rates by Race and County Poverty Level*, US, 1998–2002.
*The poverty level is defined as the percentage of the population in a county below the poverty level in the year 2000.
Source: SEER and NPCR areas reported by North American Association of Central Cancer Registries (NAACCR). Georgia, Maryland, and New Hampshire statistics are based on data for 1999–2002.

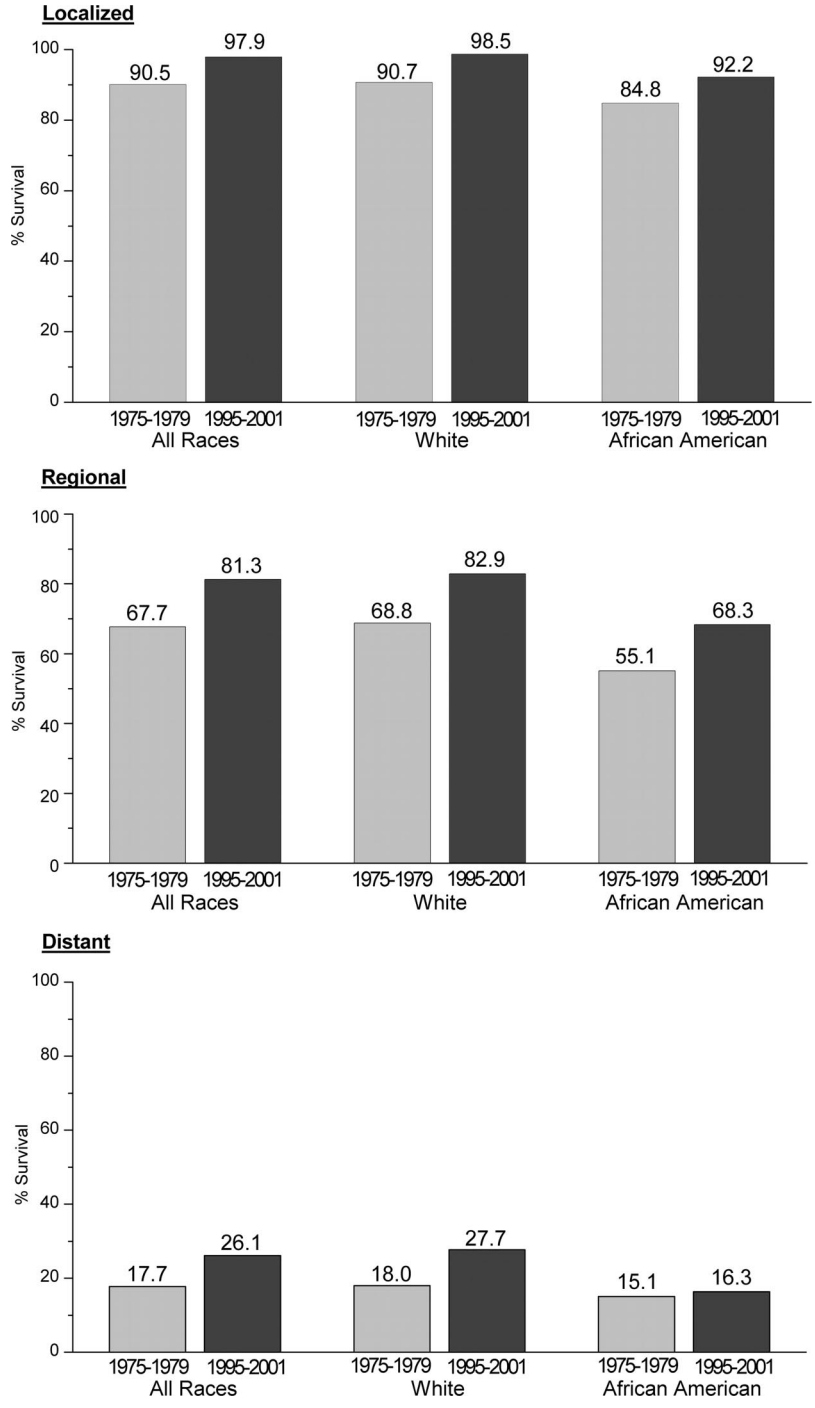

FIGURE **5** Female Breast Cancer: Five-year Relative Survival* by Race and Stage, United States (SEER), 1975–1979 and 1995–2001.
*Survival is based on follow up of patients through 2002.
Source: Surveillance, Epidemiology, and End Results Program, 1973–2002. Division of Cancer Control and Population Science, National Cancer Institute, 2005.

lation have benefited equally from medical advances, however, as is reflected in survival and mortality disparities between White and other minority populations.

