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Associations between contextual factors and colorectal cancer screening in a racially and ethnically diverse population in Texas

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Abstract

Background—Colorectal cancer is the third most commonly diagnosed cancer and the third leading cause of cancer death in the United States. Increased attention has been given to understanding the role of local contexts on cancer screening behaviors. We examined the associations between multiple tract-level socioeconomic measures and adherence to colorectal cancer screening (CRCS) in Harris County and the City of Houston, Texas.

Methods—We conducted a cross-sectional multilevel study linking individual-level data on CRCS from the 2010 Health of Houston Survey with contextual data from the U.S. Census and the U.S. Department of Housing and Urban Development. We examined tract-level poverty, education, employment, income inequality, and foreclosure measures across 543 Census tracts. Analyses were limited to individuals aged 50–74 years (N=1,720).

Results—Overall, 58.0% of the sample was adherent to any recommended CRCS test. In bivariate analyses, increasing levels of area poverty, low education, unemployment, and

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Conflict of interest statement

The authors have no conflicts of interest to report.

Authorship contribution statement

Calo conceptualized the study, performed the analysis, and drafted the manuscript as part of his dissertation work. All other authors contributed to the conceptualization of the study, provided guidance in developing the analysis plan, and critically revised various drafts of this manuscript. Linder provided the restricted data file of the 2010 Health of Houston Survey. All authors approved the final version of the manuscript.

foreclosures were associated with lower odds of adherence to CRCS. After controlling for individual-level covariates, only tract-level unemployment remained associated with adherence to CRCS (adjusted OR=0.80; 95% CI: 0.66–0.99; $P=.037$).

Conclusions—Neighborhood socioeconomic disadvantage is increasingly recognized as a determinant of health, and our study suggests that the contextual effect of area unemployment may extend to cancer screening outcomes. Our finding is important to cancer control planners because we identified a contextual marker of disparity that can be used to target local interventions to promote CRCS and thereby reduce cancer disparities among non-adherent individuals who reside in communities with high unemployment rates.

Keywords

Colorectal cancer screening; colonoscopy; sigmoidoscopy; fecal occult blood testing; socioeconomic factors; inequalities; multilevel analysis; contextual effect; Census tract

1. Introduction

Colorectal cancer is the third most commonly diagnosed cancer and the third leading cause of cancer death in the United States [1]. Evidence shows that colorectal cancer screening (CRCS) decreases both incidence and mortality from cancer by discovering and facilitating removal of precancerous polyps and detecting cancer at early, more treatable stages [2,3]. The U.S. Preventive Services Task Force (USPSTF) strongly recommends CRCS by annual high-sensitivity fecal occult blood testing (FOBT), flexible sigmoidoscopy every 5 years combined with an interval FOBT, or colonoscopy every 10 years among average risk adults aged 50–75 years [4]. Despite national recommendations for screening, fewer than 65% of U.S. adults in that age range are screened at recommended intervals, and many have never had any type of CRCS [5]. Numerous studies indicate that individual-level characteristics such as socioeconomic status (SES) and health insurance coverage are associated with adherence to CRCS guidelines [6], but these factors do not fully explain the suboptimal screening.

Increased attention has been given to understanding the role of the local context on health outcomes and behaviors and on its interplay with an individual's characteristics [7–9]. Macintyre *et al.* [10] have conceptualized local environments as “structures of opportunities and resources” that may promote or restrict health in various ways. For example, access to quality local medical services, environments that support healthy behaviors, and education and labor market opportunities could influence an individual's health. Studies have shown that socioeconomically deprived neighborhoods lack adequate health services, present precarious social and material infrastructures, and offer fewer job opportunities compared with more affluent areas [11–13].

