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EPIDEMIOLOGY

Racial disparities in clinical presentation, surgical treatment and in-hospital outcomes of women with breast cancer: analysis of nationwide inpatient sample database

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Abstract To examine racial/ethnic disparities in stage of disease and comorbidity (pre-treatment), surgical treatment allocation (breast-conserving surgery versus mastectomy), and in-hospital outcomes after surgery (post-treatment) among women with breast cancer. Nationwide inpatient sample is a nationwide clinical and administrative database compiled from 44 states representing 95 % of all hospital discharges in the Unites States. Discharges of adult women who underwent surgery for breast cancer from 2005 to 2009 were identified. Information about patients and hospitals characteristics was obtained. Multivariate logistic regression analyses were used to examine the risk adjusted association between race/ethnicity and the aforementioned outcomes (pre-treatment, treatment, and post-treatment). We identified 75,100 patient discharges. Compared to Whites, African-Americans (1.17, $p < 0.001$), and Hispanics (1.20, $p < 0.001$) were more likely to present with regional or metastatic disease. Similarly, African-American (1.58, $p < 0.001$) and Hispanics (1.11, p 0.003) were more likely to have comorbidity. Compared to Whites, African-Americans (0.71, $p < 0.001$), and Hispanics (0.77, $p < 0.001$) were less likely to receive mastectomy. Compared to Whites, African-Americans were more likely to develop post-operative complications (1.35, $p < 0.001$) and in-hospital mortality (1.87, p 0.13). Other racial groups showed no statistically significant difference compared to Whites. After controlling for potential confounders, we found racial/ethnic disparities in stage, comorbidity, surgical treatment allocation, and in-hospital outcomes among women with breast cancer. Future researches should examine the underlying factors of these disparities.

Keywords Racial disparity · Surgical treatment · In-hospital outcomes · Breast cancer

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Introduction

Despite the established consensus, guidelines, and treatment protocols [1–4] there is wide variability in practice patterns among women treated for breast cancer [5–8] leading to variable results, with less favorable outcomes among minorities. Race has been suggested to be responsible for variation in health care delivery in many studies [9–16] however, those studies were either not population-based, had little information on socio-demographic and hospital variables, or were conducted in selected urban population, that may not be representative of other parts of the country. In addition, those studies did not examine treatments and outcomes in a comprehensive way. Rather, they focused on a single aspect of breast cancer care, and failed to examine treatments in conjunction with outcomes.

Another shortcoming of previous studies is that they focused on African-American and White women only, and provided no details on the care and outcomes of other minorities such as Hispanics, Asians, and Native Americans. NIS database is a large comprehensive database that includes more than one hundred clinical and non-clinical data elements designed specifically to allow researchers to identify, and analyze national trends in health care utilization and outcome after all patients and hospital characteristics are controlled.

If we were to improve the outcomes of breast cancer treatment and insure parity among all women, we must study the current outcomes of treatment, disparity in health care delivery, if any, and address the obstacles leading to such disparity. Using the most recent available NIS data, we conducted this study to examine racial disparities in stage of disease and comorbidity (pre-treatment), surgical treatment allocation, and post-operative in-hospital outcomes (post-treatment) among women with breast cancer.

Methods

Study design and data source

This is a retrospective analysis of hospital discharge data from the Health Care Utilization Project-Nationwide Inpatient Sample (HCUP-NIS) database between 2005 and 2009. NIS database is a component of the Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality. This database represents the largest inpatient database in the United States. The NIS represent 20 % stratified sampling of US hospitals including public hospitals, children's hospitals, and academic medical centers. The database contain data from 1,050 hospitals with more than 8 million discharges annually from a variable number of states, ranging from eight states in 1988 to 44 states in 2009. The sampling frame for the 2009 NIS is a sample of hospitals that comprises approximately 95 % of all hospital discharges in the United States. Detailed information on the NIS design can be found at http://www.hcup-us.ahrq.gov/nisoverview.jsp [17]. The NIS database has been used previously in a number of studies addressing various questions across the spectrum of medical specialties [18] including peer review papers on breast cancer [19–23].