Mortality Rates

Similar to incidence rates, mortality rates vary by race and ethnicity (Figure 6). In the period 1998 to 2002, the average annual female breast cancer death rate was highest in African Americans (34.7 cases per 100,000 females), followed by Whites (25.9), Hispanics/Latinas (16.7), American Indians/Alaska Natives (13.8), and Asian Americans/Pacific Islanders (12.7).[15] The higher death rate among African Americans, despite the lower incidence rate, is due to both later stage at diagnosis and poorer stage-specific survival.[38] Similarly, breast cancer mortality is higher in Hispanics/Latinas and American Indians/Alaska Natives than in Asian Americans/Pacific Islanders despite lower incidence.

Breast cancer death rates decreased at an average annual rate of 2.4% per year since 1990 among White women, and by 1.1% per year since 1991 among African American women (Table 3). The percentage decline was larger in younger age groups. For example, from 1990 to 2002, breast cancer death rates decreased by 3.8% per year among White women under age 50, and by 2.2% per year among those age 50 and older. From 1992 through 2002, female breast cancer death rates also decreased in Hispanics/Latinas (1.9% per year), while rates remained unchanged among Asian Americans/Pacific Islanders and American Indians/Alaska Natives.[15] The decline in breast cancer mortality since 1990 has been attributed to improvements in both early detection and treatment of breast cancer.[37,39]

The disparity in breast cancer death rates between White and African American women continues to grow. During the early 1980s, breast cancer death rates for White and African American women were approximately equal, but by 2002, African American women had a 37% higher death rate than White women. Factors that contribute to the higher death rates in African Americans may include differences in access to and utilization of detection and treatment, risk factors that are differentially distributed by race or socioeconomic status, or biologic differences associated with race. Studies have also documented unequal receipt of prompt, high-quality treatment for African American women compared with White women.[40,41] For example, African American women are less likely to receive radiation therapy following breast-conserving surgery.[42,43] An analysis of the survival experience of women with breast cancer treated in US Military health care facilities suggest that the disparity in breast cancer survival between African American and White women could be reduced by 70% by providing equal treatment to all women.[44] With respect to biologic differences, previous studies show that breast cancer is often more aggressive in African American women compared with White women.[35,45]

Trends in Mammography Utilization

According to data from the NHIS, utilization of screening mammography has increased greatly among White and African American women of all ages since 1987 (Table 4). Among White women, the percentage of women age 40 and older who reported having had a mammogram within the past 2 years increased from 30% in 1987 to 71% in 2003. Similarly, during 1987 to 2003, the prevalence of mammography usage among African American women increased from 24% to 70%, respectively. Although current overall usage of mammography is similar among White and African American women, usage remains lower in women of other racial and ethnic groups.[46] Women with less than a high school education, without health insurance coverage, or who are recent immigrants to the United States are even less likely to have had a recent mammogram.[46]

Variation by State

Variation by state in mammography screening prevalence, breast cancer incidence and mortality rates, and the proportion of breast

