

COUNTY OF RESIDENCE AND SCREENING PRACTICES AMONG LATINAS AND NON-LATINA WHITES IN TWO RURAL COMMUNITIES

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Objectives: Latinas are less likely than non-Latina Whites (NLW) to utilize mammographic screening and are more likely to be diagnosed with late-stage breast cancer. Here, we examine the effects of county-level factors on guideline-concordant breast-cancer screening behaviors in Latinas and NLWs.

Design: Latinas (N=108) and NLW women (N=132) aged >40 years, residing in two adjacent rural, medically underserved counties in eastern Washington State, completed a baseline questionnaire on mammography utilization and demographics.

Main Outcomes: Differences in socioeconomic variables and knowledge of screening practices were examined by ethnicity and county of residence. Predictors of having had a mammogram within the past two years were analyzed using multivariate logistic regression.

Results: Ethnicity was not associated with having a guideline-concordant mammogram; however, age (odds ratio [OR]=1.04, 95%CI:1.01-1.08); having >12 years of education (OR=2.09, 95%CI:1.16-3.79); having a regular clinic for health care (OR=2.22, 95%CI:1.05-4.70); having had a prior clinical breast exam (OR=5.07, 95%CI:1.71-15.02), and county of residence (OR=2.27, 95%CI:1.18-4.37) were all associated with having had a guideline-concordant mammogram.

Conclusions: County of residence and having had a prior CBE were strong predictors of screening utilization. Community-level factors in medically underserved areas may influence screening patterns. *Ethn Dis.* 2019;29(1):31-38; doi:10.18865/ed.29.1.31.

INTRODUCTION

The United States (US) Preventive Taskforce concluded that reduced breast-cancer mortality is associated with mammography screening.¹ Despite these recommendations, Latinas are less likely than non-Latina Whites (NLW) to utilize mammographic screening,²⁻⁴ and are more likely to be diagnosed with late-stage breast cancer,⁵⁻⁸ contributing to a worse breast-cancer mortality rate, despite their lower breast cancer incidence rate.^{9,10} However, health and preventative practices among racial/ethnic groups are influenced by myriad factors. For example, socioeconomic status differs by race and ethnicity,¹¹ which influences rates of breast cancer screening. Further,

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a report from the REACH US Risk Factor study suggested that there were substantial variations in the use of preventive services both across different communities within the same racial/ethnic population.¹² A

To our knowledge, there are no data examining rates of mammographic utilization, socioeconomic factors such as education attainment, access to regular health care and income and comparing NLW women and Latinas in the context of their place of residence, and none in rural communities.

number of studies have examined screening practices among Latino populations across the rural/urban divide, and described disparities

leading to higher rates of late stage diagnoses for lung, colorectal and cervical cancers.¹³ Other studies have reported lower rates of breast cancer screening in rural compared with urban populations.^{14,15} However, to our knowledge, there are no data examining rates of mammographic utilization, socioeconomic factors such as education attainment, access to regular health care and income and comparing NLW

women and Latinas in the context of their place of residence, and none in rural communities. This is important as rurality and access to care may ameliorate differences among Latinas and NLW women in breast cancer screening.

Hence, we initiated a study among Latina and NLW women residents of two adjacent rural counties in eastern Washington. Here, we compare sociodemographic factors and breast

screening knowledge and practices between Latinas and NLWs, and between residents of two adjacent counties. Using multivariate logistic regression, we also examined baseline predictors of having had a guideline-concordant mammogram (within the past two years). To our knowledge, this is the first study to examine county-level differences, stratified by ethnicity, of predictors of breast-screening utilization in rural underserved communities.

Table 1. Baseline characteristics and breast screening practices among 240 Latina and NLW women aged >40 years and residing in a rural underserved area

