Published in final edited form as:

J Racial Ethn Health Disparities. 2017 April ; 4(2): 233–242. doi:10.1007/s40615-016-0222-3.

Neighborhood predictors of mammography barriers among US-based Latinas

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Abstract

Background—Little is known about how neighborhood factors are associated with Latinas' barriers to cancer screening, including mammography. To address this gap, we examined barriers to mammography by neighborhood racial/ethnic composition and socioeconomic status among a federally qualified health center (FQHC)-based sample of non-adherent Latinas in Western Washington State.

Methods—Baseline data were drawn from a larger intervention study (n = 536 Latinas). Women indicated why they had not obtained a mammogram in the past two years (No reason, knowledge, psychocultural, economic). American Community Survey (2007-2011) data were used to calculate four neighborhood measures that were categorized in tertiles (T): socioeconomic-based concentration; socioeconomic-based segregation; Latino-based concentration; and Latino-based segregation.

Results—The proportion of women reporting knowledge-, psychocultural-, and economic-based reasons for not obtaining mammograms in the past two years was respectively 0.35, 0.19, and 0.31. Approximately 14% indicated no particular reason. Relative to women residing in areas with greater Latino-based segregation, women in areas with less Latino-based segregation were less likely to report knowledge-based and economic-based reasons for not obtaining a mammogram (p = 0.05). Relative to women residing in areas with greater concentration of Latinos, women in areas with the lowest concentrations were less likely to report knowledge-based reasons for not obtaining a mammogram (p = 0.05).

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Compliance with Ethical Standards: This study protocol was approved by the institutional review boards of the Fred Hutchinson Cancer Research Center, Seattle Cancer Care Alliance, and Sea Mar Community Health Clinics. Informed consent was obtained from each study participant. YM declares no conflict of interest. JJP declares no conflict of interest. DLP declares no conflict of interest. SB declares no conflict of interest. GDC declares no conflict of interest. SAAB declares no conflict of interest.

Conclusions—Our findings provide important information about the role of neighborhood characteristics and mammography use among Latinas obtaining care from FQHCs. Future research might examine the mediating role of neighborhood characteristics in the efficacy of mammography screening interventions.

Keywords

breast cancer; mammography use; Latinas; barriers; neighborhood

Introduction

Improving early breast cancer detection among US-based Latinas is an ongoing public health priority. Despite having lower incidence relative to non-Latina Whites (NLWs), breast cancer remains the most common cancer diagnosis among Latinas.(1) Whereas incidence of some breast cancers is decreasing among NLWs, they are stable, if not slightly increasing, among Latinas.(2, 3) Finally, Latinas experience lower 5-year survival rates relative to NLWs, partially due to more frequent late-stage diagnoses.(3-6) Despite recent discussions of the high rates of overdiagnosis among predominantly NLW study samples(7), screening mammography remains the most evidence-based tool for detection of invasive, life-threatening breast cancers.(8, 9) Identifying factors that contribute to underutilization of screening mammography among Latinas and doing so through a multilevel lens is thus important.(10-15)

Barriers to mammography use among Latinas have been well-documented and include knowledge- (e.g., when to start screening, how often to start screening), psychocultural- (e.g., embarrassment, fear, motivation), and economic-based barriers (e.g., cost, health insurance).(16, 17) The type of intervention that may be most effective in improving screening may depend on characteristics of an individual's residential context or neighborhood, including neighborhood socioeconomic status and ethnic composition. Several gaps in the literature exist with regard to this goal. First, despite theory and evidence suggesting the need to measure multiple neighborhood factors simultaneously(18), previous research on neighborhoods and cancer-related care and outcomes has focused on a limited number of constructs - often times either concentration (e.g., concentrated disadvantage) or segregation (e.g., income inequality).(19-22) Different aspects of neighborhood characteristics may however have meaningful independent(23, 24) or dependent effects(25-27) on behaviors and outcomes. Second, the majority of previous research on neighborhood factors and mammography has focused on White and African American populations.(19, 21, 28-31) Little is known about the role of neighborhood characteristics for Latinas.(32, 33) Finally, most neighborhood research has examined mammography use and not characterized the underlying mechanisms or barriers to care.

