

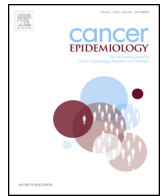


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# Race/ethnicity and socio-economic differences in breast cancer surgery outcomes

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### ABSTRACT

**Background:** The purpose of this study is to evaluate racial and socio-economic differences in breast cancer surgery treatment, post-surgical complications, hospital length of stay and mortality among hospitalized breast cancer patients.

**Methods:** We examined the association between race/ethnicity and socio-economic status with treatment and outcomes after surgery among 71,156 women hospitalized with a primary diagnosis of breast cancer using the Nationwide Inpatient Sample database from 2007 to 2011. Multivariable regression models were used to compute estimates, odds ratios and 95% confidence intervals adjusting for age, comorbidities, stage at diagnosis, insurance, and residential region.

**Results:** Black women were more likely to receive breast conserving surgery but less likely to receive mastectomies compared with white women. They also experienced significantly longer hospital stays ( $\beta = 0.31$ , 95% CI: 0.24, 0.39), post-surgical complications (OR = 1.21, 95% CI: 1.04–1.42) and in-hospital mortality (OR = 1.26, 95% CI: 1.07–1.50) compared with Whites, after adjusting for other factors including the number of comorbidities and treatment type.

**Conclusion:** Among patients hospitalized for breast cancer, there were racial differences observed in treatment and outcomes. Further studies are needed to fully characterize whether these differences are due to individual, provider level or hospital level factors, and to highlight areas for targeted approaches to eliminate these disparities.

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## 1. Introduction

Disparities in breast cancer treatment and outcomes have been documented among Black and White women in the U.S over the past several decades [1–6]. Although Black women are less likely to develop breast cancer compared with Whites, once diagnosed, Black women are less likely to receive guideline-adherent treatment [7–10] and have significantly lower 5-year survival rates [11–13]. These differences may be due to racial differences in tumor biology and disease aggressiveness [14–16], socio-economic factors and accessibility of healthcare that limit access to high quality treatment [17–20], presence of comorbid conditions [9,21,22], and psychosocial factors [23,24] that may influence responses to treatment. However, despite these explanations,

Black–White differences in breast cancer survival have persisted and actually widened in recent decades.

Variations in cancer treatment and treatment outcomes may partially account for the observed racial and socio-economic disparities in breast cancer mortality [2–11]. A growing number of studies indicate that African-American women are less likely to undergo breast-conserving surgery (BCS) compared with White women [2,12–14] whereas other studies either reported no difference [15,16] or observed opposite findings [17,18]. Many of these previous studies were conducted among Medicare recipients, [2,10,12,19,21] a population group aged 65 years and older, with limited data on socio-economic and health care access variables (beyond having Medicare insurance) in the Medicare dataset. Although overall survival rates are similar among women receiving BCS and mastectomy [25], it is not clear if there are significant differences in outcome by race/ethnicity and socio-economic status (SES) among women receiving surgery. In particular, it is unclear if Black and/or low SES women experience

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worse outcomes due to the higher prevalence of advanced disease and comorbidities; factors that are both associated with type of surgical treatment received and treatment outcome.

The aim of this analysis was to examine treatment differences and clinical outcomes among Black and White women hospitalized with a primary diagnosis of breast cancer. By utilizing data from the large Nationwide Inpatient Sample database and focusing on inpatients that had theoretically accessed the healthcare system successfully, we were able to control for differences in access to healthcare. Determining the influence of race/ethnicity and SES on the type of breast cancer treatment received, and associated cancer outcomes may help to further shed light on the persistent disparities in breast cancer outcomes between Black and White women in the U.S, highlighting areas where targeted efforts may be focused to improve survival for all women with breast cancer.

## 2. Methods

We conducted a cross-sectional study of female patients, ages 40 years and older, admitted to the hospital between 2007 and 2011 with a primary diagnosis of breast cancer. Inpatient data was obtained from the Healthcare Cost and Utilization Project

Nationwide Inpatient Sample (HCUP-NIS). The HCUP-NIS is a large all-payer inpatient care database covering over 1000 hospitals in the U.S., with data on over seven million hospital stays [26]. The dataset includes detailed clinical variables relating to all diagnoses and procedures performed during the admission, including ICD-9 codes. It also includes non-clinical variables such as median household income in the patient's zip code, rural/urban residence, hospital location, etc. Further details about the NIS can be obtained from: <http://www.hcup-us.ahrq.gov/nisoverview.jsp>.

