Receipt of Surgical Treatment in US Women with Early Stage Breast Cancer: Does Place of Birth Matter?

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Background: While effects of age, race, place of residence, and marital status on receipt of treatment among female breast cancer patients have been well documented, place of birth is a relatively less studied factor. The purpose of our study was to assess the relationship between birth place and type of surgery performed for early-stage breast cancer among US women of different racial and ethnic backgrounds.

Methods: Eligible cases (n=119,560) were selected from the SEER registries for the period 2004–2009. US-born and foreign-born patients of different racial/ethnic groups were compared to US-born non-Hispanic Whites (NHW) with respect to receipt of breast conserving surgery (BCS) or mastectomy. Results of multivariable logistic regression analyses were expressed as adjusted odds ratios (OR) and the corresponding 95% confidence intervals (CI).

Results: The proportion of BCS was highest in foreign-born Whites (62.5%) and lowest in foreign-born Asians (50.3%). Relative to US-born NHW, BCS was more common in foreign-born Whites (OR=1.21. 95% CI: 1.15–1.28) and foreign-born Blacks (OR=1.21. 95% CI: 1.15–1.28). In contrast, foreign-born Asians received less BCS compared to both US-born NHW (OR=.76, 95% CI: .72–0.80) and US-born Asians (OR=.74, 95% CI: .64–.86).

Conclusions: Foreign-born Asian breast cancer patients are less likely to receive BSC compared to US-born Whites or Asian-Americans, whereas foreign-born Whites and foreign-born Blacks are more likely to receive BCS than US-born Whites. Further studies are needed to understand cultural and or health systems factors that may explain these observations. (*Ethn Dis.* 2014;24[1]:110–115)

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Introduction

Breast cancer is the most commonly diagnosed non-cutaneous malignancy and the second leading cause of cancer mortality among women in the United States, with an estimated 232,340 new cases and 39,620 deaths in 2013.[1] The majority of these tumors are diagnosed at an early stage and are treated with mastectomy or breast conserving therapy (BCS).[2] In 1990, the National Institute of Health's Breast Cancer Coalition endorsed BCS and adjuvant radiation as an appropriate alternative to mastectomy after reviewing several randomized clinical trials demonstrating comparable survival rates for both treatments.[3] Receipt of mastectomy vs BCS among early stage breast cancers depends on several factors, including tumor size, age, socioeconomic status, geographic area, proximity to a radiation therapy center, presence of BRCA mutations, breast imaging results, availability of decision aids, and surgeon's work load.[4,5] Several studies have indicated that greater patient involvement in the decision making process increases the likelihood of mastectomy as well.[6,7] The recent prevalence of BCS has also been shown to vary by race/ethnicity with higher mastectomy rates among non-Hispanic White women[8] and Asian/Pacific Islanders.[9] However, it is unknown if breast cancer treatments differ within race/ethnicity categories by place of birth. To address this issue, our study assessed differences in receipt of BCS between foreign-born and US-born female breast cancer cases reported to the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program.

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Methods

Data on demographics, tumor characteristics, treatment and vital status are routinely collected and reported for cancer cases diagnosed in the National Cancer Institute's Surveillance, Epidemiology and End Results cancer registry areas, which represents 28% of the US population.[10] We selected females diagnosed with invasive early stage breast cancer (I, IIA, IIB, IIIA) and known place of birth between 2004–2009 (n=151,009). Since surgical treatment status was the primary outcome of interest, women with unknown surgical treatment status were excluded (n=2,533; .76%) as were those who received no surgery (26,006; 7.83%), local tumor destruction (n=18; .01%), surgery not otherwise specified (n=460; .14%) and those with mastectomy not otherwise specified (n=859; .26%). American Indians /Alaska Natives (n=1,573; .47%) were excluded from final analyses because of insufficient proportions of foreign-born persons.

The primary outcome of interest was receipt of surgical treatment comparing any BCS with mastectomy.