| Variable | Category | Latinas | NLW | P ^a | County 1 | County 2 | P |
|---|---|-----------------|-----------------|------------------|------------|-------------|------|
| | | N=108, 34.4% | N=132, 65.6% | | N=64 | N=176 | |
| Age (years) | Mean (SD) | 49.9 (7.8) | 52.4 (7.4) | .01 ^b | 51.3 (8.3) | 51.25 (7.5) | .94 |
| Ethnicity | Latina | - | - | | 22 (34.4) | 86 (58.9) | .05 |
| | NLW | | | | 42 (65.6) | 90 (51.1) | |
| County of residence | County 1 | 22 (20.4) | 42 (31.8) | .05 | - | - | |
| | County 2 | 86 (79.6) | 90 (68.2) | | | | |
| Country of birth | Mexico | 92 (85.2) | 0 | <.0001 | 16 (25.0) | 76 (43.2) | .002 |
| | Other Latin American Country | 5 (4.6) | 0 | | 2 (3.1) | 3 (1.7) | |
| | US | 8 (7.4) | 130 (98.4) | | 42 (65.6) | 96 (54.6) | |
| | Europe | 0 | 1 (0.8) | | 0 | 1 (0.6) | |
| | Missing ^c | 3 (2.8) | 1 (0.8) | | 4 (6.3) | 0 | |
| Marital status | Married/marriage-like relationship | 72 (66.7) | 91 (68.9) | .71 | 41 (64.1) | 122 (69.3) | .44 |
| | Separated/divorced/widowed/never married/single | 36 (33.3) | 41 (31.1) | | 23 (35.9) | 54 (30.7) | |
| Education (years) | <12 | 83 (76.9) | 10 (7.6) | <.0001 | 24 (37.5) | 69 (39.2) | .8 |
| | >12 | 25 (23.1) | 122 (92.4) | | 40 (62.5) | 107 (60.8) | |
| Any health insurance (private/Medi-care/Medicaid) | Yes | 30 (27.8) | 105 (79.6) | <.0001 | 35 (54.9) | 100 (56.8) | .8 |
| | No | 78 (72.2) | 26 (19.6) | | 29 (45.3) | 75 (42.6) | |
| | Missing ^c | 0 | 1 (0.8) | | 0 | 1 (0.6) | |
| Regular clinic that you attend? | Yes | 85 (78.7) | 109 (82.6) | .45 | 59 (92.2) | 135 (76.7) | .007 |
| | No | 23 (21.3) | 23 (17.4) | | 5 (7.8) | 41 (23.3) | |
| Family history of breast cancer | Yes | 23 (21.3) | 42 (31.8) | .07 | 24 (37.5) | 41 (23.3) | .03 |
| | No | 85 (78.7) | 90 (68.2) | | 40 (62.5) | 135 (76.7) | |
| Income | <\$25,000 | 60 (55.6) | 17 (12.9) | <.0001 | 21 (32.8) | 56 (31.8) | .98 |
| | >\$25,000 | 18 (16.7) | 43 (32.6) | | 16 (25.0) | 45 (25.6) | |
| | Refused/missing ^c | 30 (27.8) | 72 (54.65) | | 27 (42.2) | 75 (42.6) | |
| Ever heard of a mammogram? | Yes | 104 (96.3) | 132 (100) | .03 | 35 (94.6) | 99 (98.0) | .29 |
| | No | 4 (3.7) | 0 | | 2 (5.4) | 2 (2.0) | |
| Ever had a mammogram? | Yes | 86 (79.6) | 114 (86.4) | .08 | 30 (81.1) | 88 (87.1) | .37 |
| | No | 22 (20.4) | 18 (13.6) | | 7 (18.9) | 13 (12.9) | |

a. Pearson Chi test, unless otherwise specified.

b. t-test.

c. Missing data omitted from analysis.

NLW, Non-Latina White; SD, standard deviation.

Table 2. Baseline characteristics and breast screening practices among 240 Latina and NLW women aged >40 years and residing in a rural underserved area