Although researchers have examined the influence of residential environments on CRCS outcomes, these findings are mixed [14]. For example, Thorpe *et al.* [15] found that New York City residents living in neighborhoods in which 30–45% of families were 200% the federal poverty level reported lower compliance with any timely CRCS test (adjusted OR=0.76; 95% CI: 0.61–0.93) than those from higher income neighborhoods. Schootman *et*

al. [16] also found that increasing area-level poverty rate was independently associated with never having had a colonoscopy or sigmoidoscopy (adjusted OR=1.10; 95% CI: 1.01–1.19) or a FOBT (adjusted OR=1.19; 95% CI: 1.12–1.27) among individuals living across 98 metropolitan or micropolitan statistical areas in the United States. Conversely, in a study using a nationally representative sample of Medicare enrollees, O'Malley *et al.* [17] reported no significant associations between three measures of area-level SES (poverty, median family income, and per capita income) and adherence to timely FOBT, sigmoidoscopy, or colonoscopy. Neither was area-level poverty associated with any modality of CRCS in a study conducted by Koroukian *et al.* [18] among Medicaid-Medicare beneficiaries. Some have argued that conceptual and methodologic limitations in this literature may account for the variation in findings [14]. For example, the majority of studies published in this field can be characterized by a reliance on a limited set of area-level SES measures, the use of large heterogeneous geographic areas, limited control for individual-level correlates of CRCS, and statistical analyses that do not account for the nested structure of multilevel data [14].

In this study, we address some of the limitations and extend research by using multilevel modeling to examine the association of multiple area-level SES measures, at the tract level, with CRCS. In addition, we examined a broader range of area-level SES measures than previously explored in the cancer screening literature (e.g., income inequality, foreclosures). We hypothesize that residing in socioeconomically disadvantaged areas will be associated with poor adherence to CRCS recommendations, even after controlling for individuals' characteristics. Our hypothesis is guided by Macintyre's conceptual framework [10] and by empirical studies [15,16,19–21] that suggest there are place effects on health via collective opportunities and resources.

2. Methods

2.1. Data sources and study population

We conducted a cross-sectional multilevel study using data from the 2010 Health of Houston Survey (HHS), the U.S. Census Bureau, and the U.S. Department of Housing and Urban Development. All individual-level data were obtained from the 2010 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 [22]. 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. The cooperation rate (% of all individuals interviewed out of all eligible units ever contacted) was 62.6%, and 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 adults. A more detailed description of the overall study design and sampling methods are provided elsewhere [23].

All area-level data were aggregated at the Census-tract level and were linked to individual HHS respondents using a restricted data file of the 2010 HHS that contained Census-tract information for each participant. Data on area-level poverty, education, employment, and income inequality came from the U.S. Census Bureau (5-year estimates from 2010 Census' American Community Survey) and data on area-level foreclosures were obtained from the U.S. Department of Housing and Urban Development (18-month period through June 2008). On the basis of existing CRCs guidelines [4], we included adults between the ages of 50 to 74 in this study (the survey did not collect data on cancer screening practices among individuals 75 years of age or older). Thus, our study sample consisted of 1,720 age-eligible individuals (Level 1) distributed across 543 Census tracts (Level 2). The mean sample size by tract was 3.2 individuals (range: 1–20). This study was approved by the Committee for the Protection of Human Subjects at The University of Texas Health Science Center at Houston.

2.2. Measures

2.2.1. Dependent variable: Adherence to CRCs—The USPSTF screening guidelines in effect during the data collection period of the 2010 HHS were used to determine the main outcome, a dichotomous measure of timely receipt of any CRCs. An individual was considered adherent if he/she reported having a FOBT in the previous 12 months, a flexible sigmoidoscopy in the previous 5 years, or a colonoscopy in the previous 10 years. The 2010 HHS questionnaire on CRCs consisted of standardized questions adapted from the Behavioral Risk Factor Surveillance Survey. Use of FOBT was assessed by asking whether or not the participant ever had the test and if so how recently. Likewise, the participant was asked whether or not he/she ever underwent either sigmoidoscopy or colonoscopy and if so how recently.

2.2.2. Tract-level socioeconomic variables—Because we hypothesized that health is influenced by neighborhood environments through the availability of structures of opportunities and resources, we tested a number of tract-level measures relevant to such contexts: 1) poverty (% of individuals living below the U.S. poverty line), 2) education (% of adults aged ≥25 years without high school education), and 3) unemployment (% of individuals aged ≥16 years in the labor force who are unemployed). These three measures provide a meaningful summary of the specified area's SES and show data that can be compared over time and across regions [24]. In addition, we tested an area-level measure of income inequality based on the Gini coefficient [25], a statistical dispersion measurement that ranks income distribution on a scale between 0 and 1. A tract that scores 0 has perfect equality of income distribution among its residents. Conversely, a Gini coefficient of 1 expresses maximal income inequality; for example, one person has all the income and the rest have none. We also analyzed a measure of tract foreclosures (% of foreclosures started over 18 months through June 2008). Evidence shows that foreclosures disproportionately affect vulnerable minority and low-income families [26] and therefore have the potential to exacerbate health disparities across communities, principally in areas where foreclosures are

high. We are unaware of other research assessing the associations of tract-level income inequality and foreclosures with any modality of cancer screening, so our study may provide new insights on the mechanisms linking neighborhood environments to cancer screening outcomes. In the absence of a priori category considerations, we tested continuous versions of the area-level variables (per 5% increases). This approach was used by others [16,27] and allowed us to compare our findings with those from previous research.

