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Breast cancer characteristics and outcomes among Hispanic Black and Hispanic White women

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Abstract

Evaluating breast cancer outcomes specific to Hispanics of different race (e.g. Hispanic Black, Hispanic White) may further explain variations in the burden of breast cancer among Hispanic women. Using data from the SEER 17 population-based registries, we evaluated the association between race/ethnicity and tumor stage, hormone receptor status, and breast cancer-specific mortality. The study cohort of 441,742 women, aged 20–79, who were diagnosed with primary invasive breast cancer between January 1, 1992 and December 31, 2008, included 44,246 Hispanic whites, 622 Hispanic Blacks, 44,797 non-Hispanic Blacks and 352,077 non-Hispanic whites. Hispanic black, Hispanic white and non-Hispanic black women had a 1.5–2.5 fold greater risk of presenting with stage IV breast cancer compared to non-Hispanic whites. All groups were significantly more likely than non-Hispanic whites to be diagnosed with ER+/PR– (1.1–1.5 fold increase) or ER–/PR– (1.4–2.2 fold increase) breast cancer. Hispanic black, Hispanic white and non-Hispanic black women had a 10–50 % greater risk of breast cancer-specific mortality compared to non-Hispanic whites. Our findings underscore the breast cancer disparities that continue to exist for Hispanic and black women, overall, as well as between Hispanic women of different race. These disparities highlight the factors that may lead to the poor outcomes observed among Hispanic and black women diagnosed with breast cancer, and for which targeted strategies aimed at reducing breast cancer disparities could be developed.

Keywords

Background

Hispanics represent the only racial/ethnic population in the United States (US) for which breast cancer is the most frequently diagnosed and leading cause of cancer related death among women [1]. Hispanic women are more likely to be diagnosed with larger tumors and/ or metastatic disease [2, 3], and they are 20 % more likely to die from breast cancer than non-Hispanic white women [4]. However, Hispanics are a heterogeneous population with data indicating that disparities in breast cancer outcomes vary in magnitude across Hispanic subgroups defined by geographic origin, and some evidence that Mexican and Puerto Rican women living in the United States have particularly poor outcomes [5–7].

Additionally, women of Hispanic ethnicity can be of any race [8], but few studies have examined the distribution of breast cancer outcomes among Hispanic women of different races (e.g., Hispanic blacks vs. Hispanic whites) [9,10]. To address this gap, using 1992–2008 Surveillance, Epidemiology, and End Results (SEER) Program data we examined differences in breast cancer stage, joint estrogen receptor (ER)/progesterone receptor (PR) status and breast cancer-specific mortality among Hispanic black and Hispanic white women in relation to non-Hispanic blacks and non-Hispanic whites. Our objective was to conduct a comprehensive assessment of breast cancer outcomes among Hispanic black and Hispanic white women to identify both disparities and needs specific to each Hispanic subgroup. Evaluating disparities specific to different Hispanic populations has the potential to further explain variations in the burden of breast cancer among Hispanic women and can also identify groups of women who could benefit considerably from targeted interventions.

Methods

We used data on women aged 20–79 years who were diagnosed with primary invasive breast cancer between January 1992 and December 2008, with no prior history of cancer, identified through the SEER 17 population-based cancer registries. Women less than 20 and older than 79 years of age were excluded from the study. We selected this age range for two reasons: (i) the rarity of breast cancer among women under age 20 years and (ii) the low levels of mammographic screening among women   80 years of age, which could influence our analysis of stage at diagnosis. We selected 1992 as the study starting point, because it was the first year that SEER started collecting information on Hispanic ethnicity. The population-based SEER registries included in this study were those serving the states of California, Connecticut, Hawaii, Iowa, Kentucky, Louisiana, New Jersey, and Utah, the greater metropolitan areas of Atlanta, Georgia, Detroit, Michigan, and Seattle, WA, and rural Georgia. Of note, the registries serving greater California (excluding the San Francisco-Oakland, San Jose-Monterey, and Los Angeles metropolitan areas), Kentucky, Louisiana, New Jersey and Rural Georgia joined the SEER program in 2000, so data from these registries were only available from 2000 to 2008.