| Variable | Category | Latinas | NLW | P ^a | County 1 | County 2 | P |
|---|---------------------------------|-----------------|-----------------|----------------|-----------|------------|-----|
| | | N=108, 34.4% | N=132, 65.6% | | N=64 | N=176 | |
| Had mammogram within past 2 years? | Within last 2 years | 56 (51.9) | 88 (66.7) | .02 | 32 (50.0) | 112 (63.6) | .05 |
| | More than 2 years ago/never | 52 (48.2) | 44 (33.3) | | 32 (50.0) | 64 (36.4) | |
| Thought about going to a clinic/hospital to get a mammogram | Yes | 93 (86.1) | 108 (81.8) | .13 | 53 (82.8) | 148 (84.1) | .75 |
| | No | 13 (13.0) | 24 (18.2) | | 10 (15.6) | 27 (15.3) | |
| | Missing | 2 (1.9) | 0 | | 1 (1.6) | 1 (0.6) | |
| Intention to have a mammogram within the next 3 months | Yes | 74 (68.5) | 51 (38.6) | <.0001 | 25 (39.1) | 100 (56.8) | .07 |
| | No | 31 (28.7) | 79 (59.9) | | 37 (57.8) | 73 (41.5) | |
| | Don't know/missing ^c | 3 (2.8) | 2 (1.5) | | 2 (3.1) | 3 (1.7) | |
| Ever heard of a clinical breast exam? | Yes | 96 (88.9) | 125 (94.7) | .10 | 58 (92.1) | 162 (92.1) | .36 |
| | No | 12 (11.1) | 7 (5.3) | | 5 (7.9) | 14 (7.9) | |
| Ever had a clinical breast exam (CBE)? | Yes | 89 (83.2) | 124 (94.7) | .004 | 58 (92.1) | 155 (88.6) | .43 |
| | No | 18 (16.8) | 7 (5.3) | | 5 (7.9) | 20 (11.4) | |
| Know where to get a cheap mammogram | Yes | 36 (33.3) | 50 (37.9) | .47 | 26 (40.6) | 60 (34/1) | .35 |
| | No | 72 (66.7) | 82 (62.1) | | 38 (59.4) | 116 (65.9) | |

a. Pearson Chi test, unless otherwise specified.

b. t-test.

c. Missing data omitted from analysis.

NLW, Non-Latina White.

MATERIALS AND METHODS

Setting

This study was part of a larger questionnaire-based survey of women's attitudes and knowledge of breast-, cervical-, and colon-cancer screening. The study was conducted in two adjacent counties in the Lower Yakima Valley of eastern Washington, a rural agricultural region, where a large percentage (69%) of the population is of Latino origin, the majority of whom (75%) identify as Mexican American.¹⁶ Residents experience high poverty levels, relatively few years of education, and low rates of insurance coverage.¹⁷ In 2015, the population of County 1 was 21.0% Latino and 71.5% NLW, with an average per capita income of \$28,758; County 2 was 52.4% Latino and 41.5% NLW with a per capita income of \$20,412.^{18,19} This was

a convenience sample. Two counties immediately adjacent to the regional Fred Hutch Center for Community Health Promotion in Yakima Valley were selected. Outreach work such as health fairs and promotion activities were not historically performed here, and respondents would not have been exposed to interventions to increase breast health awareness, making this an ideal setting for addressing the question.

Participants

Eligibility

Women aged 18-69 years, residents of the target counties, and self-identifying as either Latina or NLW. For this study on breast-cancer screening behaviors, we restricted the analysis to women aged ≥40 years when recommended annual mammographic screening begins in the United States.

Recruitment

The study was approved by the Institutional Review Boards of the Fred Hutchinson Cancer Research Center (FHCRC), in accordance with assurances filed with and approved by the US Department of Health and Human Services. In 2013, staff from the FHCRC's Center for Community Health Promotion in Yakima Valley invited women to participate. Recruitment occurred at grocery stores, religious organizations, and community events. If interested, women provided written informed consent, and completed a brief screening survey, which was reviewed by study staff to determine eligibility. If eligible, participants then completed the questionnaire described below. They were offered a \$10 gift card as an incentive.

We enrolled 496 (255 Latinas, 241 NLW) women. Analysis was restricted to women eli-

gible for breast-cancer screening ie, >40 years of age. The final sample size was 240 women (Tables 1, 2).

Data Collection and Analysis

Questionnaire

The 30-item baseline questionnaire asked questions on demographics including race/ethnicity, education level, knowledge of breast cancer risk factors, family history of breast cancer, and breast-cancer screening practices.

Covariates and Main Outcomes

Baseline variables were categorized as country of birth: Mexico/other Latin American country/US/Europe. Marital status: married/separated/divorced/widowed/never married/single. Educational attainment: </≥12 years. Any health insurance (private/Medicare/Medicaid/other): Yes/No. Having a regular clinic to attend for health care needs: Yes/No. Income level: <\$25,000/year, >\$25,001/year. Knowledge of breast cancer screening, having had a prior clinical breast examination (CBE), ever thinking of having a mammogram, intention to have a mammogram within the next three months, and knowledge of where to go to get a cheap mammogram, were all categorized as Yes/No.

