

# Association of Race and Breast Cancer Stage

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**Purpose:** To determine if breast cancer stage exhibits any significant variation between African Americans and white Americans.

**Methods:** We conducted a retrospective cohort study. Inclusion criteria required a diagnosis of breast cancer that was reported to the TriHealth tumor registry from 1991–2003. For each patient, we collected data on race; American Joint Committee on Cancer stage at diagnosis; and 12 potential confounding variables, including topography, morphology, laterality, age, menopausal age, smoking status, estrogen and progesterone receptor status, marital status, menopausal status, family history of breast cancer in a first-degree relative and insurance status.

**Results:** 5,751 patients (5,119 Caucasians, 632 African Americans) were eligible to be included in the study. African Americans were significantly younger, with a younger age of menopause, less family history of breast cancer, fewer positive estrogen and progesterone receptors, higher rate of cigarette smokers, more Medicaid insured, and more single and divorced individuals compared to Caucasian Americans ( $p < 0.05$ ). Multivariate analysis found no difference between the races for stage 0, stage 2 and stage 4. African Americans had significantly less stage 1 (RR 0.80, 95% CI: 0.67–0.96), less combined stage 0 and 1 (RR 0.75, 95% CI: 0.63–0.89) and more combined stage 3 (RR 1.50 95% CI: 1.11–2.01).

**Conclusion:** Although there was no difference among the races for topography, morphology and laterality of their breast cancers, African-American race is a predictor of more advanced stage at diagnosis.

**Key words:** breast cancer ■ race

## INTRODUCTION

Breast cancer is the most common cancer among women in the United States. It is diagnosed in approximately 240,000 women and kills an estimated 40,000 women each year. It is suspected that as the baby boomer population ages the absolute number of women diagnosed will rise by one-third over the next 20 years, increasing the number to 320,000 females diagnosed annually.<sup>1</sup> The peak age of diagnosis is 45–65 years, with approximately 77% occurring in females age  $>50$ .<sup>2</sup> Though screening recommendations vary among organizations, American Cancer Society guidelines for breast cancer screening consist of optional monthly self-breast exams starting at age 20, and clinical breast exams every 2–3 years until the age of 40, then annually. Yearly mammograms are initiated at the age of 40 as well, or earlier, based on preexisting risk factors.<sup>3</sup> Multiple risk factors for breast cancer have been identified including: increasing age, presence in a first-degree relative, early menarche, nulliparity, delayed first pregnancy, prior personal history of breast cancer, endometrial cancer, abnormal breast biopsy, exogenous estrogen use, radiation exposure, geographical influence, diet and white race.<sup>1</sup>

Breast cancer has the second highest death rate among cancers for both African-American and Caucasian women nationwide. The overall lifetime risk of being diagnosed with breast cancer is 10.14% for African-American women and 13.83% for Caucasian women; however, approximately 31/100,000 African-American women die annually compared to 27/100,000 white women.<sup>4</sup> From this data, it is conclusive that although Caucasian women are diagnosed more frequently, African-American women have a higher mortality rate.

In previous studies, it has been found that African-American women are more likely to present with advanced-stage breast cancer at diagnosis and, consequently, a poorer prognosis.<sup>5–9</sup> The largest most comprehensive study of its kind to evaluate the relationship among race, breast cancer stage, treatment and survival was performed by Li et al. They con-

© 2006. From Bethesda Family Medicine Residency Program (Woods, director of epidemiology; Luking, Atkins, third-year residents) and The E. Kenneth Hatton, MD Institute for Research and Education (Engel), Cincinnati, OH. Send correspondence and reprint requests for *J Natl Med Assoc*. 2006;98:683–686 to: Dr. Scott E. Woods, Director of Epidemiology, Bethesda Family Medicine Residency Program, 4411 Montgomery Road, Suite 200, Cincinnati, OH 45212; phone: (513) 531-6720, ext. 246; fax: (513) 531-2624; e-mail: liverdoctor@yahoo.com

ducted a cohort study comprised of 124,934 women diagnosed with breast cancer from the Surveillance, Epidemiology and End Results Program (SEER). In their study, African Americans were significantly more likely to be diagnosed with American Joint Committee on Cancer (AJCC) stages 2, 3 and 4, and were significantly less likely to be in stage 1 compared to Caucasian Americans. They also found African-American women were 40% more likely to undergo initial treatments that were below national standards.<sup>5</sup> One important limitation of this study is

that they were unable to control for any assessment of socioeconomic status.