Our primary exposure of interest was race/ethnicity, which was categorized into four groups, based on SEER data: non-Hispanic white, non-Hispanic black, Hispanic white and Hispanic black. SEER uses the North American Association of Central Cancer Registries (NAACR) Hispanic Identification Algorithm (NHIA) to identify cancer cases who are Hispanic/Latino, using variables on race, maiden name, surname, sex and place of birth [11]. The NHIA has been validated for Hispanics in Florida [12]. Women with other combinations of race and ethnicity were excluded from our analyses. The primary outcomes of interest were: AJCC tumor stage (Stages I–IV), joint estrogen receptor (ER)/progesterone receptor (PR) status (ER+/PR+, ER+/PR–, ER–/PR–) and breast cancer-specific mortality. Patients diagnosed with ER–/PR+ breast cancer were not included in our analysis of ER/PR status due to the infrequency of this ER/PR combination (n for Hispanic black cases = 9). Breast cancer-

specific mortality was assessed using data on vital status, survival time, and cause of death. Specifically, SEER collects data on total survival time in months, starting from month/year of diagnosis until death due to breast cancer, death due to a cause other than breast cancer, date last known to be alive, or December 31, 2008 (study cutoff date). The inclusion of covariates in our analyses was limited to those available through the SEER program. The variables used in this study included: age at diagnosis, year of diagnosis, SEER registry, surgery and radiation treatment, and county level estimates of the percent of individuals below the poverty level, percent of individuals with less than a high school education, percent of individuals who are foreign born and percent of individuals with language isolation, all based on the 2000 census data.

Polytomous logistic regression was used to test for associations between race/ethnicity and AJCC stage and ER/PR status. Risk of breast cancer-specific mortality by race/ethnicity was assessed using the Cox proportional hazards model. For the main analyses, non-Hispanic White women served as the referent group, and estimates were adjusted for age at diagnosis, year of diagnosis, SEER registry, percent of individuals below the poverty level, percent of individuals with less than a high school education, percent of individuals who are foreign born and percent of individuals with language isolation. Analysis of ER/PR status was additionally adjusted for AJCC stage. In assessing breast cancer-specific mortality, we adjusted for the aforementioned covariates, ER/PR status, AJCC stage, surgical and radiation treatment. Effect modification between race/ethnicity and age at diagnosis was assessed using an interaction model for each outcome of interest. The interaction model included the same covariates from the primary model, although we replaced age at diagnosis, as a continuous variable, with a two category dummy variable (age <50 years and age   50 years). A significant interaction, at the alpha = 0.05 level, indicated that the association between race/ethnicity and the outcome of interest was modified by a woman's age at diagnosis. We followed significant interactions with stratified regression analyses assessing women who were younger than age 50 years and those who were 50 years of age and older, separately. The interaction term was found to be statistically significant for stage at diagnosis ($p < 0.001$), ER/PR status ($p < 0.001$) and breast cancer specific mortality ($p = 0.046$). All analyses were carried out using Stata/SE 10.1 statistical package.

Results

Non-Hispanic white breast cancer patients had the oldest mean age at diagnosis, 58.7 years, and Hispanic black women had the youngest mean age at diagnosis, 52.6 years, of the four racial/ethnic groups included (Table 1). The majority of Hispanic whites came from the Greater California and Los Angeles registries, while the majority of Hispanic black women were from the New Jersey and Los Angeles registries. A greater proportion of both Hispanic white (45.3 %) and non-Hispanic black women (44.3 %) lived in counties within the highest quartile of the population living below the federal poverty level, compared to the proportions observed for Hispanic blacks (32.0 %) and non-Hispanic whites (21.6 %). Hispanic white and Hispanic black women also lived in counties where higher proportions of the population were less educated, foreign-born, and had higher levels of language isolation compared to the counties in which non-Hispanic black and non-Hispanic white women lived.

