

Breast Cancer Epidemiology in Blacks and Whites: Disparities in Incidence, Mortality, Survival Rates and Histology

Claudia R. Baquet, MD, MPH; Shiraz I. Mishra, MBBS, PhD; Patricia Commiskey, MA; Gary L. Ellison, PhD, MPH; and Mary DeShields, MD

Financial support: This research was supported by grants from the National Center for Minority Health and Health Disparities (P60MD000532) and National Cancer Institute (U01CA114650, U56CA096302, and P20CA119192).

The contents of the article are solely the responsibility of the authors and do not necessarily represent the views of the funding agencies. The authors acknowledge the invaluable statistical consultations provided by Olga Goloubeva.

Background: This study presents black–white breast cancer statistics, tumor histology and receptor status, and treatment patterns for all ages and by age groups (<40, 40–49, and ≥50).

Methods: The study used data from the National Cancer Institute (NCI) Surveillance, Epidemiology and End Results (SEER) program for the time period 1995–2004. Age-adjusted incidence, mortality, relative survival rates, tumor grade, histology and receptor status, and treatment patterns for invasive breast cancer were calculated for nine SEER cancer registries for 1995–2004.

Results: Invasive breast cancer age-adjusted incidence for black women age <40 was significantly higher than those for white women (rate ratio=1.16, 95% confidence interval: 1.10–1.23). Age-adjusted mortality rate for black women age <40 was twice that for white women. Compared to white women, black women were significantly more likely to be diagnosed with regional or distant disease, have lower relative five-year survival rate and have higher likelihood of being diagnosed with tumors with poorer prognosis. Black women were less likely to receive breast cancer surgery as part of the treatment plan.

Conclusions: Race/ethnic disparities in invasive breast cancer epidemiology, prognostic indicators and treatment patterns exist between black and white women. The study findings support the need for innovative research, especially on the multifaceted determinants of the differential epidemiology of breast cancer. Equally important, there is a need for evidence-guided equal delivery of quality care to eliminate breast cancer disparities among black women.

Key words: breast cancer ■ minority health ■ mortality ■ survival ■ tumor

© 2008. From the Departments of Medicine (Baquet), Family and Community Medicine (Mishra), and Office of Policy and Planning (Baquet, Mishra, Ellison), University of Maryland School of Medicine, Baltimore, MD; Tulane University School of Public Health and Tropical Medicine (Commiskey), New Orleans, LA; and Eastern Shore Oncology, Easton, MD (DeShields). Send correspondence and reprint requests for *J Natl Med Assoc.* 2008;100:480–488 to: Dr. Claudia R. Baquet, University of Maryland School of Medicine, Office of Policy and Planning, 685 W. Baltimore St., Suite 618, Baltimore, MD 21201; phone: (410) 706-1742; fax: (410) 706-6150; e-mail: cbaquet@som.umaryland.edu

INTRODUCTION

In recent years, incidence and mortality rates for all cancers combined have shown measurable stabilization, if not declines.^{1,2} Despite these gains, race/ethnic disparities still persist in cancer incidence, mortality, stage at diagnosis and survival.^{1–8} Black women have lower incidence rate but higher mortality rate than non-Hispanic white (hereafter referred as “white”) women for all cancer sites combined.^{2,8} In addition, black women compared with white women are more likely to have poorer stage distribution (i.e., regional or distant) when diagnosed with cancer and to have lower five-year survival rates (risk adjusted for age and stage of diagnosis) for most cancer sites.^{1,9} Furthermore, black women have benefited less than white women from advances made in early detection and treatment.¹⁰ Such race/ethnic disparities in cancer epidemiology are evident even for common cancers, including cancer of the breast.

Globally, breast cancer incidence and mortality rates remain highest in developed countries compared with developing countries.¹¹ Trends in age-adjusted incidence and mortality rates over three decades (1973–1977 and 1993–1997) show breast cancer incidence rising 30–40% from the 1970s to the 1990s in most countries, with the most marked increases among women aged ≥50 years.¹¹ In the United States, between the period 1997–2002, the rate of increase (0.4% per year) in age-adjusted breast cancer incidence rate was slower than that observed during the period 1980–1987 (3.7% per year).¹² In addition, from 1990–2002, there was an annual decline of 2.3% in age-adjusted breast cancer-related mortality rate.¹²

Epidemiologic studies suggest that substantial disparities exist between black and white women in their

breast cancer experience. For women in the United States, breast cancer is the most common cancer, excluding skin cancers, and is the second leading cause of cancer-related mortality. Trends in age-adjusted incidence and mortality rates over three decades (1973–1977 and 1993–1997) show that the percent change in age-adjusted incidence rates between the 1970s and 1990s was higher for black (37%) than white (27%) women and, for the same time period, the percent change in age-adjusted mortality rates was higher for black (17%) than white (-12%) women.¹¹ Furthermore, for the period 1993–1997, the mortality rate of 19.7 per 100,000 women-years for white women in the United States was ranked ninth (a rate lower than in all other high-risk countries except Australia) and the mortality rate of 26.0 per 100,000 women-years for black women in the United States was the second highest in the world.¹¹

In the United States, for the period 1988–2002, age-adjusted breast cancer incidence and mortality rates for white women were 134.4 per 100,000 and 26.4 per 100,000, respectively, and those for black women were 119.4 per 100,000 and 34.7 per 100,000,² respectively. Compared with black women age ≥ 50 who have had stable incidence since 1993, white women in the same age group have had an increase in incidence since 1987.⁴ Among women age < 50 , breast cancer incidence rates have been stable for white women since 1986 and have declined among black women since 1991.⁴ Although overall age-adjusted breast cancer incidence rate is higher among white than black women, black women age < 35 have a higher incidence rate than white women.⁴