Inclusion criteria

International Classification of Disease, ninth edition (ICD-9) was used to identify all hospital discharges of adult women in the NIS database between 2005 and 2009 with primary diagnosis codes of breast cancer and coincident procedure codes for breast surgery. Primary ICD-9 diagnoses and procedures codes are shown in supplementary Appendix I. For the purpose of the analysis, surgical procedures were categorized into either breast-conserving surgery (BCS) group which included lumpectomy, quadrantectomy, and subtotal mastectomy or mastectomy group which included all other different types of mastectomies. Patients with a diagnosis of breast cancer but without the associated procedure code and those with two or more procedure codes were excluded.

Patient and hospital characteristics

We adjusted for the following covariates: age, residential income (median household income for the patient's zip code), insurance type, discharge year, geographic region, teaching status of hospitals, location of hospital (urban versus rural), hospital ownership, hospital bed size, hospital volume, stage, and type of surgical procedure.

Residential income provides a quartile classification of the estimated median household income of residents in the patient's zip code. The quartiles are identified by values of 1–4, indicating the poorest to wealthiest populations. Hospitals were classified as teaching or non-teaching hospitals by the presence of any residency program approved by the Accreditation Council for Graduate Medical Education or membership in the Council of Teaching Hospitals. Designation as an urban or rural hospital was according to Census 2000 definitions of urban population (>50,000) or rural population (<50,000). Hospital's bed size categories are defined based on region of the US., the urban–rural designation of the hospital, in addition to the teaching status.

Using unique hospital identification numbers, we estimated hospital volume using method previously described [24, 25]. First, we calculated the average annual volume of breast cancer surgical procedures for each hospital over the five study years. We then ranked hospitals in order of increasing total volume and selected two volume cutoffs that sorted hospitals into three evenly sized groups: low, intermediate, and high volume.

Since NIS has no data on stages of breast cancer, a new variable was constructed based on stage of cancer using the clinical criteria of Disease Staging [26]. A hierarchical algorithm based on the ICD-9 codes assigned the most severe disease. Distant disease was assigned when ICD-9 codes indicated metastatic disease to other organs (196.0–196.2, 196.5–196.9, 197.0–197.8, 198.80–198.89, and 199.00–199.18). Regional disease was assigned when there was evidence of enlarged lymph nodes (785.6) or malignant neoplasm of the upper axilla and upper limb (196.3). Local disease or no evidence of metastases was assigned when none of the previous codes appeared or when the cancer was coded as in situ (233.0). Disease Staging has been evaluated and validated in previous studies [27].

Comorbidities were identified using ICD-9 codes and used to calculate the modified Charlson comorbidity index (CCI) [28]. The CCI is a global measure of comorbidities that is calculated based on the presence of four atherosclerotic comorbidities of peripheral arterial disease, myocardial infarction, cerebrovascular disease, and congestive heart failure; and 13 non-atherosclerotic comorbid condition including diabetes mellitus with and without complication, chronic lung disease, gastrointestinal ulcer, arthritis, paraplegia, renal failure, malignancy with and without metastasis, acquired immunodeficiency syndrome, dementia, liver disease, and liver failure. The Charlson index as modified by Deyo [29] measures comorbidity by assigning scores of 1, 2, 3, or 6 to each of a patient's comorbid conditions. These scores are then added up to a single index score, which reflects the overall comorbidity of the patient. We divided patients based on CCI score into two groups: no comorbidity (CCI score 0) and comorbidity (CCI scores $\geq$1). The most recent ICD-9 coding algorithm by Quan et al. [30] was used to identify those comorbidities (Supplementary Appendix II). The CCI has been validated for administrative databases [28–30] and has been used in many studies to examine the influence of comorbidity on treatment and outcomes including studies on breast cancer [31–33].

Outcomes

1. Pre-treatment outcomes: the primary pre-treatment outcomes of interest were: (a) regional or metastatic disease and (b) comorbidity (CCI score $\geq$1). Regional and metastatic diseases were grouped into a single category that labeled "non-local."
2. Surgical treatment allocation: the primary treatment-related outcome was receipt of mastectomy compared to BCS, as the former represents the more invasive type of surgical treatment.
3. Post-treatment: the primary post-treatment outcomes of interest were:
   (a) Post-operative complications: included cardiovascular, pulmonary, renal, infectious, bleeding, and wound complications. Because the NIS contains inpatient data only, complications occurring after hospital discharge were not captured in our analysis.
   (b) In-hospital mortality: all-case in-hospital mortality was defined as death during hospitalization and was assessed based on information regarding vital status at discharge. Because the NIS database contains inpatient data only, deaths occurring after hospital discharge were not included in our analysis.