Patients treated with lumpectomy, segmental mastectomy or any other tissue sparing surgery, were included in the BCS group, and those with simple, radical or extended radical mastectomy were included in the mastectomy group. The main predictor variable was place of birth, and all participants were categorized as US-born or foreign-born. Individuals born in US territories such as Puerto Rico or American Samoa were not considered in the US-born group since the ethno-cultural context was more relevant for this study than the geopolitical context. We further grouped foreign-born patients according to the major geographical regions of the world.[11] The regions were categorized as: 1) Latin America (Central and South America); 2) the Caribbean; 3) East Africa; 4) West Africa; 5) Europe, the Middle East and North Africa combined; and 6) East Asia, Oceania, South East Asia and Indochina combined. Hybrid variables of race and place of origin were also included in the analysis.

Several demographic and clinical factors were considered in the analysis as control variables. Age at diagnosis was dichotomized as <50 or ≥ 50 years. Marital status at diagnosis was classified as single (never married), married, or divorced/separated/widowed. Tumor size (<2 cm vs ≥ 2 cm) and grade were also included as covariates. Tumors recorded to be >60 cm were considered out of range and excluded. Stage was categorized as I, IIA, IIB or IIIA. Area of residence at diagnosis was categorized into metro, urban and rural areas as follows: counties in metro areas $>250{,}000$ population were classified as metropolitan; counties in metro areas with populations between 20,000–250,000 or had populations between 2,500–20,000 but were adjacent to metro counties were considered as non-metro urban; counties with $<20{,}000$ population that were not adjacent to metro area were considered rural.[12]

We performed multivariable logistic regression analyses to estimate the likelihood of receipt of BCS in foreign-born patients of different racial/ethnic groups compared to US-born Whites after adjusting for relevant covariates described above. To take into consideration known differences in receipt of treatment by race,[13] we compared different racial-ethnic / place of birth categories (eg, US-born Asians or foreign-born Blacks) to US-born Non-Hispanic Whites (NHW) who were used as the reference category. In addition, we conducted within race / ethnicity analyses by comparing foreign-born to US-born cases. The results of multivariable analyses were expressed as adjusted odds ratios (OR) and the corresponding 95% confidence intervals (CI). A two-sided alpha error of $<.05$ was used as the cut-off point to determine statistical significance. All statistical analyses were performed using SAS 9.3; Statistical Institute, Cary, NC, USA.

RESULTS

Among all study participants 57.5% underwent BCS and the remaining 42.5% had mastectomy. Mean age at diagnosis among patients receiving any mastectomy (60.4 years) was slightly lower than that for the BCS group (61.9 years). As shown in Table 1, BCS was slightly more common among foreign-born Whites (62.4%), than US-born Whites (58.3%), but generally similar among those born in the United States (57.9%) and abroad (56.2%) The proportion of women treated with BCS decreased with increasing disease stage, tumor size and grade. The difference in receipt of BCS was particularly evident when comparing residents of metropolitan areas (58.2%) to those residing in rural areas (47.8%). The frequencies of BCS and mastectomy were similar across marital status categories.

Multivariable analysis included 5,226 European Whites, 79 West African Blacks, 90 East African Blacks, 383 Caribbean Blacks, 8,478 Asia-born Asians and 6,888 Hispanics born in Latin America. Among the US-born participants 73,634 were NHW, 11,605 Blacks, 3,020 Asians and 5,455 Hispanics. Using US-born NHW as reference, foreign-born Whites and Blacks were about 20% more likely to undergo BCS (Table 2). The differences across racial/ethnic groups among US-born patients were small (OR range 1.05–1.06) and in most analyses not statistically significant. As shown in Table 2, the only group that was significantly less likely to receive BCS compared to US-born NHW were foreign-born Asians/Pacific Islanders (OR=.76; 95% CI: .72–.80).

Table 3 presents the results of analyses comparing US-born and foreign-born breast cancer patients within each racial/ethnic group. Among Whites, foreign-born women were more likely to undergo BCS than their US-born counterparts (OR=1.21; 95% CI: 1.15–1.28); and among Asians the association was in the opposite direction (OR=0.74; 95% CI: 0.64–0.86). In contrast, no statistically significant place of birth related differences were observed among Blacks and Hispanics.

