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Area-level socioeconomic inequalities in the use of mammography screening: A multilevel analysis of the Health of Houston Survey

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Abstract

Background—An emerging literature reports that women who reside in socioeconomically deprived communities are less likely to adhere to mammography screening. This study explored associations between area-level socioeconomic measures and mammography screening among a racially and ethnically diverse sample of women in Texas.

Methods—We conducted a cross-sectional multilevel study linking individual-level data from the 2010 Health of Houston Survey and contextual data from the U.S. Census. Women ages 40–74 years (N=1,541) were included in the analyses. We examined tract-level poverty, unemployment, education, Hispanic and Black composition, female-headed householder families, and crowding as contextual measures. Using multilevel logistic regression modeling, we compared most disadvantaged tracts (quartiles 2–4) to the most advantaged tract (quartile 1).

Results—Overall, 64% of the sample was adherent to mammography screening. Screening rates were lower ($P<.05$) among Hispanics, those foreign born, women aged 40–49 years, and those

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with low educational attainment, unemployed, and without health insurance coverage. Women living in areas with high levels of poverty (quartile 2 vs. quartile 1: OR=0.50; 95% CI: 0.30–0.85), Hispanic composition (quartile 3 vs. quartile 1: OR=0.54; 95% CI: 0.32–0.90), and crowding (quartile 4 vs. quartile 1: OR=0.53; 95% CI: 0.29–0.96) were less likely to have up-to-date mammography screening, net of individual-level factors.

Conclusion—Our findings highlight the importance of examining area-level socioeconomic inequalities in mammography screening. The study represents an advance on previous research because we examined multiple area measures, controlled for key individual-level covariates, used data aggregated at the tract level, and accounted for the nested structure of the data.

Keywords

Breast cancer; mammography screening; socioeconomic factors; inequalities; multilevel analysis; contextual effect; Census tract

Introduction

Cancer contributes significantly to morbidity and mortality among women in the United States (Siegel, Ma, Zou, & Jemal, 2014). Specifically, breast cancer is the most frequently diagnosed cancer among women (American Cancer Society, 2014; Kohler et al., 2015), with 224,147 new cases in the U.S. in 2012 (the most recent year numbers are available) (U.S. Cancer Statistics Working Group, 2015). It also ranks second as a cause of cancer death with 41,150 deaths (U.S. Cancer Statistics Working Group, 2015). Fortunately, mammography screening enables early diagnosis and treatment and therefore has the potential to reduce mortality (Smith et al., 2013; American Cancer Society, 2013). Despite strong evidence in support of routine screening, pervasive disparities in mammography screening have been largely documented (Sabatino et al., 2015). Research shows that a woman's characteristics such as socioeconomic status, access to health insurance, and race/ethnicity are important predictors of having up-to-date mammography screening (Henry et al., 2014; Mack et al., 2009; Meissner et al., 2007; Sabatino et al., 2008).

In addition to women's characteristics, an emerging literature has reported that women who reside in socioeconomically deprived areas are less likely to adhere to mammography screening guidelines (Pruitt et al., 2009). Nonetheless, not all contextual measures evaluated have been significantly associated with screening (Baker et al., 2004; Dailey et al, 2007; Litaker & Tomolo, 2007; Akinyemiju et al., 2013; Coughlin & King, 2010), and in other studies, significant associations have become nonsignificant following adjustment for individual characteristics (Wells & Horm, 1998; Dailey et al., 2007). Pruitt and colleagues (2009) have argued that conceptual and methodologic heterogeneity in the literature may be responsible for the observed variation in findings. For example, studies primarily analyzed larger, more heterogeneous area units, including Metropolitan Statistical Areas (MSAs) (Baker et al., 2004) or counties (Akinyemiju et al., 2013; Coughlin, Leadbetter, Richards, & Sabatino, 2008; Coughlin & King, 2010). Although debate exists about appropriate geographic levels of analysis (Diez-Roux, 2000), research indicates that smaller geographic units (e.g., tracts or block groups) model socioeconomic gradients in some health outcomes more consistently than larger area units (Krieger et al., 2002). Nonetheless, not only are multilevel studies under-represented in the cancer screening literature but so are studies employing area-based measures at the Census tract level (Pruitt et al., 2009). In addition, the majority of literature reports described populations that were ≥75% non-Hispanic Whites and no study reported including substantial proportions of Hispanics (Pruitt et al., 2009).

