Racial Differences in Patterns of Care Among Medicaid-Enrolled Patients With Breast Cancer

By Gretchen Kimmick, MD, MS, Fabian Camacho, MS, Kristi Long Foley, PhD, Edward A. Levine, MD, Rajesh Balkrishnan, PhD, and Roger Anderson, PhD

Duke University Medical Center, Durham; Departments of Medicine, Surgery, and Public Health Sciences, Wake Forest University School of Medicine, Winston-Salem, NC; Ohio State University, Columbus, OH

Abstract

Purpose: Suboptimal care among minority and low-income patients may explain poorer survival. There is little information describing patterns of health care in Medicaid-insured women with breast cancer in the United States. Using a previously created and validated database linking Medicaid claims and state-wide tumor registry data, we describe patterns of breast cancer care within a low-income population.

Methods: Sample characteristics were described by frequencies and means. Logistic regressions were used to determine predictors of type of surgery, use of radiation therapy after breast-conserving surgery (BCS), and use of adjuvant chemotherapy.

Results: The sample consisted of 974 women. The dataset included only white (58%) and black (42%) women. Sixty-seven

percent were treated with mastectomy; 43% received adjuvant chemotherapy; and 67% of women receiving BCS received adjuvant radiation. In multivariate analysis, predictors of BCS were young age, black race, and smaller tumor size. Furthermore, there was a trend toward more black than white women with tumors 4 cm or larger having BCS (18% v 8%; $P = .06$). Race was not related to use of adjuvant radiation therapy after BCS or to use of adjuvant chemotherapy.

Conclusion: In this group of patients with breast cancer enrolled in Medicaid, black women were more likely than white women to have BCS. Race was not associated with adjuvant radiation therapy or chemotherapy use. Factors affecting the quality of care delivered to low-income and minority patients are complex, and better care lies in exploring areas that need improvement.

Introduction

Decades of clinical trials research led to the development of treatment guidelines that minimize risk of recurrence, extend survival, and improve quality of life in women with breast cancer.^{1,2} These guidelines recommend local therapy, with either mastectomy or breast-conserving surgery (BCS) followed by radiation therapy (RT), and use of adjuvant systemic therapy (hormonal therapy or chemotherapy) if warranted by risk of recurrence. Apparent suboptimal care, particularly among minority and low-income patients, is an area of growing interest because of the potential link to poorer survival.³⁻⁶ Compared with white women, black women are diagnosed with more advanced-stage breast cancer and have poorer survival rates.⁵⁻¹³ The disparity is attributed to socioeconomic status, limited access to care, differences in comorbidities, and differences in treatment.^{4,14-22}

The extent to which disparities in cancer care exist for early-stage breast cancer is uncertain. Some reports show that black women are less likely to undergo BCS than are white women,^{23,24} while others find that racial differences in BCS were less evident when adjusting for socioeconomic status, hospital size, urban residence, and health insurance status.^{22,25-27} Only a few studies report that black women are more likely to undergo BCS compared with white women, but none specifically queried a low-income population.^{8,28,29} Most were based on information from a single medical center or managed care organization^{23,30} or were derived from a SEER-Medicare linked database comprised primarily by older individuals.³⁰

Systematic omission of essential components of therapy for breast cancer adversely affects survival.³¹ Bradley et al reported that women with Medicaid insurance were less likely to have BCS and RT after BCS, compared with women not insured by Medicaid. Insurance status was also associated with mortality (odds ratio, 1.41, 95% CI, 0.99 to 2.01 for health maintenance organizations; odds ratio, 5.53, 95% CI, 4.24 to 7.21 for fee for service).⁸

We developed, implemented and evaluated a cancer registry–Medicaid linked database, using data from the state of North Carolina, to fill the need for a cancer treatment surveillance system inclusive of low-income individuals with Medicaid insurance claims.⁴¹ Here, we describe patterns of care within this low-income population, with attention to the effect of race on breast cancer care.

Methods

The study was approved by the institutional review board at Wake Forest University School of Medicine (Winston-Salem, North Carolina).

Data

We used the North Carolina Central Cancer Registry to identify 1,401 women with in situ or invasive breast cancer in 1998 and 1999 and enrolled in Medicaid at least 1 month prior to the month of cancer diagnosis. From this population, we included 974 women who satisfied the following criteria: (1) had either a mastectomy or BCS; (2) were white or black (other minorities

were excluded due to low numbers); (3) had a recorded tumor size; (4) were stage I-III (not unstaged, in situ or metastatic); and (5) had continuous Medicaid eligibility for 12 months following the month of diagnosis. Race was defined as white or black as abstracted from medical records by hospital registrars following North American Association of Central Cancer Registries (NAACCR) guidelines.