2.2.3. Individual-level covariates—Guided by Andersen’s behavioral model of health services use [28], we included individual-level characteristics that predispose individuals to seek CRCS, enabled them to obtain CRCS, and reflected their need for CRCS: sex, age, race/ethnicity, birthplace (foreign born or born in the U.S.), marital status, educational attainment, income level relative to the income threshold for poverty set by the federal government (<100%, 100% to <200%, 200%; for more information about the classification of poverty by the U.S. federal government, see Ruggles [29]), employment status, health insurance coverage, and perceived health status.

2.3. Analytical methodology

Data analysis began with descriptive statistics on all individual-level variables. The effects on CRCS of these variables were tested via chi-square. We used survey weights generated from the sampling strategy to estimate screening rates. The associations between tract-level measures and individuals’ adherence to CRCS guidelines were determined using a series of two-level, random intercept regression models. Model assumptions regarding random effects were evaluated by visual inspection of normal-probability plots of the residuals. Associations were reported with odds ratios (OR) and 95% confidence intervals (95% CI). Bivariate analyses evaluated the direct and independent associations between contextual measures and CRCS, accounting for the length of time that an individual reported living at the address in order to control for varying exposure to residential environments. We also explored the possibility that these associations could be explained entirely through individuals’ socioeconomic characteristics by controlling for individual-level variables (multivariable analyses). Reduction in ORs relative to unadjusted analysis was used as evidence for mediation. Only individual-level variables with a statistically significant association ($P \leq .05$) with CRCS in the individual-level covariate model were included in multivariable analyses. We also tested cross level interaction of area-level variables with individual characteristics but these were small in magnitude and did not change the outcome measures, so we did not include these in multilevel analyses. Tract-level variables were presented in separate models due to multicollinearity; in total, we ran five unconditional models and five multivariable models. 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 [30]. To estimate the proportion of the total variance in CRCS resulting from the influence of the tract areas, we reported the intraclass correlations (ICC). All analyses were conducted using Stata 12 (StataCorp LLP, College Station, Texas).

3. Results

Characteristics of the study population are presented in Table 1; our sample consisted of 1,720 age-eligible respondents who provided data on all individual-level variables. Almost half of the sample was non-Hispanic White (49.7%). The majority of participants reported being 50–59 years of age (59.2%) and married or living together (69.5%), having some college or more (54.9%) and family incomes higher than the federal poverty threshold (76.3%), being employed (55.4%), having private or publicly-funded health insurance coverage (81.0%), and reported having good, very good, or excellent health (71.7%).

Overall, 58.0% of the sample was adherent to any timely CRCS test (Table 2). Individuals who did not complete high school (44.0%) or were unemployed and looking for a job (48.2%), and those with family incomes below the federal poverty level (46.8%) – all indicators of lower SES – were less likely to report any recommended CRCS. With respect to demographic characteristics, participants who were Hispanic (45.4%), foreign born (46.0%), aged 50–59 years (51.4%), and never married or were separated, divorced, or widowed (51.4%) were least likely to adhere to CRCS. Similarly, individuals with no health insurance coverage were less likely to be adherent to CRCS guidelines (35.9%).

Associations between tract-level socioeconomic measures and adherence to CRCS guidelines (ORs per 5% increase) are summarized in Table 3. Consistent with our hypothesis, individuals living in areas with high levels of unemployment were less likely than their counterparts to have had CRCS as recommended. This association was attenuated by the inclusion of the individual-level factors but remained statistically significant in the adjusted model; for each increase of 5% in area unemployment, people had odds 0.8 (95% CI: 0.66–0.99; $P=.037$) times lower of having had any recommended CRCS compared to those who lived in tracts with lower levels of unemployment. There were also associations between tract-level poverty (OR=0.88; 95% CI: 0.82–0.94), education (OR=0.89; 95% CI: 0.85–0.93), and foreclosures (OR=0.57; 95% CI: 0.43–0.76) with adherence to CRCS guidelines in bivariate analyses. Nonetheless, these associations were reduced and became nonsignificant after adjustment for Individual characteristics (multivariable analyses). No associations between tract-level income inequality and use of CRCS were observed in bivariate and multivariable analyses.