The current study seeks to address such gaps in the literature and relies on a conceptual framework informed by Galster and others' consideration of different mechanisms by which neighborhoods can influence health (Figure 1).(34, 35) In the context of screening mammography, relationships between neighborhood characteristics and individuals' perceived barriers to screening mammography use might be understood in terms of social-

interactive (e.g., social contagion/collective socialization, social networks) and institutional mechanisms (e.g., access and quality of healthcare sources). For example, neighborhoods may vary by local institutional resources (e.g., number of available hospitals and providers, distance to clinics, insurance), such that individuals living in neighborhoods with fewer resources may be more likely to report economic-based barriers. Social-interactive mechanisms may be health-protective or aversive factors on knowledge- and psychocultural-based barriers, depending on the types of social networks, norms, and support that are present. On the one hand, social cohesion and support has been linked with improved self-reported health behaviors and outcomes.(25, 36) Family/friend recommendations and support to obtain mammograms has further been tied to improved mammography intention and use among Latinas. (37-39) That said, support can be a risk factor, if peers represent negative sources of influence (e.g., spreading fatalistic misconceptions and myths about risks associated with mammography) or are limited as resources (e.g., limited knowledge about mammography guidelines, resources; limited ability to provide instrumental support). (40)

Neighborhood socioeconomic status indicators are the most commonly studied neighborhood characteristics in general and also specifically for breast healthcare.(19) Residence in neighborhoods with concentrated socioeconomic disadvantage has been associated with lower adherence to screening mammography guidelines.(19, 28, 41) A similar but conceptually distinct neighborhood-level, socioeconomic construct is socioeconomic-based segregation has been associated with worse population health and higher breast cancer mortality specifically.(20) Associations between area-level socioeconomic status indicators and screening mammography may reflect institutional mechanisms (e.g., low access to mammography facilities) or social-interactive mechanisms (e.g., fewer social ties and lower social support; greater access to health-averse social support resources), resulting in area-level non-adherence.(25, 42, 43) Examining barriers in relation to neighborhood-level socioeconomic status indicators would be helpful toward choosing which interventions to implement, including programs with low cost/free screening and/or evidence-based education. Such work is particularly relevant concerning screening mammography promotion efforts among Latinas, given they represent 16% of the overall US population and 23% of impoverished people, but also 40% of individuals living in concentrated socioeconomic disadvantage.(44)

Ethnic composition indicators, especially absolute racial/ethnic group concentration (e.g., % Latino) and segregation, are other common indicators in neighborhood research.(18, 21, 22, 24) Latino residential patterns represent a complex and dynamic picture of rises and declines in spatial assimilation across time as well as differences across established and new destinations for immigrants.(45-49) Ethnic density has been observed to be health-protective for Latinos living in the US in particular(50), despite adverse socioeconomic characteristics. Interesting recent work further suggests relationships between ethnic density, social support, and health may be stronger among US-born Latinos relative to foreign-born Latinos.(51, 52) Simultaneously, the majority of these studies have assessed self-rated health and health behaviors that do not rely upon healthcare utilization; the one extant study to examine breast cancer screening found that Latinas residing in ethnic enclaves were less likely to obtain mammograms relative to other Latinas.(53) This may be due to institutional mechanisms,

wherein Latinas residing in areas with greater Latino concentration or areas with greater unequal distribution of Latinos may experience greater economic-based barriers, as Latino residents residing in these areas tend to be poorer than other Latinos.(54) In terms of social-interactive mechanisms, while ethnic composition has been tied with greater social ties and emotional support(55), it does not appear to be associated with greater informational nor instrumental support.(52) Simultaneously, Latinas living within such neighborhoods may have greater exposure to health-averse norms, such as fatalism and vergüenza/embarrassment.(40) Analyses examining relationships between ethnic composition indicators and mammography barriers can provide preliminary evidence to indicate which interventions may be most effective for Latinas living in versus outside of ethnic enclaves, including programs low cost/free screening, evidence-based education, and/or culturally-based client counseling.