Methods used to create a North Carolina Central Cancer Registry–Medicaid linked dataset have been previously described.⁴¹ In North Carolina, Medicaid is almost entirely fee for service, with one small managed-care program (< 10,000 covered lives); therefore, exclusions for missing data from health maintenance organization enrollees is minimal. Our dataset included detailed claims for both Medicaid and Medicare (those legally blind, disabled, or older than 65 years) for the dually insured. For simplicity, we refer to all study claims as “Medicaid” claims regardless of source of reimbursement. The Medicaid claims and Central Cancer Registry data were merged at the North Carolina Central Cancer Registry facility with a probabilistic match algorithm based on two matching strings (Social Security number, and the first three characters of the first name to prevent mismatching a patient’s cancer record with her husband’s Medicaid record).

Variables

Predictors used in the analysis included age, race, tumor size (cm), estrogen-receptor (ER) status, and number of involved nodes. An index of comorbidity, a Charlson score based on the version of D’Hoore et al,⁴² was calculated for each patient from diagnosis codes available in the Medicaid claims database. This index assigns points ranging from 1 to 6 for diagnoses (as codified by the first three digits of the 9th Revision of the International Classification of Diseases) present in a particular patient. Diagnostic codes relating to breast cancer (174.x) were removed from calculations. Procedure and treatment variables used to determine whether the patient had a mastectomy, BCS, chemotherapy, and adjuvant RT were derived from the linked North Carolina Central Cancer Registry and Medicaid claims information. Based upon results of dataset testing,⁴³ we used the method of replacing missing registry data on treatment with Medicaid claims. Standard of care was defined by those suggested by the NCCN.¹

Analysis

Statistical analyses were performed using the SAS system’s logistic regression procedure (SAS Institute, Inc., Cary, North Carolina).⁴³ Four separate logistic regressions were used to examine predictors of the odds for type of surgery (mastectomy *v* BCS), RT use after BCS, RT use after mastectomy, and chemotherapy use. The model for type of surgery included age, race, Charlson score, and tumor size as predictors. The model for use of adjuvant chemotherapy included age, type of surgery, race, Charlson score, tumor size, positive or negative status of regional lymph nodes, and ER status. In the models for use of adjuvant RT after BCS or mastectomy, the same predictors that

were included in the adjuvant chemotherapy model were used (excluding surgery type), and use of chemotherapy was included.

Odds ratios derived from the model estimates were assumed significant and were highlighted if their 95% CIs fell greater or less than 1. Where appropriate, χ^2 tests were conducted to test the equality of proportions between black and white races, both for chemotherapy treatment and RT use after BCS.

Results

Sample characteristics are presented in Table 1. Patients were evenly distributed across age groups. Fifty-eight percent were white. Mean adjusted modified Charlson comorbidity score was 1.4 (standard deviation, 1.3). Thirty percent of tumors were 1 to 2 cm, 46% were 2 to 5 cm, and 13% were larger than 5 cm. Most cancers were node negative (47%) and ER positive (47%). Sixty-seven percent were managed with mastectomy. Of those who had BCS, 67% also received RT. Overall, 43% of women received chemotherapy; 69% of women with node-positive breast cancer received chemotherapy.

Comorbidity score increased with increasing age ($P < .0001$; Table 1). We examined the relationship of comorbidity to race, tumor size, and chemotherapy use. No significant difference in comorbidity level by race was observed ($P = .3682$). Higher comorbidity score was positively correlated with larger tumor size ($P = .0076$). For patients with tumors of 0 to 1 cm, the mean comorbidity score was 0.99, compared with 1.34 for those with tumors 1 to 2 cm, 1.44 with tumors 2 to 5 cm, and 1.49 with tumors 5 cm or larger. The mean comorbidity score for patients who received adjuvant chemotherapy was lower than that for those who did not receive adjuvant chemotherapy (1.29 *v* 1.44; $P = .0490$).

Predictors of Breast Surgery

Older age, white race, and larger tumor size were associated with a higher likelihood of mastectomy (Table 2). Compared with women younger than 50 years, women aged 75 years and older were 1.49 times (95% CI, 1.00 to 2.23) more likely to have a mastectomy. The odds ratio for mastectomy versus BCS, in black versus white women was 0.66 (95% CI, 0.49 to 0.88). In addition, more black women with large tumors (≥ 4 cm; 18% *v* 8%; $P = .060$) and involved nodes (26% *v* 14%; $P = .0039$) had BCS. Larger tumor size was also associated with higher risk of having a mastectomy. Within our database, we only found one person who was treated with neoadjuvant chemotherapy.