The aim of this study was to build on this growing body of research by evaluating whether tract-level social and economic characteristics were independently associated with adherence to mammography screening guidelines in a racially and ethnically diverse sample of women in Texas. We hypothesize that women residing in disadvantaged areas are less likely to adhere to screening guidelines, even after controlling for individual-level factors. There are many reasons to expect such an association. Macintyre, Ellaway, and Cummins (2002) have suggested that social and economic attributes of local environments shape the opportunities and material resources available to individuals and the collective social functioning of neighborhoods. These opportunities can support healthy behaviors, including cancer screening, through the presence of quality health care services and the availability of material and social resources used to increase or maintain one's health capital.

Methods

Data Sources and Study Population

We conducted a cross-sectional multilevel analysis using data from the 2010 Health of Houston Survey (HHS) and the U.S. Census Bureau. All individual-level data were obtained from the HHS, a population-based survey of randomly chosen households in the city of Houston and Harris County, Texas. Harris is the third most populous county in the U.S. and the most populous one in Texas. The survey is the area's most extensive health survey to date and collects data on a wide variety of health topics, providing communities with information about their unmet health needs (Health of Houston Survey, 2011a). Briefly, the 2010 HHS employed an address-based design to capture households with landline phones, cell phone-only households, and households without telephones in order to overcome limitations associated with random digit-dialing telephone interviewing. The survey also used a multistage sampling design to assure a representative sample of ethnic minorities and low income residents. The survey was administered in English, Spanish, and Vietnamese with responses recorded by telephone interviewers, on a secure web site, or in a mail-in questionnaire. Individuals were eligible to participate in the survey if they were 18 years or older. The cooperation rate (% of all individuals interviewed out of all eligible units ever contacted) was 62.6% and the response rate (% of all individuals interviewed out of all eligible sample units in the study, not just those contacted) was 28.9%. The 2010 HHS sample consisted of 5,116 eligible adults. A more detailed description of the overall study design and sampling methods are provided elsewhere (Health of Houston Survey, 2011b).

All area-level data were aggregated at the Census tract and were linked to individual HHS respondents using a restricted data file of the 2010 HHS that contained Census tract information for each participant. Area-level data came from the American Community Survey 5-year estimates (2008–2012). We used 5-year estimates because tract-level data were not available from 1-year estimates, and these are more reliable than 3-year estimates (U.S. Census Bureau). Our analytic sample comprised of 1,541 women aged 40 to 74 years who knew their mammography screening status. The sample was distributed across 534 Census tracts. This study was approved by the Committee for the Protection of Human Subjects at The University of Texas Health Science Center at Houston.

Measures

Dependent variable: Adherence to mammography screening—We used the U.S. Preventive Services Task Force (USPSTF) screening guidelines (Nelson et al., 2009) in effect at the beginning of the data collection period of the 2010 HHS to determine the main outcome, a dichotomous measure of timely receipt of mammography screening. Women were considered adherent to mammography screening if they reported having had a mammogram within the previous two years. The 2010 HHS questionnaire on mammography screening consisted of standardized questions adapted from the Behavioral Risk Factor Surveillance Survey.

Tract-level socioeconomic measures—Because Macintyre and colleagues (2002) have suggested that health is largely influenced by neighborhood environments through the availability of opportunity structures and collective social functioning, we tested a number of area-level measures relevant to such contexts: 1) poverty (% of individuals living below the U.S. poverty line), 2) unemployment (% of individuals aged ≥16 years in the labor force who are unemployed), 3) low education (% of adults aged ≥25 years without high school education), 4) racial and ethnic composition (% of non-Hispanic Blacks and Hispanic individuals, respectively), 5) female-headed householder families (% of households with a female head), and 6) crowding (% of homes with >1 person per room). These contextual measures provide a meaningful summary of important aspects of the specified area's socioeconomic conditions and employ data that can be compared over time and across regions (Krieger et al., 2002). Following the work of others (Dailey et al., 2011; Coughlin & King, 2010), we tested quartiles of tract-level socioeconomic measures. Quartile 1 represents lowest socioeconomic disadvantage while quartile 4 means the highest disadvantage.