Hispanic white, Hispanic black and non-Hispanic black women were significantly more likely than non-Hispanic white women to be diagnosed with late-stage invasive breast cancer (Table 2). Hispanic blacks and non-Hispanic blacks were at similar risk of being diagnosed with stage II (OR = 1.5 [95 % CI 1.2–1.8]; $p < 0.001$ and OR = 1.5 [95 % CI 1.5–1.6]; $p < 0.001$, respectively) and stage III tumors (OR = 2.1 [95 % CI 1.7–2.7]; $p < 0.001$ and OR = 2.1 [95 % CI 2.0–2.1]; $p < 0.001$, respectively) compared to non-Hispanic whites.

Non-Hispanic black women had the greatest risk of being diagnosed with stage IV invasive breast cancers compared to non-Hispanic white women (OR = 2.5 [95 % CI 2.4–2.6; $p <$ 0.001), followed by Hispanic black (OR = 1.9 [95 % CI 1.3–2.7]; $p < 0.001$) and Hispanic white women (OR = 1.5 [95 % CI 1.4–1.5]; $p < 0.001$).

Compared to each other, the risks of stage II and stage III breast cancer were similar across non-Hispanic black, Hispanic white and Hispanic black women. However, among women 50 years at diagnosis, Hispanic black women had a higher risk of stage IV breast cancer compared to Hispanic white women (OR = 1.5 [95 % CI 1.1–2.7], $p < 0.05$, results not shown). Whereas, among women <50 years of age at diagnosis, Hispanic black women had a lower risk of stage IV disease compared to non-Hispanic black women (OR = 0.4 [95 % CI 0.2–0.8], $p < 0.05$, results not shown).

Non-Hispanic black, Hispanic white, and Hispanic black women were all more likely than non-Hispanic white women to be diagnosed with ER +/PR– and ER–/PR– breast cancer (Table 3). The magnitudes of these risks were highest and statistically equivalent among non-Hispanic black and Hispanic black women, compared to non-Hispanic whites. Compared to Hispanic white women, risks of both ER+/PR– and ER–/PR– breast cancer were significantly higher for Hispanic black women, overall (OR$_{ER+/PR-}$ = 1.4 [95 % CI 1.1–1.8]; $p < 0.05$ and OR$_{ER-/PR-}$ = 1.6 [95 % CI 1.3–2.0]; $p < 0.001$, results not shown) and among women 50 years at diagnosis (OR$_{ER+/PR-}$ = 1.5 [95 % CI 1.1–2.1]; $p < 0.05$ and OR$_{ER-/PR-}$ = 1.9 [95 % CI 1.4–2.4]; $p < 0.001$, results not shown). Among women <50 years at diagnosis, Hispanic black women had a significantly higher risk of ER–/PR– breast cancer, only, compared to Hispanic white women (OR = 1.9 [95 % CI 1.4–2.4]; $p < 0.001$, results not shown). There were no significant differences in ER/PR status between Hispanic black and non-Hispanic black women.

The risk of breast cancer-specific mortality was 1.1–1.5 times greater for Hispanic white, Hispanic black and non-Hispanic black women, compared to non-Hispanic whites (Table 4). Hispanic black women had a significantly higher risk of breast cancer-specific mortality compared to Hispanic whites, overall (HR = 1.4 [95 % CI 1.1–1.7]; $p < 0.05$) and among women younger than age 50 at diagnosis (HR = 1.9 [95 % CI 1.4–2.5]; $p < 0.001$, results not shown). No significant differences in breast cancer-specific mortality were observed between Hispanic black and non-Hispanic black women.

Discussion

This study extends previous research on breast cancer among Hispanic subgroups [5, 6, 13–17], by providing a comprehensive assessment of differences in breast cancer outcomes between Hispanic white and Hispanic black women. While few studies present data on Hispanic black and Hispanic white women, separately [7, 9], our findings indicate that Hispanic black women experience breast cancer disparities that are similar in magnitude to non-Hispanic black women and, in general, are more pronounced than those faced by Hispanic white women. Prior work by Trapido et al. [9] found that Hispanic black and Hispanic white women were more frequently diagnosed with late stage breast cancer compared to non-Hispanic white women, in a Florida-based population. Similarly, another study based in southern Florida reported that both Hispanic black and Hispanic white women had lower odds of presenting with local-stage breast cancer (OR = 0.56 [95 % CI 0.27–1.17] and OR = 0.78 [95 % CI 0.56–1.10], respectively) compared to non-Hispanic white women [7]. So, while some differences were seen, both studies were based on relatively small sample sizes with 38 and 176 Hispanic black cases, respectively [7, 9]. Here we add to these results, showing that Hispanic black women may be at greater risk of Stage IV breast cancer diagnosis compared to Hispanic white women, though their risk is lower