Statistical analysis

Simple descriptive analyses such as counts and percentages were used to describe data. We examined the distribution of the aforementioned factors across race using Chi square test for the categorical variables and *t* test for the continuous variables, and then we performed a series of multivariate logistic regression analyses to calculate odds ratio (*OR*) and *P* value for the association between the five subgroups of race as an independent risk factors and the outcomes of interest (pre-treatment, treatment, and post-treatment) after adjusting for other variables. Three multiple regression analyses were performed, each one subsumed within the next. The first model used pre-treatment outcomes (non-local disease and CCI score of one or greater) as a dependent variable and included demographics (age, insurance type, residential income, discharge year, and geographical region) as covariates. The second model used receipt of mastectomy as the dependent variable and included the same set of covariates used previously plus hospital characteristics (teaching status of hospitals, location of hospital, hospital ownership, hospital bed size, and hospital volume) and the dependent variables from the first model (stage and CCI score) as additional independent predictors. The third model used post-treatment outcomes (post-operative complications and in-hospital mortality) as the dependent outcomes and included the same set of covariates used in the second model plus including type of surgical treatment as an additional independent predictor. Our objective was to define the models by keeping only the statistically significant and clinically relevant predictors using backward stepwise elimination of the non-significant predictors. For all statistical analysis, the threshold for significance was 0.05. All the analysis was generated using SAS software, Version 9.3 for Windows (SAS Institute Inc., Cary, NC, USA).

Results

We identified 75,100 hospital discharges of women with primary diagnosis of breast cancer after undergoing breast surgery between 2005 and 2009. Univariate analyses of various characteristics by race for selected variables are presented in Table 1. Overall, about 58.3 % of women were White, 8.6 % African-American, 5.7 % Hispanic, 2.6 % Asian, 0.4 % Native American, and 24.4 % were

Table 1 Comparison of various characteristics among 75, 100 women with breast cancer by race/ethnicity, nationwide in-patient sample, 2005–2009

Characteristic	White (n = 43,818, 58.3 %)		African-American (n = 6,454, 8.6 %)		Hispanic (n = 4,270, 5.7 %)		Asian (n = 1,979, 2.6 %)		Native American (n = 302, 0.04 %)		p value[a]
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	
Age at discharge, year											<0.001
<50	9,881	23	1,918	30	1,556	36	660	33	88	29	
≥50	33,937	77	4,536	70	2,714	64	1,319	67	214	71	
Residential income[b]											<0.001
1	7,863	18	2,830	45	1,433	35	198	10	99	34	
2	9,991	23	1,371	22	938	23	316	16	56	19	
3	10,747	25	1,129	18	944	23	408	21	51	17	
4	14,441	34	934	15	802	19	999	52	88	30	
Insurance type											<0.001
Medicare	18,933	43	2,232	35	1,095	26	491	25	106	35	
Medicaid	2,157	5	1,041	16	929	22	271	14	29	10	
Private including HMO	21,397	49	2,752	43	1,719	40	1,122	57	137	46	
Self-pay (uninsured)	468	1	181	3	235	6	58	3	13	4	
Hospital teaching status											<0.001
Non-teaching	21,295	53	2,192	37	1,781	44	662	37	98	34	
Teaching	18,640	47	3,684	63	2,265	56	1,115	63	194	66	
Hospital volume											
Low	1,294	3	158	2	83	2	36	2	14	5	
Medium	6,482	15	833	13	607	14	220	11	33	11	
High	36,042	82	5,463	85	3,580	84	1,723	87	255	84	
Stage[c]											<0.001
Local	31,585	72	4,363	68	2,975	70	1427	72	222	73	
Regional	10,848	25	1,769	27	1143	27	483	24	72	24	
Metastatic	1,385	3	322	5	152	3	69	4	8	3	
CCI score											<0.001
0	30,025	69	3,806	59	2,930	69	1,409	71	196	65	
≥1	13,793	31	2,648	41	1,340	31	570	29	106	35	
Surgical treatment											<0.001
BCS	38,367	12	5,434	16	3,611	15	1,751	12	261	14	
MAS	5,451	88	1,020	84	659	85	228	88	41	86	
Post-operative complication											<0.001
No	42,706	97	6,205	96	4,162	97	1,941	98	296	98	
Yes	1112	3	249	4	108	3	38	2	6	2	