In addition to disparities in breast cancer incidence and mortality, there are substantial black–white differences in stage at diagnosis, five-year survival and treatment patterns. Compared to white women, black women have elevated risk for stage-III and stage-IV tumors, adjusting for age at diagnosis; year of diagnosis; and Surveillance, Epidemiology and End Results (SEER) registry.^{13–15} Black women compared with white women are more likely to be diagnosed with breast cancer at a regional or distant stage of the disease and have lower relative survival rates within each stratum of stage of diagnosis of breast cancer.^{2,4,10,14} Moreover, the survival disparities between white and black women persist even after adjusting for insurance status and access to health-care.⁹ Compared with white women, black women have 50% great risk of breast cancer-related mortality after adjusting for stage, estrogen (ER)/progesterone (PR) receptor status, surgical treatment, radiation therapy, age at diagnosis and SEER registry.¹³

In terms of appropriateness of treatment, evidence indicates that the proportion of women receiving inappropriate care for breast cancer is rising in the United States.¹⁶ Among women with stage-I or -II breast cancer with tumors < 5.0 cm, black women are 40% more likely than white women to receive inappropriate primary sur-

gical and radiation breast cancer treatment.¹³ In terms of surgery for breast cancer treatment, evidence suggests that black women are less likely to receive surgery (of any type) than white women,¹⁷ although there are mixed results for breast-conserving surgery. One study indicated that among women who had surgery for breast cancer, black women were more likely than white women to receive breast-conserving surgery,¹⁷ whereas, another study suggested that black women were less likely than white women to receive breast-conserving surgery.¹⁸

This study provides a comprehensive analysis of breast cancer statistics for black and white women for three age groups: < 40 , 40–49 and ≥ 50 . In addition to incidence, mortality and survival rates, key prognostic factors such as stage, histology and tumor grade, hormone receptor (ER and PR) status, and treatment differences are also presented for black and white women using the most recent data derived from the National Cancer Institute (NCI) SEER program, a population-based registry, for the time period 1995–2004.¹⁹ Data presented in this study could suggest areas for additional research that may explain breast cancer disparities in black women. Additional research may produce further documentation of specific disparities and identify possible explanatory factors related to risk, mortality, poorer survival or treatment differences, and tumor biology between black and white women. As with any biomedical research, the ultimate intention of this research is the reduction or elimination of these disparities.

METHODS

Data on breast cancer incidence, mortality, survival, stage at diagnosis, ER/PR status, histology, surgical and radiation treatment for black and white women were obtained from population-based data collected by NCI's SEER program.¹⁹ The SEER-9 registry is utilized to obtain statistics for the most recent decade of available data, 1995–2004. Invasive breast cancers are included for black and white women residing in nine geographical regions comparable to the general U.S. population. These nine areas are: Atlanta, GA; Connecticut; Detroit, MI; Hawaii; Iowa; New Mexico; San Francisco–Oakland, CA; Seattle–Puget Sound, WA; and Utah. Data from these nine areas represent an estimated 10% of the U.S. population.

The data were analyzed using the NCI SEER software SEER*Stat version 6.3.5²⁰ unless otherwise stated. Data are presented for women of all ages and for three age groups— < 40 , 40–49 and ≥ 50 —for both races. For the period 1995–2004, there were 155,495 cases of invasive breast cancer for white women and 15,877 cases for black women reported in the nine geographic areas. Incidence rates were age-adjusted to the 2000 U.S. standard by direct standardization²¹ and include the total number of invasive cancers, including unstaged cancers but excluding in-situ lesions.

Data on female breast cancer mortality from 1995–2004 were derived from the National Center for Health Statistics (NCHS)²² and NCI’s SEER program²³, and analyzed using SEER*Stat software.²⁰ The mortality rates were calculated based on the number of deaths with breast cancer given as the underlying cause of death occurring in black and white females during the years 1995–2004 in the nine geographic areas. The mortality rates were age adjusted by the direct method to the 2000 U.S. standard population.²¹

The stage-at-diagnosis categories used in this report were localized, regional, distant and unstaged diseases. Localized disease denoted an invasive neoplasm confined entirely to the breast; regional disease was a neoplasm that had extended beyond the limits of the breast directly into surrounding organs, tissues or regional lymph nodes; and distant disease was defined as a neoplasm that had spread to remote sites of the body. The category of unstaged disease was used for cancers for which insufficient information was available to permit accurate assignment of a stage.

The SEER program has classified breast cancer tumors according to the International Classification of Diseases for Oncology, 3rd edition (ICD-O3).²⁴ This analysis considered several different histopathologic subtypes of breast cancer, including: infiltrating duct carcinoma (8500), lobular carcinoma (8520), infiltrating duct and lobular carcinoma (8522), mucinous adenocarcinoma (8480–8481), comedocarcinoma (8501), adenocarcinoma (8140), tubular adenocarcinoma (8201 and 8211), medullary carcinoma (8510), papillary carcinoma (8050), and all other histopathologic breast carcinoma subtypes. More than 70% of breast cancer tumors in this analysis were infiltrating duct carcinomas.

The relative survival rate is a net measure of the influence of breast cancer on normal life expectancy in the absence of other causes of death. Since cause-of-death information on death certificates is often inadequate to determine whether an individual died from the primary cancer diagnosis, the relative survival rate is the preferred method for reporting survival from cancer reg-

istry data. Relative survival is the ratio of the proportion of the observed survivors in a cancer cohort to the proportion of expected survivors in a comparable cancer-free cohort based on the assumption of independent competing causes of death. The relative survival rate adjusts for the general survival rate of the standard U.S. population for the race, gender, age and date for which the age was coded.^{25,26}

RESULTS

Age-Adjusted Incidence and Mortality Rates

For the period 1995–2004, the age-adjusted incidence rate was 16% higher among black than among white women age <40 (incidence rate ratio (IRR)=1.16; 95% confidence interval (CI): 1.10–1.23) (Table 1). For the same period, compared with white women, black women ages 40–49 and those ≥50 had lower age-adjusted incidence rates. Figure 1 presents the age-adjusted incidence rates by race and age groups. For the period 1995–2004, the age-adjusted incidence rates increased by 0.8% per year [estimated annual percent change (EAPC)=0.8 and 0.2% EAPC=0.2], respectively, among white and black women age <40, but these increases were not statistically significant. Over the same period, the age-adjusted incidence rates for black and white women ages 40–49 years and age ≥50 showed small declines (data not shown).

