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Factors that influence mammography use and breast cancer detection among Mexican-American and African-American women

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Abstract

Objective—This study examined factors that influence mammography use and breast cancer detection, including education, health insurance, and acculturation, among Mexican-American (MA) and African-American (AA) women.

Methods—The study included 670 breast cancer cases (388 MAs and 282 AAs), aged 40–86 years at diagnosis. Data on mammography use, detection, and delay in seeking care were collected via questionnaires and medical records. Using a language-based bidimensional acculturation measure, MAs were classified as English-dominant ($n = 67$), bilingual ($n = 173$), and Spanish-dominant ($n = 148$). Mammography prior to diagnosis was assessed by racial/ethnic acculturation subgroup using logistic regression.

Results—In age-adjusted models, mammography use was non-significantly lower among English-dominant (OR = 0.84; 95% CI: 0.45–1.59) and bilingual (OR = 0.86; 95% CI: 0.55–1.35) MAs and significantly lower among Spanish-dominant MAs (OR = 0.53; 95% CI: 0.34–0.83) than among AA women. After adjustment for education or insurance, there was no difference in mammography use by race/ethnicity and acculturation subgroup. Despite high self-reported mammography use (75%), a large proportion of cases reported self-detection (59%) and delay in seeking care >90 days (17%).

Conclusions—These findings favor promoting culturally appropriate messaging about the benefits and limitations of mammography, education about breast awareness, and prompt reporting of findings to a health professional.

Keywords

Mammography; Screening; Acculturation; Mexican-American; African-American

Introduction

Despite the fact that Hispanic and African-American (AA) women in the United States have lower breast cancer (BC) incidence rates than non-Hispanic whites (NHWs), women in these minority groups are more likely to die from BC than their NHW counterparts [1–4]. Screening mammography alone is estimated to reduce BC mortality by 15% [5] and is associated with higher rates of detection of smaller, more treatable tumors, with a shift in the disease pattern toward earlier-stage disease for women aged 40 years and above [6–9]. However, the benefit of screening mammography has been less apparent among racial/ethnic minority groups compared with NHWs over the last few decades [3, 10]. Women from medically underserved populations, including Hispanics and AAs as well as recent immigrants, are less likely to receive routine mammographic screening than NHWs [11, 12], which may partially explain the higher prevalence of more aggressive disease observed at diagnosis in these populations [3, 10, 13–15].

Several studies have identified race/ethnicity-specific characteristics that may explain differences in receipt of mammography. Younger age structure of the population [16, 17], lower socioeconomic status (SES) or lower education [17], limited English language proficiency [18], living in a rural or border region [19, 20], and lack of health insurance or usual source of health care [21] have been shown to significantly influence knowledge about BC risk and screening mammography. Notably, studies have reported lower screening mammography in women less acculturated to a dominant culture compared to those more acculturated [22] and in foreign-born or recent immigrants compared to US-born women [18, 23].

The present study assesses mammography use and BC detection among Mexican-American (MA) and AA women. Specifically, the aim of the study was to identify factors that influence mammography use and BC detection among MA women of varying levels of acculturation compared to AA women. This paper adds to the current body of literature on socioeconomic and cultural barriers to mammography use and BC detection. We hypothesized that AA women and high-accultured, English-dominant MA women use mammography more frequently than low-accultured, Spanish-dominant MA women and that Spanish-dominant women are more likely to delay seeking care and self-detect their BC.

Materials and methods

Study population

The *Ella* Binational Breast Cancer Study is a case-only study including women of Mexican descent in the United States and Mexico; details of the study have been described previously [24]. Briefly, eligible participants were women aged 18 years and older at diagnosis of invasive BC, occurring within 24 months of consent into the study. When the *Ella* Study began, a companion study was launched, aimed at recruiting AA BC cases at the MD Anderson Cancer Center; recruitment was conducted side-by-side, using the same procedures, recruiters, and data collection instruments. This companion study included both MA ($n = 388$) and AA ($n = 282$) women, enrolled in the United States between 1 March 2007 and 1 March 2010, aged 40 years and older, consistent with current American Cancer Society (ACS) screening guidelines [25]. The AA women served as a highly acculturated comparison group, since the population was predominantly US-born (95%), and all participants were English-speaking; this approach has been used in the literature [26].