Table 1 continued

Characteristic	White ($n = 43{,}818$, 58.3 %)		African-American ($n = 6{,}454$, 8.6 %)		Hispanic ($n = 4{,}270$, 5.7 %)		Asian ($n = 1{,}979$, 2.6 %)		Native American ($n = 302$, 0.04 %)		p value[a]
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)	
In-hospital mortality											0.08
No	43,701	99.90	6,433	99.80	4,264	99.90	1,976	99.90	302	100	
Yes	24	0.10	13	0.20	3	0.10	1	0.10	0	0	

Result for "Other" and "Unknown" racial groups are not presented in this table; data for racial distributions by discharge year, geographical region, hospital location, hospital ownership, and hospital bed size are not presented in this table

CCI Charlson Comorbidity Score, *BCS* breast-conserving surgery, *MAS* mastectomy

[a] Derived from Chi squared test for categorical variables and *t* test for continuous variables

[b] Zip income provides a quartile classification of the estimated median household income of residents in the patient's zip code. The quartiles are identified by values of 1–4, indicating the poorest to wealthiest populations

[c] Based on stage of cancer using the clinical criteria of Disease Staging

classified as others and unknown. The mean age of the study population was 60 years, and 75 % of the women were older than 50 years. White women were older at time of discharge compared to other women. About 18 % of Whites and 10 % of Asians lived in poor neighborhoods compared to 45 % African-Americans, 35 % Hispanics, and 34 % of Native Americans. About 1 % of White women did not have health insurance compared to 3 % African-Americans, 6 % of Hispanics 3 % Asians, and 4 % of Native Americans. White women underwent the surgery in teaching and high-volume hospitals less frequently compared to women of other racial groups. About 28 % of White women presented with non-local disease, whereas this was 32 % of African-American, 30 % Hispanic, 28 % of Asian, and 27 % of Native Americans. About 31 % of White women had comorbidity compared to 41 % African-Americans, 31 % Hispanics, 29 % Asians, and 35 % of Native Americans. With respect to type of surgical treatment, about 88 % of Whites received mastectomy compared to 85 % of African-Americans, 85 % Hispanics, 88 % Asian, and 86 % Native American. Post-operative complications occurred in 2017 patients (2.7 %). About 3 % of White women developed complications post-operatively compared to 4 % of African-Americans, 3 % Hispanics, 2 % Asians, 2 % of Native Americans. In-hospital mortality for the entire cohort was 0.08 % ($n = 59$). This was 0.10 % among White Women, 0.20 % African-Americans, 0.10 % Hispanics, 0.10 % Asians, 0 % among Native Americans.

After adjusting for age, residential income, insurance type, discharge year, and geographical region; African-Americans (*OR* 1.17, $p < 0.001$) and Hispanics (*OR* 1.20, $p < 0.001$) were more likely to present with non-local disease compared to White women. Similarly, African-American (1.58, $p < 0.001$) and Hispanics (1.11, p 0.003) were more likely to present with comorbidity compared to White women (Table 2).

After adjusting for both demographic (age, residential income, insurance type, discharge year, and geographical region) and hospital characteristics (teaching status of hospitals, location of hospital, hospital ownership, hospital bed size, and hospital volume) plus stage and comorbidity, African-American (*OR* 0.71, $p < 0.001$) and Hispanics (*OR* 0.77, $p < 0.001$) were less likely to receive mastectomy compared to White women (Table 3).

The results for the multivariate analyses for the association between race/ethnicity and post-treatment outcomes are presented in Table 4. Covariates included were demographic, hospital characteristics, stage, comorbidity, and type of surgical treatment. Regarding post-operative complications, compared to White women, African-American women were more likely to develop post-operative complication (*OR*, 1.34, p value < 0.001). Regarding

Table 2 Risk-adjusted analysis for pre-treatment outcomes by race/ethnicity, nationwide inpatient sample, 2005–2009

Characteristic	Non-local disease[a]			CCI score ≥1		
	Events number	OR	*p* value	Events number	OR	*p* value
Race/ethnicity						
White (ref)	12,233	1		13,793	1	
African-American	2,091	1.17	<0.001	2,648	1.58	<0.001
Hispanic	1,295	1.20	<0.001	1,340	1.11	0.003
Asian	552	0.96	0.43	570	1.09	0.14
Native American	80	0.87	0.33	106	1.2	0.12