For all age groups, black women had statistically significantly higher age-adjusted mortality rates than white women between 1995–2004 (Table 1). The age-adjusted mortality rate for black women age <40 was more than twice the rate for white women age <40. In addition, the age-adjusted mortality rates were 80% and 24%, respectively, higher for black women ages 40–49 and age ≥50 than white women in the same age group. Age-adjusted mortality rates by race and age groups for the period 1995–2004 are presented in Figure 2. For the period 1995–2004, there were statistically significant (p<0.05) declines in the age-adjusted mortality rates for black and

Table 1. Age-adjusted incidence and mortality rates for female invasive breast cancer by race and age group, 1995–2004

Age (Years)	Incidence Rates				Mortality Rates			
	White	Black	B/W Rate Ratio	95% CI	White	Black	B/W Rate Ratio	95% CI
All ages	139.2	120.4	0.87	0.85–0.88	26.4	35.2	1.33	1.32–1.34
<40	12.9	15.0	1.16	1.10–1.23	1.6	3.4	2.07	1.99–2.14
40–49	158.7	147.2	0.93	0.90–0.96	20.1	36.2	1.80	1.76–1.84
≥50	388.6	322.8	0.83	0.81–0.85	80.9	100.1	1.24	1.22–1.25

B/W: Black–white; Incidence and mortality rates are per 100,000 and age adjusted to the 2000 U.S. population by direct standardization; The p values test the equality of the incidence and mortality rates for black and white women; CI: Confidence interval

white women in each age group, but the rate of decline was faster for white women. The age-adjusted mortality rate decreased 3.2% per year for white (EAPC=-3.2) and 2.1% for black (EAPC=-2.1, $p<0.05$) women age <40.

Among women ages 40–49, the age-adjusted mortality rate decreased 4.0% per year for white women (EAPC=-4.0) and 2.6% for black (EAPC=-2.6, $p<0.05$) women; and, among women age ≥ 50 , the age-adjusted mortality

Figure 1. Breast cancer age-adjusted incidence rates by race and age groups, SEER, 1995–2004

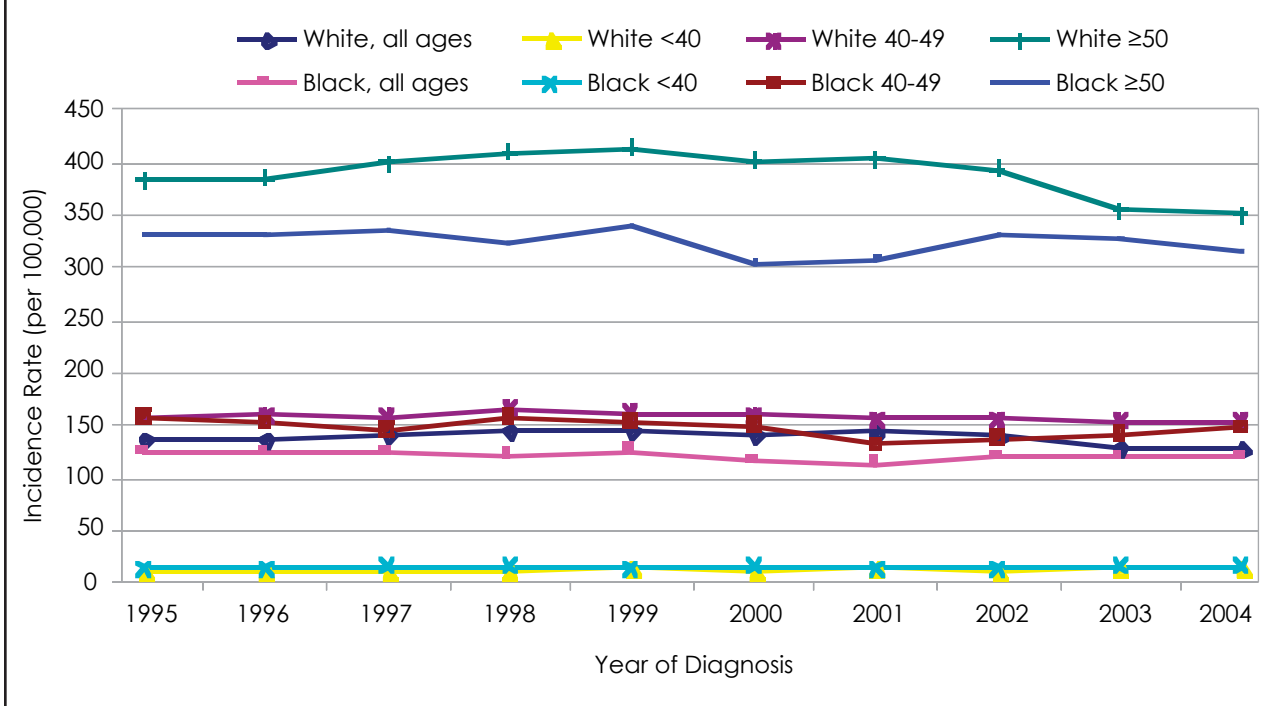
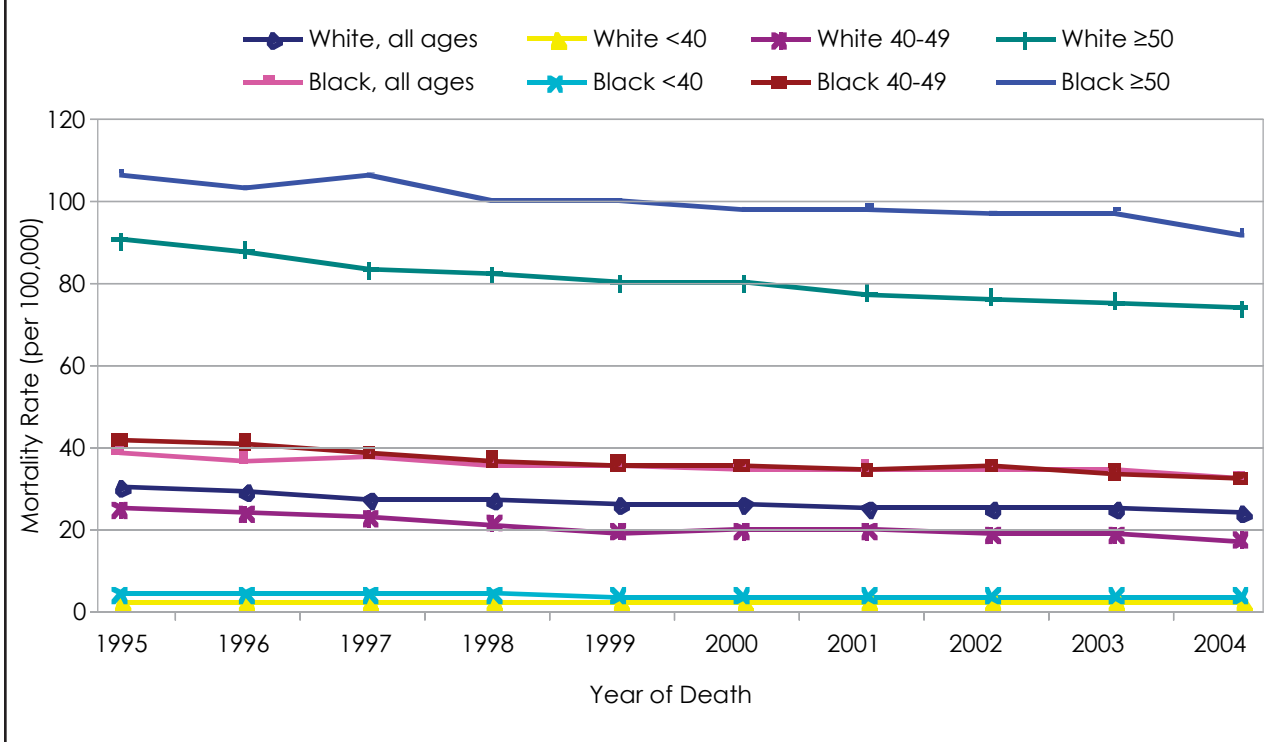