Table 4 extends the above analyses by evaluating specific regions of birth as the independent variable of interest. European Whites were more likely to receive BCS than US NHW (OR=1.30; 95% CI: 1.22–1.39). Neither West African nor East African Blacks were significantly different from US Whites in receipt of surgical treatment; however, the corresponding association was statistically significant (OR=1.31; 95% CI: 1.04–1.66) for Caribbean born Blacks. When the analyses by region of birth were repeated within each race / ethnicity category, only among Asians the result remained statistically significant: OR=.72; 95%CI: .65-.79 (Table 4).

DISCUSSION

Overall the odds of receiving either BCS or mastectomy in our study did not differ widely by place of birth.

Table 1. Demographic and cancer characteristics of female breast cancer patients from 2004–2009 in SEER Registry, *n* (%)

Patient and Tumor Characteristics	BCS (*n*=68,798)	Mastectomy (*n*=50,792)	Total (*N*=119,560)
Age at diagnosis, years			
<50	14,007 (51.3)	13,302 (48.7)	27,309
≥50	54,761 (59.4)	37,490 (40.6)	92,251
Place of birth and race			
US Whites[a]	42,957 (58.3)	30,677 (41.7)	73,634
Foreign born Whites[a]	5,042 (62.5)	3,029 (37.5)	8,071
US Blacks	6,384 (55.1)	5,221 (44.9)	11,605
Foreign born Blacks	444 (57.2)	332 (42.8)	776
US Asians/Pacific Islanders	1,791 (59.3)	1,229 (40.7)	3,020
Foreign born Asians/Pacific Islanders	4,379 (50.3)	4,319 (49.7)	8,698
Unknown Race	150 (63.8)	85 (36.2)	235
US Hispanics[b]	3,089 (56.6)	2,366 (43.4)	5,455
Foreign born Hispanics[b]	4,532 (56.2)	3,534 (43.8)	8,066
Born in the US			
Yes	54,327 (57.9)	39,553 (42.1)	93,880
No	14,441 (56.2)	11,239 (43.8)	25,680
Stage			
I	41,621 (68.6)	19,032 (31.4)	60,653
IIA	16,935 (54.6)	14,104 (45.4)	31,039
IIB	5,295 (38.5)	8,461 (61.5)	13,756
IIIA	2,672 (27.2)	7,149 (72.8)	9,821
Unknown	2,245 (52.3)	2,046 (47.7)	4,291
Tumor size			
<2 cm	47,573 (66.2)	24,340 (33.8)	71,913
≥2 cm	20,622 (46.5)	23,740 (53.5)	44,362
Unknown	573 (17.4)	2,712 (82.6)	3,285
Grade			
Well differentiated/ I	16,716 (66.9)	8,281 (33.1)	24,995
Moderately differentiated/II	27,662 (58.2)	19,910 (41.8)	47,572
Poorly differentiated/ III	20,329 (52.1)	18,673 (47.9)	39,002
Undifferentiated/ IV	699 (48.9)	730 (51.1)	1,429
Unknown	3,364 (51.3)	3,198 (48.7)	6,562
Residence			
Metro	62,903 (58.2)	45,238 (41.8)	108,141
Urban	4,432 (52.6)	3,994 (47.4)	8,426
Rural	1,430 (47.8)	1,559 (52.2)	2,989
Unknown	3 (75.0)	1 (25.0)	4
Marital status at diagnosis			
Single (never married)	8,748 (56.1)	6,845 (43.9)	15,593
Married	38,012 (57.8)	27,727 (42.2)	65,739
Separated/Divorced/Widowed	20,375 (57.8)	14,881 (42.2)	35,256
Unknown	1,633 (54.9)	1,339 (45.1)	2,972

BCS, breast conserving surgery.
[a] Non-Hispanic.
[b] Whites only.

The only exceptions were consistently lower frequency of BCS among foreign-born Asians (regardless of the comparison group) and the higher likelihood of BCS in foreign-born Whites and Blacks relative to US-born NHW.