We are testing the associations between socioeconomic- and Latino-based concentration and distribution with barriers in obtaining a mammogram in the past two years among a sample of Latinas who have utilized a federally qualified health center (FQHC). The current study thus adds to multiple lines of evidence to assess the role of four neighborhood characteristics in barriers to mammography use among a FQHC-based sample of U.S.-based Latinas who have not obtained a mammogram in the past two years. Such work will facilitate intervention planning and implementation in conjunction with FQHCs and other health care systems providing care to underserved populations, as certain barriers may be targeted due to their greater prevalence in specific neighborhood contexts.

Methods

Procedures

We use baseline data from ¡Fortaleza Latina!, a multi-faceted, randomized controlled intervention dedicated to improving screening mammography among non-adherent Latinas residing in Western Washington State.(56) Baseline data were collected between 2011 and 2014.(56) As noted above, participants are from a FQHC-based sample of Latina residents living in Western Washington State. For recruitment, electronic medical records were used to identify potential participants who met the following eligibility criteria: 1) identification as Latina or Hispanic; 2) no receipt of a screening mammogram within the past two years, confirmed by electronic medical records; 3) age between 42-74 years; and 4) receipt of care from one of the four clinic sites within the past five years. Electronic medical record abstraction occurred that women were identified by their retrospective healthcare history (e.g., last use of mammogram in record was over 2 years ago or has not happened; all women had used care at least once in the past five years). We note that, at the point of data collection (2011-2014), our age range reflected recommendations by the American Cancer Society guidelines and not those reflected by the US Preventive Services Taskforce (USPSTF). This was based on two reasons: 1) the Breast, Cervical, and Colon Health Program in King County, the program that serves many of our clinic sites' patients, provides reimbursements for screening among average-risk women beginning at age 40, and 2) the Preventive Health Mandate of the Affordable Care Act requires that all health insurance plans cover mammography screening at no cost for women beginning at age 40. We

excluded women ages 40–41 because they were not 2-years overdue for a mammogram, based on ACS guidelines. Once identified, participants were invited, screened, and consented to participate during an in-person visit in English or Spanish, depending on participants' preferences. Of the 1,060 participants reached by staff, 70% (n = 741) were eligible to participate.⁽⁵⁶⁾ Of these 741 women, 72% agreed to participate and completed the baseline survey (n = 536 total).

Measures

Mammography barriers—To assess barriers to mammography use, Latinas were asked, via an open-ended question, “Is there a particular reason why you haven't had a mammogram yet/in the past two years?” The nine response categories were then classified, based on previous literature^(16, 17) and frequency distributions, into the following groups: *No reason*; *Knowledge* (e.g., “Didn't need/didn't know I needed this test”), *Psychological* (e.g., “Too painful, unpleasant, or embarrassing”), *Economic* (e.g., “Too expensive, no insurance/cost”), and *Other* (e.g., pregnancy, residential migration).

Neighborhood characteristics—Women provided their addresses during interviews, which were geocoded to the block level. American Community Survey 2007–2011 block- and block group-level socioeconomic and Latino composition data were linked to each participant.⁽⁵⁷⁾ The first variable was block group-level socioeconomic deprivation concentration, which used principal components analysis to extract a single factor (explaining 55% of total variance) from the following variables: percent of residents with less than a high school diploma, percent of residents with household incomes below 100% the federal poverty level, percent of residents who are unemployed, and median household income. The second variable was socioeconomic-based segregation, measured by the census tract-level Gini coefficient of estimated household-level income from a synthetic population dataset. The third variable was Latino-based concentration, calculated as block-level % Latino. The fourth variable was Latino-based segregation, measured by the census tract-level Gini coefficient of block-level % Latino to indicate the heterogeneity in percentage of Latino residents within the census tract. Area-level variables were statistically significantly correlated with one another ($r_s=0.1$ – 0.6 , all $p<.05$). Preliminary distribution of the data suggested reclassification of variables into tertiles, wherein top tertiles had more concentrated or unequal distribution concerning neighborhood socioeconomic deprivation and Latinos.