The multivariable multilevel model of area-level unemployment showed that individuals who were aged 60–74 years (OR=2.10; 95% CI: 1.41–3.12) and those with family incomes 200% above the federal poverty level (OR=1.67; 95% CI: 1.09–2.56) had higher odds of CRCS (data not shown). In contrast, those who never married or were separated, divorced, or widowed (OR=0.52; 95% CI: 0.38–0.72) and individuals with no health insurance coverage (OR=0.25; 95% CI: 0.15–0.40) had lower odds of adherence to CRCS guidelines. No other individual-level covariate was associated with CRCS in the multivariable multilevel model of area-level unemployment.

4. Discussion

The current study adds to the growing body of research into the role of community environments on cancer screening by evaluating the associations of multiple measures of social and economic contextual characteristics and adherence to CRCS in a racially/ethnically diverse adult population. Our study shows that rates of CRCS among age-eligible individuals living in Harris County, Texas (58.0%) are comparable than those reported nationally (58.6% in 2010) [31]. These are distant from Healthy People 2020 goals for CRCS (70.5%), however [32]. Because cancer screening requires individuals to interact with the larger environment in which those services are placed [14], a better understanding of the effect of area-level factors on CRCS is needed to reduce screening disparities. We found that individuals who lived in areas of high unemployment were less likely than their counterparts to report adherence to CRCS guidelines. Our finding is important to cancer control planners because we identified a contextual marker of disparity that can be used to target local interventions to promote CRCS and thereby reduce cancer disparities among nonadherent individuals who reside in disadvantaged communities.

To our knowledge, this study is the first reporting that individuals who live in areas with high unemployment rates are less likely to be up-to-date on CRCS. Unemployment is a social determinant of health that involves individuals, communities, local economy, and labor markets, so the mechanisms linking unemployment to health behaviors also relate to one's context. Although explanatory mechanisms for potential associations between one's context and cancer screening have not been fully elucidated [14], the literature suggests that economic attributes of communities may influence the local availability of healthcare resources [10,13]. While an area's economic vitality may attract healthcare providers through local investment and infrastructure, in economically deprived areas, residents may struggle to sustain local healthcare markets [27]. Other hypothesized pathways include the availability of social resources (e.g., social capital or collective efficacy) that may support individuals' abilities to access health information and preventive services [9,33]. Evidence suggests that a neighborhood's economic attributes shape its social resources [9]. In addition, social norms and attitudes toward preventive healthcare services are believed to differ by residential areas [34] and may influence a person's behavior toward seeking cancer screening. Our ability to test these pathways and potential mechanisms was limited by the variables available in the databases we used. (e.g., we did not control directly for tract-level healthcare resources since available databases like the Area Health Resources Files are assembled at the county-level).

Although some studies [15,16,20,21] have reported significant associations between area-level poverty and education and CRCS, our findings were consistent with other research reporting no associations [17–19]. Inconsistencies between our findings and others could be due to several considerations. For example, methodological issues, such as using different geographic units for analyses, could lead to disparate results. The current study measured area effects at the Census tract, while other studies [15,16] relied on larger, more heterogeneous area units, such as Metropolitan Statistical Areas or counties. Although debate exists about appropriate geographic levels of analysis [8,35], 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 [24]. Studies using Census tracts are under-represented in the cancer screening literature [14]. Discrepancies in the findings may also be a result of the different definitions of screening examined. We evaluated adherence to CRCS following current USPSTF guidelines, while others [16,21] evaluated various ways of screening, including CRCS within the previous year regardless of test modality and lifetime use of FOBT. Finally, unlike previous studies [15,21] that employed categorical measures of area-level SES, our study evaluated continuous measures. It is important to highlight that no consensus exists in the cancer screening literature regarding the best way to measure contextual variables [14] although some recommendations have been made [24].