Data collection

Study methods and information regarding characteristics of the *Ella* Study population and recruitment sites have been published previously [24]. Trained bilingual interviewers administered the *Ella* Risk Factor Questionnaire (RFQ) to study participants in English or Spanish. The questionnaire was used to collect sociodemographic characteristics, country of birth, level of education, breast health history, language use/exposure, family history of BC among first-degree relatives, and other data on established risk factors for BC. Self-reported BC screening behaviors, including routine breast self-examination (BSE), clinical breast examination (CBE) by a health professional, mammography use prior to diagnosis, method of BC detection, and delay between noticing first BC symptom(s) and seeking medical

attention, were also captured by the questionnaire. To ascertain mammography use, interviewers prompted participants for the number of mammograms received in the 5 years prior to diagnosis not associated with any BC symptoms. Although data on mammography use were not recorded using a year-to-year format, interviewers were trained to take this into account in the collection method to minimize recall error. Given that delayed medical attention among women with symptomatic BC lasting >90 days is associated with poorer outcomes [27, 28], this cut-point was used in the analysis. Reasons for no prior mammography or delay between noticing first BC symptom(s) and seeking medical attention were ascertained via a series of response variables that have been reported in the literature [11, 12, 17, 19, 27, 29]. Age at diagnosis ($n = 550$), stage at diagnosis ($n = 524$), and health insurance status at the time of registration at medical facility ($n = 622$) were abstracted from medical records, if available. Otherwise, age at interview ($n = 120$) and health insurance status at diagnosis ($n = 47$) were collected via the *Ellla* RFQ. The study was approved by the University of Arizona and the M.D. Anderson Cancer Center Institutional Review Boards; all study participants provided written informed consent.

Exposure variables

To measure level of acculturation, the RFQ included two orthogonal, four-item measures of cultural orientation; one scale assessed degree of English language use/exposure, and one scale assessed degree of Spanish language use/exposure. These cultural orientation scales were primarily based on Marin and Gamba's (1996) Bidimensional Acculturation Scale (BAS) [30], which has been previously validated in Hispanic populations [31–33]. Each of the 8 items had responses from 1 (*never*) to 5 (*always*). Both English (Cronbach's $\alpha = 0.94$) and Spanish (Cronbach's $\alpha = 0.94$) acculturation scales were highly reliable, and these scales were moderately inversely correlated ($\rho = -0.33$, $p < 0.001$). MAs who completed both scales were placed into one of three acculturation groups using the recommended 2.99 average cutoff for both scales: (1) bilingual (scored ≥ 3.0 average in both the English and Spanish scales); (2) Spanish-dominant (scored ≥ 3.0 average in the Spanish scale only); and (3) English-dominant (scored ≥ 3.0 average in English scale only). The 33 respondents who noted that they were monolingual Spanish or English speakers and did not complete the BAS and the 2 women who scored low in both English and Spanish dimensions of the BAS were classified as English- or Spanish-dominant based on interview language. All AA participants completed the RFQ in English and were primarily US-born (95%).

Statistical analyses

Four groups were identified according to race/ethnicity and the acculturation scale: English-dominant AAs, English-dominant MAs, bilingual MAs, and Spanish-dominant MAs. This method has been previously employed to compare Hispanics of varying levels of acculturation with other highly acculturated racial/ethnic subgroups, such as AAs and NHWs [26]. Student's *t*-tests and chi-square tests were used to assess differences between race/ethnicity and level of acculturation with other characteristics. Bivariate and multivariate logistic regression analyses were conducted to assess confounding variables in the relationship between racial/ethnic acculturation subgroups and mammography use in the last 5 years prior to BC diagnosis (yes/no). Based on a review of the literature, wide array of potential factors associated with mammography use and/or race/ethnicity and acculturation

were considered as potential confounders. Most covariates reflect sociodemographic variables often considered competing explanatory factors to race/ethnicity or acculturation markers [33, 34] though family history was also considered given the strength of relationships to cancer screening behaviors in prior studies [35]. In preliminary models, covariates with a Wald statistic p -value < 0.2 were included. Multivariate logistic regression assessed the relationship between mammography use and the four subgroups. Due to collinearity between education and health insurance (chi-square test, $p < 0.001$), these categorical variables were included separately and together in the final multivariate model. All statistical analyses were conducted using Stata 10.1 (StataCorp, College Station, TX).