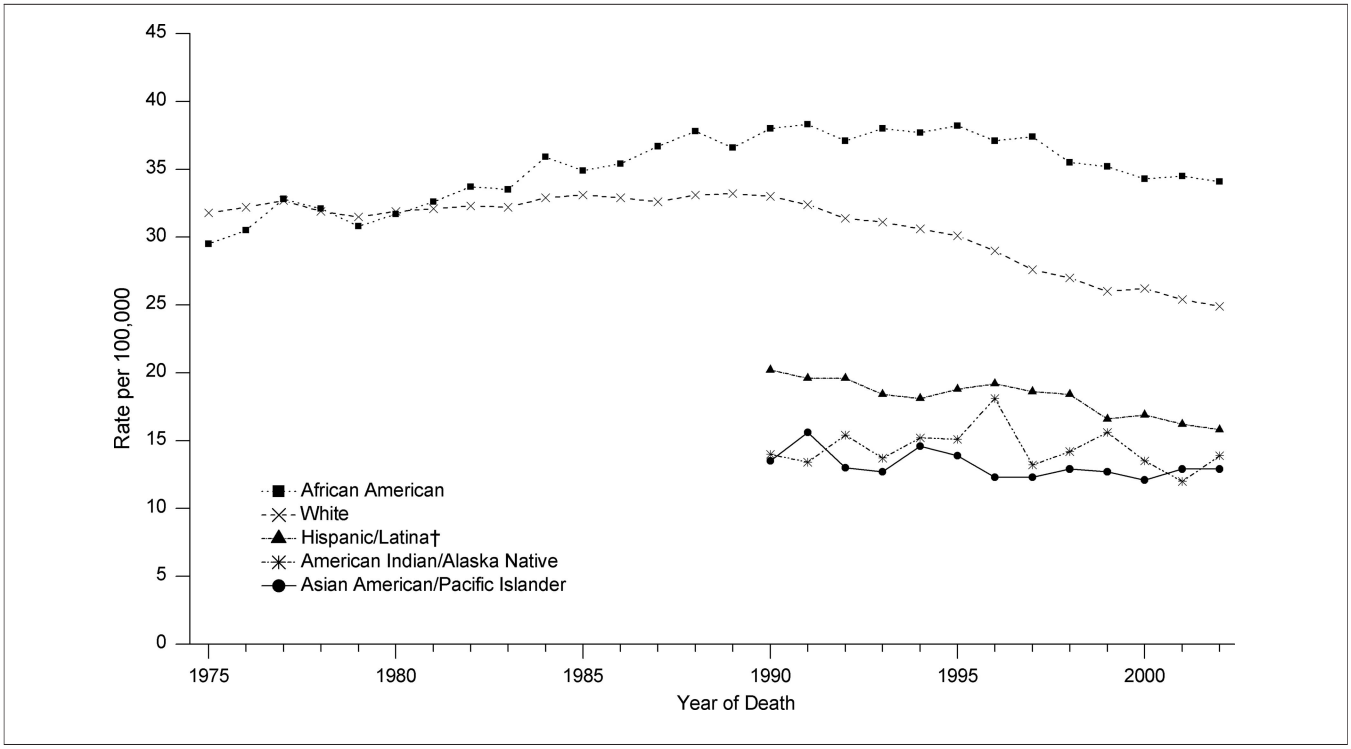

FIGURE **6** Female Breast Cancer Death Rates* by Race and Ethnicity, United States, 1975 to 2002.
*Rates are age-adjusted to the 2000 US Standard Population.
†Information is included for all states except Connecticut, Maine, Maryland, Minnesota, New Hampshire, New York, North Dakota, Oklahoma, and Vermont.
Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

TABLE **3** Trends in Female Breast Cancer Death Rates According to Joinpoint Analyses by Race and Age, United States, 1975-2002

	Trend 1		Trend 2	
	Years	**Annual % Change**	**Years**	**Annual % Change**
All races				
All ages	1975–1990	0.4*	1990–2002	−2.3*
Ages ≥50	1975–1990	0.6*	1990–2002	−2.0*
Ages <50	1975–1990	−0.3*	1990–2002	−3.3*
White				
All ages	1975–1990	0.3*	1990–2002	−2.4*
Ages ≥50	1975–1990	0.5*	1990–2002	−2.2*
Ages <50	1975–1990	−0.6*	1990–2002	−3.8*
African American				
All ages	1975–1991	1.6*	1991–2002	−1.1*
Ages ≥50	1975–1993	1.6*	1993–2002	−1.2*
Ages <50	1975–1988	1.7*	1988–2002	−1.9*

*The annual percent change is statistically significantly different from zero (two-sided $P < 0.05$).
Annual percent change is based on rates age-adjusted to the 2000 US standard population and is determined by Joinpoint Regression Program version 3.0 (National Cancer Institute, Bethesda, MD).
Source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

TABLE 4 Use of Mammography* among Non-Hispanic White and African American (AA) Women by Age, United States, Selected Years 1987-2003