Individual-level characteristics—During baseline interviews, women indicated their age, marital status, lifetime mammography history, socioeconomic status (education, income, insurance status), and acculturation (spoken language, country of birth).

Analysis

There were low amounts of missing data (1% per variable), except for income (18%). We conducted analyses with and without income and found similar associations. Thus, we report associations that exclude income. We use listwise deletion techniques, given 91% of our sample had data on all study variables. Relative to the women excluded from the sample (n = 33), women in the analytic sample were less likely to be insured ($p = 0.016$), indicate

English as their primary spoken language ($p = 0.020$), more likely to live in a neighborhood with greater socioeconomic deprivation concentration ($p = 0.005$) and Latino-based segregation ($p = 0.028$), and more likely to indicate no reason, psychocultural, and economic-based barriers ($p < 0.0001$). Notably, no participants in the analytic sample indicated an “Other” reason. Other differences across study variables were not statistically significant.

To address our objective, we conducted three sets of multinomial regression models to examine the relationship between neighborhood characteristics and mammography barriers, wherein odds of each barrier type were calculated by dividing the probability of that barrier by the probability of reporting ‘No reason’. First, we assessed separately the effect of neighborhood characteristics (socioeconomic status, ethnic composition) for mammography barriers, after adjusting for age, marital status, and lifetime mammography history as confounders. Each model included both concentration and distribution variables related to the neighborhood characteristic (e.g., socioeconomic deprivation concentration and distribution). Inclusion of both concentration and distribution variables in all models comes from suggestions that these constructs should be included jointly.(23, 24) Notably, dependent effects were explored for both socioeconomic deprivation and ethnic composition, based on other literature that has implied interactive effects.(25-27) Preliminary analyses revealed non-significant interaction terms ($p = 0.13-0.89$). Given this, we report models that include both main effects and no interaction term. Second, we adjusted for the set of individual-level characteristics conceptually related to the neighborhood characteristics and which may serve as mediators or confounders, in line with seminal work by Drs. Diez Roux, Sampson, as well as Rothwell and Massey.(58-61) Specifically, it is important to adjust for measures of individual-level socioeconomic status in studies investigating the effects of neighborhood socioeconomic status to estimate more accurately contextual as opposed to compositional neighborhood effects(58, 59), and to control for the possibility that individual SES causes both residence in socioeconomic deprived neighborhoods and individual-level health outcomes (i.e., is a confounder).(60) Simultaneously, individual socioeconomic status indicators may be influenced by neighborhood socioeconomic factors and may subsequently influence health behaviors.(61) For neighborhood socioeconomic deprivation concentration and distribution, planned model would include age, marital status, education, income, and insurance status. For neighborhood variation in Latino-based concentration and distribution, the planned model included age, marital status, country of birth, and spoken language. The third model included all individual-level and neighborhood characteristics. Finally, we conducted sensitivity analyses to align with USPSTF guidelines and assessed relationships between neighborhood factors and reasons to not obtain mammograms among women aged 52-64 years old.

Results

The median age of participants was 50 years and 60% of the sample was married (Table 1). Approximately 26% of participants had never obtained a mammogram during their lifetime. With regard to socioeconomic status, 69% of participants had less than a high school diploma, 59% were living at or less than 100% of the federal poverty level, and 74% were

without health insurance. The majority of participants (81%) was born in Mexico and spoke Spanish (96%). Table 1 also provides the frequency distribution of barriers for not obtaining a mammogram within the past two years. Approximately 14% indicated no reason, 35% knowledge-based reasons, 19% psychological-based reasons, and 31% economic-based reasons.