comorbidities, tumor biology, access, utilization, and other structural/organizational characteristics of health care [2, 3, 28–36]. Nevertheless, despite accounting for several key covariates in our analyses, disparities persist, with Hispanic black and non-Hispanic black women being at greatest risk of breast cancer-specific mortality.

In interpreting the results of this study it is also important to acknowledge its limitations. Data on race/ethnicity was based on the NAACR Hispanic Identification Algorithm (NHIA) and, therefore, may be subject to potential misclassification [8, 37]. This is particularly important for Hispanics, who may be of any race, as they are commonly misclassified as non-Hispanic White/Black, with one study showing that close to one-third of self-reported Hispanic whites being misclassified as non-Hispanic white [37]. Moreover, since our analyses relied only on data available through the SEER program, we lacked data on several important potential confounders and effect modifiers including individual-level measures of country of origin, preferred language, years in the US, and insurance status, among others. Despite the large portion of the US covered by the SEER program we still had a comparatively small number of Hispanic black breast cancer cases, limiting our statistical power to a certain degree. Another potential issue is that the majority of Hispanic black cases came from the New Jersey (28.5 %) and Los Angeles (23.1 %) SEER registries; however, analyses limited to these two registries yielded results that were quite similar to our overall findings (Supplemental Table 1).

Despite these limitations, there are several important strengths of our study. We were able to explore several breast cancer outcomes among a large, nationally representative sample of Hispanic women. These findings build upon those studies showing the heterogeneity in breast cancer outcomes between Hispanic subgroups, adding considerably to the sparse literature documenting the breast cancer disparities that Hispanic black women experience. The disparities identified in our study underscore the combination of factors that may lead to the poor outcomes observed among U.S. Hispanic and black women diagnosed with breast cancer, and point to the on-going need for targeted strategies aimed at reducing breast cancer disparities in high risk populations such as Hispanic black women.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Table 1