### 2.1. Clinical variables

Breast cancer diagnosis was identified using the International Classification of Disease, ninth edition ICD-9 codes (174.0–174.9). Since the HCUP-NIS does not include cancer stage variables, we created a proxy breast cancer stage variable using the clinical criteria of disease staging. We assigned metastatic stage when the ICD-9 code indicated metastatic disease to other organs (196.0), non-metastatic stage when those specific codes were absent, and in-situ when ICD-9 code 2330 was assigned. These staging criteria have been validated in previous studies, including in the HCUP-NIS database [22,27]. We created a modified Deyo comorbidity index

**Table 1**  
Distribution of baseline characteristics by race among breast cancer patients, nationwide inpatient sample, 2007–2011.

	Race				P-value
	White (N = 52,055) N (%) / mean (SD)	Black (N = 9,060) N (%) / mean (SD)	Hispanic (N = 5,372) N (%) / mean (SD)	Other (N = 4,669) N (%) / mean (SD)	
Age at admission—years	62.6 (13.1)	59.8 (12.4)	57.9 (12.2)	59.0 (12.2)	<.0001
Length of stay—days	2.4 (3.4)	3.3 (4.7)	2.7 (4.0)	2.5(4.3)	<.0001
Number of Co-morbidities	0.233 (0.52)	0.289(0.58)	0.169 (0.44)	0.161 (0.43)	<.0001
Residential income					
First Quartile-Lowest	9,265 (18.13)	4,061 (46.37)	1,691 (32.45)	683 (15.33)	<.0001
Second Quartile	11,760 (23.01)	1,853 (21.16)	1,187 (22.78)	806 (18.09)	
Third Quartile	12,713 (24.88)	1,515 (17.30)	1,298 (24.91)	1,114 (25.00)	
Fourth Quartile-Highest	17,361 (33.98)	1,328 (15.17)	1,035 (19.86)	1,853 (41.58)	
Insurance type					
Medicare	21,767 (41.64)	3,230 (35.65)	1,414 (26.32)	1,314 (28.14)	<.0001
Medicaid	2,821 (5.42)	1,592 (17.57)	1,264 (23.53)	662 (14.18)	
Private	25,907 (49.77)	3,591 (39.64)	2,145 (39.93)	2,403 (51.47)	
Other	1,651 (3.17)	647 (7.14)	549 (10.22)	290 (6.21)	
Residential region					
Large metro	26,958 (51.79)	6,407 (70.72)	3,941 (73.36)	3,446 (73.81)	<.0001
Small metro	13,873 (26.65)	1,540 (17.00)	988 (18.39)	694 (14.86)	
Micropolitan	5,324 (10.23)	573 (6.32)	216 (4.02)	253 (5.42)	
Stage at presentation					
In-situ	6,715 (12.90)	997 (11.00)	630 (11.73)	717 (15.36)	<.0001
Non-metastatic	30,252 (58.12)	4,834 (53.36)	3,004 (55.92)	2,571 (55.07)	
Metastatic	15,088 (28.98)	3,229 (35.64)	1,738 (32.35)	1,381 (29.58)	
Mastectomy					
No	24,641 (47.34)	4,585 (50.61)	2,621 (48.79)	2,154 (46.13)	<.0001
Yes	27,414 (52.66)	4,475 (49.39)	2,751 (51.21)	2,515 (53.87)	
Breast conserving					
No	50,071 (96.19)	8,619 (95.13)	5,101 (94.96)	4,442 (95.14)	<.0001
Yes	1,984 (3.81)	441 (4.87)	271 (5.04)	227 (4.86)	
Complications					
0	49,813 (95.69)	8,626 (95.21)	5,171 (96.26)	4,482 (95.99)	0.06
1	2,091 (4.02)	407 (4.49)	183 (3.41)	172 (3.68)	
>=2	151 (0.29)	27 (0.30)	18 (0.32)	15 (0.29)	
Died during Hospitalization					
No	51,116 (98.38)	8,800 (97.24)	5,264 (98.04)	4,600 (98.65)	<.0001
Yes	842 (1.62)	250 (2.76)	105 (1.96)	63 (1.35)	

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