Predictors of Chemotherapy Use

Use of adjuvant chemotherapy was associated with younger age, larger tumor size, presence of involved lymph nodes, and ER negativity (Table 3). Compared with persons younger than 50 years, the odds ratio for receiving chemotherapy was 0.23 (95% CI, 0.14 to 0.39), 0.09 (95% CI, 0.05 to 0.16), and 0.02 (95% CI, 0.01 to 0.04) for women aged 50 to 64 years, 65 to 74 years, and 75 years and older, respectively.

Table 1. Sample Characteristics: A Medicaid-Enrolled Group of Patients With Nonmetastatic, Invasive Breast Cancer

Characteristic	Patients	
	No.	%
Total breast cancer sample	974	100
Age, years		
< 50	202	21
50-64	270	28
65-74	189	19
≥ 75	313	32
Race		
Black	406	42
White	568	58
Adjusted Charlson score		
Overall		
Mean	1.37	
SD	1.32	
By age group, years		
< 50		
Mean	0.99	
SD	1.06	
50-64		
Mean	1.36	
SD	1.24	
65-74		
Mean	1.45	
SD	1.49	
≥ 75		
Mean	1.56	
SD	1.37	
Tumor size, cm		
0-1	113	12
1-2	290	30
2-5	449	46
≥ 5	122	13
Regional lymph nodes		
Not examined	169	17
Negative	458	47
1-3 positive	206	21
≥ 4 positive	141	14
Estrogen-receptor status		
Not done/missing	314	32
Positive	459	47
Negative	201	21
Patients who had a mastectomy	650	67

Continued

Table 1. Continued

Characteristic	Patients	
	No.	%
Patients receiving chemotherapy		
Overall	419	43
Node-positive breast cancer	241*	69
Patients receiving radiation therapy	218†	67

NOTE. Patients in this sample must have had a recorded tumor size, mastectomy, or breast-conserving surgery, and not been unstaged or had either in situ or distant staging.

* Frequency and percent is of all patients in the sample who had a positive node.

† Frequency and percent is of all patients in sample who had breast-conserving surgery.

The odds ratio for chemotherapy use was 0.37 (95% CI, 0.23 to 0.60) for women with ER-positive, compared with ER-negative breast cancer. This relationship held true when the group was subdivided by age into groups that were younger than 65 years (odds ratio, 0.41; 95% CI, 0.23 to 0.74) and 65 years and older (odds ratio, 0.30; 95% CI, 0.15 to 0.61). Patients with smaller tumors compared with tumors larger than 5 cm, were less likely to receive chemotherapy; odds ratios were 0.17 (95% CI, 0.072 to 0.38), 0.38 (95% CI, 0.19 to 0.75), and 0.58 (95% CI 0.31 to 1.07) for tumors 0 to 1 cm, 1 to 2 cm, and 2 to 5 cm, respectively.

Race was unrelated to delivery of chemotherapy. Among black and white women, respectively, 52% and 39% ($P = .1081$) with a tumor 2 cm or larger and 77% and 68% ($P = .4307$) with involved nodes received chemotherapy.

Predictors of Adjuvant RT After BCS

RT delivery after BCS was more common if chemotherapy was also used (odds ratio, 2.71; 95% CI, 1.14 to 6.42) and when there were one to three involved lymph nodes (odds ratio, 4.33; 95% CI, 1.08 to 17.36), versus four or more involved lymph nodes (Table 4). Age and comorbidity level were not significantly related to RT after BCS. RT use after BCS was similar in black and white populations (68% and 66%, respectively, $P = .7119$).