Individual-level covariates—The selection of covariates was guided by Andersen's behavioral model of health services use (Andersen, 1995). It suggests that people's use of health services is a function of their predisposition to use services (e.g., age), factors which enable or impede use (e.g., health insurance coverage), and their need for care (e.g., perceived health status). Following Andersen's model, we included individual-level characteristics that predispose women to seek a mammogram, enabled them to obtain such a screening test, and reflected their need for cancer screening: age (40–49, 50–59, 60–74 years), race/ethnicity (White, Black, Hispanic, other), birthplace (foreign born or U.S. born), marital status (never married, separated, divorced, and widowed, or married and living together), educational attainment (<high school, high school graduate, >high school), income level relative to the income threshold for poverty set by the federal government (<100%, 100% to <200%, ≥200%), employment status (currently employed, unemployed and looking for job, or unemployed but not looking for job), health insurance coverage (uninsured, private, or public), and perceived health status (fair and poor, or excellent, very good, and good).

Data analyses

Data analyses began with descriptive statistics on all individual-level variables; we reported weighted percentages with 95% confidence intervals (95% CI). The association of mammography screening with these variables was tested via chi-square. We used survey weights generated from the sampling strategy to estimate screening rates. The associations between tract-level measures and women's adherence to mammography screening guidelines were determined using a series of two-level, random intercept regression models and reported as odds ratios (OR) with 95% CI. Model 1 (bivariate analyses) evaluated the direct and independent associations between contextual measures and mammography screening, accounting for the length of time that a woman reported living at her residential address. By controlling for individual variables, we explored, in Model 2 (multivariable analyses), the possibility that these associations could be explained entirely through women's characteristics. Only individual-level variables with a statistically significant association (P<.05) with mammography screening were included in Model 2. We also tested mixed-level interactions between tract-level socioeconomic measures and age groups. Tract-level variables were presented in separate models due to multicollinearity. In the multilevel analyses, individual-level sampling weights were scaled so that the new weights summed to the level 2 (Census tract) cluster sample size and were incorporated into the models (Carle, 2009). All analyses were conducted using the GLLAMM (Generalized Linear Latent and Mixed Models) program in Stata 12 (StataCorp LLP, College Station, Texas).

Results

Characteristics of the study population are shown in Table 1. About 60% of the women were racial/ethnic minorities and 29% were foreign born. The majority (63%) were married or lived with a partner. Approximately 21% had less than a high school education and about 12% were unemployed and looking for work. Almost 31% of the sample, lived in households with incomes below the federal poverty level, and almost 27% had no health insurance coverage.

Overall, 64% of the sample were adherent to mammography screening guidelines (Table 2). Only 56% of Hispanic women reported receiving recommended mammography screening compared with 73% and 66% of Black and White women, respectively. Women who were 40–49 years of age (52%) and those foreign born (56%) had relatively low mammography screening rates compared with their older and U.S. born female counterparts. Some 55% of women with high school diplomas had undergone mammography screening as recommended compared with 71% of women with higher educational attainment. Only 58% of women who reported household incomes below 100% and between 100%–200% of the federal poverty level also reported having received a recommended mammogram compared with 71% of women with higher household incomes. Women who were unemployed and looking for work (47%) and those uninsured (45%) had relatively low rates of adherence to mammography guidelines, compared with those employed (66%) and with private health insurance (72%).