Table 2 provides results for the three sets of multinomial regression models. Across models, Latino-based segregation emerged as an important predictor of knowledge- and economic-based reasons to not obtain mammograms in the past two years. Specifically, residents living in areas with less Latino-based segregation had lower odds of reporting knowledge- and economic-based reasons relative to counterparts. These associations remained significant after controlling for individual- and neighborhood-level characteristics (Table 2, Models 2). Neighborhood socioeconomic status indicators and Latino concentration were largely not associated with reasons to obtain mammograms with a few exceptions. First, across all models, women in the lowest tertile of Latino-based concentration (T1) appeared to have lower odds of knowledge-based reasons for not obtaining a mammogram in the past two years than women in the greatest tertile of Latino-based concentration (T3). In Model 2, women living in the lowest tertile of Latino-based concentration (T1) also appeared to have lower odds of psychocultural-based reasons for not obtaining a mammogram in the past two years than women in the greatest tertile of Latino-based concentration (T3). In Model 3, there was an association between socioeconomic-based segregation and knowledge-based reasons, wherein women in the lowest tertile of socioeconomic-based distribution had greater odds of reporting knowledge-based reasons than women in the highest tertile of socioeconomic-based distribution.

Finally, we conducted sensitivity analyses wherein we conducted the same types of models among women aged 52-74 years old ($n = 208$). Differences between the lowest (T1) and greatest tertile of Latino-based segregation (T3) persisted with regard to knowledge- (Model 3, $aOR = 0.26$, 95%CI [0.07, 0.90], $p = 0.034$) and economic-based reasons (Model 3, $aOR = 0.23$, 95%CI [0.07, 0.82], $p = 0.024$). Other associations documented above were not significant within this subpopulation, but neighborhood socioeconomic deprivation was related to psychocultural-based reasons, T1 and T3: Model 3, $aOR = 0.15$, 95%CI [0.03, 0.83], $p = 0.030$.

Discussion

Multilevel approaches are increasingly used to understand the complex picture of cancer-related care disparities(11, 62) and mammography disparities in particular.(63) Intervention efforts have been multi-faceted in order to address the wide range of risk factors associated with non-adherence to evidence-based screening mammography guidelines among U.S.-based Latinas.(56, 64) There are thus a number of interventions to select when developing programs throughout the United States, including programs that dispense low cost/free screening mammography, evidence-based education, and counseling targeted to cultural norms and values. Nonetheless, the effectiveness of certain programs may depend on local Latino populations' needs, preferences, and experiences. We argue that analyses which examine associations between neighborhood characteristics and perceived barriers may

serve to inform which of these programs would be most beneficial for specific groups of Latinas. The current study provide preliminary evidence regarding this hypothesis and suggests the importance of considering neighborhood characteristics during intervention development among Latinas linked with FQHC healthcare systems, especially with regard to Latino-based segregation.

Our work indicates that Latinas residing within neighborhoods with high levels of Latino-based segregation may be particularly vulnerable to knowledge- and economic-based barriers to mammography use relative to Latinas living in other contexts. Further, there were significant differences in knowledge-based barriers between Latinas residing in areas with the least and most amount of Latino residents. One explanation of our findings is that Latinas living within these concentrated areas of Latinos amid a largely NLW region experience low collective awareness of screening mammography guidelines. Despite having potentially strong social ties and access to great social support, women may not be able to exchange health-protective information with their neighbors and potentially be exposed to their peers' misperceptions about screening mammography (e.g., one-time receipt of mammography use as sufficient for early breast cancer detection). Such a scenario, based on social-interactive mechanisms, may explain the association between Latino-based distribution and knowledge-based barriers. Another implication may be that the most vulnerable Latinas reside within these concentrated clusters, either due to discriminatory societal practices or self-selection.(60, 65-69) In this case, Latinas may independently experience and simultaneously share knowledge- and economic-based barriers with their Latina neighbors. This scenario, based on both institutional and social-interactive mechanisms, may explain in part the association of both knowledge- and economic-based barriers in areas with greater Latino-based segregation. In line with this, while individuals may experience strong emotional support, self-selection and discriminatory societal practices may result in lower access to peers who can provide instrumental or informational support. Future research examining these distinct scenarios is warranted through direct assessment of these different mediators (e.g., types of social support and resources available and used). The current study and such future work help to inform the state of the science concerning the role and mechanisms of neighborhood for cancer disparities. Further, assessments such as our study may lead to more efficient intervention development by guiding standard qualitative formative research.