The main outcome was defined as meeting the recommended mammographic screening frequency, ie, having had a mammogram within the past two years vs more than two years or never.²⁰

Covariates included in the models were: having health insurance; a usual clinic for health care; income level; county of residence,

educational attainment; ethnicity; having had a prior CBE, familial history of breast cancer, age, and marital status. The following variables were collinear: ethnicity and country of birth (country of birth excluded); having had a prior CBE and having heard of a CBE (heard of CBE excluded); and having heard of a mammogram was excluded, as it was collinear with the outcome measure (compliance with mammography recommendations).

Statistical Analysis

We tested for baseline differences in categorical variables between Latinas and NLW, and between residents of County 1 and County 2, using the Pearson chi-squared test. To reduce the chances of obtaining false-positive results (type I errors) from multiple tests performed on a single set of data, we applied the Bonferroni correction for multiple comparisons. Significance was set at $P=.05/16=.003$ for 16 separate comparisons for ethnicity, and the same for county of residence. Differences in age were analyzed using the t-test. We also examined differences in compliance with mammographic screening between Latinas and NLW, stratified by county of residence.

We performed multivariate logistic regression with meeting the recommended mammographic screening frequency as the main outcome, adjusted for covariates listed above. After the first model was run, variables with a $P > .1$ were excluded from the model, and the final model run. All P-values are two-sided. Analyses were performed using Stata Version 14 (College Station, Texas).

RESULTS

Mammography Status

Two-hundred and forty (108 Latinas, 132 NLW; Tables 1,2) women aged >40 years completed the baseline questionnaire. Of these, 51.9% of Latinas had had a mammogram within the past two years, compared with 66.7% of NLW.

Sociodemographic Variables

After Bonferroni correction, there were no statistically significant differences by ethnicity or country of residence, in marital status, family history of breast cancer, having a regular health clinic, ever having had a mammogram, thinking about having a mammogram, or ever having heard of a mammogram or clinical breast exam (CBE) (Tables 1,2). More NLW had health insurance compared with Latinas (79.6% vs. 27.8% respectively, $P < .001$), and had spent longer in education (92.4% with >12 years of education, vs 23.1% respectively, $P < .0001$), and were less likely to live in poverty (12.9% vs 55.6% respectively, $P < .0001$). Latinas were statistically significantly more likely to have been born in Mexico, and were, on average, younger than NLW ($P = .01$). Finally, Latinas were less likely to have had a prior CBE compared with NLW (83.2% vs 94.7%, $P = .004$), but were more likely to intend to have a mammogram within the next 3 months (68.5% vs 38.6% $P < .0001$). There were few statistically significant differences between residents of County 1 and 2: 43.2% of residents of County 2 were born in Mexico compared with 25% in County 1 ($P = .002$) and were less

likely to have a regular clinic that they attended for health care (76.7% vs 92.2% respectively, $P=.007$).

Equal proportions of Latinas and NLW had had a mammogram within the past two years in County 1 (both 50%, $P=.84$, Table 3); in County 2, 74.4% of NLW vs. 52.3% of Latinas had a mammogram within the past two years ($P=.006$).

In the final model (Table 4), increasing age ($OR=1.04$, 95%CI 1.01-1.08); >12 years of education ($OR=2.09$, 95%CI 1.16-3.79); having a regular clinic for health care ($OR=2.22$, 95%CI 1.05-4.70), county of residence ($OR=2.27$, 95% CI 1.18-4.37), and having a prior CBE ($OR=5.07$,

Table 3. Differences in screening compliance between NLWs and Latinas, by country of residence.

| County | County 1 | | County 2 | |
|------------------------------|-----------|-----------|-----------|-----------|
| | Latina | NLW | Latina | NLW |
| Screening compliance | N (%) | N (%) | N (%) | N (%) |
| Mammogram >2 years ago/never | 11 (50.0) | 21 (50.0) | 41 (47.7) | 23 (25.6) |
| Mammogram <2 years ago | 11 (50.0) | 21 (50.0) | 45 (52.3) | 67 (74.4) |
| Total | 22 | 42 | 86 | 90 |
| P^a | 1.00 | | 0.002 | |

a. Pearson Chi test.

95%CI 1.71-15.02) were all associated with increased odds of having had a guideline-concordant mammogram. Confidence intervals were wide for having a prior CBE due to small

numbers. Neither ethnicity, income, marital status, family history of breast cancer nor having any type of health insurance were associated with odds of having a mammogram (all $P>0.1$).