Tract-level poverty, unemployment, low education, Hispanic population composition, and crowding were significantly associated (P<.05) with adherence to mammography screening guidelines (Table 3, Model 1). In adjusted models (Table 3, Model 2), women living in areas with moderate levels of poverty (quartile 2) had significantly lower odds of having mammography screening than women living in the lowest disadvantaged area (quartile 2 vs. quartile 1: OR=0.50, 95% CI: 0.30–0.85). Women who live in tracts with high percentages of Hispanic populations (quartiles 2 and 3) also had significantly lower odds of having mammography screening than women in areas with the lowest composition of Hispanics (quartile 2 vs. quartile 1: OR=0.52, 95% CI: 0.30–0.89; and quartile 3 vs. quartile 1: OR=0.54, 95% CI: 0.32–0.90). Similarly, women living in areas with higher levels of crowding (quartiles 2–4) had significantly lower odds of up-to-date mammography screening than those living in tracts with the lowest level of residents living in crowding (quartile 2 vs. quartile 1: OR=0.49, 95% CI=0.30–0.83; quartile 3 vs. quartile 1: OR=0.50, 95% CI=0.29–0.88; and quartile 4 vs. quartile 1: OR=0.53, 95% CI=0.29–0.96). The associations for tract-level unemployment and low education were attenuated after adjustment for individual-level variables and were no longer statistically significant in Model 2. We found a mixed-level interaction between age and area-level crowding. In tracts with moderate levels of crowding (quartiles 2 and 3), women aged 50–59 years had higher odds of having mammography screening than younger women (quartile 2: OR=3.95, 95% CI=1.25–12.50; and quartile 3: OR=3.16, 95% CI=1.14–8.80). We found no other mixed-level interaction between age and tract-level variables.

Discussion

Our findings contribute to the growing literature on the associations between social and economic contextual characteristics and cancer screening. Our study shows suboptimal use of mammography screening (64.0%) among age-eligible women in Harris County, Texas, rates that are even lower than U.S. rates (72.4% in 2010) (CDC, 2012) and are distant from Healthy People 2020 goals (81.1%) (US Department of Health and Human Services, 2011). Because cancer screening requires women to interact with the larger environment in which mammography services are placed (Pruitt et al., 2009), a better understanding of the effect of area-level socioeconomic inequalities on mammography use is needed to reduce screening disparities and then, meet national goals. Our findings support those of previous research (Dailey et al., 2011; Schootman, Jeffe, Baker, & Walker, 2006; Wells & Horm 1998) that reports women who live in more socioeconomically disadvantaged areas are less likely to receive recommended mammography screening.

We know little about the potential pathways through which place characteristics influence adherence to mammography screening. Macintyre and colleagues (2002) have proposed that opportunity structures and collective social functioning contexts influence use of health services. Both mechanisms may have accounted, in part, for our results. Opportunity structures in communities may affect a woman’s ability to obtain mammography screening through effects on income, education, and access to employment-based health insurance. For example, research shows that women who live in communities with high rates of poverty are less likely to undergo mammography screening as recommended (Schootman, Jeffe, Baker, & Walker, 2006), an observation supported in our study. Alternatively, we found no associations between area-level unemployment and low education with breast cancer screening, a finding previously reported in the literature (Wells & Horm, 1998; Coughlin &

King, 2010; Baker et al., 2004; Jackson et al., 2009). These observations suggest that not all area socioeconomic characteristics exert a similar effect on mammography screening utilization. Although not measured directly here, opportunity structures may also be related to the quantity and local accessibility of health care resources and may, consequently, influence screening utilization. For example, strong economic areas may attract more health care businesses through financial incentives, improved infrastructure, and market competition (Litaker & Tomolo, 2007). Future refinements could incorporate data on Tax Increment Reinvestment Zones, special zones created by the Houston City Council to attract new investment, to examine the direct effect of local economic development on health care markets. Evidence supports the effectiveness of community-wide interventions to improve the health of individuals through investment in community economic development and by addressing contextual barriers in obtaining health care services (Stewart, Beachler, & Slayton, 2003; Beachler, Holloman, & Herman, 2003; Felix, Wootten, & Stewart, 2005).