Neighborhood socioeconomic status indicators were largely not associated with mammography barriers. Interdependent effects between concentration and segregation were also not observed. It should be noted that the four neighborhood variables were closely related to one another and thus collinearity may have influenced our significant and non-significant estimates concerning other neighborhood factors, including socioeconomic-based distribution and Latino-based concentration. That said, correlations were lower than 0.80, suggesting collinearity may not have strongly influenced findings. (70) Such findings may alternatively reflect the lack of data focused on this particular population of Latinas. Specifically, less work has first assessed the impact of neighborhood characteristics for breast healthcare among Latina populations. Second, it may be that neighborhood socioeconomic status indicators may impact Latinas who are linked to healthcare systems differently from Latinas who are not linked to such systems. Nonetheless, our project may

be applicable to Latinas with lower socioeconomic status and access to programs for the underserved, given we partnered with a FQHC and given our sample's demographic characteristics (e.g., 69% <high school, 59% 100% FPL). Regardless, our work adds to the growing dialogue concerning the ability to measure accurately the independent contributions of these different neighborhood characteristics as well as their potential interactive effects. (26, 60, 65, 71)

Limitations

The current study had several limitations. First, the current study is cross-sectional. No data were collected across time, although items were temporally worded and women were identified through their retrospective healthcare history. There was limited ability to disentangle the effects of different neighborhood characteristics, such as socioeconomic deprivation concentration and Latino-based distribution. Our generalizability is further limited by the use of clinic-based recruitment. Second, our assessment of barriers across the past two years was a single question measured at one time point. While it is likely that the most salient, prominent barrier was selected from the participant's perspective, potentially other barriers were also present and recall bias may have influenced our findings. Third, neighborhood selection bias may have occurred with regard to migration to certain neighborhoods because of mammography-related reasons, thus restricting our ability to provide precise estimates. Fourth, our study is limited with regard to generalizability, given our clinic-based recruitment strategies. We cannot be certain these findings reflect the needs and experiences of individuals who are not engaged with health care systems. Finally, our study did not systematically address other life stressors and priorities that may have affected women's decisions to obtain mammograms. Indeed, our open-ended question only may have captured the most salient reasons and not all contributing factors.

Implications

The current study provides several venues for future research and practice. First, more quantitative research is warranted to interpret the effects of neighborhood and other contextual factors on Latinas' breast cancer screening utilization. Such studies should be carefully designed to examine the unique contributions of neighborhood racial/ethnic composition and socioeconomic status to confirm the role of racial/ethnic composition for Latino health. More work is warranted to explore the differential effects of concentration and distribution for different neighborhood-level exposures. Second, qualitative research is warranted to identify mechanisms underlying the relationship between Latino-based concentration and segregation with knowledge- and economic-based barriers. Understanding whether or not these relationship are a result of social mechanisms and collective efforts (e.g., social exchanges concerning mammography) or are an aggregate result of individuals with similar individual-level barriers through qualitative examination of if and what neighborhood social resources are used are particularly necessary. This work also speaks to the larger gap in the literature concerning mechanisms underlying unequal distribution by socioeconomic status and race/ethnicity among Latinos. Third, the current study offers support about the utility of considering neighborhood context when planning efforts to promote breast cancer screening among Latinas, especially those already linked to healthcare systems. Specifically, our data suggest that areas with high unequal distribution of

Latinos may benefit from interventions that provide evidence-based education about breast cancer and screening mammography as well as interventions that alleviate economic-based barriers. Notably, these programs may be beneficial to all populations – however the magnitude of the efficacy may differ by Latino-based segregation, wherein more individuals may experience those barriers. Future researchers may wish to compare the relative effectiveness of such interventions by neighborhood factors and quantify this mediation hypothesis, in terms of assessing if area-level differences in intervention effectiveness are a result of area-level differences in the proportion of knowledge- and economic-based barriers within certain neighborhoods (e.g., areas with greater Latino-based segregation).