Figure 2. Breast cancer age-adjusted mortality rates by race and age groups, SEER, 1995–2004



rate decreased 2.1% for white women (EAPC=-2.1) and 1.4% (EAPC=-1.4) for black women.

Stage at Diagnosis

Black women were significantly more likely than white women (9.0 vs. 5.3%, $p<0.0001$) to receive a breast cancer diagnosis at an advanced stage of the disease, and 34.2% of black women received a breast cancer diagnosis at a regional stage compared with 27.8% of white women ($p<0.0001$) (data not shown). Women (black and white) age <40 were proportionally more likely to receive a breast cancer diagnosis at a regional stage (44.6% of black women and 41.6% of white women, $p<0.05$) than women ages 40–49 (38.9% of black women and 35.2% of white women, $p<0.0001$) and women age ≥ 50 (31.1% of black women and 25.4% of white women, $p<0.0001$).

Relative Survival Rates

Table 2 presents five-year relative survival rates for female invasive breast cancer by race, age groups and stage at diagnosis. Black women (77.1%) compared with white women (89.7%, $p<0.0001$) had a significantly lower five-year survival rate regardless of the stage of breast cancer diagnosis and age groups. Although five-year survival rates for both black (17.5%) and white (28.8%) women diagnosed with distant stage cancer were relatively low, white women age <40 diagnosed with distant breast cancer had a five-year relative survival rate more than twice that of black women in the same age group and with similar stage-of-diagnosis (37.4% for white women vs. 13.4% for black women, $p<0.0001$).

Table 2. Five-year relative survival rates for female invasive breast cancer by race, age groups and stage-at-diagnosis, 1995–2004

Stage	All Ages			Age <40			Ages 40–49			Age ≥ 50		
	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value
All stages	89.7	77.1	<0.0001	85.2	68.4	<0.0001	89.6	78.1	<0.0001	90.1	78.3	<0.0001
Localized	98.7	93.0	<0.0001	94.3	86.2	<0.0001	96.4	90.9	<0.0001	99.6	94.7	<0.0001
Regional	84.3	71.1	<0.0001	81.0	65.3	0.0284	85.9	74.0	<0.0001	84.1	71.2	<0.0001
Distant	28.8	17.5	<0.0001	37.4	13.4	<0.0001	38.4	24.7	<0.0001	26.0	15.7	<0.0001
Unstaged	45.3	40.8	<0.0001	71.9	40.4	0.0177	68.9	50.1	<0.0001	39.7	37.1	<0.0001

The p values test the equality of five-year relative survival rates for black and white women.

Table 3. Estrogen- and progesterone-receptor status for invasive breast cancer by race and age groups, 1995–2004

	All Ages			Age <40			Ages 40–49			Age ≥ 50		
	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value
ER Receptor Status												
ER+	66.2	47.5		51.1	37.9		62.3	43.6		68.0	50.2	
ER-	17.2	29.8		34.7	41.3		23.5	35.9		14.8	26.0	
Other	16.6	22.7		14.2	20.8		14.2	20.5		17.2	23.8	
			<0.0001			<0.0001			<0.0001			<0.0001
PR Receptor Status												
PR+	56.1	39.4		46.2	33.6		57.2	39.3		56.5	40.4	
PR-	25.6	36.7		38.3	45.1		27.0	39.2		24.5	34.5	
Other	18.3	23.9		15.5	21.3		15.8	21.5		19.0	25.1	
			<0.0001			<0.0001			<0.0001			<0.0001
ER/PR Receptor Status												
ER+/PR+	66.4	48.7	<0.0001	50.6	37.9	<0.0001	64.3	45.8	<0.0001	67.9	51.4	<0.0001
ER+/PR-	12.8	12.4	0.2720	8.9	9.9	0.2869	8.1	8.9	0.1667	14.1	14.1	<0.9834
ER-/PR+	2.3	3.2	<0.0001	4.0	4.9	0.2023	3.7	4.1	0.2457	1.8	2.5	<0.0001
ER-/PR-	18.5	35.7	<0.0001	36.5	47.3	<0.0001	23.9	41.2	<0.0001	16.2	32.0	<0.0001

ER+: Estrogen-receptor positive; ER-: Estrogen-receptor negative; PR+: Progesterone-receptor positive; PR-: progesterone-receptor negative. The p values test the equality of proportions for black and white women in each category classified by ER and PR status jointly.

