Socioeconomic Disparities in Breast Cancer Treatment Among Older Women

Arica White, PhD, MPH,¹ Lisa C. Richardson, MD, MPH,¹ Helen Krontiras, MD,² and Maria Pisu, PhD³

Abstract

Background: Racial disparities in breast cancer treatment among Medicare beneficiaries have been documented. This study aimed to determine whether racial disparities exist among white and black female Medicare beneficiaries in Alabama, an economically disadvantaged U.S. state.

Methods: From a linked dataset of breast cancer cases from the Alabama Statewide Cancer Registry and fee-for-service claims from Medicare, we identified 2,097 white and black females, aged 66 years and older, who were diagnosed with stages 1–3 breast cancer from January 1, 2000, to December 31, 2002. Generalized estimating equation (GEE) models were used to determine whether there were racial differences in initiating and completing National Comprehensive Cancer Network Clinical Practice guideline-specific treatment.

Results: Sixty-two percent of whites and 64.7% of blacks had mastectomy ($p=0.27$); 34.6% of whites and 30.2% of blacks had breast conserving surgery (BCS) ($p=0.12$). Among those who had BCS, 76.8% of whites and 83.3% of blacks started adjuvant radiation therapy ($p=0.33$) and they equally completed adjuvant radiation therapy ($p=0.29$). For women with tumors over 1 centimeter, whites and blacks were equally likely to start (16.1% of whites and 18.3% of black; $p=0.34$) and complete (50.6% of whites and 46.3% of black; $p=0.87$) adjuvant chemotherapy. There were still no differences after adjusting for confounders using GEE. However, differences were observed by area-level socioeconomic status (SES), with lower SES residents more likely to receive a mastectomy (odds ratio [OR]=1.26; 95% confidence interval [CI]: 1.01–1.57) and initiate radiation after BCS (OR=2.24; 95% CI: 1.28–3.93).

Conclusions: No racial differences were found in guideline-specific breast cancer treatment or treatment completion, but there were differences by SES. Future studies should explore reasons for SES differences and whether similar results hold in other economically disadvantaged U.S. states.

Introduction

BREAST CANCER IS THE MOST commonly diagnosed cancer and the second leading cause of cancer death among women in the United States.¹ Each year, approximately 200,000 women are diagnosed with breast cancer and 40,500 die from the disease.¹ White women have a higher incidence of this disease than black women (417 per 100,000 versus 388.8 per 100,000 respectively).¹ However, black women experience higher mortality than white women (171.0 per 100,000 versus per 148.2 100,000 respectively).¹ Differential receipt of standard therapy may explain some of these mortality disparities.²

Treatment for early stage breast cancer commonly consists of either mastectomy or breast conserving surgery (BCS) with or without radiation therapy.³ Evidence from randomized clinical trials has shown that long-term survival is equivalent

among women with early stage disease who receive either BCS with radiation therapy or mastectomy.⁴ Since the 1990 National Institutes of Health (NIH) consensus development conference on the treatment of early stage breast carcinoma recommended breast conservation therapy as preferable for the majority of women with stages 1–2 breast cancer,⁵ BCS has become the most common surgical treatment for early stage breast cancer.⁶ However, research has shown that when women are fully informed about their options, they are more likely to choose mastectomy,⁷ which is a complete treatment compared with BCS with radiation. Recommended treatment for advanced breast cancers includes additional systemic therapy consisting of a combination of chemotherapy, hormonal agents, or both.⁸

Several studies have found that black women are less likely to receive guideline-recommended breast cancer treatment

¹Division of Cancer Prevention and Control, National Center for Chronic Disease and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia.

²School of Medicine, and ³Division of Preventive Medicine, University of Alabama, Birmingham, Alabama.

than white women.^{9–11} However, many of these studies have focused on Medicare recipients residing in Surveillance, Epidemiology, and End Results (SEER) program areas of the United States, and few studies have examined receipt of breast cancer treatment in southern states, especially those that are not SEER registries.^{12,13} Compared with the rest of the United States, SEER regions are more likely to be affluent, with residents concentrated in urban areas.¹⁴ In contrast, Alabama is a southern state with a higher poverty rate and more rural residents than the U.S. average.¹⁵ Furthermore, this state also has more limited medical resources, especially oncology care.¹⁶ It is unclear whether these disadvantages relative to the rest of the United States impact racial differences or translate into low access to high quality cancer care for everyone.