To investigate the influence of socioeconomic and cultural factors on racial differences in breast cancer stage, Lannin et al. conducted a case-control study of 540 women from eastern North Carolina.<sup>8</sup> They found that socioeconomic and cultural factors explain some but not all of the racial variation found in late-stage breast cancer. Similarly, when Bradley et al. linked Medicaid and SEER data, they found similar results.<sup>7</sup> Current literature suggests that

**Table 1. Univariate analysis—race and breast cancer stage**

Variable	Caucasians (N=5,119)	African Americans (N=632)	Odds Ratio*	P Value
Marital Status				<0.01
Single	463 (9.0%)	119 (18.8%)		
Married	3,344 (65.3%)	280 (44.3%)		
Divorced	435 (8.5%)	119 (18.8%)		
Widowed	877 (17.1%)	114 (18.0%)		
Smoking				<0.01
Nonsmoker	3,519 (68.7%)	373 (59.0%)		
Cigarettes	968 (18.9%)	180 (28.5%)		
Ex-smoker	632 (12.3%)	79 (12.5%)		
Family Hx of Breast Cancer			0.78	0.02
Yes	1,124 (22.0%)	114 (18.0)		
No	3,995 (78.0%)	518 (82.0%)		
Estrogen Receptors			0.49	<0.01
Yes	2,831 (78.5%)	306 (64.3%)		
No	774 (21.5%)	170 (35.7%)		
Progesterone Receptors			0.58	<0.01
Yes	2,363 (65.5%)	247 (52.3%)		
No	1,246 (34.5%)	225 (47.7%)		
Medicaid			3.33	<0.01
Yes	126 (2.5%)	49 (7.8%)		
No	4,993 (97.5%)	583 (92.2%)		
Age	58.6 ± 13.5	56.4 ± 13.4		<0.01
Menopausal Age	46.0 ± 7.0	42.9 ± 7.2		<0.01
Topography				0.12
Axillary tail	13 (0.3%)	5 (0.8%)		
Breast NOS, overlapping	2,298 (44.9%)	288 (45.6%)		
Lower, inner quadrant	223 (4.4%)	31 (4.9%)		
Lower, outer quadrant	303 (5.9%)	39 (6.2%)		
Nipple	48 (0.9%)	1 (0.2%)		
Upper, inner quad	384 (7.5%)	43 (6.8%)		
Upper, outer quad	1,850 (36.1%)	225 (35.6%)		
Morphology				0.07
Infiltrating ductal	3,533 (69.0%)	455 (72.0%)		
Noninfiltrating intraductal	440 (8.6%)	36 (5.7%)		
Lobular	272 (5.3%)	30 (4.7%)		
Others	874 (17.1%)	111 (17.6%)		
Laterality				0.32
Left	2,631 (51.4%)	338 (53.5%)		
Right	2,488 (48.6%)	294 (46.5%)		
Menopausal Status				0.24
Premenopausal	1,171 (22.9%)	154 (24.4%)		
Perimenopausal	279 (5.5%)	32 (5.1%)		
Postmenopausal	3,455 (67.5%)	410 (64.9%)		
Unknown	214 (4.2%)	36 (5.7%)		

\* Odds of an African-American woman being positive compared to a Caucasian women

socioeconomic factors, mammography usage, insurance status and cultural beliefs are all possible reasons to explain some racial variation in breast cancer stage distribution.<sup>8,9</sup>

The purpose of our study was to investigate the influence of race on breast cancer stage at diagnosis, also taking into consideration additional confounding variables not previously considered, including topography, morphology and laterality.

## METHODS

We conducted a retrospective cohort study. Inclusion required a diagnosis of breast cancer, and it reported to the TriHealth tumor registry from 1991–2003. There are three TriHealth hospitals in Cincinnati, OH. This is the largest tumor registry in this geographical area. This region is approximately 89% Caucasian and 11% African-American. TriHealth dedicates a full-time nurse whose exclusive responsibility is the oversight of the tumor registry data. This nurse collects data from the patient, their chart and the treating physician. Patients are followed over time for the purposes of prognosis. For each patient, we collected data on race; AJCC stage at diagnosis; and 12 potential confounding variables, including topography, morphology, laterality, age, menopausal age, smoking status, estrogen and progesterone receptor status, marital status, menopausal status, family history of breast cancer in a first-degree relative and insurance status. Due to small number of patients in some stages, AJCC breast cancer stages 0 and 1 were analyzed as separate and combined stages, and stages 2A and 2B, and stages 3A, 3B and 3C were collapsed in the analysis into stages 2 and 3, respectively. Use of the AJCC stage for research purposes has been utilized by previous authors.<sup>6-9</sup> Races other than Caucasian and African-American were excluded due to small numbers (N=60).