	≥40 years		40-49 years		50-64 years		≥65 years	
Year	White	AA	White	AA	White	AA	White	AA
1987	30.3	23.8	34.3	27.8	33.6	26.4	24.0	14.1
1990	52.7	46.0	57.0	48.4	58.1	48.4	43.8	39.7
1991	56.0	47.7	58.1	48.0	61.5	52.4	49.1	41.6
1993	60.6	59.2	61.6	55.6	66.2	65.5	54.7	56.3
1994	61.3	64.4	62.0	67.2	67.5	63.6	54.9	61.0
1998	68.0	66.0	64.4	65.0	75.3	71.2	64.3	60.6
1999	71.1	71.0	68.3	69.2	77.9	75.0	66.8	68.1
2000	72.1	67.9	67.1	60.9	80.5	77.7	68.3	65.5
2003	70.7	70.4	65.5	68.3	77.3	76.7	68.3	65.7

*Percent of women having a mammogram within the past 2 years.
Source: National Health Interview Survey, National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention. Data for 1987 to 2000 was previously published in Health, United States, 2004. Data for 2003 are preliminary estimates and subject to adjustment based on official statistics released by NCHS.

cancers diagnosed as in situ and regional/distant is presented in Table 5. Among White women, breast cancer incidence rates range from 118.7 per 100,000 females in West Virginia to 163.9 in the District of Columbia. The percentage of in situ breast cancers, an indicator of mammography utilization, varied from 12.4% in North Dakota to 23.8% in Massachusetts among Whites and 9.5% in Nevada to 22.5% in Michigan among African Americans. Breast cancer incidence rates among African American women range from 76.6 per 100,000 females in Utah to 143.2 in Alaska. When comparing incidence rates among states, it is important to consider that incidence rates reflect the intensity of screening as well as disease occurrence.

Breast cancer death rates among White women range from 22.7 in Arkansas to 29.5 in New Jersey. In contrast, breast cancer death rates among African American women range from 25.6 in Massachusetts to 42.0 in New Mexico. Although breast cancer mortality rates continue to be higher in the Northeast compared with other regions in the United States (particularly the South), there has been an attenuation in the geographic variation because of relatively less favorable trends in the South over time.[47]

The prevalence of recent mammography screening among White women age 40 and older ranged from 47.4% in Idaho to 69.7% in Delaware. Thirty-one states had sample sizes large enough to estimate the prevalence of mammography screening within the past year in African American women age 40 and older, which ranged from 46.0% in Mississippi to 72.2% in Delaware. Recent mammography screening was lower among White and African American women with no health insurance.

Carney and colleagues recently showed that rates of recent mammography utilization in the New Hampshire BRFSS significantly overestimate the proportion of women receiving regular screening.[48] Although BRFSS data provide an opportunity to measure mammography use, geographically, these data overestimate the proportion of women receiving regular mammography according to recommended guidelines.

The National Breast and Cervical Cancer Early Detection Program (NBCCEDP), created by the CDC in 1991, has provided over 5 million screening examinations to underserved women.[49] Passage of the Breast and Cervical Cancer Prevention Act of 2000 gives states the option to provide medical assistance through Medicaid to eligible women who were screened through the NBCCEDP. These programs should help reduce disparities in screening for racial and ethnic minority women; however, estimates are that current funding levels allow it to cover only 20% of eligible women.

SUMMARY

Clinicians should follow recommended screening guidelines (Table 6) and encourage their patients age 40 and older to have annual

TABLE **5** State Variation in Female Breast Cancer Incidence and Mortality Rates* and Mammography Usage by Race