Adjusted for age, residential income, insurance type, discharge year, and geographical region

Results for other and unknown racial groups are not presented in this table

OR odds ratio, *CCI* Charlson Comorbidity Index

[a] Regional and metastatic diseases were grouped into a single category that labeled "non-local"

Table 3 Risk-adjusted analysis for treatment outcomes by race/ethnicity, nationwide inpatient sample, 2005–2009

Characteristic	Receipt of mastectomy		
	Events number	OR	*p* value
Race/ethnicity			
White (ref)	5,451	1	
African-American	1,020	0.71	<0.001
Hispanic	659	0.77	<0.001
Asian	228	1.13	0.10
Native American	41	0.88	0.46

Adjusted for age, race, residential income, insurance type, discharge year, geographical region, teaching status of hospitals, location of hospital, hospital ownership, hospital bed size, hospital volume, CCI score, and stage

Results for other and unknown racial groups are not presented in this table

OR odds ratio

in-hospital mortality, although not statistically significant, African-American, Hispanic, and Asians had a 1.8-fold, 1.4-fold, and 1.7-fold higher risk of in-hospital mortality compared to White women, respectively. There were no deaths among Native American women in this population.

Discussion

After controlling for potential confounders, we found racial/ethnic disparities in stage, comorbidity, surgical treatment, and in-hospital outcomes after surgery among women with breast cancer. Those disparities were especially noted

Table 4 Risk-adjusted analysis for post-treatment outcomes by race/ethnicity, nationwide inpatient sample, 2005–2009

Characteristic	Post-operative complications[a]			In-hospital mortality[b]		
	Events number	OR	*P* value	Events number	OR	*P* value
Race/ethnicity						
White (referent)	1,112	1		24	1	
African-American	249	1.34	<0.001	13	1.8	0.1
Hispanic	108	1.07	0.55	3	1.4	0.61
Asian	38	0.78	0.18	1	1.7	0.61
Native American	6	0.65	0.35	0	N/a[c]	N/a[c]

Ownership, hospital bed size, hospital volume, comorbidity, stage, and surgical treatment

OR odds ratio

[a] Adjusted for age, race, residential income, insurance type, discharge year, geographical region, hospital teaching status, hospital location, hospital

[b] Analyses mortality was adjusted for post-operative complications along with other variables

[c] Statistics could not be calculated due to lack of events

between White, African-American, and Hispanic women. In this large nationwide study, we found that African-American and Hispanic women presented with a higher disease stage and had higher prevalence of comorbidities compared to White women. Racial disparity in the prevalence of comorbidity has been previously reported in breast cancer patients as well as in more general group of patients. Although there is no clear understanding for the etiology of such disparity, genetic susceptibility remains the most commonly accepted theory.

The reason for the higher proportion of regional and metastatic disease we observed among African-American and Hispanic women is not clear. Previous studies have shown that racial differences in disease stage are, in part, a result of the underutilization of screening mammography [34] and clinical breast examination; [35] and lack of access to a usual source of care among minorities [36]. Although earlier studies have documented underutilization of preventive health services among racial/ethnic minorities, data from the Behavioral Risk Factor Surveillance Survey (BRFSS) and other databases suggest that mammography use among African-Americans is now comparable to that of White women. National BRFSS data has also indicated that Hispanic women have narrowed their screening disparity and Asians have closed the screening gap in mammography. Of all racial/ethnic minorities described, Native American women have the lowest breast cancer screening [37]. Research has also shown a tendency among racial/ethnic minorities to not discuss cancer diagnoses which may have resulted in racial/ethnic differences in the receipt of recommendations for earlier screening mammograms for women at increased risk of developing breast cancer [38]. In the study by Weiss et al. [39] 28 % of women who had a family history of breast cancer among first-degree relatives had not received mammogram, 43 % had received 1 or 2 mammograms, and 29 % had received 3 or more mammograms.