Regarding collective social functioning, research shows that social cohesion and social capital are important predictors of health behaviors (Kawachi & Subramanian, 2008; Kawachi & Berkman, 2000) including use of mammography screening (Dean et al., 2014). A recent study among Black women in Philadelphia, found that perceptions that a woman's neighborhood had high social capital, specifically collective efficacy, had a positive and statistically significant association with mammography use (adjusted OR=1.40, 95% CI: 1.05–1.85) (Dean et al., 2014). According to Kawachi & Subramanian (2007), communities with increased social capital may be better able to reinforce positive social norms for health behaviors (e.g., cancer screening) and to influence health through social and instrumental support (e.g., material or monetary). Research also shows that areas with a high concentration of the same racial or ethnic group may enjoy higher levels of some aspects of social capital (Kawachi & Subramanian, 2008; Kawachi & Berkman, 2000). Although a social capital perspective would suggest that women living in areas with high percentages of minority residents would have higher levels of screening use, we found no associations with regard to Black composition and lower mammography screening rates in areas with moderate Hispanic populations (quartiles 2 and 3). Our results may stem from several points. First, because communities with higher percentages of minorities generally have fewer socioeconomic resources (Williams & Collins, 2001), women who live in these areas might be expected to have less access to mammography screening. Furthermore, it may be that preventive health care in these areas is not culturally appropriate. In addition, social norms among minority women related to the health care system and the importance of routine mammography screening may influence the likelihood that women seek services (Benjamins, Kirby, & Bond Huie, 2004). Our ability to test these pathways and potential mechanisms was limited by the variables available in the databases we used. These must be specifically investigated in future research.

The few other studies that have examined the associations between area-level female-headed householder families and crowding with mammography screening have yielded mixed findings. Inconsistencies between our findings and others could be due to several considerations. For example, contrary to our study, Litaker and Tomolo (2007) reported that Ohio's women living in areas with high proportions of households headed by females were less likely to have mammography screening (adjusted OR: 0.56; 95% CI: 0.33–0.95). The authors analyzed a continuous area-level measure of female headed households while the present study used quartiles. No consensus exists in the cancer screening literature regarding the best way to measure contextual variables (Pruitt et al., 2009) although some recommendations have been made (Krieger et al., 2002). In another study, Dailey and colleagues (2007), found no association between tract-level crowding and adherence to mammography screening guidelines. The authors analyzed data from a sample comprising White and Black women from hospitals in five Connecticut cities. In contrast, the current study used data from a racially/ethnically diverse sample of women in Texas. Discrepancies in the findings may also be a result of the different definitions of screening examined. We evaluated adherence to mammography screening following current USPSTF guidelines, while others evaluated having a mammogram within the previous year (Litaker & Tomolo, 2007) or repeated adherence to mammography screening (Dailey et al., 2007). Finally, the interactive effects observed in the present research between area-level crowding and age may be accounted for by factors not measured in the current study. For example, group norms having to do with breast cancer screening services may influence the beliefs of women, and therefore, their behavior towards mammography use. Inconsistent guidelines and public health communication about who should be screened and when may also contribute to low levels of mammography screening in age-eligible, young women (Jenks, 2015; Peppercorn et al., 2015).

With respect to study limitations, we did not examine the affordability of mammography screening among respondents, the availability of programs offering free mammograms, or the presence of facilities that provide cancer screening. Research showed that cost and geographic access to health care settings are well-known predictors of mammography screening utilization (Coughlin, Leadbetter, Richards, Sabatino, 2008; Jackson et al., 2009; Mack et al., 2009; Henry et al., 2014). Our data are cross-sectional, making it possible to demonstrate correlations but not causality. Another limitation that many cancer screening studies share is the use of Census data to define area units and to obtain contextual measures. In our study, tracts were used as a proxy for context, but we did not label these administrative geographic units as synonymous of neighborhoods (Dailey et al., 2011; Krieger et al, 2002). Finally, the reliability and validity of contextual measures obtained from the Census have not been established in the literature (Pruitt et al., 2009; Geronimus & Bound, 1998).

Despite these limitations, this study extends the literature by examining a diverse number of area-level measures that relate to opportunity structures and collective social functioning pathways. The diverse sample of women available from the HHS is a major strength in terms of generalizability of the findings. We are unaware of any other multilevel study that used a sample of women in diverse racial/ethnic groups. Another strength was the use of area-level data aggregated by Census tract rather than by larger geographic units as reported in previous studies. We also controlled for varying exposure to residential environments by accounting for the length of time that a woman reported living at her residence.

In conclusion, this study shows that women living in areas marked by high levels of poverty, Hispanic composition, and housing crowding were less likely to adhere to mammography screening guidelines. The present work represents an advance on previous research because we examined multiple area measures, controlled for key individual-level covariates, used data aggregated at the tract level, and employed multilevel modeling to account for the nested structure of the data.