Results

Table 1 describes the characteristics of the *Ellla* study population by race/ethnicity and level of acculturation. There were no significant differences in the distribution of age or stage at diagnosis across subgroups. Smaller proportions of AAs (5%) and English-dominant MAs (13%) were foreign-born, compared with bilingual (41%) and Spanish-dominant (95%) MAs. Spanish-dominant MAs were more likely to be uninsured than other subgroups. Furthermore, 92% of AAs completed a high school education or equivalent, compared with 89% of English-dominant MAs, 79% of bilingual MAs, and 28% of Spanish-dominant MAs. AAs, English-dominant MAs, and bilingual MAs self-reported higher rates of BSE and CBE than Spanish-dominant MAs. Self-reported family history of BC was lower in Spanish-dominant MAs than in other subgroups. Considering a gradient of increasing level of acculturation from Spanish-dominant (lowest) to English-dominant (highest), there were clear trends for increasing mammography use in the last 5 years prior to diagnosis.

Overall, study participants were significantly more likely to report self-detection of their BC, which includes routine BSE and incidental self-discovery (58.9%; 95% CI: 55.2–62.7%), than mammography detection (30.4%; 95% CI: 26.9–33.9%). However, the frequency of reported self-detection differed substantially by racial/ethnic acculturation subgroup (Table 1). Among women who reported mammography use in the past 5 years, Spanish-dominant MAs were more likely than other groups to report self-detection of their BC. Overall, 34% (95% CI: 30.0–38.4%) of the study population who received mammography reported mammography-detected disease; the highest proportion was among English-dominant MAs (43%; 95% CI: 29.1–57.2%), and the lowest was among Spanish-dominant MAs (29%; 95% CI: 19.5–37.7%). Women younger than 55 years reported higher prevalence of self-detected BCs (64%) than those 55 years and older (46%). Additionally, younger women (< 55 years of age) who reported receiving mammography in the last 5 years were more likely to report self-detected BC than those age 55 years and older who also reported mammography use ($p < 0.001$).

Self-reported delay in seeking medical care among women with symptomatic BC differed significantly by racial/ethnic acculturation subgroups (Fig. 1; $p < 0.001$). Overall, 17% (95% CI: 14.3–20.5%) of women reported delay in seeking care > 90 days; Spanish-dominant MAs were the most likely to report this delay (33%; 95% CI: 25.4–41.3%) compared with other groups. Participants who delayed care were asked why they did so; the most commonly reported reasons for delay were “not feeling that it was important” (39%) and “cost of

procedure or lack of health insurance'' (26%). When a random sample of medical records ($n = 5$) was reviewed, self-reported medical presentation delay was consistent with physicians' notes.

Bivariate analysis of for the association of mammography use and sociodemographic factors, recruitment site, and family history of breast cancer is presented in Table 2. Consistent with screening patterns, age was positively associated with mammography use in the past 5 years (OR = 1.03; 95% CI: 1.01–1.04). Women with either a high school equivalent (OR = 0.59; 95% CI: 0.38–0.92) or less than a high school education (OR = 0.38; 95% CI: 0.25–0.59) were less likely to report receiving mammography than participants who completed some post-high school education. Compared with women with private insurance, those with public insurance (OR = 0.28; 95% CI: 0.19–0.43) and those with no insurance (OR = 0.39; 95% CI: 0.23–0.66) had similar, lower odds of reporting mammography use. Women who reported a family history of BC were more than twice as likely to report mammography use in the past 5 years than women with no family history (OR = 2.19; 95% CI: 1.26–3.80).

Mammography use in relation to racial/ethnic and acculturation subgroups is presented in Table 3. In the age-adjusted model (model 1), English-dominant and bilingual MA women were slightly less likely to report mammography use than AAs, although these results were not statistically significant. However, Spanish-dominant MAs were significantly less likely to report mammography use (OR = 0.53; 95% CI: 0.34–0.83) than AAs. After adjustment for age and education and/or health insurance (models 2–4), no significant differences in mammography use were observed between Spanish-dominant MAs and AAs. Further adjustment for contraceptive use, hormone replacement therapy use, parity, marital status, body mass index, or family history of BC among first-degree relatives did not materially change the results (data not shown). As shown in Table 3, comparisons within the MA group show that Spanish-dominant women were less likely than the other two MA groups to report mammography use; however, these differences were attenuated in the multivariate model.

Discussion

Consistent with data from the National Health Interview Survey [36], AA and MA women in the *Ella* Study reported high rates of mammography use; however, differences across race/ethnicity and acculturation are evident. Our results show that although Spanish-dominant MA women with BC were less likely to report prior mammography use than English-dominant MA or AA women, the differences are largely explained by other contextual factors. In particular, level of education and health insurance status could account for differences in mammography use across race/ethnicity and acculturation. Overall, Spanish-dominant MA women are less likely to report mammography use, more likely to be uninsured, and more likely to report self-detected BCs than English-dominant MAs or AAs. However, similar to the published literature, the findings of this study show that racial/ethnic differences in screening are attenuated when controlling for health system access and socioeconomic variables [23, 37], suggesting the latter may be intervening through policy or education-based cancer control strategies.