Histology and Tumor Grade

Infiltrating ductal carcinoma, is the most common breast cancer cell type for both black (71.1%) and white (68.8%) women (data not shown). Compared to white women, black women were proportionally less likely to be diagnosed with lobular carcinoma (5.5% of black women and 8.9% of white women) but were more likely to be diagnosed with medullary carcinoma (1.6% of black vs. 0.6% of white). In terms of tumor grade, 43.6% of black women compared with 29.7% of white women were diagnosed with poorly differentiated breast cancer (data not shown). More than one-half of black (59.2%) and white (51.5%) women age <40 were diagnosed with poorly differentiated invasive breast cancer. Among women ages 40–49 years, 51.0% of black and 37.6% of white women were diagnosed with poorly differentiated invasive breast cancer; and, among women ≥50, 38.9% of black and 26.7% of white women were diagnosed with poorly differentiated invasive breast cancer.

Hormone Receptor Status

Table 3 presents data on estrogen (ER+/ER-) and progesterone (PR+/PR-) status by age group for black and white women with invasive breast cancer. Regardless of age groups, black women were proportionally more likely than white women to be diagnosed with ER- (ER- and ER-/PR-) and PR- breast cancers.

Treatment Patterns

Although the majority of women with invasive breast cancer had surgery performed on their malignancies, black women (88.8%) were proportionally less likely than white women (94.0%) with invasive breast cancer to have surgery performed on their malignancies (Table 4).

In addition, black women (5.4%) compared with white women (2.5%) with invasive breast cancer were proportionally more likely to not have surgery recommended for their invasive breast cancer. A similar distribution for surgical intervention (or lack thereof) was observed among black and white women by the three age groups. In terms of receipt of radiation therapy, the majority of women with invasive breast cancer did not receive radiation, with black women (60.8%) more likely than white women (54.3%) to not receive radiation treatment.

DISCUSSION

This paper presents racial disparities in female invasive breast cancer incidence, mortality, stage at diagnosis, tumor grade, relative survival rates, and histology and treatment patterns based on data from the NCI SEER program, a population based registry, for the period 1995–2004. Previous studies^{2,4,13-15} have reported these rates based on the SEER data for varying periods ending 2002. This report extends findings reported previously with an emphasis on breast cancer epidemiology disparities between black and white women, uses the most recent data available from the NCI SEER program (1995–2004), and presents data for three age groups (i.e., age <40, 40–49 and ≥50).

The results indicate that there are persistent age-adjusted disparities in invasive breast cancer epidemiology between black and white women. Overall, compared with white women, black women had lower age-adjusted incidence rate, higher mortality rate, lower relative survival rate, higher likelihood of being diagnosed with regional or distant disease and with poorly differentiated tumors, higher likelihood of being diagnosed with tumors associated with poorer prognosis (i.e., the more

Table 4. Treatment patterns for female invasive breast cancer by race and age group, 1995–2004

	All Ages			Age <40			Ages 40–49			Age ≥50		
	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value	White (%)	Black (%)	P Value
Surgery^a												
Cancer-directed surgery performed	94.0	88.8	<0.0001	95.9	89.8	<0.0001	96.3	92.0	<0.0001	93.3	87.6	<0.0001
Cancer-directed surgery not recommended	2.5	5.4	<0.0001	1.7	5.3	<0.0001	1.6	4.1	<0.0001	2.7	5.8	<0.0001
Contraindicated due to other conditions	0.2	0.2	0.9727	0.1	0.1	0.5832 ^c	0.1	0.0	0.7165 ^c	0.3	0.3	0.3172
Other	3.3	5.6	<0.0001	2.3	4.8	<0.0001	2.0	3.9	<0.0001	3.6	6.3	<0.0001
Radiation^b												
Performed	45.7	39.2	<0.0001	48.7	40.3	<0.0001	51.9	43.2	<0.0001	44.2	37.7	<0.0001
Not performed	54.3	60.8		51.3	59.7		48.1	56.8		55.8	62.3	

a: P values are for testing the equality of proportions for black and white women in each surgery status; b: P values are two sided and are for testing whether ethnicity and radiation status are associated within age category; c: Fisher's exact p value

dangerous medullary carcinoma, ER negative (ER- and ER-/PR-) tumors, and poorly differentiated tumors), lower likelihood of receiving cancer surgery, and higher likelihood of having breast surgery contraindicated for their cancer.

Analyses by race-age subgroups revealed more striking disparities among younger (age <40) black women. Compared with white women age <40, black women in the same age group had 16% higher age-adjusted breast cancer incidence rate and more than twice the age-adjusted mortality rate. In addition, black women age <40, compared with women in other race-age subgroups, were more likely to be diagnosed with breast cancer at a regional stage, have a lower relative survival rate and were more likely to be diagnosed with poorly differentiated tumors.