Implications for Policy and/or Practice

Our findings highlight the importance of examining social and economic characteristics of communities as well as individual factors in cancer screening behaviors. This research contributes to the emerging literature (Calo, Vernon, Lairson, & Linder, 2015) showing that individuals who live in more socioeconomically disadvantaged areas in Houston, Texas are less likely to receive recommended cancer screening services. Findings from this multilevel study may help public health professionals and cancer control planners to better allocate resources in areas with the greatest need for community-wide interventions aimed at increasing mammography screening. These are critical to reduce Houston's cancer inequalities and to meet the national mammography screening goals of Healthy People 2020. Policy strategies such as tax increment financing can be used for community redevelopment to improve local health care markets in socioeconomically deprived areas.

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Table 1

Descriptive characteristics of the study population, 2010 Health of Houston Survey (N=1541).

	Weighted % (95% CI)[1]
Race/ethnic group	
White	39.8 (36.3, 43.4)
Black	21.9 (19.2, 25.0)
Hispanic	31.9 (28.3, 35.8)
Other	6.4 (4.6, 8.7)
Foreign born	29.2 (25.7, 33.0)
Age	
40–49	40.5 (36.7, 44.4)
50–59	36.5 (33.0, 40.1)
60–74	23.0 (20.5, 25.8)
Marital status	
Married, living together	63.3 (59.7, 66.7)
Never married, separated, divorced, widowed	36.7 (33.3, 40.3)
Education	
Less than high school	21.2 (17.9, 24.9)
High school graduate	32.2 (28.7, 35.9)
Some college or more	46.6 (43.0, 50.3)
Employment status	
Employed	51.2 (47.5, 55.0)
Unemployed, looking for work	12.6 (10.3, 15.4)
Unemployed, not looking	36.2 (32.6, 39.9)
Federal poverty level	
<100%	31.2 (27.7, 35.0)
100% to <200%	23.4 (20.3, 26.9)
≥200%	45.4 (41.7, 49.1)
Health insurance	
Private or public	72.3 (68.6, 75.7)
Uninsured	27.7 (24.3, 31.4)
Perceived fair/poor health	27.4 (23.9, 31.1)

[1]Weighted N = 561,079

Table 2

Percentage of women who reported having had mammography screening as recommended, 2010 Health of Houston Survey.

	No. respondents who had mammography/ Total respondents	Weighted % (95% CI)	*P*
Overall	1,041/1,541	64.0 (60.3, 67.5)	---
Race/ethnic group			
White	449/643	66.7 (61.4, 71.7)	.003
Black	281/383	73.5 (66.9, 79.3)	
Hispanic	198/330	56.1 (48.4, 63.5)	
Other	117/185	53.6 (37.4, 69.0)	
Foreign born			
No	787/1,114	67.4 (63.2, 71.3)	.007
Yes	258/427	55.7 (36.8, 52.0)	
Age			
40–49	260/472	52.3 (45.6, 59.0)	<.001
50–59	415/571	70.3 (64.4, 75.6)	
60–74	370/498	74.6 (69.1, 79.3)	
Marital status			
Married, living together	569/819	66.0 (61.2, 70.6)	.134
Never married, separated, divorced, widowed	476/722	60.5 (54.7, 66.0)	
Education			
Less than high school	119/194	62.8 (53.4, 71.3)	.001
High school graduate	230/373	54.9 (47.8, 61.8)	
Some college or more	696/974	70.8 (66.3, 74.9)	
Employment status			
Employed	595/855	65.8 (60.7, 70.6)	.003
Unemployed, looking for work	78/152	47.4 (36.9, 58.1)	
Unemployed, not looking	372/534	67.2 (61.0, 72.8)	
Federal poverty level			
<100%	236/396	57.9 (50.8, 64.7)	.002
100% to <200%	223/347	57.7 (49.2, 65.7)	
≥200%	586/798	71.4 (66.5, 75.9)	
Health insurance			
Private or public	885/1,188	71.5 (66.3, 76.2)	<.001
Uninsured	160/353	44.9 (37.2, 52.9)	
Perceived health status			
Excellent, very good, good	810/1,169	65.4 (61.3, 69.4)	.232
Fair, poor	235/372	60.1 (52.0, 67.7)	

Table 3

Associations between tract-level socioeconomic measures and adherence to mammography screening guidelines.