Distribution of characteristics of the breast cancer cases by race/ethnicity

Characteristic	Non-hispanic white (*n* = 352,077)	Non-hispanic black (*n* = 44,797)	Hispanic white (*n* = 44,246)	Hispanic black (*n* = 622)
	n (%)	*n* (%)	*n* (%)	*n* (%)
Age at diagnosis, years				
20-29	1,550 (0.4)	559 (1.2)	633 (1.4)	13 (2.1)
30-39	17,484 (5.0)	4,077 (9.1)	4,746 (10.7)	73 (11.7)
40-49	68,439 (19.4)	11,221 (25.0)	12,156 (27.5)	192 (30.9)
50-59	94,332 (26.8)	12,285 (27.4)	11,642 (26.3)	163 (26.2)
60-69	89,762 (25.5)	9,624 (21.5)	8,961 (20.2)	110 (17.7)
70-79	80,510 (22.9)	7,031 (15.7)	6,108 (13.8)	71 (11.4)
Mean age at diagnosis [95 % CI]	58.7 [58.6, 58.8]	55.2 [55.1, 55.3]	54.0 [53.9, 54.1]	52.6 [51.7, 53.6]
Year of diagnosis				
1992-1995	51,672 (14.7)	6,156 (13.7)	5,004 (11.3)	63 (10.1)
1996-1999	56,329 (16.0)	6,801 (15.2)	6,016 (13.6)	71 (11.4)
2000-2003	112,662 (32.0)	13,766 (30.7)	13,454 (30.7)	207 (33.3)
2004-2008	131,414 (37.3)	18,074 (40.4)	19,772 (44.7)	227 (45.2)
SEER registry				
Atlanta	14,592 (4.1)	6,814 (15.2)	522 (1.2)	55 (8.8)
Connecticut	29,952 (8.5)	2,132 (4.8)	1,501 (3.4)	40 (6.4)
Detroit	27,290 (7.7)	7,892 (17.6)	498 (1.1)	39 (6.3)
Greater California	58,857 (16.7)	3,182 (7.1)	12,327 (27.9)	64 (10.3)
Hawaii	2,865 (0.8)	71 (0.2)	228 (0.5)	2 (0.3)
Iowa	25,192 (7.2)	340 (0.8)	204 (0.5)	0 (0.0)
Kentucky	18,278 (5.2)	1,275 (2.8)	78 (0.2)	4 (0.6)
Los Angeles	37,298 (10.6)	7,653 (17.1)	14,601 (33.0)	144 (23.1)
Louisiana	12,898 (3.7)	5,552 (12.4)	269 (0.6)	14 (2.2)
New Jersey	32,887 (9.3)	4,803 (10.7)	3,184 (7.2)	177 (28.5)
New Mexico	9,160 (2.6)	166 (0.4)	3,888 (8.8)	5 (0.8)
Rural Georgia	668 (0.2)	359 (0.8)	6 (0.0)	1 (0.2)
San Francisco-Oakland	24,540 (7.0)	3,182 (7.1)	3,162 (7.1)	54 (8.7)
San Jose-Monterey	12,901 (3.7)	335 (0.7)	2,532 (5.7)	6 (1.0)
Seattle-Puget Sound	32,750 (9.3)	995 (2.2)	653 (1.5)	13 (2.1)
Utah	11,949 (3.4)	46 (0.1)	593 (1.3)	4 (0.6)
% Population living below poverty level[a], quartiles				
<7.63 %	93,924 (26.7)	5,205 (11.6)	5,219 (11.8)	97 (15.6)
7.63-11.03 %	100,613 (28.6)	8,516 (19.0)	6,523 (14.7)	133 (21.4)
11.04-16.38 %	81,340 (23.1)	11,232 (25.1)	12,453 (28.2)	193 (31.0)
16.40 %	76,138 (21.6)	19,844 (44.3)	20,030 (45.3)	199 (32.0)
% Population with less than a high school education[a], quartiles				

Characteristic	Non-hispanic white (n = 352,077)	Non-hispanic black (n = 44,797)	Hispanic white (n = 44,246)	Hispanic black (n = 622)
	n (%)	n (%)	n (%)	n (%)
<13.96 %	99,706 (28.3)	5,279 (11.8)	3,586 (8.1)	86 (13.8)
13.96-17.41 %	90,552 (25.7)	9,530 (21.3)	7,594 (17.2)	109 (17.5)
17.42-25.04 %	86,217 (24.5)	16,546 (36.9)	9,459 (21.4)	199 (32.0)
25.05 %	75,540 (21.5)	13,442 (30.0)	23,586 (53.3)	228 (36.7)
% Population who are foreign born[a], quartiles				
<6.68 %	91,562 (26.0)	8,104 (18.1)	2,757 (6.2)	38 (6.1)
6.68-15.44 %	94,242 (26.8)	17,602 (39.3)	5,322 (12.0)	150 (24.1)
15.45-25.13 %	87,201 (24.8)	7,673 (17.1)	13,639 (30.8)	184 (29.6)
25.14 %	79,010 (22.4)	11,418 (25.5)	22,507 (50.9)	250 (40.2)
% Population with language isolation[a*], quartiles				
<2.53 %	97,274 (27.6)	8,306 (18.5)	1,517 (3.4)	39 (6.3)
2.53-4.79 %	92,679 (26.3)	14,703 (32.8)	5,030 (11.4)	119 (19.1)
4.80-8.69 %	85,157 (24.2)	10,077 (22.5)	13,367 (30.2)	215 (34.6)
8.70 %	76,905 (21.8)	11,711 (26.1)	24,311 (55.0)	249 (40.0)

[a] These variables are based on county level attributes, calculated using the United States Census 2000 SF files. The technical documentation for the 2000 SF files is available from the Census Bureau at: http://www.census.gov/main/www/cen2000.html