Acknowledgments

Funding support: This work was supported in part by the National Cancer Institute at the National Institutes of Health [P50CA148143, R25CA92408, U54CA203000, U54CA202997, U54CA202995]. Y.M. was also supported by the University of Illinois at Chicago Center for Research on Women and Gender and the University of Illinois Cancer Center.

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Figure 1.

Table 1

Study sample characteristics (n = 504).

	Median (Range)
Age (yrs)	50.00 (42.00-74.00)
	N (proportion)
Married	301 (0.60)
Have had a mammogram previously	374 (0.74)
<High School	349 (0.69)
100% FPL	301 (0.59)
Without health insurance	371 (0.74)
Speak English	20 (0.04)
Country of birth	
US	13 (0.03)
Mexico	408 (0.81)
Other	83 (0.17)
Reasons to not obtain mammograms in past 2 years	
No reason	72 (0.14)
Knowledge	178 (0.35)
Psychocultural	97 (0.19)
Economic	157 (0.31)

Table 2

Multivariable multinomial regression models (n = 504)

	Models 1 ¹					
	Knowledge			Psychocultural		
	OR	95% CI	P	OR	95% CI	P
Socioeconomic deprivation concentration						
Test for trend	0.78	0.55, 1.11	0.165	0.74	0.50, 1.10	0.135
T1	0.58	0.28, 1.18	0.132	0.53	0.24, 1.15	0.108
T2	0.91	0.45, 1.84	0.786	0.56	0.25, 1.24	0.150
T3	Ref	Ref	Ref	Ref	Ref	Ref
Socioeconomic-based segregation						
Test for trend	1.33	0.92, 1.91	0.125	1.27	0.84, 1.90	0.254
T1	1.77	0.87, 3.57	0.115	1.62	0.73, 3.59	0.238
T2	1.82	0.90, 3.69	0.095	1.92	0.87, 4.23	0.105
T3	Ref	Ref	Ref	Ref	Ref	Ref
Latino-based concentration						
Test for trend	0.66	0.46, 0.96	0.028	0.67	0.45, 1.01	0.056
T1	0.40	0.19, 0.86	0.019	0.44	0.19, 1.03	0.059
T2	0.85	0.39, 1.85	0.678	0.95	0.41, 2.32	0.909
T3	Ref	Ref	Ref	Ref	Ref	Ref
Latino-based segregation						
Test for trend	0.52	0.36, 0.75	0.001	0.85	0.56, 1.28	0.428
T1	0.24	0.11, 0.53	<0.0001	0.61	0.26, 1.46	0.267
T2	0.32	0.14, 0.71	0.005	0.60	0.25, 1.45	0.256
T3	Ref	Ref	Ref	Ref	Ref	Ref
Economic						
Test for trend	0.64	0.44, 0.94	0.024	0.51	0.35, 0.74	<0.0001
T1	0.38	0.18, 0.81	0.005	0.23	0.11, 0.51	<0.0001
T2	0.48	0.22, 1.03	0.056	0.40	0.18, 0.88	0.024
T3	Ref	Ref	Ref	Ref	Ref	Ref

	Models 2 ²					
	OR	95% CI	P	OR	95% CI	P
Socioeconomic deprivation concentration ³						
Test for trend	0.81	0.57, 1.16	0.254	0.77	0.52, 1.15	0.196
T1	0.63	0.30, 1.30	0.212	0.57	0.26, 1.25	0.160