Prevalence of risk factors may help explain disparities in breast cancer incidence. Unfortunately, very few studies which could establish the prevalence of risk factors have included black women.²⁷ It is suggested^{6,27} that the higher breast cancer incidence rate among black women ≤45 years and the lower incidence rate at older ages may be a function of the differences in breast cancer risk profile between black and white women. In terms of prevalence of risk factors,^{6,27} compared to white women, black women have slightly younger age at menarche, greater frequency of ovulatory menstrual cycles during adolescence, higher birth rate (especially among those ≤20 years), lower likelihood of breastfeeding, greater propensity to use oral contraceptives before age 20, lower likelihood to use hormone replacement therapy, higher prevalence of overweight and obesity (especially postmenopausal) and lower propensity for physical activity. There is some evidence to suggest that, unlike the protective effect of pregnancy on breast cancer risk among women after age 45, early childbearing and higher birth rate observed among black women could increase the likelihood of higher incidence of premenopausal breast cancer.²⁸⁻³⁰ Moreover, among younger black women, multiparity³¹ coupled with lower likelihood of lactation and shorter duration of lactation³² may also contribute to a higher incidence rate. The reduction in modifiable risk factors, including hormone replacement therapy, alcohol consumption, physical activity and duration of breastfeeding, could substantially reduce breast cancer incidence.³³

Black-white difference in survival and mortality may be due to differences in tumor phenotypes, molecular biology and genetic alterations. These differences include a higher prevalence among black women of breast cancer with poor prognostic indicators, such as, no estrogen receptor (ER-) expression,^{8,9,15,29,34} poorly differentiated tumors,⁸ basal-like tumor subtype;³⁵ high nuclear grade^{34,36,37} and high S-phase;³⁶ higher frequency of hypermethylation in ER-/PR- and being younger (<50 years) with breast cancer;³⁸ higher mitotic index and

marked tumor necrosis;^{34,37} defects in specific cell cycle-regulatory proteins;³⁴ overexpression of p53;³⁹ and tumors that are grade-III and high-grade nuclear atypia.³⁷ Premenopausal black women, unlike postmenopausal black and nonblack women, have a higher prevalence of basal-like subtype of breast tumors.³⁵ Basal-like subtype of breast tumors is associated with more aggressive attributes, including higher proliferative capacity (i.e., higher mitotic index) and histologic grade (i.e., poorly differentiated vs. well- or moderately differentiated) and marked pleomorphism.³⁵ Compared with white women, black women have a decreased risk of lobular carcinoma and increased risk of medullary carcinoma.¹⁵ Lobular carcinoma is associated with better prognosis.⁴⁰ However, despite controlling for tumors with several of these poor prognostic characteristics, black women still have poorer survival than white women.⁴¹ Therefore, it is still to be determined whether these characteristics are sufficient to explain the poorer prognosis and excess mortality among black women with breast cancer.

Poorer survival rates for black women may also be due to racial differences in patterns of care and/or unequal patterns of care. Black women receive less-than-adequate care for breast cancer as compared with that received by white women.^{42,43} Black women age <50 with ER+ or ER- tumors had significantly lower stage-specific survival rates than white women,¹⁴ whereas there were no significant differences in stage-specific survival rates between black and white women age 65 years or older regardless of the ER status.¹⁴ Comparable survival rates between black and white women were observed when there was equivalent treatment for comparable disease stage.^{44,45} In addition, black women were more likely to terminate chemotherapy prematurely than white women, and premature termination of chemotherapy is associated with poorer survival.⁴¹ Moreover, black women are less likely than white women to receive surgical removal of their tumors,¹⁷ even after controlling for age, socioeconomic status and insurance coverage. Some of the reasons for black-white disparities in breast cancer patterns of care include differential occurrences of adverse events, noncompliance with planned therapy and incomplete adherence to treatment regimen^{6,41,46,47}—factors which may impact adjuvant chemotherapy and subsequent survival. Poorer survival due to diagnosis with late-stage disease among black women is also due to underuse of mammography (adjusting for socioeconomic status and other comorbidities)⁴⁸ and taking longer time to obtain an initial medical consultation⁴⁹ after a diagnosis of breast cancer.

The reasons presented here are, by themselves, not sufficient to explain disparities in breast cancer care and outcomes. There is a need to address race-based and socioeconomic discrimination in the provision of appropriate, evidence-based quality care for breast cancer, including consideration of treatment decisions based on

insurance coverage, access to care, physician–patient interactions, cultural factors and historical mistrust.

There is mixed evidence for socioeconomic factors as predictors of disparities in breast cancer epidemiology, especially mortality and survival.^{7,17,50,51} Socioeconomic status is poorly understood and inconsistently defined. Socioeconomic factors reflect income, poverty level, education, geography of residence, population density, occupation and occupational category, access to and utilization of healthcare, diet, age at bearing children, physical activity, compliance/adherence to patterns of preventive care and treatment, and other determinants of cancer etiology, early detection and treatment, and survivorship. A meta-analysis of survival in black and white women with breast cancer indicated that race/ethnicity was an independent predictor of poor survival, even after controlling for socioeconomic status.⁷ Another study reported that black race and socioeconomic factors were independent predictors of breast cancer mortality and that the association between black race and breast cancer mortality persisted, albeit weaker, even after adjusting for socioeconomic factors.⁵¹ However, it has also been shown that, after adjusting for socioeconomic factors, there was no association between being black and unfavorable breast cancer outcomes.¹⁷ On the other hand, low socioeconomic status (and not race) was associated with last-stage breast cancer, types of treatment received and mortality rates.¹⁷ It has been suggested⁵² that socioeconomic factors should be considered as “cross-cutting risk factors” both for developing breast cancer as well as for breast cancer-related mortality. Moreover, focusing solely on socioeconomic factors without due consideration of racial and cultural factors that affect health- and cancer-related behaviors would provide a confounded assessment of disparities in breast cancer epidemiology and patterns of care.⁵² These findings further reinforce the need for further research on the biologic, genetic, and socioeconomic and cultural determinants which may impact breast cancer epidemiology.