Univariate analysis using Chi-squared and t tests were performed to evaluate the prevalence of confounding variables by race. Confounding variables found to exhibit statistically significant variation between the two races were included in the regression model. Then, nominal regression analysis for

dichotomous variables investigated the adjusted risk between race and each breast cancer stage while controlling for any significant potential confounding variables. Data analysis was conducted using SPSS statistical software (SPSS Inc., Chicago, IL). Utilizing a two-tailed alpha of 0.05 and a beta of 0.10, it was estimated that approximately 5,500 patients would be required for this study to have 90% power to find a significant difference between the two races for any stage if they differ by 20%.

## RESULTS

Five-thousand, seven-hundred-fifty-one patients (5,119 Caucasians, 632 African Americans) were eligible to be included in the study. There was no significant difference for menopausal status, topography, morphology and laterality of their breast cancers. African Americans were significantly younger, with a younger onset of menopause, less family history of breast cancer, fewer positive estrogen and progesterone receptors, more cigarette smokers, more Medicaid insured and more single and divorced individuals compared to Caucasians Americans (Table 1,  $p < 0.05$ ). Multivariate analysis found no difference between the races for stage 0, stage 2 and stage 4 (Table 2). African Americans had significantly less stage-1 breast cancer (RR 0.80, 95% CI: 0.67–0.96), less combined stage 0 and 1 (RR 0.75, 95% CI: 0.63–0.89) and more combined stage-3 (RR 1.50 95% CI: 1.11–2.01).

## DISCUSSION

We found that African-American women possess the same histological types of breast cancer, in similar locations in the breast, and have the same left/right breast distribution as Caucasian Americans. However, as with previous research in this area,<sup>6-9</sup> our results found that African-American race is a predictor of advanced breast cancer stage at diagnosis. In addition, similar to Lannin et al.,<sup>8</sup> controlling for Medicaid insurance did not explain all of the racial variation in breast cancer stage. However, different from previous studies, we found no difference between the races for AJCC stage-4 breast cancer.

**Table 2. Adjusted multivariate analysis\*—race and breast cancer stage**

AJCC Stage	Odds Ratio**	95% CI	P Value
0	0.15	(0.02–1.12)	0.06
1	0.80	(0.67–0.96)	0.02
0 and 1	0.75	(0.63–0.89)	0.001
2	1.16	(0.98–1.39)	0.09
3	1.50	(1.11–2.01)	0.01
4	0.98	(0.79–1.21)	0.85

\* Controlling for family history, marital status, smoking, estrogen and progesterone receptors, insurance status, age, menopausal age;

\*\* The odds of an African-American women being in each stage compared to a Caucasian women.

There are a few possible reasons for our findings. First, African Americans may have less access to care. Ideally, we would have liked to assess and control for a better indicator of socioeconomic status (SES) than just Medicaid insurance. Education level or annual income would be a preferred SES variable. When previous researchers have investigated this topic and controlled for SES, they have still found a significant effect of race on stage at diagnosis. Second, breast cancer may act differently in African-American women. It may be harder to find on mammography and palpation or may grow at a faster pace than Caucasian Americans. Although there is no scientific data to suggest either of these possibilities, if true, these could cause the cancers of African-American women to be diagnosed at a more advanced stage. It is known that African Americans possess a lower incidence of breast cancer compared to Caucasians and, appropriately, their race is recognized as a predictor of a lower risk of developing the disease.<sup>3</sup>

Our project was unique from previous research in that we investigated the variables of topography, morphology and laterality. We felt that one or more of these variables could explain, in addition to SES, some of the variation in stage demonstrated between the two races. However, since there was no difference for all three variables, this suggests that breast cancer is very similar for both races. Although several potential confounders were found to be different between the two races (age, receptor status, etc.), controlling for the variations had minimal impact on the outcomes of interest.

The study population should well represent the general population in Cincinnati. The TriHealth tumor registry is the largest in the county. The three hospitals serve urban, suburban and rural geographical populations. The percentage of African Americans in the study (11%) is identical to the overall county prevalence.

There are a few limitations of our project that need to be mentioned when considering our results. First, we have only regional data for our investigation. Although our results were consistent with previous investigations, there may be some geographical areas where this relationship of race and breast cancer stage is different. Second, our study possessed small populations in certain stages. In particular stages 0, 3A, 3B, 3C, 2A and 2B all lacked power individually. The combined stages possessed better power; however, ideally our study would have had adequate numbers of patients to look at each individual stage. However, previous researchers with large, national data sets have also combined these stages for analysis. And third, our study would be stronger if we possessed a better control variable to

assess SES than simply Medicaid insurance status.

Since these findings have been found across several populations, future research should focus on African Americans and why they get diagnosed later than Caucasian Americans. In particular, it would be important to see if access to care is the primary reason for the difference.

## CONCLUSION

Although there was no difference between the races for topography, morphology and laterality of their breast cancers, African-American race is a predictor of more advanced stage at diagnosis even after controlling for multiple confounding variables.

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