	Models 1 ¹					
	Knowledge			Psychocultural		
	OR	95% CI	P	OR	95% CI	P
T2	0.97	0.47, 2.00	0.933	0.61	0.27, 1.37	0.231
T3	Ref	Ref	Ref	Ref	Ref	Ref
Socioeconomic- based segregation ³						
Test for trend	1.29	0.90, 1.87	0.170	1.25	0.83, 1.88	0.284
T1	1.67	0.82, 3.42	0.158	1.57	0.70, 3.50	0.273
T2	1.79	0.88, 3.63	0.109	1.87	0.85, 4.13	0.120
T3	Ref	Ref	Ref	Ref	Ref	Ref
Latino-based concentration ⁴						
Test for trend	0.66	0.46, 0.95	0.027	0.66	0.44, 1.00	0.048
T1	0.40	0.18, 0.86	0.019	0.42	0.18, 1.00	0.051
T2	0.85	0.39, 1.85	0.675	0.93	0.39, 2.18	0.862
T3	Ref	Ref	Ref	Ref	Ref	Ref
Latino-based segregation ⁴						
Test for trend	0.52	0.36, 0.76	0.001	0.84	0.56, 1.28	0.432
T1	0.24	0.11, 0.54	<0.0001	0.61	0.26, 1.47	0.272
T2	0.32	0.15, 0.72	0.005	0.59	0.24, 1.45	0.252
T3	Ref	Ref	Ref	Ref	Ref	Ref
Model 3 ⁵						
	OR	95% CI	P	OR	95% CI	P
Socioeconomic deprivation concentration						
Test for trend	1.10	0.71, 1.69	0.667	0.91	0.57, 1.45	0.686
T1	1.07	0.43, 2.68	0.887	0.69	0.26, 1.83	0.454
T2	1.47	0.64, 3.41	0.366	0.74	0.30, 1.85	0.518
T3	Ref	Ref	Ref	Ref	Ref	Ref
Socioeconomic-based segregation						
Test for trend	1.52	1.02, 2.25	0.039	1.39	0.91, 2.14	0.131
T1	2.23	1.02, 4.86	0.045	1.96	0.82, 4.64	0.128
				1.40	0.63, 3.12	0.415

Models 1 ¹											
	Knowledge			Psychocultural			Economic			P	
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P		
T2	1.86	0.88, 3.91	0.104	2.04	0.90, 4.62	0.088	1.67	0.79, 3.54	0.180		
T3	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref		
Latino-based concentration											
Test for trend	0.61	0.39, 0.94	0.025	0.69	0.43, 1.12	0.130	0.85	0.55, 1.32	0.468		
T1	0.36	0.14, 0.90	0.029	0.51	0.19, 1.43	0.201	0.74	0.29, 1.88	0.520		
T2	0.76	0.31, 1.84	0.540	1.04	0.40, 2.71	0.944	1.03	0.41, 2.58	0.944		
T3	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref		
Latino-based segregation											
Test for trend	0.48	0.33, 0.71	<0.0001	0.79	0.52, 1.21	0.284	0.50	0.34, 0.74	0.001		
T1	0.21	0.10, 0.49	<0.0001	0.55	0.22, 1.34	0.188	0.23	0.10, 0.52	<0.0001		
T2	0.34	0.15, 0.77	0.010	0.60	0.24, 1.50	0.274	0.41	0.18, 0.94	0.034		
T3	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref		

Notes. For all models, concentration and segregation variables are simultaneously included within the construct of interest (i.e., socioeconomic deprivation concentration and socioeconomic-based segregation; Latino-based concentration and Latino-based segregation).

¹Models 1 adjust for age, marital status, and lifetime mammography history.

²Models 2 include additional individual-level covariates.

³Adjusted for age, marital status, lifetime mammography history, education, insurance.

⁴Adjusted for age, marital status, lifetime mammography history, spoken language, country of birth.

⁵Model 3 includes the four neighborhood indicators, age, marital status, lifetime mammography history, education, insurance, spoken language, and country of birth.