Racial/ethnic differences in the utilization of clinical breast examination or breast self-examination also may underlie the differentials in stage we observed. According to data from the National Survey of America's families, about 40 % of Whites women in US did not have clinical breast exam in the past 12 months compared to 45 % of African-Americans and 58 % of Hispanic [40]. Furthermore, differences in access to a usual source of care may contribute to racial differentials in the use of clinical breast examination (due to the lack of opportunity to have a breast examination) and in the use of breast self-examination, because self-examination may not be recommended or because the proper technique for breast self-examination is not taught. Data from the Medical Expenditure Panel Survey showed that 29.6 % of Hispanic women and 20.2 % of African-American women, compared with 15.2 % of White women, have no regular source of care [36]. However, our findings retained their significance after adjusting for sociodemographics such as type of insurance and residential annual income.

We also found racial/ethnic disparities in the surgical treatment of women with breast cancer. Although they had higher disease stage, African-American and Hispanic women were less likely to undergo Mastectomy compared to White women. Data are largely inconsistent regarding racial/ethnic disparities in the receipt mastectomy versus BCS. Earlier studies reported that women were more likely to receive mastectomy compared to White women [41, 42]. More recent studies, however, reported either no difference [43, 44] or opposite findings [45, 46]. Although we noted a higher prevalence of (comorbidity CCI scores $\geq$1) among African-American and Hispanic women compared with White women, our analysis showed no statistically significant association between comorbidity score and the receipt of mastectomy versus BCS among our patients (results are not shown). A recent study utilizing 14 years data from a comprehensive cancer registry reported diagnosis year, insurance status and stage to be the major independent determinants of the recipient of mastectomy [47]. Our findings retained significance after adjusting for age, residential income, insurance type, discharge year, stage, and comorbidity score along with other hospital characteristics.

With regard to post-operative in-hospital outcomes, African-Americans were more likely to develop post-operative complications compared to Whites. Finally, although not statistically significant, African-American, Hispanic, and Asian women had higher risk of in-hospital mortality compared to White women. Possible explanations for these observations are older age, higher prevalence of adverse prognostic indicators, and higher disease stage. In our previous study, comorbidity was found to have strong and progressive association with risk of post-operative morbidity and mortality [48]. However, after adjusting for comorbidity, stage of disease, and type of surgical treatment along with other sociodemographic and hospital characteristics, African-American race was independently associated with an increased risk of post-operative complications, whereas the association with in-hospital mortality was marginal. As mentioned above, differences for other racial groups were not statistically significant likely due to small number of deaths. To our knowledge, this is the first study to report, on a national level, the racial disparity in the post-operative complications and the in-hospital mortality in the immediate post-operative period.

The current study was conducted using an administrative database and is subject to certain limitations. First, as noted above the current study looks at the outcome measure of in-hospital morbidity and mortality. This may reflect lower rates compared with studies utilizing 30 days morbidity and mortality rates, especially if patients are being discharged from hospital before death. Second, because NIS identifies only inpatient admission, procedures performed in an outpatient setting are not captured. The low rate of BCS (13 %) in our study likely reflects the NIS focus on inpatients and exclusion of those undergoing out-patient procedures. Nevertheless, recent data has shown that mastectomy rates declined until 2004, but have since increased. [47, 49, 50] Possible explanations are younger populations with higher life time risk, higher stage disease, more biologically aggressive tumor, patient preference, and fear of recurrence. Therefore, it is not unreasonable to attribute part of this disproportion in rates of BCS versus mastectomy to a real trend in increasing utilization rates of mastectomy over the last decade. Third, due to lack of information on staging we used the clinical criteria of Disease Staging to define the stage of breast cancer in this study which might not be as accurate as other more validated staging system such as the American Joint Committee on Cancer staging. Fourth, NIS is an administrative database which lacks information on clinical and pathological characteristics of the tumors. Racial/ethnic differences in prevalence of adverse biologic characteristics and tumor aggressiveness may also contribute to disparities in breast cancer outcomes. Therefore, it is important to determine the role, if any, that differences in tumor biology play in racial/ethnic disparities in cancer presentation, treatment, and outcomes. Finally, we did not have access to individual patient identifier, and thus we could not link patient multiple admissions.

In conclusion, using a large nationwide database, we found racial/ethnic disparities in comorbidity, surgical treatment, post-operative complications, and in-hospital mortality among with women breast cancer. Those disparities were specially noted between Africans–Americans and Hispanics compared to Whites. Future researches should examine the underlying factors of such disparities. A better understanding of these factors will facilitate the development of strategies to help eliminate the health care disparities.

Conflict of interest The authors declare that they have no conflict of interest.

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