	Quartile[a]	Adherence to mammography screening guidelines, weighted % (95% CI)	Model 1: Tract-level characteristics only, OR (95% CI)	Model 2: Adjustment for individual-level covariates, OR (95% CI)[b]
Poverty	1 (Low)	73.0 (65.8, 79.2)	1.00	1.00
	2	59.4 (51.2, 67.1)	0.53 (0.33, 0.85)**	0.50 (0.30, 0.85)*
	3	62.6 (55.4, 69.3)	0.66 (0.41, 1.05)	0.74 (0.43, 1.30)
	4 (High)	60.6 (53.6, 67.2)	0.51 (0.32, 0.82)**	0.61 (0.34, 1.11)
Unemployment	1 (Low)	67.1 (59.3, 74.0)	1.00	1.00
	2	66.0 (57.7, 73.3)	0.83 (0.52, 1.31)	0.93 (0.56, 1.56)
	3	62.8 (56.1, 69.1)	0.68 (0.43, 1.07)	0.82 (0.50, 1.36)
	4 (High)	60.4 (52.8, 67.5)	0.63 (0.40, 0.98)*	0.67 (0.39, 1.15)
Low education	1 (Low)	75.2 (67.9, 81.3)	1.00	1.00
	2	60.7 (53.1, 67.8)	0.58 (0.36, 0.95)*	0.69 (0.40, 1.19)
	3	61.7 (54.4, 68.6)	0.55 (0.34, 0.87)*	0.66 (0.36, 1.19)
	4 (High)	60.1 (53.1, 66.7)	0.56 (0.34, 0.91)*	0.85 (0.44, 1.65)
Racial composition	1 (Low)	66.7 (59.7, 73.1)	1.00	1.00
	2	61.5 (53.5, 68.9)	0.89 (0.57, 1.40)	0.94 (0.58, 1.53)
	3	61.1 (53.4, 68.2)	0.81 (0.51, 1.30)	0.71 (0.42, 1.20)
	4 (High)	66.8 (59.7, 73.2)	0.98 (0.61, 1.55)	0.74 (0.41, 1.33)
Hispanic composition	1 (Low)	75.4 (68.3, 81.4)	1.00	1.00
	2	65.8 (58.3, 72.7)	0.49 (0.30, 0.80)**	0.52 (0.30, 0.89)*
	3	57.3 (49.3, 64.9)	0.47 (0.30, 0.73)**	0.54 (0.32, 0.90)*
	4 (High)	58.6 (51.6, 65.2)	0.42 (0.27, 0.67)**	0.67 (0.37, 1.20)
Female-headed household	1 (Low)	65.6 (58.0, 72.5)	1.00	1.00
	2	62.6 (54.4, 70.1)	0.87 (0.53, 1.41)	0.97 (0.57, 1.64)
	3	66.2 (59.0, 72.7)	0.76 (0.49, 1.19)	0.87 (0.52, 1.47)
	4 (High)	62.0 (54.9, 68.5)	0.75 (0.48, 1.18)	0.84 (0.47, 1.50)
Crowding	1 (Low)	75.5 (68.2, 81.5)	1.00	1.00
	2	64.3 (56.5, 71.3)	0.53 (0.33, 0.85)**	0.49 (0.30, 0.83)**
	3	60.4 (53.0, 67.4)	0.49 (0.31, 0.78)**	0.50 (0.29, 0.88)*
	4 (High)	56.5 (49.4, 63.3)	0.42 (0.27, 0.68)**	0.53 (0.29, 0.96)*

Note: Tract-level measures were modeled separately. Models 1 and 2 were adjusted for the length of time in years that a participant reported living at the current neighborhood.

[a] Quartile 1 reflects lowest deprivation while quartile 4 means the highest.

[b] Additional adjustment for age, race/ethnicity, nativity, educational attainment, income level relative to the income threshold for poverty set by the federal government, employment status, and health insurance coverage.

* $P<.05$;

** $P<.01$

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