Table 4. Multivariate logistic regression: baseline predictors of having had a guideline-concordant mammogram among women aged >40 years

| Covariate | Category | OR | CI | P | OR | CI | P |
|---|-----------------------------------|-----------------|------------|------|--------------------------|------------|------|
| | | Excluded $P>.1$ | | | Final Model ^c | | |
| Ethnicity | Latina | 1.00 | - | .79 | | | |
| | NLW | 1.12 | .45-2.78 | | | | |
| Age | Continuous | 1.04 | .99-1.08 | .07 | 1.04 | 1.01-1.08 | .05 |
| Income ^a | <\$25,000 | 1.00 | - | .41 | | — | |
| | >\$25,000 | 1.44 | .59-3.50 | | | | |
| Education | <12 years | 1.00 | - | .09 | 1.00 | - | 0.01 |
| | >12 years | 2.01 | .90-4.82 | | 2.09 | 1.16-3.79 | |
| Health insurance (private/Medicare, Medicaid/other) | Yes | 1.00 | - | .90 | | — | |
| | No | 1.04 | .51-2.17 | | | | |
| | Missing ^a | - | - | | | | |
| Regular clinic for health care | No | 1.00 | - | .04 | 1.00 | - | .04 |
| | Yes | 2.26 | 1.04-4.89 | | 2.22 | 1.05-4.70 | |
| Family history of breast cancer | Yes | 1.00 | - | .18 | | — | |
| | No | .62 | .31-1.24 | | | | |
| County | County 1 | 1.00 | - | .008 | 1.00 | - | .01 |
| | County 2 | 2.51 | 1.27-4.98 | | 2.27 | 1.18-4.37 | |
| Prior CBE | No | 1.00 | - | .003 | 1.00 | - | .003 |
| | Yes | 5.14 | 1.72-15.33 | | 5.07 | 1.71-15.02 | |
| Marital status | Married/married like relationship | 1.00 | - | .59 | | — | |
| | Single ^b | 1.19 | .63-2.28 | | | | |
| Know where to get a cheap mammogram | No | 1.00 | - | .08 | 1.75 | .95-3.22 | .07 |
| | Yes | 1.75 | .94-3.27 | | | | |

a. Missing data excluded.

b. Divorced/single/separated/widowed.

c. After the first model was run, variables with a P value >.1 were excluded, and the model re-run.

d. We included ethnicity in the final model: comparing NLWs with Latinas $OR=1.02$, 95% CI .44-2.32 ($P=.96$).

DISCUSSION

These data illustrate profound disparities between NLW and Latinas residing in two rural counties in eastern Washington. Regardless of their county of residence, Latinas in this rural region are more likely to lack health insurance, live in poverty, and to have spent less time in education, compared with NLWs. The uninsured rate among Latinas in these two counties was considerably higher than the 2015 national average (72.2% vs 16.2%, respectively).²¹ Compliance with breast-cancer screening guidelines was low among Latinas, with only 51.9% of women having had a mammogram within the past two years, compared with 66.7% of NLW.

In a multivariate regression model, age, having >12 years of education, having a regular clinic for health care, being resident of County 2, and having had a prior CBE were predictive of being guideline compliant, ie, having had a mammogram within the past two years. Although these data confirm evidence from cohort studies, to our knowledge, this is the first study to examine social indicators of health relevant to breast-cancer outcomes, comparing Latinas and NLW, resident in two adjacent rural counties in eastern Washington.

Another study, while describing similar overall rates of screening mammography in the past two years for both Latinas and NLWs, found that lack of education, low income, no health insurance, and not having a usual source of health care were associated with a low prevalence of screening mammography.²² A review of the current screening guidelines and barriers to their uptake, using

data from the National Health Interview Survey, identified Latina ethnicity, lack of health insurance and <12 years of education as being associated with a lower prevalence of screening.

We also found that having a prior CBE was statistically significantly associated with breast screening compliance. Similar to our findings, a study examining predictors of screening behavior in the multi-ethnic cohort, reported that a posi-

Compliance with breast cancer screening guidelines was low among Latinas, with only 51.9% of women having had a mammogram within the past two years, compared with 66.7% of non-Latina Whites.

tive screening history was also associated with increased odds of having a mammogram (OR=3.04, 95%CI 2.86–3.22).²³ While CBE is no longer recommended by the American Cancer Society as part of its screening guidelines,²⁴ CBE may have an educational impact beyond its role in early detection. For example, a Peruvian study demonstrated that women who had had a prior CBE had shorter delays from symptom development to presentation compared with

women who had never undergone a CBE and were more likely to be diagnosed with early-stage disease.²⁵