Breast cancer treatment depends on a variety of complex factors including tumor size, age, socioeconomic status, geographic area, proximity to a radiation therapy center, presence of BRCA mutations, breast imaging results, availability of decision aids, and surgeon's work load.[4,5] Utilization and access to pre-operative magnetic resonance imaging and breast reconstruction increase the likelihood of mastectomy.[8,14] Additionally, patient involvement in the treatment decision making process increases the likelihood of mastectomy across race/ethnicity.[6,7] Clinical trials indicate that post-diagnosis survival of early breast cancer patients is about the same regardless of the type of surgery.[15–22] Studies comparing the psychosocial consequences of BCS and mastectomy demonstrated that BCS better serves to protect women's self-image[23] but requires additional adjustment related to radiation therapy.[24] Factors affecting breast cancer recurrence after BCS or mastectomy are mostly surgery-specific although hormone receptor status appears to be a predictor of prognosis regardless of treatment type.[25,26] Recurrence after BCS was of particular concern in the earlier era, but modern series have shown similar rates of post-surgical recurrence (2%–5%) given the effective use of systemic therapy.[27]

Despite general endorsement of BCS as an alternate to mastectomy, Asian American women in our study had low BCS utilization. This finding has important public health implications especially given that Asian Americans are the fastest growing minority in the United States[28] and they experience an increased risk of breast cancer after migrating to the US and adopting a more Western lifestyle.[29,30] Previous studies have also documented lower BCS rates among Asian women; a population-based study by Prehn et al found that Asian / Pacific Islander women were more likely to receive mastectomies than US White women (58% vs 42%).[31] Goel et al considered the effect of being US-born vs being foreign-born and found that foreign-born Asian / Pacific Islander women were significantly less likely to receive BCS than US NHW and these differences persisted over time between 1992–2000.[32] Chinese women residing

Table 2. Adjusted odds ratios for partial surgery (BCS) received by combined measure of place of birth and race in female breast cancer patients from 2004–2009 in SEER Registry with US Whites as reference

	n	Adjusted OR[a]	95% CI	*P*
Place of birth and race				
US Whites[b]	73,634	1.00	Referent	
Foreign born Whites [b]	8,071	1.21	(1.15, 1.28)	<.0001
US Blacks	11,605	1.06	(1.02, 1.11)	.0090
Foreign born Blacks	776	1.21	(1.15, 1.28)	<.0001
US Asians/Pacific Islanders	3,020	1.05	(.97, 1.14)	.2046
Foreign born Asians/Pacific Islanders	8,698	.76	(.72, .80)	<.0001
US Hispanics[c]	5,455	1.05	(.99, 1.11)	.1322
Foreign born Hispanics[c]	8,066	1.11	(1.05, 1.17)	<.0001

BCS, breast conserving surgery.
[a] Adjusted for age, marital status, tumor size, grade, stage and urban/rural residence.
[b] Non-Hispanic.
[c] Whites only.

in Hong Kong were also found to have similarly low BCS utilization.[33] A recent qualitative study observed that Chinese immigrant women may be less prone to share information about their cancer diagnosis with others, and may have different attitudes towards screening and treatment due to their beliefs regarding efficacy of traditional Eastern and Western medicine.[34] Other studies have noted modesty, less emphasis on the physical appearance of breasts, and the burden placed on family members of patients undergoing prolonged radiation as reasons for higher rates of mastectomy among Asian women compared to White women.[35–37] These cultural factors may have had a greater influence among foreign-born women than US-born Asian women, accounting for the particularly high prevalence of mastectomy among foreign-born Asians. Future research and community-based efforts aimed at understanding breast cancer treatment practices among the Asian American women are needed, especially considering the aforementioned increasing population of Asian Americans and increased breast cancer risk upon migrating to the United States.[28,29,30]

Table 3. Adjusted odds ratios for partial surgery (BCS) received by combined measure of place of birth and race in female breast cancer patients from 2004–2009 in SEER Registry with corresponding US races/ethnicity groups as reference

	n	Adjusted OR[a]	95% CI	*P*
Place or birth and race				
US Whites[b]	73,634	1.00	Referent	
Foreign born Whites [b]	8,071	1.21	(1.15, 1.28)	<.0001
US Blacks	11,605	1.00	Referent	
Foreign born Blacks	776	1.10	(.93, 1.30)	.2873
US Asians/Pacific Islanders	3,020	1.00	Referent	
Foreign born Asians/Pacific Islanders	8,698	.74	(.64, .86)	<.0001
US Hispanics [c]	5,455	1.00	Referent	
Foreign born Hispanics [c]	8,066	1.06	(.98, 1.15)	.1330

BCS, breast conserving surgery.
[a] Adjusted for age, marital status, tumor size, grade, stage and urban/rural residence.
[b] Non-Hispanic.
[c] Whites only.