In our study, we found no significant associations between area-level foreclosures and income inequality with CRCS. These results need to be considered in light of measurement issues. First, the foreclosure data were collected between 2007 and 2008, almost two years before the HHS study enrollment. Although socioeconomic attributes of communities generally do not change dramatically over short time periods, we cannot rule out large changes in foreclosure rates in this two-year period. In fact, foreclosure activity increased 26%, from 2009 to 2010, in the Houston MSA, the biggest increase among the 20 largest metropolitan areas in the United States [36]. Regarding income inequality, studies have shown that the effects of inequality on health outcomes vary by population size [37,38]. Researchers have suggested that income inequality is better captured with the use of larger areas encompassing larger populations and greater heterogeneity but not with the use of areas with small and more homogeneous populations, such as those employed in our study [39,40].

It is important to acknowledge other limitations of our study findings. First, our data are cross-sectional, making it possible to demonstrate associations but not causality. A limitation that many multilevel studies share in the cancer screening literature is the use of Census data. In this study, Census tracts were used as a proxy for contexts, but we did not label these administrative geographic units as synonymous with “neighborhoods.” It is unlikely that the territorial boundaries of a Census tract coincide with what one recognizes as a neighborhood. Other limitations of this study include our reliance on self-reported CRCS utilization and a relative low response rate of the 2010 HHS survey. However, studies have shown that self-reports of previous CRCS tests agreed well with medical records [41]. In addition, the reliability and validity of contextual measures obtained from the Census have not been firmly established in the literature [14]. Although multiple area-level SES measures were used in this study, these measures did not capture aspects of living standards, both material and social. A much wider and meaningful set of area-level SES measures have been developed in other countries such as the Townsend Material Deprivation Index [42], which relate to how people live. Finally, in the present study, tract-level measures did not account for much of the geographic variation of CRCS. Further testing of other contextual factors that can explain these variations is needed; for example, availability and accessibility of health care facilities where CRCS services are rendered.

4.1. Conclusions

Our study is the first to report that individuals who resided in areas with higher unemployment rates were less likely to adhere to current CRCs guidelines. Neighborhood socioeconomic disadvantage is increasingly recognized as a determinant of health, and our findings suggest that the effect of area unemployment may extend to cancer screening outcomes. Further research is needed to fully understand the mechanisms linking local environments with disease preventive behaviors in order to develop multilevel interventions that are likely to influence CRCs adherence among individuals who reside in disadvantaged communities.

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Highlights

- Only 58% of adults in Houston, Texas were adherent to colorectal cancer screening.
- Having had colorectal cancer screening differs by individual's characteristics.
- Living in areas with high unemployment has a negative impact on screening behaviors.
- Area-level disadvantage is increasingly recognized as a determinant of health.

Table 1

Descriptive characteristics of the study population, 2010 Health of Houston Survey (N=1,720).

	N	Weighted % (95% CI) ^a
Female	1,044	46.8 (43.3–50.4)
Race/ethnic group		
White	836	49.7 (46.0–53.3)
Black	354	19.3 (16.5–22.5)
Hispanic	276	22.4 (19.3–25.7)
Other	254	8.8 (6.8–10.9)
Foreign born	453	25.6 (22.4–29.2)
Age		
50–59	904	59.2 (55.7–62.6)
60–74	816	40.8 (37.4–44.3)
Marital status		
Married, living together	985	69.5 (66.4–72.5)
Never married, separated, divorced, widowed	735	30.5 (27.5–33.6)
Education		
Less than high school	186	17.6 (14.8–20.8)
High school graduate	370	27.5 (24.2–31.1)
Some college or more	1,164	54.9 (51.2–58.5)
Employment status		
Employed	935	55.4 (51.8–59.0)
Unemployed, looking for work	141	9.0 (7.1–11.2)
Unemployed, not looking	644	35.6 (32.3–39.0)
Federal poverty level		
<100%	362	23.7 (20.7–27.0)
100% to <200%	377	21.9 (19.1–25.0)
200	981	54.4 (50.7–58.0)
Health insurance		
Private	908	53.7 (50.0–57.2)
Public	529	27.3 (24.4–30.4)
Uninsured	283	19.0 (16.3–22.1)
Perceived fair/poor health	433	28.3 (24.9–32.0)

^aWeighted N = 700,585

Table 2

Prevalence of adherence to any colorectal cancer screening test, 2010 Health of Houston Survey (N=1,720).