Using linked data from the Centers for Medicare and Medicaid Services and the Alabama Statewide Cancer Registry, a registry funded by the Centers for Disease Control and Prevention's National Program of Cancer Registries (NPCR), racial and socioeconomic differences in the initiation and completion of treatment among Alabama Medicare beneficiaries diagnosed with breast cancer were examined. Findings may offer a better understanding of breast cancer disparities in Alabama and socioeconomically similar states.

Methods

Data source

Data sources for this study included records from the Alabama Statewide Cancer Registry (ASCR), a population-based cancer registry, and Medicare claims. The data collected by the ASCR have been recognized as high quality by the North American Association of Central Cancer Registries (NAACCR) with a designation of silver certification in 2003 for case completeness greater than 90%. The Medicare data included claims for inpatient, outpatient, and physician encounters. This analysis is part of a larger study to assess completion of cancer-directed treatment in Medicare patients with breast, colorectal, lung, or prostate cancer. Approval for this study was granted by the institutional review boards of the University of Alabama at Birmingham and the Centers for Disease Control and Prevention.

Study population

The study population consisted of women 66 years old and older diagnosed in Alabama with stages 1, 2, and 3 breast cancer (International Classification of Diseases for Oncology, third edition codes C60.1–C60.9) from January 1, 2000, to December 31, 2002 ($N=2,426$). Although Medicare covers ages 65 and older, the study population was set at a minimum age of 66 years to allow at least 1 year of eligibility in Medicare before the date of diagnosis to ascertain comorbidity data. To ensure we had claims for all women, we included in the analyses those who were continuously enrolled in Medicare part A and part B, and were enrolled in fee for service plans (not in managed care) ($N=2,117$).

Race/ethnicity was based on the racial classification in the registry data and restricted to non-Hispanic blacks and whites, and histologic types were restricted to those consistent with breast cancer. Our final cohort consisted of 2,097 Medicare beneficiaries with stages 1–3 breast cancer. Of these, 87.7% of patients were white and 12.3% were black.

Study variables

Therapy. Receipt of treatment was based on the National Comprehensive Cancer Network (NCCN) guidelines.⁸ To identify breast cancer treatments (mastectomy, BCS, chemotherapy and radiation therapy), we used the *International Classification of Disease, Ninth Revision*, Current Procedure Terminology (CPT), and Healthcare Common Procedure Coding System (HCPCS) codes.^{17–19} We searched for relevant codes in the period starting 2 months before the diagnosis date reported by ASCR and ending 1 year after that date. Standard adjuvant chemotherapy was defined as those treatments delivered after surgery with chemotherapy agents listed in the *NCCN Clinical Practice Guidelines*.⁸ These included the following combinations: (1) doxorubicin (A) and cyclophosphamide (C); (2) C, methotrexate (M), and fluorouracil (F); (3) AC plus paclitaxel (P); (4) epirubicin (E) and C; (5) docetaxel (T), A, and C; (6) FAC, CAF, ECMF, ACMF, ATC, and FEC.

Treatment duration was defined as the time from the first and last claim for that treatment. We defined a binary variable equal to 1 for completed radiation if radiation therapy lasted 35 days or more (5 weeks), which was the standard for whole breast radiation therapy during the study period. Completion of chemotherapy depended on each specific drug regimen and on the number of treatments needed for completing therapy. The standard number of treatments was obtained from the NCCN guidelines.⁸ Chemotherapy was considered incomplete if the number of treatments were less than three for AC; five for CMF; eight for ACP and EC; six for FEC, CAF, FAC, and TAC; and twelve for ACMF. We defined a binary variable equal to 1 for complete chemotherapy if a woman had at least the standard number of treatments.

Sociodemographic and clinical characteristics. Variables assessed in this study included age (66–75 and 75+ years), race (black and white), stage at diagnosis (stage 1, 2, and 3), Klabunde adaptation of the Charlson comorbidity index (0 and ≥ 1), and socioeconomic status (SES). SES was assessed based on the 2000 Census tract of residence at diagnosis and included percentage African American ($\geq 30\%$ versus $<30\%$), percent living below the poverty line ($\geq 20\%$ vs. $<20\%$), and percent with less than a high school education ($\geq 40\%$ vs. $<40\%$). Urban and rural residence are based on a county-level classification system which accounts for population per square mile, the size and number of cities in a county, percentage of total employment comprised by employment in public education, and per capita agricultural sales.²⁰ Information on comorbidities was ascertained from Medicare claims by identifying 18 diagnoses or related procedures that were recorded between 1 year before and 1 month after the diagnosis of breast cancer.²¹