Limitations of this study are those inherent in archived dataset, including the population-based cancer registry data of the SEER program. First, there may be errors introduced during the process of registering cancer patients, and the abstraction and coding of data by the respective SEER registries. The SEER program has in place a rigorous quality-control system. The program conducts various types of quality-control studies, including casefinding, recoding and reliability, which are designed using appropriate statistical procedures that provide for obtaining measures used to assess the performance of the SEER registries.⁵³ Second, the age-adjusted incidence data are not adjusted for delayed reporting, which affects the most recent 1–3 years of incidence data (in this case, 2002–2004). The age-adjusted incidence rate data presented here are for a 10-year period, thus reducing the potential error due to delayed report-

ing of breast cancer. Furthermore, delays in reporting in SEER registries are primarily relevant for cancers frequently diagnosed in outpatient settings.² Third, racial or ethnic misclassifications can occur in registering mortalities, which would affect the mortality rates. The true extent of racial or ethnic misclassifications in death certificate coding remains unknown.¹⁹

In conclusion, persistent breast cancer disparities experienced by black women, especially younger black women, present an important opportunity for research advances in prevention, early detection and treatment. There is a need for innovative research, especially in the multifaceted (biologic, social and cultural) determinants of the differential epidemiology of breast cancer. Moreover, and equally importantly, there is a need to eliminate barriers to healthcare access and to evidence-guided equal delivery of quality care to improve treatment, prognosis and survivability of black women with breast cancer.

REFERENCES

- Jemal A, Clegg LX, Ward E, et al. Annual report to the nation on the status of cancer, 1975-2001, with a special feature regarding survival. *Cancer*. 2004;101(1):3-27.
- Jemal A, Siegel R, Ward E, et al. Cancer statistics, 2006. *CA Cancer J Clin*. 2006;56(2):106-130.
- US Department of Health and Human Services. National Healthcare Disparities Report. Rockville, MD: U.S. Department of Health and Human Services, Agency for Health Care Research and Quality; 2003.
- Smigal C, Jemal A, Ward E, et al. Trends in breast cancer by race and ethnicity: update 2006. *CA Cancer J Clin*. 2006;56(3):168-183.
- Tammemagi CM, Nerenz D, Neslund-Dudas C, et al. Comorbidity and survival disparities among black and white patients with breast cancer. *JAMA*. 2005;294(14):1765-1772.
- Newman LA. Breast cancer in African-American women. *Oncologist*. 2005;10(1):1-14.
- Newman LA, Griffith KA, Jatoi I, et al. Meta-analysis of survival in African American and white American patients with breast cancer: ethnicity compared with socioeconomic status. *J Clin Oncol*. 2006;24(9):1342-1349.
- Chlebowski RT, Chen Z, Anderson GL, et al. Ethnicity and breast cancer: factors influencing differences in incidence and outcome. *J Natl Cancer Inst*. 2005;97(6):439-448.
- Field TS, Buist DS, Doubeni C, et al. Disparities and survival among breast cancer patients. *J Natl Cancer Inst Monogr*. 2005;(35):88-95.
- Chu KC, Tarone RE, Brawley OW. Breast cancer trends of black women compared with white women. *Arch Fam Med*. 1999;8(6):521-528.
- Althuis MD, Dozier JM, Anderson WF, et al. Global trends in breast cancer incidence and mortality 1973-1997. *Int J Epidemiol*. 2005;34(2):405-412.
- Edwards BK, Brown ML, Wingo PA, et al. Annual report to the nation on the status of cancer, 1975-2002, featuring population-based trends in cancer treatment. *J Natl Cancer Inst*. 2005;97(19):1407-1427.
- Li CI, Malone KE, Daling JR. Differences in breast cancer stage, treatment, and survival by race and ethnicity. *Arch Intern Med*. 2003;163(1):49-56.
- Chu KC, Lamar CA, Freeman HP. Racial disparities in breast carcinoma survival rates: separating factors that affect diagnosis from factors that affect treatment. *Cancer*. 2003;97(11):2853-2860.
- Li CI, Malone KE, Daling JR. Differences in breast cancer hormone receptor status and histology by race and ethnicity among women 50 years of age and older. *Cancer Epidemiol Biomarkers Prev*. 2002;11(7):601-607.
- Nattlinger AB, Hoffmann RG, Kneusel RT, et al. Relation between appropriateness of primary therapy for early-stage breast carcinoma and increased use of breast-conserving surgery. *Lancet*. 2000;356(9236):1148-1153.
- Bradley CJ, Given CW, Roberts C. Race, socioeconomic status, and

breast cancer treatment and survival. *J Natl Cancer Inst.* 2002;94(7):490-496.

18. Lazovich D, Solomon CC, Thomas DB, et al. Breast conservation therapy in the United States following the 1990 National Institutes of Health Consensus Development Conference on the treatment of patients with early stage invasive breast carcinoma. *Cancer.* 1999;86(4):628-637.

19. National Cancer Institute. Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence—SEER 9 Regs Limited-Use, November 2006 Sub (1973–2004)—Linked To County Attributes—Total U.S., 1969–2004 Counties. Bethesda, MD: National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2007, based on the November 2006 submission; April 2007. Accessed 11/30/06.

20. National Cancer Institute. Surveillance Research Program, National Cancer Institute SEER*Stat software version 6.3.5. Bethesda, MD: National Cancer Institute, DCCPS, Surveillance Research Program; 2007. Accessed 11/30/06.

21. Ries LAG, Harkins D, Krapcho M, et al, eds. SEER Cancer Statistics Review, 1975–2003. Bethesda, MD: National Cancer Institute, based on November 2005 SEER submission, posted to the SEER website, 2006. Accessed 11/30/06.

22. National Center for Health Statistics. Mortality Data from the National Vital Statistics System. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. Accessed 09/12/06.

23. National Cancer Institute. Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Mortality—All COD, Public-Use with State, Total U.S. (1990–2004). Bethesda, MD: National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2007. Underlying mortality data provided by NCHS, April 2007. www.cdc.gov/nchs/. Accessed 06/12/07.

24. Fritz A, Percy C, Jack A, et al, eds. International Classification of Diseases for Oncology, 3rd ed. Geneva: World Health Organization; 2000.