As has been reported in the literature [38], women with symptom-detected BCs are 2.3 times more likely to die of their disease than those with screen-detected tumors. Results from the present study suggest a high rate of self-detected cancers despite high rates of reported mammography use. Contrary to published results, which report 56% of BCs as mammography-detected and 37% as patient-detected [39], the majority (~70%) of women in the *Ella* Study do not report mammography-detected disease. Reasons for high rates of self-detection may include the following: (1) women did not receive regular recommended screening mammography; (2) BC of an aggressive nature detected between screening intervals; (3) BCs in these women are not detectable by mammography; or (4) misreporting. Factors contributing to mammography failure among screened women include higher breast density [40], obesity [41], health system variables [42], or poor performance of film mammography compared with digital mammography [43]. Due to earlier age at diagnosis in AA and Hispanic women compared with NHWs [44, 45] and higher false-negative rates of mammograms in younger women [37, 40], reduced mammography performance in this population may partially explain more advanced disease and poorer outcomes among racial/ethnic minority women. Our data also show that among women who reported mammography use in the previous 5 years, younger women (<55 years) had a higher proportion of self-detected cancers than older women, suggesting that more aggressive cancers might be more likely in younger women.

Factors such as the cost of health care remain a barrier to screening for many low-income women. In the present study, nearly one-third of women cited that cost or a lack of health insurance caused them to delay seeking medical care for BC-related symptoms. Overall, 17% of the women in this study reported delay >90 days, consistent with the literature [27, 46]. Spanish-dominant MA women had the highest proportion of delay >90 days (33.3%), which may be due to lower health care access and/or lower awareness of the health relevance of breast symptoms [27, 46]. Despite the lack of efficacy of BSE [47], current ACS screening guidelines emphasize the importance of education about the benefits and limitations of BSE [25]. Breast awareness is an important tool for women with lower access to mammography screening who are more likely to self-detect tumors.

This study adds to our knowledge on BC screening and detection behaviors among immigrant and racial/ethnic minority women. However, results should be interpreted in context of study limitations. The *Ella* Study does not include a population-based sample. In addition, since this study includes primarily self-reported data, some misclassification is likely, especially since we did not collect mammography data in a per-year basis. Previous studies suggest overestimation of mammogram use among racial/ethnic minority women [48, 49] and underreporting of variables such as family history of BC [10, 50]. Although interviewers prompted participants for screening mammography to focus on mammograms not associated with any symptoms, it is not possible to completely distinguish screening mammography from diagnostic mammography. While the proportion of women who reported mammography use is higher than those of some population-based studies [51], it is important to note that our data include mammography use in the last 5 years among BC cases. Furthermore, a large proportion of cases also reported self-detection of tumors, which may have resulted in diagnostic mammography, before receiving a biopsy and therefore prior to BC diagnosis. Consequently, it is likely that a majority of women in this study did

not receive routine screening mammography prior to diagnosis. Lastly, because we did not record mammography data on a yearly basis over the previous 5 years, we could not assess interval cancers in this population.

Findings from this study may have implications for other immigrant and minority populations, since similar trends in mammography use are observed by level of acculturation in different groups, including other Hispanic subgroups and Asian populations [52–54]. Language-based acculturation measures such as the BAS are useful in understanding differences observed in screening behaviors within diverse immigrant groups, as acculturation may be used as a proxy for variation in SES, health care access, and health literacy within populations. Though less descriptive than contemporary acculturation measures, interview language is a useful unidimensional proxy for acculturation [55] and remains the most frequently used and strongest single indicator of acculturation [33, 56–58]. The instrument is correlated with other acculturation markers frequently used in related research, including nativity, generational status, age at US immigration, and length of time lived in the United States [22]. While there are criticisms of the validity and theoretical basis of acculturation measures [34, 59–61], adequate and nuanced measurement of acculturation allows for the identification of variables linked to risk-enhancing or protective behaviors associated with BC [22, 30]. The present study addresses the major criticism of acculturation models by highlighting social determinants of health behaviors as key factors in health disparities [61]. Categorizing participants into acculturation subgroups allows us to gain insight into socioeconomic variables that explain differences in mammography use and detection among heterogeneous MA women.