Analysis

Generalized estimating equation (GEE) models, accounting for clustering of patients within reporting hospitals, were used to determine whether there were significant differences in breast cancer treatment between black and white women, including:

(1) Initiation of a particular therapy (mastectomy, BCS, radiation therapy in women who received BCS, and adjuvant standard chemotherapy in women with tumors greater than 1 centimeter);

(2) Completion of radiation therapy among women who started radiation after BCS; and

(3) Completion of adjuvant chemotherapy among women who began this therapy.

When estimating the odds of starting or completing radiation, we also controlled for receipt of chemotherapy. When estimating the odds of receiving chemotherapy, we adjusted for the presence of positive or negative lymph nodes. When estimating the odds of completing chemotherapy, we adjusted for whether the chemotherapy regimen was a doxorubicin-based regimen. At the time of the study, this treatment was the most recommended type of chemotherapy and was associated with better outcomes than other therapies; however, it may lead to more side effects and discontinuation of treatment.⁸ Analyses were completed using PROC GENMOD with REPEATED option in SAS (v 9.1).

Results

There were significant differences in sociodemographic and clinical characteristics between black and white women diagnosed with breast cancer (Table 1). Blacks (43.8% stage 2 and 15.1% stage 3) were more likely to be diagnosed at a later stage than whites (34.7% stage 2 and 6.6% stage 3). More blacks (31.4%) had tumors greater than 3 centimeters in diameter compared with whites (16.8%). Relative to whites, blacks were more likely to reside in census tracts in which 30% or more residents are black (73.6% versus 19.1%), 40% or more residents do not have a high school diploma (51.9% versus 41.8%), ≥20 percent of people live below poverty (59.3% versus 15.8%), and in urban areas (47.8% versus 31.6%).

No differences in the receipt of treatment were observed between white and black women (Table 2). These results held for mastectomy (OR=0.83; 95% CI: 0.53–1.29) and BCS (OR=1.03; 95%CI: 0.63–1.70) after adjusting for age, stage, tumor size, comorbidities, and area-level SES (Table 3.) Similarly, no differences were observed in the initiation (OR=1.13; 95% CI: 0.58–2.18) or completion (OR=1.30; 95% CI: 0.69–2.43) of radiation therapy after adjusting for these covariates plus standard chemotherapy. After adjusting for the presence of positive or negative lymph nodes and other covariates, no differences were found between blacks versus whites in initiating adjuvant chemotherapy (OR=1.09; 95% CI: 0.64–1.85). Likewise, no racial differences were observed in completing adjuvant chemotherapy after adjusting for age, stage, tumor size, comorbidities, SES and doxorubicin-based regimen (OR=0.66; 95% CI: 0.30–1.45).

Some differences in treatment were observed by age, stage, comorbid conditions, and area-level SES (Tables 2, 3). Women older than 75 were more likely to receive mastectomy (OR=1.32; 95% CI: 1.08–1.61), and less likely to receive breast conserving surgery (OR=0.80; 95% CI: 0.65–0.97), initiate radiation after BCS (OR=0.24; 95% CI: 0.16–0.36), and initiate chemotherapy (OR=0.22; 95% CI: 0.16–0.29) compared with women 66 to 74 years old (Table 3). Women with higher stage of disease were more likely to have mastectomy (OR=3.57; 95% CI: 2.81–4.54) and to initiate chemotherapy (OR=4.15; 95% CI: 2.94–5.87), while they were less likely to have breast conserving surgery (OR=0.26; 95% CI: 0.20–0.33) than their counterparts. Women with at least one comorbid condition were less likely to start radiation (OR=0.66; 95% CI: 0.45–0.97) or chemotherapy (OR=0.65; 95% CI: 0.43–0.99) than