Predictors of Adjuvant RT After Mastectomy

Of the women who had a mastectomy, 29.4% received RT. As would be expected, smaller tumor size and fewer involved nodes were associated with less postmastectomy RT. Compared with women with tumors that were larger than 5 cm, the odds ratios for women with 1- to 2-cm tumors and 2- to 5-cm tumors were 0.19 (95% CI, 0.10 to 0.39) and 0.24 (95% CI, 0.14 to 0.43). In women with negative nodes and one to three involved nodes, compared with four or more individual nodes, the odds ratios for receiving postmastectomy RT were 0.14 (95% CI, 0.28 to 0.25) and 0.23 (95% CI, 0.13 to 0.41). Use of chemotherapy was associated with higher odds ratio for receiving RT (odds

Table 2. Predictors of Mastectomy Versus BCS

	Patients With BCS		Outcome: Mastectomy v BCS (N = 974)‡	
	No.	%	Odds Ratio	95% CI
Age, (years)				
< 50	202	36	1	
50-64	270	35	1.22	0.81 to 1.83
65-74	189	33	1.50	0.96 to 2.36
≥ 75	313	29	1.49	1.00 to 2.23
Race (black v white)	406	37	0.66	0.49 to 0.88
Adjusted Charlson score			1.06	0.95 to 1.18
Tumor size, cm†				
0-1	113	57	0.07	0.034 to 0.15
1-2	290	43	0.13	0.066 to 0.24
2-5	449	27	0.26	0.14 to 0.50
> 5	122	10	1	

Abbreviation: BCS, breast-conserving surgery.

* Reference category for age is < 50 years.

† Reference category for tumor size is 5 cm or larger.

‡ Bold faced odds ratios are significantly different from one with $P < .05$ and 95% CIs greater or less than 1.

ratio, 5.19; 95% CI, 2.94 to 9.17). Race was unrelated to delivery of postmastectomy RT.

Discussion

In this population of Medicaid-enrolled patients with breast cancer, black race was associated with a higher likelihood of BCS. There was no significant association of race with use of RT after BCS, use of RT after mastectomy, or the use of adjuvant chemotherapy.

Use of BCS has increased since the early 1980s^{44,45}; however, a parallel trend in less appropriate use of local therapy is noted, such as omission of RT after BCS, axillary node assessment, or both.⁴⁶ This is seen regardless of age, race, stage, and population density. We find that younger women, black women, and women with smaller tumors are more likely to have BCS. More frequent mastectomy use in older women⁴⁷⁻⁴⁹ and in women with larger tumors is not surprising. It is interesting, however, that in this Medicaid-enrolled population, more black women than white women had BCS. On the contrary, other studies show similar or lower rates of BCS in black compared with white women.^{23,24,50,51} Compared with other reports, our database is unique because it consists only of Medicaid participants who, by definition, have low income. Within this Medicaid-insured group, after controlling for age, race, comorbidity level, and stage of disease, black women were less likely than white women to have a mastectomy. Further studies are needed to determine if black women with BCS, versus mastectomy, have higher risk for local recurrence or poorer prognosis and how this is related to other factors.

We are reporting an underuse of adjuvant RT. RT was delivered in only 67% of women after BCS. Postmastectomy RT was delivered in only 64% of women with tumors larger than 5 cm and in 67% of women with four or more involved lymph nodes. This rate of omission of adjuvant RT after BCS is considerably higher than recently reported rates for early-stage breast cancer, which range from 6% to 14%.^{50,52,53} In multivariate analysis, the use of RT after BCS was associated with use of chemotherapy versus no chemotherapy, and the presence of one to three involved nodes versus four or more involved nodes. We might speculate that women who accept chemotherapy would also accept RT. The reason women with one to three nodes would receive RT more often than women with four or more involved nodes is elusive and may be quite complex; possible contributing factors include low referral rates, low uptake rates, or lack of physician recommendation to proceed with treatment.

More black women than white women with large tumors (≥ 4 cm) and involved lymph nodes had BCS, both factors that increase risk of recurrence. Risk of local recurrence can be decreased by adjuvant RT but prior reports claim lower RT use in minority populations.^{22,47,54-56} In this Medicaid-enrolled group therefore, we were interested that rates of adjuvant RT after BCS or mastectomy were similar in black and white women; furthermore, rates were similar in women with large tumors (58% v 52%; $P = .4421$). It is possible that black women who were marginal candidates for BCS because of large tumor size were treated with BCS (due to tumor-breast size ratio) in order to avoid mastectomy. Combined with overall lower rates of adjuvant RT and other factors (such as being overweight, which is a poor prognostic factor in itself⁵⁷), black women may be