Barriers to mammography screening and early detection are complex and multifactorial. Controversy regarding mammography screening has emerged recently in the United States; results of the present study raise important questions about the delivery of BC screening guidelines suggested by the U.S. Preventive Services Task Force [62, 63]. This agency recommends against *routine* mammography screening in women aged 40–49 years. Instead, the guidelines state, “The decision to start regular, biennial screening mammography before the age of 50 years should be an individual one and take patient context into account, including the patient’s values regarding specific benefits and harms.” However, our results suggest that this recommendation might create an unexpected barrier for Spanish-speaking, low-accultured women, as they often lack awareness about screening, have lower access to primary and preventative health care services [1, 23, 64, 65], and are less likely to report a family history of BC [50]. In addition, these and other immigrant women may not have the knowledge or skills needed to seek care or to initiate discussions related to their individual level of risk, cancer-screening benefits, and the importance of follow-up care for breast abnormalities. Thus, caution should be considered in attempts to individualize screening recommendations for younger women from underserved populations, including non-English-speaking patients, as these may further contribute to disparities related to BC screening and early detection.

In conclusion, results from our study show that although differences in mammography use are evident among MA and AA women with BC, these differences were largely explained by level of education and health insurance status. Furthermore, we found that nearly 60% of

women reported self-detected tumors and 17% experienced delay in seeking medical care >90 days. Findings from this study favor the use of culturally appropriate messaging about the benefits and limitations of mammography screening, as well as the promotion of breast awareness and prompt reporting of findings to a health professional.

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Fig. 1.

Frequency distribution of medical presentation delay among women with symptomatic breast cancer by African-American (AA) and Mexican-American (MA) acculturation subgroup. * $p < 0.001$ determined by chi-square test statistic

Characteristics of *Ella* Study participants age 40 years by African-American (AA) and Mexican-American (MA) acculturation subgroup ($n = 670$)

Table 1

Characteristic	Racial/ethnic acculturation subgroup ^a			
	AA ($n = 282$)	MA English-dominant ($n = 67$)	MA bilingual ($n = 173$)	MA Spanish-dominant ($n = 148$)
Age at diagnosis (year)	54.9 ± 9.6	55.3 ± 10.9	53.6 ± 9.7	54.4 ± 11.0
Stage at diagnosis ^b				
I–IIB	169 (68.4)	31 (81.6)	85 (68.0)	76 (66.7)
III–IV	78 (31.6)	7 (18.4)	40 (32.0)	38 (33.3)
Nativity ^b				
US-born	260 (95.2)	58 (86.6)	103 (59.5)	7 (4.8)
Foreign-born	13 (4.8)	9 (13.4)	70 (40.5)	141 (95.3)
Health insurance status ^b				
Private insurance	131 (60.7)	32 (62.8)	81 (61.8)	19 (19.4)
Public insurance	76 (35.2)	16 (31.4)	31 (23.7)	34 (34.7)
No insurance	9 (4.2)	3 (5.9)	19 (14.5)	45 (45.9)
Highest level of education ^b				
Post-high school	171 (62.2)	26 (39.4)	85 (49.1)	20 (13.6)
High school	83 (30.2)	33 (50.0)	52 (30.1)	21 (14.3)
Less than high school	21 (7.6)	7 (10.6)	36 (20.8)	106 (72.1)
Ever employed >1 year ^b	265 (98.2)	66 (98.5)	165 (95.9)	109 (78.4)
Family history, BC in 1st degree relative(s) ^b	53 (20.7)	14 (22.2)	32 (18.9)	15 (10.9)
Oral contraceptive use ^b	195 (73.3)	41 (62.1)	118 (68.2)	67 (45.9)
BSE prior to diagnosis ^b	250 (90.9)	54 (80.6)	146 (84.4)	105 (71.0)
CBE prior to diagnosis ^b	239 (87.2)	61 (91.0)	144 (83.2)	102 (69.4)
Mammography use in last 5 years prior to diagnosis ^b	217 (78.9)	51 (76.1)	131 (75.7)	98 (66.2)
Age at first mammogram (years) ^b	38.3 ± 7.5	39.6 ± 6.5	39.9 ± 8.3	42.2 ± 9.1
Method of detection ^b				