[*] The Census Bureau defines linguistically isolated as a household in which all adults speak a language other than English and none speak English "Very Well." Adult is defined as age 14 years and older. More information can be found at: http://www.census.gov/hhes/socdemo/language/data/census/li-final.pdf

Table 2

Risk of advanced stage breast cancer by race/ethnicity[†]

Race/ethnicity	Stage I	Stage II		Stage III		Stage IV	
	n (%)	n (%)	OR [95 % CI]	n (%)	OR [95 % CI]	n (%)	OR [95 % CI]
Total							
Non-hispanic white	166,596 (49.8)	124,805 (37.3)	Ref.	28,079 (8.4)	Ref.	14,810 (4.4)	Ref.
Non-hispanic black	14,456 (34.4)	18,376 (43.8)	1.5 [1.5, 1.6][‡]	5,725 (13.6)	2.1 [2.0, 2.1][‡]	3,405 (8.1)	2.5 [2.4, 2.6][‡]
Hispanic white	15,769 (37.9)	18,257 (43.9)	1.4 [1.3, 1.4][‡]	5,419 (13.0)	1.7 [1.7, 1.8][‡]	2,143 (5.1)	1.5 [1.4, 1.5][‡]
Hispanic black	202 (34.5)	259 (44.3)	1.5 [1.2, 1.8][‡]	89 (15.2)	2.1 [1.7, 2.7][‡]	35 (6.0)	1.9 [1.3, 2.7][‡*]
Age <50 years							
Non-hispanic white	34,101 (41.0)	37,387 (44.9)	Ref.	8,784 (10.5)	Ref.	2,986 (3.6)	Ref.
Non-hispanic black	4,071 (27.4)	7,396 (49.7)	1.6 [1.5, 1.6][‡]	2,364 (15.9)	2.1 [1.9, 2.2][‡]	1,037 (7.0)	2.6 [2.4, 2.8][‡]
Hispanic white	4,839 (29.4)	8,245 (50.0)	1.4 [1.4, 1.5][‡]	2,623 (15.9)	1.8 [1.7, 1.9][‡]	776 (4.7)	1.6 [1.5, 1.8][‡]
Hispanic black	78 (30.1)	127 (49.0)	1.4 [1.1, 1.9][‡]	46 (17.8)	2.0 [1.4, 3.0][‡]	8 (3.1)	1.1 [0.5, 2.2][*]
Age 50 years							
Non-hispanic white	132,495 (52.8)	87,418 (34.8)	Ref.	19,295 (7.7)	Ref.	11,824 (4.7)	Ref.
Non-hispanic black	10,385 (38.3)	10,980 (40.5)	1.5 [1.5, 1.6][‡]	3,361 (12.4)	2.1 [2.0, 2.1][‡]	2,368 (8.7)	2.5 [2.4, 2.6][‡]
Hispanic white	10,930 (43.5)	10,012 (39.9)	1.3 [1.3, 1.4][‡]	2,796 (11.1)	1.6 [1.5, 1.7][‡]	1,367 (5.4)	1.4 [1.3, 1.5][‡]
Hispanic black	124 (38.0)	132 (40.5)	1.5 [1.2, 2.0][‡]	43 (13.2)	2.1 [1.5, 3.0][‡]	27 (8.3)	2.4 [1.6, 3.7][‡*]

OR odds ratio; *CI* confidence interval; *Ref.* referent group

[†]$p < 0.05$

[†]Non-Hispanic White women served as the reference group for all odds ratios, adjusting for age at diagnosis, year of diagnosis, SEER registry, county level poverty, county level education, county level foreign born, and county level language isolation

[‡]$p < 0.001$

[*]*F* test for trend <0.05

Table 3

Risk of breast cancer by ER/PR status by race/ethnicity[†]