TABLE 1. CHARACTERISTICS OF OLDER WOMEN DIAGNOSED WITH STAGES 1–3 BREAST CANCER BY RACE (N=2,097), ALABAMA 2000–2002

	Black (n=258)		White (n=1839)		P
	n	%	n	%	
Age at diagnosis					
65–74	122	47.3	960	52.2	0.14
75+	136	52.7	879	47.8	
Stage at diagnosis					
Stage 1	106	41.1	1078	58.6	<0.0001
Stage 2	113	43.8	639	34.7	
Stage 3	39	15.1	122	6.6	
Tumor size (cm)					
<1.0	34	13.2	355	19.3	<0.0001
1–1.9	79	30.6	721	39.2	
2–2.9	53	20.5	357	19.4	
3 or more	81	31.4	309	16.8	
Missing	11	4.3	97	5.3	
Estrogen receptor status*					
ER+	117	45.3	908	49.4	0.23
ER missing	101	39.1	734	39.9	0.81
Comorbidity index					
0	180	69.8	1378	74.9	
≥1	78	30.2	475	25.1	0.07
SES variables†					
≥30% black	190	73.6	352	19.1	<0.0001
<30% black	68	26.4	1487	80.9	
≥40% with <high school	134	51.9	768	41.8	0.002
<40% with <high school	124	48.1	1071	58.2	
≥20% below poverty	153	59.3	290	15.8	<0.0001
<20% below poverty	105	40.7	1549	84.2	
Urban/rural residence					
Urban	121	47.8	577	31.6	<0.0001
Rural	132	52.2	1250	68.4	

*Reference group is estrogen receptor (ER) negative.

†Socioeconomic variables based on Census tract of residence at diagnosis (percent African American, percent living below the poverty line, and percent with high school education or less).

ER+, estrogen receptor positive; SES, socioeconomic status.

women with no comorbidities. Women residing in lower SES census tracts, where more than 40% of residents had less than a high school education, were more likely to have a mastectomy (OR=1.26; 95% CI: 1.01–1.57) than their counterparts. Additionally, women residing in poorer census tracts, where more than 20% of residents lived below the poverty line, were more likely to initiate radiation after BCS than women in areas where less than 20% of residents were in poverty (OR=2.24; 95% CI: 1.28–3.93).

Discussion

In Alabama, we found no differences in breast cancer treatment initiation or completion between older black and white women enrolled in Medicare during the study period. Regardless of race, women living in areas with fewer high school graduates were more likely to have a mastectomy than those who lived in areas with more high school graduates. In addition, women residing in areas with higher poverty were more likely to initiate radiation after BCS compared with women residing in low poverty areas. These findings suggest

TABLE 2. PERCENTAGE OF OLDER BREAST CANCER PATIENTS RECEIVING THERAPY BY PATIENT CHARACTERISTICS, ALABAMA, 2000–2002

	Mastectomy (n=2097)	BCS (n=2097)	Radiation after BCS initiated (n=715)	Radiation after BCS completed (n=554)	Adjuvant chemotherapy initiated* (n=1708)	Adjuvant chemotherapy completed (n=280)
All	62.7	34.1	77.5	82.1	16.4	50.0
Race						
White	62.4	34.6	76.8	81.6	16.1	50.6
Black	64.7	30.2	83.3	omit	18.3	46.3
Age at diagnosis						
Age 66–74	59.3	36.7	88.9	81.9	24.7	49.5
Age 75+	66.2	31.3	63.2	82.6	7.7	51.6
Stage at diagnosis						
Stage 1	50.3	46.5	77.5	82.9	6.3	52.8
Stage 2	77.1	20.9	77.7	79.5	23.7	47.3
Stage 3	85.7	omit	omit	omit	36.2	55.2
Stage 2–3	78.6	18.0	77.4	79.5	26.0	49.3
Tumor size						
<1.0	40.1	56.8	77.8	80.8	–	–
1–1.9	58.6	38.9	80.7	83.3	9.7	52.6
2–2.9	70.0	27.3	75.0	76.2	21.0	47.7
3 or more	84.6	11.3	68.2	86.7	26.4	47.6
Missing	66.7	25.0	63.0	100.0	12.0	69.2
Estrogen receptor status[†]						
ER+	57.9	39.1	77.3	81.3	13.6	52.7
ER missing	64.5	31.7	76.6	84.2	12.9	46.6
Comorbidity Index						
0	60.9	35.4	78.9	82.1	17.9	48.4
≥1	67.7	30.4	72.6	82.3	12.1	56.4
Socioeconomic status variables[‡]						
≥30% black	64.2	32.8	81.5	86.2	15.6	40.8
<30% black	62.1	34.5	76.2	80.7	16.7	53.1
≥40% with <high school	68.6	28.2	79.5	83.2	16.3	44.7
<40% with <high school	58.2	38.6	76.4	81.5	16.5	54.1
≥20% below poverty	67.5	29.6	85.5	87.5	17.4	37.5
<20% below poverty	61.4	35.3	75.7	80.8	16.1	53.7
Urban/rural residence						
Urban	64.6	32.0	78.5	80.2	15.5	52.4
Rural	58.6	38.4	75.4	83.6	16.7	46.0

Omit indicates that the cell suppressed due to small n.