Table 3. Predictors of Adjuvant Chemotherapy Use

	Outcome: Chemotherapy (N = 974)		By Age Group			
	Odds Ratio	95% CI¶	< 65 Years		≥ 65 Years	
			Odds Ratio	95% CI	Odds Ratio	95% CI
Age, years*						
< 50	1					
50-64	0.23	0.14 to 0.39				
65-74	0.09	0.05 to 0.16				
≥ 75	0.02	0.01 to 0.04				
Mastectomy	1.26	0.83 to 1.90	1.03	0.63 to 1.67	0.94	0.49 to 1.82
Race (black v white)	1.19	0.84 to 1.70	1.04	0.65 to 1.65	1.69	1.02 to 2.82
Adjusted Charlson score	0.94	0.82 to 1.08	0.89	0.71 to 1.06	0.90	0.75 to 1.08
Tumor size, cm†						
0-1	0.17	0.072 to 0.38	0.07	0.02 to 0.23	0.52	0.13 to 2.13
1-2	0.38	0.19 to 0.75	0.14	0.05 to 0.40	1.17	0.43 to 3.13
2-5	0.58	0.31 to 1.07	0.28	0.10 to 0.80	1.35	0.56 to 3.26
> 5	1		1		1	
Regional lymph nodes‡						
Not examined	0.08	0.04 to 0.17	0.07	0.02 to 0.23	0.05	0.02 to 0.14
Negative	0.16	0.09 to 0.28	0.12	0.05 to 0.31	0.18	0.09 to 0.39
1-3 positive	0.62	0.34 to 1.14	0.53	0.19 to 1.46	0.62	0.29 to 1.31
≥ 4 positive	1		1		1	
Estrogen receptor status§						
Not done/missing	0.46	0.28 to 0.76	0.53	0.29 to 0.98	0.32	0.15 to 0.68
Positive	0.37	0.23 to 0.60	0.41	0.23 to 0.74	0.30	0.15 to 0.61
Negative	1		1		1	

* Reference category for age is < 50 years.

† Reference category tumor size is ≥ 5 cm.

‡ Reference category for regional lymph nodes is four or more positive nodes.

§ Reference category is estrogen-receptor negative.

¶ Bold faced odds ratios are significantly different from one with $P < .05$ and 95% CIs greater or less than 1.

predisposed to poorer outcomes. Of note, our sample included only Medicaid-insured low-income women, and previous studies have not clearly sorted out independent effects of race and poverty on treatment. Thus, it is instructive that in the context of this low-income population, black women did not seem to be disadvantaged relative to white women in terms of RT delivery, as both groups were undertreated. To our knowledge, the finding that black women, even those with tumors 4 cm and larger, had BCS more frequently is new and warrants further investigation.

Racial differences in surgery for large tumors raise questions about the appropriateness of therapy. There are two main studies^{58,59} confirming equivalent survival in women after BCS followed by RT compared with mastectomy, and neither of those studies included women with tumors larger than 4 cm. In prac-

tice, eligibility for BCS is determined by primary tumor size and its ratio to the patient's breast size and the perceived cosmetic outcome of such surgery. Women with larger breasts, therefore, may have BCS for larger tumors than women who have smaller breasts. Furthermore, there is a known correlation between race and elevated body mass index, which may partially explain the higher rate of BCS for larger tumors.^{57,60} In fact, there is little published experience using BCS in patients with tumor sizes larger than 4 cm.⁶¹ In a study of conservative surgery and RT in black versus white patients, Tuimokumo et al reported higher local relapse rates (19% v 13%) and poorer cosmetic results in black women.⁶² They did a multivariate analysis taking into account all known risk factors for local relapse, including age, race, margin status, use of adjuvant therapy, and RT dose and found that only black race and young age were associated with ipsilateral breast recurrence. In their report, black women pre-

Table 4. Predictors of Adjuvant Radiation Therapy Use After Breast-Conserving Therapy

	Patients With Radiation Therapy		Outcome: Radiation (n = 324)	
	No.	%	Odds Ratios	95% CI
Age, years*				
< 50	73	78	1	
50-64	96	82	2.29	0.88 to 5.95
65-74	63	75	1.47	0.52 to 4.19
≥ 75	92	38	0.68	0.24 to 1.91
Chemotherapy	116	84	2.71	1.14 to 6.42
Race (black v white)	150	68	0.75	0.40 to 1.40
Adjusted Charlson score			0.97	0.77 to 1.21
Tumor size, cm†				
0-1	65	81	2.38	0.46 to 12.14
1-2	124	73	0.89	0.19 to 4.16
2-5	123	54	0.43	0.09 to 1.94
> 5	12	58	1	
Regional lymph nodes‡				
Not examined	102	33	0.48	0.12 to 1.84
Negative	154	84	3.00	0.83 to 10.86
1-3 positive	52	87	4.33	1.08 to 17.36
≥ 4 positive	16	63	1	
Estrogen receptor§				
Not done/missing	105	64	1.11	0.46 to 2.67
Positive	159	68	1.32	0.58 to 3.04
Negative	60	72	1	

* Reference category for age is < 50 years.