	White						African American					
	Recent Mammogram, 2004†		Incidence, 1998–2002‡			Mortality, 1998–2002§	Recent Mammogram, 2004†		Incidence, 1998–2002‡			Mortality, 1998–2002§
State	Age ≥40 (%)	No health insurance (%)	In situ (%)¶	Regional/ distant (%)¶	Average Rate	Average Rate	Age ≥40 (%)	No health insurance (%)	In situ (%)¶	Regional/ distant (%)¶	Average Rate	Average Rate
Alabama	61.4	31.0	17.0	32.7	118.9	24.8	60.9	42.4	15.7	44.7	103.0	32.3
Alaska	50.8	26.9	18.6	37.9	143.0	23.9	—	—	—	—	143.2	—
Arizona	58.8	32.4	16.5	32.3	123.4	24.8	—	—	15.1	42.0	89.7	37.0
Arkansas	51.7	25.3	—	—	—	22.7	50.8	—	—	—	—	37.4
California	60.2	23.8	16.2	26.4	139.1	26.0	53.7	—	15.2	22.5	117.6	33.3
Colorado	57.2	29.0	18.0	31.9	136.6	23.5	48.4	—	18.6	39.1	99.6	30.4
Connecticut	67.0	43.7	21.9	31.4	145.5	26.2	65.7	—	21.0	37.2	116.7	31.5
Delaware	69.7	41.2	20.9	29.5	131.1	26.9	72.2	—	18.3	37.5	117.9	35.8
Dist. of Columbia	65.2	—	20.1	29.9	163.9	28.8	63.8	—	16.6	34.7	124.9	40.2
Florida	61.9	26.1	17.1	28.9	128.8	23.5	62.3	—	16.5	41.9	102.4	30.8
Georgia‡	59.8	36.8	17.8	32.9	129.7	24.1	56.7	36.3	16.6	45.0	108.7	32.0
Hawaii	—	—	17.3	28.2	154.2	25.2	—	—	—	—	85.6	—
Idaho	47.4	19.2	15.4	33.6	131.5	25.3	—	—	—	—	—	—
Illinois	59.2	28.9	17.6	33.9	134.0	27.2	66.1	—	14.9	43.1	124.1	39.0
Indiana	53.2	27.6	16.3	33.5	128.7	26.3	50.3	—	16.2	42.1	119.0	37.3
Iowa	61.0	35.2	15.3	31.6	132.0	25.3	—	—	11.9	46.0	126.9	37.8
Kansas	63.5	31.2	—	—	—	24.9	59.2	—	—	—	—	38.5
Kentucky	60.1	31.0	15.3	33.8	126.0	26.5	54.7	—	12.5	41.3	130.9	36.8
Louisiana	60.5	35.8	14.7	34.9	124.8	26.4	59.6	46.4	13.5	46.5	120.6	38.6
Maine	64.3	40.3	18.1	31.5	132.7	24.6	—	—	—	—	87.0	—
Maryland‡	63.6	36.1	18.1	27.4	133.4	26.9	64.5	—	18.3	32.9	117.8	35.1
Massachusetts	68.4	45.1	23.8	30.3	144.1	27.4	65.8	—	20.8	40.5	93.7	25.6
Michigan	63.2	30.1	19.7	30.1	133.9	25.9	63.7	—	22.5	42.4	120.6	36.0
Minnesota	65.9	—	—	—	138.7	25.4	—	—	—	—	107.8	30.0
Mississippi	51.8	26.0	—	—	—	24.0	46.0	35.3	—	—	—	36.6
Missouri	51.7	16.5	15.4	34.2	127.4	26.0	58.5	—	14.7	42.0	119.2	36.4
Montana	56.7	31.9	18.0	31.2	127.9	24.5	—	—	—	—	—	—
Nebraska	62.0	34.0	16.4	31.3	134.6	23.6	—	—	15.2	41.4	108.0	41.3
Nevada	51.2	16.4	15.6	33.7	122.6	26.9	—	—	9.5	39.5	100.2	31.3
New Hampshire‡	64.9	31.4	21.5	30.9	137.2	26.5	—	—	—	—	115.7	—
New Jersey	60.5	30.6	19.6	35.1	140.7	29.5	60.8	—	16.9	44.4	115.2	34.3
New Mexico‡	54.8	16.4	15.7	34.4	122.7	23.6	—	—	11.8	38.3	84.9	42.0
New York	61.4	36.8	18.6	30.0	133.9	28.1	56.8	—	17.6	40.2	95.3	30.6
North Carolina	63.3	35.4	—	—	—	23.8	63.5	45.4	—	—	—	35.1
North Dakota	57.5	25.3	12.4	32.9	123.8	25.9	—	—	—	—	—	—
Ohio	58.0	27.6	17.2	31.6	127.9	27.9	69.4	68.5	17.7	37.8	116.8	37.8
Oklahoma	51.7	19.0	13.7	30.6	134.3	26.2	51.4	—	13.8	44.4	120.6	39.5
Oregon	57.9	25.9	16.2	30.9	145.3	26.1	—	—	14.9	40.5	122.3	25.8
Pennsylvania	55.9	31.0	17.6	32.7	131.4	27.3	56.9	—	19.6	41.2	117.7	38.1
Rhode Island	67.5	39.1	18.3	30.4	134.1	26.8	—	—	12.3	34.4	88.2	25.8
South Carolina	55.8	33.0	16.4	30.9	127.5	24.5	57.4	44.4	16.5	43.6	108.2	35.2
South Dakota	62.0	26.5	—	—	—	24.0	—	—	—	—	—	—
Tennessee	62.8	31.4	—	—	—	25.4	66.1	—	—	—	—	34.0
Texas	52.3	21.1	—	—	—	24.4	48.4	—	—	—	—	36.0
Utah	49.6	20.7	16.1	36.7	122.2	23.6	—	—	—	—	76.6	—
Vermont	60.1	39.8	—	—	—	26.3	—	—	—	—	—	—
Virginia	59.4	24.3	—	—	—	26.0	64.1	56.8	—	—	—	37.4
Washington	55.9	20.3	17.4	33.4	150.6	24.8	50.7	—	18.5	46.3	110.1	31.9
West Virginia	58.5	31.6	16.2	31.7	118.7	25.9	—	—	11.4	40.6	118.1	38.5
Wisconsin	59.8	44.0	13.9	31.1	135.4	25.7	63.2	—	16.3	44.4	123.7	32.0
Wyoming	51.8	25.6	—	—	—	23.3	—	—	—	—	—	—
Range	47.4–69.7	16.4–45.1	12.4–23.8	26.4–37.9	118.7–163.9	22.7–29.5	46.0–72.2	35.3–68.5	9.5–22.5	22.5–46.5	76.6–143.2	25.6–42.0