Bold denotes statistical significant difference at $p < 0.05$.

*Among women with tumors greater than 1 cm.

[†]Reference group is ER negative.

[‡]Socioeconomic status variables based on Census tract of residence at diagnosis (percent African American, percent living below the poverty line, and percent with high school education or less).

BCS, breast conserving surgery.

that in an equally insured population, neighborhood-level SES plays a significant role, beyond race, in whether women in Alabama receive breast cancer treatment.

There was variation in treatment between this study and similar studies of older women in SEER regions. Compared with other studies, Alabama's rates for BCS were lower, but higher for mastectomy.^{10,11,22,23} Findings for radiation after BCS were comparable to others.⁹ Chemotherapy rates in Alabama were lower than in SEER regions¹¹; however, rates were comparable in non-SEER regions.²⁴

Our findings with regards to race are consistent with a previous study that examined receipt of initial treatment among all black and white women diagnosed with breast cancer in Alabama and found no racial differences in standard breast cancer treatment.¹² Our analysis expands on this work

by also highlighting that there are no racial differences in completing therapy among this population. However, our findings are in contrast to most studies of Medicare beneficiaries residing in SEER areas who were diagnosed with breast cancer during a similar timeframe as ours. These studies did find racial differences in BCS followed by radiation,^{9–11} radiation completion,²⁵ and chemotherapy initiation.^{11,26}

Differences in receipt of mastectomy by SES have been demonstrated previously in the scientific literature.^{6,27,28} These findings suggest that women residing in lower SES areas face significant financial and/or knowledge barriers that influence receipt of treatment. Factors that may contribute to these differences include structural barriers such as access to transportation,³ distance of residence to treatment facilities,²⁹ type of hospital performing breast cancer

TABLE 3. ADJUSTED ODDS OF RECEIVING CANCER THERAPY FOR OLDER WOMEN WITH BREAST CANCER, ALABAMA, 2000–2002

	BCS (n = 2097)	Mastectomy (n = 2097)	Radiation after BCS initiated (n = 715)	Radiation after BCS completed (n = 554)	Adjuvant chemotherapy initiated* (n = 1708)	Adjuvant chemotherapy completed (n = 280)
Black (vs. white)	1.03 (0.63–1.70)	0.83 (0.53–1.29)	1.13 (0.58–2.18)	1.30 (0.69–2.43)	1.09 (0.64–1.85)	0.66 (0.30–1.45)
Age 75+ years (vs. 66–74)	0.80 (0.65–0.97)	1.32 (1.08–1.61)	0.24 (0.16–0.36)	0.93 (0.63–1.36)	0.22 (0.16–0.29)	0.79 (0.40–1.57)
Stage 2–3 (vs. 1)	0.26 (0.20–0.33)	3.57 (2.81–4.54)	0.83 (0.57–1.20)	0.81 (0.45–1.47)	4.15 (2.94–5.87)	0.99 (0.43–2.31)
Node positive (vs. negative)	—	—	—	—	1.95 (1.44–2.64)	1.32 (0.70–2.49)
Comorbidity index ≥ 1 (vs. 0)	0.86 (0.69–1.08)	1.24 (0.98–1.56)	0.66 (0.45–0.97)	0.87 (0.54–1.39)	0.65 (0.43–0.99)	0.85 (0.49–1.45)
Standard chemotherapy (vs. no standard chemotherapy)	—	—	2.13 (0.80–5.67)	0.82 (0.40–1.67)	—	—
Doxorubicin-based regimen (vs. other regimens)	—	—	—	—	—	0.65 (0.38–1.11)
Socioeconomic status variables[†]	1.19 (0.87–1.65)	0.88 (0.69–1.13)	0.99 (0.58–1.67)	1.36 (0.73–2.54)	0.79 (0.54–1.14)	1.23 (0.66–2.31)
≥ 30% black (vs. < 30%)	0.79 (0.63–1.01)	1.26 (1.01–1.57)	1.06 (0.73–1.54)	0.86 (0.45–1.65)	0.96 (0.70–1.33)	1.48 (0.90–2.45)
≥ 40% with less high school (vs. < 40%)	0.80 (0.55–1.15)	1.27 (0.91–1.79)	2.24 (1.28–3.93)	1.12 (0.61–2.04)	1.17 (0.73–1.88)	1.50 (0.84–2.67)
≥ 20% below poverty (vs. < 20%)	1.05 (0.88–1.26)	0.99 (0.83–1.18)	1.02 (0.77–1.34)	0.75 (0.49–1.14)	0.99 (0.69–1.40)	1.56 (0.93–2.63)
Rural (vs. urban)						