25. Brown CC. The statistical comparison of relative survival rates. *Biometrics.* 1983;39(4):941-948.

26. Ederer F, Axtell LM, Cutler SJ. The relative survival rate: a statistical methodology. *Natl Cancer Inst Monogr.* 1961;6:101-121.

27. Bernstein L, Teal CR, Joslyn S, et al. Ethnicity-related variation in breast cancer risk factors. *Cancer.* 2003;97(1 suppl):222-229.

28. Pathak DR, Osuch JR, He J. Breast carcinoma etiology: current knowledge and new insights into the effects of reproductive and hormonal risk factors in black and white populations. *Cancer.* 2000;88(5 suppl):1230-1238.

29. Pathak DR. Dual effect of first full term pregnancy on breast cancer risk: empirical evidence and postulated underlying biology. *Cancer Causes Control.* 2002;13(4):295-298.

30. Palmer JR, Wise LA, Horton NJ, et al. Dual effect of parity on breast cancer risk in African-American women. *J Natl Cancer Inst.* 2003;95(6):478-483.

31. Hall IJ, Moorman PG, Millikan RC, et al. Comparative analysis of breast cancer risk factors among African-American women and white women. *Am J Epidemiol.* 2005;161(1):40-51.

32. Ursin G, Bernstein L, Wang Y, et al. Reproductive factors and risk of breast carcinoma in a study of white and African-American women. *Cancer.* 2004;101(2):353-362.

33. Clarke CA, Purdie DM, Glaser SL. Population attributable risk of breast cancer in white women associated with immediately modifiable risk factors. *BMC Cancer.* 2006;6(1):170.

34. Porter PL, Lund MJ, Lin MG, et al. Racial differences in the expression of cell cycle-regulatory proteins in breast carcinoma. *Cancer.* 2004;100(12):2533-2542.

35. Carey LA, Perou CM, Livasy CA, et al. Race, breast cancer subtypes, and survival in the Carolina Breast Cancer Study. *JAMA.* 2006;295(21):2492-2502.

36. Elledge RM, Clark GM, Chamness GC, et al. Tumor biologic factors and breast cancer prognosis among white, Hispanic, and black women in the United States. *J Natl Cancer Inst.* 1994;86(9):705-712.

37. Chen VW, Correa P, Kurman RJ, et al. Histological characteristics of breast carcinoma in blacks and whites. *Cancer Epidemiol Biomarkers Prev.* 1994;3(2):127-135.

38. Mehrotra J, Ganpat MM, Kanaan Y, et al. Estrogen receptor/progesterone receptor-negative breast cancers of young African-American women have a higher frequency of methylation of multiple genes than those of Caucasian women. *Clin Cancer Res.* 2004;10(6):2052-2057.

39. Jones BA, Kasl SV, Howe CL, et al. African-American/White differences in breast carcinoma: p53 alterations and other tumor characteristics. *Cancer.* 2004;101(6):1293-1301.

40. du Toit RS, Locker AP, Ellis IO, et al. An evaluation of differences in prognosis, recurrence patterns and receptor status between invasive lobular and other invasive carcinomas of the breast. *Eur J Surg Oncol.* 1991;17(3):251-257.

41. Hershman D, McBride R, Jacobson JS, et al. Racial disparities in treatment and survival among women with early-stage breast cancer. *J Clin Oncol.* 2005;23(27):6639-6646.

42. Diehr P, Yergan J, Chu J, et al. Treatment modality and quality differences for black and white breast-cancer patients treated in community hospitals. *Med Care.* 1989;27(10):942-958.

43. Breen N, Wesley MN, Merrill RM, et al. The relationship of socio-economic status and access to minimum expected therapy among female breast cancer patients in the National Cancer Institute Black-White Cancer Survival Study. *Ethn Dis.* 1999;9(1):111-125.

44. Dignam JJ. Efficacy of systemic adjuvant therapy for breast cancer in African-American and Caucasian women. *J Natl Cancer Inst Monogr.* 2001(30):36-43.

45. Dignam JJ, Redmond CK, Fisher B, et al. Prognosis among African-American women and white women with lymph node negative breast carcinoma: findings from two randomized clinical trials of the National Surgical Adjuvant Breast and Bowel Project (NSABP). *Cancer.* 1997;80(1):80-90.

46. Griggs JJ, Sorbero ME, Stark AT, et al. Racial disparity in the dose and dose intensity of breast cancer adjuvant chemotherapy. *Breast Cancer Res Treat.* 2003;81(1):21-31.

47. Hershman D, Weinberg M, Rosner Z, et al. Ethnic neutropenia and treatment delay in African American women undergoing chemotherapy for early-stage breast cancer. *J Natl Cancer Inst.* 2003;95(20):1545-1548.

48. McCarthy EP, Burns RB, Coughlin SS, et al. Mammography use helps to explain differences in breast cancer stage at diagnosis between older black and white women. *Ann Intern Med.* 1998;128(9):729-736.

49. Coates RJ, Bransfield DD, Wesley M, et al. Differences between black and white women with breast cancer in time from symptom recognition to medical consultation. Black/White Cancer Survival Study Group. *J Natl Cancer Inst.* 1992;84(12):938-950.

50. Brawley OW. Disaggregating the effects of race and poverty on breast cancer outcomes. *J Natl Cancer Inst.* 2002;94(7):471-473.

51. Grann V, Troxel AB, Zojwalla N, et al. Regional and racial disparities in breast cancer-specific mortality. *Soc Sci Med.* 2006;62(2):337-347.

52. Baquet CR, Commiskey P. Socioeconomic factors and breast carcinoma in multicultural women. *Cancer.* 2000;88(5 suppl):1256-1264.

53. National Cancer Institute. Surveillance, Epidemiology, and End Results—Data Access and Quality. National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch. Accessed 09/13/06. ■



REUSE THIS CONTENT

To photocopy, e-mail, post on Internet or distribute this or any part of *JNMA*, please visit www.copyright.com.