Missing data means statistic could not be calculated. For Behavioral Risk Factor Surveillance System (BRFSS) estimate of mammography screening, percentage was not calculated if there were 50 or fewer respondents. For incidence, statistics were not calculated if there were six or fewer cases; for mortality, statistics were not calculated if there were 25 or fewer deaths.

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

†Recent mammogram is defined as having had a mammogram within the past year and is based on the Centers for Disease Control and Prevention (CDC)'s BRFSS data. Women with no health insurance are age 40 to 64 years.

‡Source: SEER and NPCR areas reported by North American Association of Central Cancer Registries (NAACCR) for 1998-2002. Georgia, Maryland, and New Hampshire statistics are based on data for 1999-2002. Data for New Mexico is reported by SEER.

§Source: National Center for Health Statistics, CDC, 2005.

¶Percent in situ is based on both in situ and invasive cases, whereas percent regional/distant is based on invasive cases only. Unstaged cases were included in computing percentages of in situ and regional/distant stage disease.

TABLE **6** Screening Guidelines for the Early Detection of Breast Cancer

- Yearly mammograms are recommended starting at age 40 years. The age at which screening should be stopped should be individualized by considering the potential risks and benefits of screening in the context of overall health status and longevity.
- Clinical breast exam should be a part of a periodic health exam about every 3 years for women in their 20s and 30s and every year for women age 40 and older.
- Women should know how their breasts normally feel and report any breast change promptly to their health care providers. Breast self-exam is an option for women starting in their 20s.
- Women at increased risk (eg, family history, genetic tendency, past breast cancer) should talk with their doctors about the benefits and limitations of starting mammography screening earlier, having additional tests (ie, breast ultrasound and magnetic resonance imaging), or having more frequent exams.

mammography. The increased risk of breast cancer associated with HRT use should be considered when evaluating treatment options for menopausal symptoms. Clinicians should also ensure that patients at high risk for breast cancer are identified and offered appropriate referrals and treatment. Preventive health strategies for women at average risk are to avoid weight gain and obesity, to engage in regular physical activity, and to minimize or avoid alcohol consumption. Although continued research is needed on the causes, prevention, and treatment of breast cancer, much progress can be made by applying current knowledge fully and equitably to all segments of the population. The continued presence of disparities in progress against breast cancer requires enhanced efforts to ensure that all women have access to high quality prevention, detection, and treatment services.

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