Bold denotes statistical significant difference at $p < 0.05$.

*Among women with tumors greater than 1 cm.

[†]Socioeconomic status variables were based on Census tract of residence at diagnosis.
BCS, breast conserving surgery.

surgery,¹⁰ and patient preferences.³⁰ Targeted interventions are needed to address these barriers.

Our result that women from poorer Census tracts were more likely to initiate radiation after breast conserving surgery was surprising. Previous literature had reported lower use by SES.^{31–33} Moreover, prior research has shown that women living a greater distance from radiation facilities^{29,34} or who reside in areas with a low density of radiation oncologists³² are less likely to receive radiation after BCS. Relative to the rest of the United States, Alabama has fewer physicians per capita³⁵ and one of the lowest numbers of radiation facilities per 1,000 cancer cases.¹⁶ These factors may be compounded in areas with a high proportion of residents of low SES. In addition, lack of transportation³ and lack of referral to a radiation oncologist may hinder residents of low SES areas from receiving high quality cancer care.³⁶ However, for the older women in our sample, living in higher poverty neighborhoods did not hinder the initiation of radiation after BCS, even though women from low income neighborhoods were also more likely to be from rural Census tracts (not shown). This study lacked any information on individual-level SES. Therefore, it is plausible that women living in high poverty neighborhoods may in fact have the financial means to travel for radiation and undergo BCS with radiation. This finding warrants further research.

The association between age and receipt of treatment was expected as previous studies have demonstrated that older women are less likely to receive breast conserving surgery compared with younger women.^{6,31,36} It is unclear whether this is the result of patient preferences, barriers to care, physician recommendation, or other factors that may influence treatment. In this study, women with comorbid conditions were less likely than women with no comorbidities to receive radiation after BCS and chemotherapy—a finding documented in other studies.³⁷ Older women are likely to have more comorbidities which may limit therapy options. Additional research is needed to better understand these factors in order to inform efforts to ensure that older women receive appropriate treatment.³⁸

This study has strengths that support the validity of its findings. First, it included a large population-based cohort of women with breast cancer. Second, inclusion of Medicare claims provided an accurate and complete source for receipt and completion of surgical resection, chemotherapy and radiation therapy.³⁹ Furthermore, these Medicare claims enabled us to capture medical care that Alabama residents received nationwide. Finally, the guidelines for breast cancer treatment were relatively stable during this time period so the findings are less likely to be affected by clinical and other factors.

There were a few limitations for this study. First, the study population only included women 66 years of age and older; therefore, these findings cannot be generalized to younger women. Moreover, it included only women in fee-for-service Medicare plans; however, Riley et al. found that treatment patterns for early stage breast cancer were similar for women in fee-for-service and managed care plans.⁴⁰ Also, the number of black women in this cohort was small which may have limited our ability to detect some differences between the racial groups.

An additional limitation is that since individual-level socioeconomic status was not available, socioeconomic status at the census-tract level served as their proxy; therefore, results may be subject to residual confounding. Information on tu-

mor subtypes was limited. Compared with white women, black women more frequently present with tumor subtypes that have no targeted therapies and a poorer prognosis.⁴¹ However, the number of women with these tumor subtypes in our population was likely small since they are more commonly found among premenopausal women. Also, we were unable to examine the use of other systemic therapies for breast cancer, such as hormone therapy. Finally, in using claims data, we are unable to determine the role that patient preferences or physician recommendation played with regards to receipt of treatment.

In conclusion, there were no differences in breast cancer treatment received by older white and black women in Alabama. These findings suggest that racial disparities in mortality are likely influenced by factors other than the receipt of surgery and the receipt and completion of radiation or chemotherapy. Additional studies are needed to further explore the role of SES, patient and provider preferences and other factors that may influence receipt of breast cancer treatment in an older insured population in Alabama and other socioeconomically similar states.