Race/ethnicity	ER+/PR+	ER+/PR–			ER-/PR–	
	n (%)	*n* (%)	OR [95 % CI]		*n* (%)	OR [95 % CI]
Total						
Non-hispanic white	196,364 (67.9)	36,548 (12.6)	Ref.		56,181 (19.4)	Ref.
Non-hispanic black	17,187 (49.8)	4,407 (12.8)	1.3 [1.3, 1.4][‡]		12,935 (37.5)	2.2 [2.2, 2.3][‡]
Hispanic white	21,003 (61.0)	4,225 (12.3)	1.1 [1.0, 1.1][‡]		9,191 (26.7)	1.4 [1.3, 1.4][‡]
Hispanic black	250 (49.2)	70 (13.8)	1.5 [1.2, 2.0][†]		188 (37.0)	2.2 [1.8, 2.7][‡*]
Age <50 years						
Non-hispanic white	47,642 (66.1)	6,126 (8.5)	Ref.		18,273 (25.4)	Ref.
Non-hispanic black	5,678 (46.5)	1,246 (10.2)	1.6 [1.5, 1.7][‡]		5,285 (43.3)	2.2 [2.1, 2.3][‡]
Hispanic white	8,043 (59.0)	1,248 (9.1)	1.1 [1.0, 1.2][†]		4,342 (31.8)	1.3 [1.3, 1.4][‡]
Hispanic black	116 (51.6)	22 (9.8)	1.4 [0.8, 2.2]		87 (38.7)	1.8 [1.4, 2.5][‡*]
Age 50 years						
Non-hispanic white	148,722 (68.5)	30,422 (14.0)	Ref.		37,908 (17.5)	Ref.
Non-hispanic black	11,509 (51.6)	3,161 (14.2)	1.3 [1.2, 1.3][‡]		7,650 (34.3)	2.3 [2.2, 2.4][‡]
Hispanic white	12,960 (62.3)	2,977 (14.3)	1.1 [1.0, 1.1][‡]		4,849 (23.3)	1.4 [1.3, 1.4][‡]
Hispanic black	134 (47.3)	48 (17.0)	1.7 [1.2, 2.3][†]		101 (35.7)	2.6 [2.0, 3.4][‡*]

OR odds ratio; *CI* confidence interval; *Ref.* referent group

[†]Non-Hispanic White women served as the reference group for all odds ratios, adjusting for age at diagnosis, year of diagnosis, stage at diagnosis, SEER registry, county level poverty, county level education, county level foreign born, and county level language isolation. ER-/PR+ breast cancer was not included in our analysis due to small sample size

[†]$p < 0.05$

[‡]$p < 0.001$

[*]F test for trend <0.05

Table 4

Risk of breast cancer-specific mortality by race/ethnicity[†]

Race/ethnicity	Patients at risk *n*	Events *n* (%)	HR 95 % CI]
Total			
Non-hispanic white	357,077	39,339 (11.2)	Ref.
Non-hispanic black	44,797	9,225 (20.6)	1.4 [1.4, 1.5][‡]
Hispanic white	44,246	5,786 (13.1)	1.1 [1.0, 1.1][†]
Hispanic black	622	112 (18.0)	1.5 [1.2, 1.8][‡*]
Age <50 years			
Non-hispanic white	87,473	10,366 (11.8)	Ref.
Non-hispanic black	15,857	3,648 (23.0)	1.5 [1.4, 1.6][‡]
Hispanic white	17,535	2,517 (14.3)	1.1 [1.0, 1.1][†]
Hispanic black	278	59 (21.2)	2.0 [1.5, 2.7][‡*]
Age 50 years			
Non-hispanic white	264,604	29,033 (11.0)	Ref.
Non-hispanic black	28,940	5,577 (19.3)	1.4 [1.3, 1.5][‡]
Hispanic white	26,711	3,269 (12.2)	1.1 [1.0, 1.1][‡]
Hispanic black	344	53 (15.4)	1.1 [0.8, 1.5][*]

HR hazard ratio; *CI* confidence interval; *Ref.* referent group

[†] Non-hispanic white women served as the reference group; age at diagnosis, year of diagnosis, SEER registry, county level poverty, county level education, county level foreign born, county level language isolation, surgery performed, and radiation therapy as covariates.

[†] $p < 0.05$

[‡] $p < 0.001$

[*] F test for trend <0.05