Unlike other studies, ethnicity was not associated with odds of having a mammogram in this study, possibly because the social indicators of health associated with mammography use are strongly associated with ethnicity in this region. There were no statistically significant differences in overall mammogram utilization between Latinas and NLWs. However, Latinas were less likely to have had a mammogram within the past two years compared with NLWs in County 2 (52.3% vs 74.4%), supporting the concept that health disparities and behaviors associated with poor outcomes for breast cancer tend to be concentrated in low-SES minority groups.²⁶ A recent article examining underlying reasons for not obtaining mammograms in the past two years among 536 Latinas in eastern Washington included knowledge, psychocultural, and economic-based reasons. Women in areas with less Latino-based segregation were less likely to report knowledge-based and economic reasons for not obtaining mammograms.²⁷

It is noteworthy that NLW residents in County 1 were as unlikely as Latinas to have had a guideline-concordant mammogram; rates were comparably low at 50% in both groups, which is significantly lower than the 2015 national average of 65% for NLW women aged >40 years, and 60.9% for Latinas.²⁸ This might suggest that other factors beyond individual level differences in SES, education and ethnicity, may influence screening practices. While there was a higher proportion of

NLWs living in poverty in County 1 vs County 2, which may account for lower uptake of screening among NLW, poverty rates were still considerably lower than rates among Latinas in both counties. Yet, there were few statistically significant differences that might explain associations between guideline compliance and county of residence—there were no statistically significant differences in having health insurance, nor in income, between residents of the two counties. Community level differences, unexplored in this study, may account for these associations. While a higher proportion of women had a regular health care clinic in County 1, a Medical Expenditure Panel Survey study pointed out that usual source of care and reporting unmet medical needs may not be comparable across the entire rural-urban continuum. For example, in very rural counties, having a usual source of care may simply reflect an extremely limited supply of health care providers. Consequently, a person may answer in the affirmative when asked, “Do you have a particular person or place to go when you are ill or have a question about your health?”²⁹

It is unclear what county-level differences underlie differences in screening behavior among Latinas and NLWs in the two counties. Both counties share a common county boundary, and are both designated as Health Profession Shortage Areas (<https://bhw.hrsa.gov/shortage-designation/hpsas>).³⁰ Of 38 counties ranked in the Washington County Health Rankings, weighted scores for health behaviors, clinical care, and social and economic factors, scored

County 1 as 17 and County 2 as 34, with lower scores associated with better rankings.³¹ While this study collected data only on place of residence, further explorations of this region’s social conditions and policies, and social and institutional contexts might inform future studies. High poverty, rurality, health policies, and health care delivery systems can interact with and influence individual-level barriers. In studies examining the influence of geographic variation and community risk factors on likelihood of having a diagnosis of early vs late-stage breast cancer, women residing in the highest socioeconomic (SES) communities had increased odds of having early-stage breast cancer compared with residents with the lowest SES.³² Regardless of race/ethnicity, women living in communities where >90% of residents completed high school had a higher percentage of early-stage diagnoses vs. areas where <70% completed high school. Similar results were reported for areas with least vs most poverty.²⁶

Our study has several limitations. These include the relatively small numbers of respondents >40 years of age, the cross sectional nature of the study and the fact that we did not capture community-level data such as community-level income, poverty, social capital and urban-rural status by zip code, and other contextual factors known to influence cancer outcomes.³³ Strengths of our study include characterization of approximately equal numbers of Latinas and NLWs resident in two rural counties. Typically, studies compare data from national data or large cohort studies, which may not be generalizable to smaller communities.

CONCLUSION

In conclusion, both county of residence, and having a prior CBE were factors that influenced screening behaviors, which can contribute to breast cancer disparities. The relationship between county of residency and compliance with breast screening guidelines suggests that community-level factors may influence screening behaviors; these should be further explored. In addition, the role of CBE as a potential tool to increase compliance with mammographic screening guidelines may warrant investigation. These may provide intervention opportunities for policy-makers to improve screening rates.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Duggan, Carosso, Thompson; Acquisition of data: Carosso, Ibarra, Thompson; Data analysis and interpretation: Duggan, Molina, Thompson; Manuscript draft: Duggan, Molina, Ibarra, Thompson; Acquisition of funding: Thompson; Administrative: Molina, Carosso, Thompson; Supervision: Carosso, Thompson

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