Acknowledgments

This study was supported by Cooperative Agreement U48 DP000225-01 from the Centers for Disease Control and Prevention's Prevention Research Centers Program.

Disclosure Statement

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

No competing financial interests exist.

References

1. U.S. Cancer Statistics Working Group. United States cancer statistics: 1999–2009 incidence and mortality web-based report. 2013. Available at: www.cdc.gov/uscs Accessed January 31, 2013.
2. van Ravesteyn NT, Schechter CB, Near AM, et al. Race-specific impact of natural history, mammography screening, and adjuvant treatment on breast cancer mortality rates in the United States. *Cancer Epidemiol Biomarkers Prev* 2011;20:112–122.
3. Goodwin JS, Hunt WC, Samet JM. Determinants of cancer therapy in elderly patients. *Cancer* 1993;72:594–601.
4. Fisher B, Anderson S, Redmond CK, Wolmark N, Wickerham DL, Cronin WM. Reanalysis and results after 12 years of follow-up in a randomized clinical trial comparing total mastectomy with lumpectomy with or without irradiation in the treatment of breast cancer. *N Engl J Med* 1995;333:1456–1461.
5. National Institutes of Health (NIH). Treatment of early-stage breast cancer. NIH Consensus Development Conference consensus statement, June 18–21, 1990. *JAMA* 1991;265:391–395.
6. Alderman AK, Bynum J, Sutherland J, Birkmeyer N, Collins ED, Birkmeyer J. Surgical treatment of breast cancer among the elderly in the United States. *Cancer* 2011;117:698–704.
7. Lantz PM, Janz NK, Fagerlin A, et al. Satisfaction with surgery outcomes and the decision process in a population-based sample of women with breast cancer. *Health Serv Res* 2005;40:745–767.
8. National Comprehensive Cancer Network (NCCN). NCCN clinical practice guidelines in oncology: Breast cancer. Fort Washington, PA: NCCN, 2005.