† Reference category for tumor size is 5 or more cm.

‡ Reference category for regional lymph nodes is four or more positive lymph nodes.

§ Reference category is ER negative.

¶ Bold faced odds ratios are significantly different from one with $P < .05$ and 95% CIs greater or less than 1.

sented with larger tumors, but tumor size was not included in their multivariate analysis. It is plausible, therefore, that local and distant recurrence rates are adversely affected by the use of BCS in women with larger tumors. This is an issue that requires further exploration.

Adjuvant chemotherapy use was associated with younger age, larger tumor size, presence of involved lymph nodes, and ER-negative status. There was a trend, albeit insignificant in the Medicaid dataset, for black women with tumors larger than 2 cm or with involved lymph nodes, to receive chemotherapy, in accordance with guidelines, more often than white women. Access to health care is a complex process that includes the timely use of personal health services to achieve the best possible health outcome⁶³ and is essential to receiving quality care. Previous analyses of treatment patterns found that women with no usual source of care were

significantly less likely to receive minimum expected therapy.³⁴ Health care professionals need to educate and assist healthy women of low socioeconomic status (especially those of low health care use) in ways to seek and obtain appropriate medical care.

Strengths of our study include the unique population of low-income women and the robust database. All of the individuals were covered by North Carolina Medicaid, for which the eligibility includes: persons whose income limit is 100% poverty level and who are older than 65 years, blind, or disabled, and persons whose income is 180% poverty level who are pregnant, or caring for young children. In constructing the hybrid database, we used claims data to replace data missing from the registry and case reports from the registrar to verify accuracy of replaced data. RT, for instance, was underreported in registry data.^{37,41}

Table 5. Predictors of Postmastectomy RT

	Frequency With RT		Outcome: RT (n = 650)	
	No.	%	Odds Ratios	95% CI¶
Age, years*				
< 50	129	47	1	
50-64	174	36	1.09	0.61 to 1.93
65-74	126	26	1.40	0.71 to 2.79
≥ 75	221	13	0.57	0.27 to 1.17
Chemotherapy	303	50	5.19	2.94 to 9.17
Race (black v white)	256	32	0.92	0.59 to 1.42
Adjusted Charlson score			1.07	0.91 to 1.26
Tumor size, cm†				
0-1	48	25	0.51	0.20 to 1.27
1-2	166	14	0.19	0.10 to 0.39
2-5	326	24	0.24	0.14 to 0.43
> 5	110	64	1	
Regional lymph nodes‡				
Not examined	67	24	0.31	0.14 to 0.70
Negative	304	13	0.14	0.08 to 0.25
1-3 positive	154	29	0.23	0.13 to 0.41
≥ 4 positive	125	67	1	
Hormone receptor ER§				
ER not done/missing	209	25	0.75	0.42 to 1.34
ER positive	300	27	0.95	0.55 to 1.65
ER negative	141	37	1	

* Reference category for age is < 50 years.

† Reference category for tumor size is ≥ 5 cm.

‡ Reference category for regional lymph nodes is four or more positive lymph nodes.

§ Reference category is ER-negative.

¶ Bold faced odds ratios are significantly different from one with $P < .05$ and 95% CIs greater or less than 1.

Our study is limited by the fact that our population is from a single state in the southeastern United States and may not be generalizable to other geographic locations. In addition, though the NC Medicaid population is representative of one low income group, not all impoverished people are insured by Medicaid; studies using other indicators of SES may find different results. Furthermore, claims and registrar data are insufficient to determine some absolute and relative contraindications to treatments; for instance, tumor to breast size, tumor location and patient preference influence surgical choice.

In conclusion, in a state-wide database of women diagnosed with breast cancer and insured by Medicaid, both black and white women were at appreciable risk of undertreatment for breast cancer. In multivariate analysis, race was associated with type of surgery, but not use of chemotherapy or use of RT after BCS. There was more frequent use of BCS for large tumors

among black women than white women within this population. It is unknown how this may impact survival or more immediate outcomes, such as quality of life. Factors affecting the quality of care delivered to low income patients are complex and solutions lie in exploring the areas that need improvement. This report implies that, within the North Carolina population insured via Medicaid, the use of BCS, particularly for large tumors, needs to be reassessed. Furthermore, access to care after surgery, such as chemotherapy and RT, needs to be improved.

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Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

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