Overall the odds of receiving either BCS or mastectomy in our study did not differ widely by place of birth.

To our knowledge, ours is the first study to examine differences in breast cancer surgery between foreign-born and US-born Whites. The higher rate of mastectomy among US-born Whites compared to foreign-born Whites, the majority of whom were born in Europe, is consistent with high rates of BCS in Europe relative to the United States.[38,39] A study examining data from 23 European breast cancer centers reported continued declines in mastectomy rates in recent years and in 2010, approximately 78% of early stage breast cancer patients received definitive BCS[39] Similarly, BCS rates in London (79%) were higher when compared to large cities in the United States including New York and Los Angeles.[38] Higher BCS utilization in Europe, which has been attributed to national screening programs, greater treatment standardization, as well as differences in clinicopathological features,[38] may extend to Europeans migrating to the United States. However, future studies examining more detailed clinical features as well as patient preferences are needed to confirm and clarify this association.

This is one of the first studies to explore the effect of place of birth on receipt of surgery. However, it has a number of limitations. Nearly 54% of the data were excluded due to missing place of birth. However, we found that the proportions of partial surgery and mastectomy were similar between those with known (58.83%) and unknown place of birth (57.52%). Kim et al examined patterns for missing data in SEER database and found that there were no such discernible patterns of

Table 4. Adjusted odds ratios for covariates of interest comparing receipt of breast conserving surgery place of birth and race in early stage female breast cancer patients from the SEER Registry from 2004–2009

	n	Adjusted OR [a]	95% CI	*P*
Place of birth and race				
US Whites[b]	73,634	1.00	Referent	
European Whites[b,c]	5,226	1.31	(1.23, 1.40)	<.0001
US Blacks	11,605	1.06	(1.02, 1.11)	.0090
West African Blacks	79	.85	(.52, 1.41)	.5284
East African Blacks	90	1.39	(.85, 2.30)	.1925
Caribbean Blacks	383	1.31	(1.04, 1.66)	.0225
US Asians/Pacific Islanders	3,020	1.05	(.97, 1.14)	.2046
Asia born Asians/Pacific Islanders[d]	8,478	.76	(.72, .80)	<.0001
US Hispanics[e]	5,455	1.05	(.99, 1.11)	.1322
Latin American Hispanics[e]	6,888	1.09	(1.03, 1.15)	.0038
US Blacks	11,605	1.00	Referent	
West African Blacks	79	.73	(.44, 1.20)	.2093
East African Blacks	90	1.25	(.76, 2.04)	.3886
Caribbean Blacks	383	1.20	(.95, 1.52)	.1307
US Asians/Pacific Islanders	3,020	1.00	Referent	
Asia born Asians/Pacific Islanders[d]	8,478	.72	(.65, .79)	<.0001
US Hispanics[e]	5,455	1.00	Referent	
Latin American Hispanics[e]	6,888	1.04	(.96, 1.13)	.3811

[a] Adjusted for age, marital status, tumor size, grade, stage and urban/rural residence.
[b] Non-Hispanic only.
[c] Includes Middle Eastern and North African peoples.
[d] All of Asia except the Middle East, South Asia combined with Oceania.
[e] White Hispanics only.

association between probability of having missing data and patient's age, race, sex or registry[40] and this relates to lessened chances of bias due to missing data in our study. For many comparisons, our analyses were based on small numbers (eg, there were only 79 West Africans), due in part to the study covering only about 28% of the US population. Nevertheless, the variability of estimates was consistently low with relatively precise 95% confidence intervals. In addition, no information was available on years spent in the United States and thus the effect of acculturation could not be studied in our analysis.

In summary, we found that foreign-born Asian breast cancer patients appear to be less likely to receive breast conserving surgery (BSC) compared to US-born Whites or Asian-Americans, whereas non-Hispanic White and Black immigrants were more likely to receive BCS compared to US Whites. Further studies are needed to understand the cultural and health system factors that may explain these observations.

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