9. Gross CP, Smith BD, Wolf E, Andersen M. Racial disparities in cancer therapy: Did the gap narrow between 1992 and 2002? *Cancer* 2008;112:900–908.
10. Keating NL, Kouri E, He Y, Weeks JC, Winer EP. Racial differences in definitive breast cancer therapy in older women: are they explained by the hospitals where patients undergo surgery? *Med Care* 2009;47:765–773.
11. Sail K, Franzini L, Lairson D, Du X. Differences in treatment and survival among African-American and Caucasian women with early stage operable breast cancer. *Ethn Health* 2012;17:309–323.
12. Worthington J, Waterbor JW, Funkhouser E, Falkson C, Cofield S, Fouad M. Receipt of standard breast cancer treatment by African American and White women. *Int J Med Sci* 2008;5:181–188.
13. Lipscomb J, Gillespie TW, Goodman M, et al. Black-white differences in receipt and completion of adjuvant chemotherapy among breast cancer patients in a rural region of the US. *Breast Cancer Res Treat* 2012;133:285–296.
14. Warren JL, Klabunde CN, Schrag D, Bach PB, Riley GF. Overview of the SEER-Medicare data: Content, research applications, and generalizability to the United States elderly population. *Med Care* 2002;40:IV-3–18.
15. U.S. Census Bureau: State and County QuickFacts. 2011. Available at: <http://quickfacts.census.gov/qfd/states/01000.html>
16. Ballas LK, Elkin EB, Schrag D, Minsky BD, Bach PB. Radiation therapy facilities in the United States. *Int J Radiat Oncol Biol Phys* 2006;66:1204–1211.
17. American Medical Association. Physicians' current procedural terminology-CPT 2000. Chicago, IL: American Medical Association, 2000.
18. Health Care Financing Administration. HCFA common procedure coding system (HCPCS): National level II medicare codes. Los Angeles, CA: Practice Management Information Corporation, 2000.
19. U.S. Public Health Services. International classification of diseases, 9th revision. Clinical modification, 5th ed. Los Angeles, CA: Practice Management Information Corporation, 1996.
20. Alabama Department of Public Health Office of Primary Care and Rural Health: Indicators of health status in Alabama: Cancer mortality. 2007. Available at www.adph.org/ruralhealth/Default.asp?id=1798, 2012.
21. Klabunde CN, Potosky AL, Legler JM, Warren JL. Development of a comorbidity index using physician claims data. *Clin Epidemiol* 2000;53:1258–1267.
22. Curtis E, Quale C, Haggstrom D, Smith-Bindman R. Racial and ethnic differences in breast cancer survival: How much is explained by screening, tumor severity, biology, treatment, comorbidities, and demographics? *Cancer* 2008;112:171–180.
23. Du Xianglin L, Gor BJ. Racial disparities and trends in radiation therapy after breast-conserving surgery for early-stage breast cancer in women, 1992 to 2002. *Ethn Dis* 2007;17:122–128.
24. 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;97:1407–1427.
25. Srokowski TP, Fang S, Duan Z, et al. Completion of adjuvant radiation therapy among women with breast cancer. *Cancer* 2008;113:22–29.
26. Giordano SH, Duan Z, Kuo YF, Hortobagyi GN, Goodwin JS. Use and outcomes of adjuvant chemotherapy in older women with breast cancer. *J Clin Oncol* 2006;24:2750–2756.
27. Byers TE, Wolf HJ, Bauer KR, et al. The impact of socioeconomic status on survival after cancer in the United States: Findings from the National Program of Cancer Registries Patterns of Care Study. *Cancer* 2008;113:582–591.
28. Bradley CJ, Given CW, Roberts C. Race, socioeconomic status, and breast cancer treatment and survival. *J Natl Cancer Inst* 2002;94:490–496.
29. Voti L, Richardson LC, Reis IM, Fleming LE, Mackinnon J, Coebergh JW. Treatment of local breast carcinoma in Florida: The role of the distance to radiation therapy facilities. *Cancer* 2006;106:201–207.
30. Katz SJ, Lantz PM, Janz NK, et al. Patient involvement in surgery treatment decisions for breast cancer. *J Clin Oncol* 2005;23:5526–5533.
31. Gilligan MA, Kneusel RT, Hoffmann RG, Greer AL, Nattiger AB. Persistent differences in sociodemographic determinants of breast conserving treatment despite overall increased adoption. *Med Care* 2002;40:181–189.
32. Smith GL, Xu Y, Shih YC, et al. Breast-conserving surgery in older patients with invasive breast cancer: current patterns of treatment across the United States. *J Am Coll Surg* 2009;209:425–433, e422.
33. Singh GK, Miller BA, Hankey BF, BK. E. Area socioeconomic variations in U.S. cancer incidence, mortality, stage, treatment, and survival, 1975–1999. NCI Cancer Surveillance Monograph Series, Number 4. Bethesda, MD: National Cancer Institute, 2003.
34. Athas WF, Adams-Cameron M, Hunt WC, Amir-Fazli A, Key CR. Travel distance to radiation therapy and receipt of radiotherapy following breast-conserving surgery. *J Natl Cancer Inst* 2000;92:269–271.
35. U.S. Census Bureau. Statistical abstract of the United States: 2012 (131st Edition). Washington, DC: 2011. Available at: www.census.gov/compendia/statab
36. Mandelblatt JS, Hadley J, Kerner JF, et al. Patterns of breast carcinoma treatment in older women: Patient preference and clinical and physical influences. *Cancer* 2000;89:561–573.
37. Bhargava A, Du XL. Racial and socioeconomic disparities in adjuvant chemotherapy for older women with lymph node-positive, operable breast cancer. *Cancer* 2009;115:2999–3008.
38. Smith BD, Gross CP, Smith GL, Galusha DH, Bekelman JE, Haffty BG. Effectiveness of radiation therapy for older women with early breast cancer. *J Natl Cancer Inst* 2006;98:681–690.
39. Du XL, Key CR, Dickie L, Darling R, Geraci JM, Zhang D. External validation of medicare claims for breast cancer chemotherapy compared with medical chart reviews. *Med Care* 2006;44:124–131.
40. Fisher B, Anderson S, Bryant J, et al. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med* 2002;347:1233–1241.
41. Agurs-Collins T, Dunn BK, Browne D, Johnson KA, Lubet R. Epidemiology of health disparities in relation to the biology of estrogen receptor-negative breast cancer. *Semin Oncol* 2010;37:384–401.

Address correspondence to:

Arica White, PhD, MPH
 Division of Cancer Prevention and Control
 Centers for Disease Control and Prevention
 4770 Buford Highway Northeast
 Mailstop F76
 Atlanta, GA 30341

E-mail: awhite5@cdc.gov