Characteristic	Racial/ethnic acculturation subgroup ^a			
	AA (<i>n</i> = 282)	MA English-dominant (<i>n</i> = 67)	MA bilingual (<i>n</i> = 173)	MA Spanish-dominant (<i>n</i> = 148)
Self-detected	161 (58.8)	31 (46.3)	96 (55.5)	102 (68.9)
Mammography-detected	80 (29.2)	29 (43.3)	60 (34.7)	32 (21.6)
Physician-detected by CBE	29 (10.6)	4 (6.0)	15 (8.7)	10 (6.8)
Other	4 (1.5)	3 (4.5)	2 (1.2)	4 (2.7)
Delay between first breast cancer symptom(s) and seeking medical attention ^b				
<30 days	141 (61.8)	43 (71.7)	98 (63.6)	63 (45.7)
30–90 days	59 (25.9)	14 (23.3)	32 (20.8)	29 (21.0)
>90 days	28 (12.3)	3 (5.8)	24 (15.6)	46 (33.3)

^a Categorical variables are expressed as percent distribution within each racial/ethnic acculturation subgroup. Continuous variables are expressed as mean (SD)

^b Due to missing data, *n* differed for the following variables: stage (*n* = 524), nativity (*n* = 658), insurance (*n* = 669), education (*n* = 661), employment (*n* = 626), family history (*n* = 648), contraceptive use (*n* = 651), BSE (*n* = 663), CBE (*n* = 661), mammography use (*n* = 663), age at first mammogram (*n* = 500), method of detection (*n* = 662), delay (*n* = 580)

Table 2

Odds ratios for mammography use according to sociodemographic factors, recruitment site, and family history of breast cancer among *Ella* Study participants ($n = 663$)

Variable	No. (%)	OR(95% CI)
Age		
40–49 years	252 (38.0)	1.0
50–64 years	305 (46.0)	1.97 (1.34–2.90)
65 years and older	106 (16.0)	1.65 (0.97–2.79)
Continuous (per year)		1.03 (1.01–1.04)
Recruitment site		
Texas	503 (75.9)	1.0
Arizona	160 (24.1)	1.32 (0.86–2.02)
Highest level of education ^a		
Post-high school	302 (45.7)	1.0
High school or equivalent	189 (28.6)	0.59 (0.38–0.92)
Less than high school	170 (25.7)	0.38 (0.25–0.59)
Health insurance status		
Private insurance	306 (46.2)	1.0
Public insurance	248 (37.4)	0.28 (0.19–0.43)
No insurance	109 (16.4)	0.39 (0.23–0.66)
Family history of breast cancer ^a		
No	512 (81.8)	1.0
Yes	114 (22.8)	2.19 (1.26–3.80)

Defined as self-reported mammography use in the last 5 years prior to breast cancer diagnosis among women ages 40 years

^aDue to missing data, n differed for the following variables: education ($n = 661$), family history ($n = 626$)

Table 3

Mammography use among African-American (AA) and Mexican-American (MA) women by acculturation subgroup after adjustment for sociodemographic characteristics ($n = 663$)

Covariates	OR(95% CI)			
	Model 1	Model 2 ^a	Model 3	Model 4 ^a
Racial/ethnic acculturation subgroup				
5AA	1.0	1.0	1.0	1.0
MA-English-dominant	0.84 (0.45–1.59)	1.05 (0.54–2.04)	0.75 (0.39–1.44)	0.88 (0.44–1.76)
MA-bilingual	0.86 (0.55–1.35)	1.02 (0.63–1.62)	0.78 (0.48–1.26)	0.89 (0.55–1.47)
MA-Spanish-dominant	0.53 (0.34–0.83)	1.02 (0.58–1.80)	0.66 (0.40–1.09)	1.09 (0.59–2.00)
Age (<i>continuous</i>)	1.03 (1.01–1.04)	1.04 (1.02–1.06)	1.04 (1.02–1.06)	1.05 (1.03–1.07)
Highest level of education				
Post-high school	–	1.0	–	1.0
High school or equivalent	–	0.57 (0.36–0.89)	–	0.71 (0.44–1.13)
Less than high school	–	0.32 (0.19–0.56)	–	0.44 (0.25–0.76)
Health insurance status				
Private insurance	–	–	1.0	1.0
Public insurance	–	–	0.24 (0.16–0.37)	0.26 (0.17–0.41)
No insurance	–	–	0.46 (0.26–0.83)	0.47 (0.26–0.84)

Defined as self-reported mammography use in the last 5 years prior to breast cancer diagnosis among women ages 40 years

^aDue to missing data on level of education, n differed for model 2 and model 4 ($n = 661$)