	No. respondents who had CRCS / total respondents	Weighted % (95% CI)	Crude OR (95 % CI)
Overall	1,720	58.0 (54.5–61.9)	---
Sex			
Male	421/676	57.7 (51.8–63.3)	Reference
Female	630/1,044	58.4 (54.1–62.7)	0.92 (0.75–1.12)
Race/ethnic group			
White	552/836	64.1 (59.2–68.7)	Reference
Black	219/354	57.1 (47.9–65.8)	0.83 (0.64–1.08)
Hispanic	140/276	45.4 (37.4–53.6)	0.53 (0.40–0.70)
Other	140/254	57.8 (45.8–68.8)	0.63 (0.57–1.04)
Foreign born			
No	817/1,267	62.2 (58.0–66.2)	Reference
Yes	234/453	46.0 (38.4–53.7)	0.89 (0.86–0.94)
Age			
50–59	488/904	51.4 (46.4–56.5)	Reference
60–74	563/816	67.6 (62.4–72.4)	1.89 (1.55–2.31)
Marital status			
Married, living together	634/985	61.0 (56.1–65.6)	Reference
Never married, separated, divorced, or widowed	417/735	51.4 (45.9–56.8)	0.85 (0.77–0.94)
Education			
Less than high school	86/186	44.0 (34.7–53.7)	Reference
High school graduate	210/370	55.3 (47.6–62.8)	1.53 (1.07–2.17)
Some college or more	755/1,164	63.9 (59.3–68.2)	2.14 (1.57–2.93)
Employment status			
Employed	566/935	55.2 (49.9–60.4)	Reference
Unemployed, looking for work	63/141	48.2 (36.6–60.1)	0.52 (0.36–0.75)
Unemployed, not looking	422/644	64.8 (59.4–69.9)	1.23 (1.01–1.52)
Federal poverty level			
<100%	174/362	46.8 (39.3–54.4)	Reference
100% to <200%	218/377	55.5 (47.7–63.0)	1.48 (1.10–1.98)
200	659/981	64.0 (58.8–68.9)	2.21 (1.72–2.82)
Health insurance			
Private	603/908	60.9 (55.4–66.1)	Reference
Public	353/529	67.8 (61.9–73.3)	1.01 (0.81–1.27)
Uninsured	95/283	35.9 (27.8–44.8)	0.26 (0.20–0.33)
Perceived health status			
Excellent, very good, good	801/1,287	59.9 (55.8–63.8)	Reference
Fair, poor	250/433	53.3 (45.4–61.1)	0.91 (0.81–1.01)

Table 3

Associations between tract-level socioeconomic measures and adherence to colorectal cancer screening using multilevel logistic regression models (N=1720).

Tract-level measures	Bivariate models: Tract-level characteristics only, OR (95% CI) ^a	Multivariable models: Additional adjustment for individual-level covariates ^b , OR (95% CI) ^a
Poverty		
% of individuals below the federal poverty line	0.88 (0.82–0.94) **	0.97 (0.89–1.05)
Unemployment		
% of persons aged 16 years labor force who are unemployed	0.73 (0.61–0.88) **	0.80 (0.66–0.99) *
Education		
% persons aged 25 years than a 12th-grade education	0.89 (0.85–0.93) **	0.97 (0.92–1.03)
Income inequality		
GINI index	0.95 (0.85–1.07)	0.98 (0.87–1.09)
Foreclosure risk		
% of foreclosures started over 18 months through June 2008	0.57 (0.43–0.76) **	0.78 (0.55–1.10)

Notes: All models were adjusted for the length of time (years) that a participant reported living at the same neighborhood.

ICC in bivariate models: Poverty = 0.026; Unemployment = 0.028; Education = 0.019; Income inequality = 0.028; Foreclosure = 0.021.

ICC in multivariable models: Poverty = 0.016; Unemployment = 0.020; Education = 0.010; Income inequality = 0.025; Foreclosure = 0.024.

^a Odds ratios and 95% confidence intervals by 5% increases in tract-level measures.

^b Individual-level covariates include gender, age, race/ethnicity, foreign born, marital status, employment status, educational attainment, poverty level, and health insurance coverage.

* $P=.037$;

** $P<.01$