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FACTORS CONTRIBUTING TO LOWER CANCER SCREENING UTILIZATION IN A SUB-SAMPLE OF UNITED WAY 2-1-1 CALLERS

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DEDICATION

To Yolanda, Maria, Blanca, Baby Celia, Pepe, Celia, and Richie

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by

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FACTORS CONTRIBUTING TO LOWER CANCER SCREENING UTILIZATION IN A SUB-SAMPLE OF UNITED WAY 2-1-1 CALLERS

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This dissertation was a secondary analysis of data from a Cancer Prevention Research Institute of Texas (CPRIT)-funded [grant # PP100077 & PP120086] cancer-control intervention with The University of Texas Health Science Center at Houston (UTHealth) School of Public Health and United Way 2-1-1. The aims of the three dissertation papers were addressed by examining a sub-sample of 2-1-1 callers that were drawn from the parent study baseline data. Participants were required to need at least once cancer prevention service to be included in the parent study and dissertation analyses. This dissertation was a cross-sectional analysis of de-identified data examining the associations between perceived neighborhood problems and cancer screening, perceived neighborhood problems and cancer fatalism, and perceived discrimination and cancer screening.

Paper one examined the association between perceived neighborhood problems and colorectal, cervical and breast cancer screening. Adjusted logistic regression results showed that perceived neighborhood problems were not associated with colorectal cancer screening, cervical screening, or breast cancer screening. However, participants that had either public or

private insurance had higher odds of being screened for colorectal cancer, cervical cancer, and breast cancer, compared to participants without insurance.

Paper two examined the association between perceived neighborhood problems and cancer fatalism. The results of the multiple regression analysis showed that perceived neighborhood problems were associated with fatalism [R^2 = .21, F(11, 556) = 13.09, p < 0.0001]. Paper 3 examined how perceived medical and interpersonal discrimination were independently associated with cancer screening. Adjusted logistic regression showed that perceived medical discrimination was associated with a reduced likelihood of being screened for colorectal cancer screening (OR=0.59; 95% CI 0.31, 0.99), but not cervical or breast cancer screening. Perceived interpersonal discrimination was not associated with colorectal, cervical, and breast screening. Additionally, participants that had insurance had higher odds of being screened for cervical cancer (aOR= 2.33, 95% CI = 1.79, 3.03), and breast cancer (aOR= 5.84, 95% CI = 3.72, 9.17), but not colorectal cancer (aOR= 0.28, 98% CI= 0.14, 0.55). The results of all papers 2 and 3 suggest that perceived neighborhood problems and discrimination are potentially associated with lower utilization of cancer screening services. This finding is important because it provides further evidence that environmental conditions, real or perceived, constrain behavior.

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BACKGROUND

Literature Review

Despite a 20-year decline in cancer mortality in Texas, minority men and women continue to have disproportionately higher rates of cancer mortality, compared to White men and women.[1-3] The Texas Cancer Report (2017) found Non-Hispanic Black men had the highest rates of colorectal cancer mortality (29.3 per 100,000) compared to White men (17.4 per 100,000), and Non-Hispanic Black women had higher breast cancer mortality rates (30.8 per 100,000) compared to White women (20.5 per 100,000). The higher prevalence of cancer incidence and mortality in minority populations represents significant cancer disparities.

Regular cancer screening has contributed to an overall decline in cancer mortality.[4-7] Cancer screening is effective at decreasing cancer mortality through the early detection of cancer precursors;[8] allowing for early treatment before cancer develops. Cancer screening allows for early detection,[3,8] which improves treatment outcomes and survival.[3,9] Routine cancer screening allows for the early detection and referral for treatment, which is strongly associated with survival.[5,8] The U.S. Preventive Services Task Force (USPTSF) publishes cancer recommendations. For colorectal cancer, USPTSF recommends adult men and women ages 50-75 obtain a fecal occult blood test (FOBT) annually, flexible sigmoidoscopy every 5 years or 10 years with a fecal immunochemical test (FIT) every year, or colonoscopy every 10 years. For cervical cancer, women ages 21-65 have a cytology every 3 years, and for breast cancer, women ages 50-74 have a breast biennially.[10]

Low-income minorities are more likely to experience inequality, in part due to lower educational achievement.[11-13] Lower educational status is a predictor of lower cancer

screening utilization.[14-18] Lower educational status in several studies is associated with less exposure to medical system leading to lower cancer screening rates.[2,19] Lower educational achievement is also associated with a lower likelihood having health insurance. Individuals without health insurance have higher odds of not being screened for cancer, leading higher rates of cancer mortality.[8]

Inequality is associated with lower levels of trust in healthcare professions. Lower levels of trust in healthcare provides potentially leads to the belief that individuals are receiving inadequate care. Individual's perceptions about their quality and access of care is strongly associated with cancer screening.[7,15,17,18,20-27] Thus, discrimination has received more attention as a potential predictor of lower cancer screening rates. [21,23,28-33] Discrimination is broadly defined as the differences in treatment, communication, and decision-making by individuals in positions of power.[34] Within the context of cancer screening, discrimination by physicians is difficult to observe, therefore discrimination is measured by self-reported perceptions of physician-patient interactions. Understanding perceptions of discrimination in a healthcare setting is key in understanding why low-income minorities continue to remain under-screened.

Inequality is also associated with a greater probability of living in high poverty neighborhoods, compared to Non-Hispanic Whites. [1,18,22,35] In Texas, 21% of Non-Hispanic Blacks and 20% of Hispanics live in poverty, compared to only 8% of Non-Hispanic Whites.[36] Individuals living in poor neighborhoods have limited access to healthcare resources and have greater environmental constraints.[12] Broadly, the mechanism that links poor neighborhood conditions to health are studied at two levels: the objective neighborhood

level and the individual level.[37] At the objective neighborhood level, area-level indices (e.g., census-tract information and zip code data) are used to describe the physical environment and its connection to cancer screening.[38-45] For example, Meissner and colleagues (2006) and Eibner and Sturm (2006) found that people living in low-income neighborhoods had limited access to prevention services, and had to travel greater distances to clinics and hospitals, compared to individuals living in high-income neighborhoods.[46,47] At the individual level, neighborhood conditions are assessed with individuals' perceptions of their neighborhoods.[46,48,49]

Exposure to harsh living conditions potentially creates a sense of hopelessness and powerlessness that constrains how decisions are made and acted upon.[50] For example, living in a neighborhood with high crime and social mistrust can discourage people from forming connections within their neighborhoods.[51] Physical conditions of the neighborhood, such as vandalism, garbage, and pitted sidewalks and roads may also directly discourage social cohesion.[52,53] Daily experiences with poor neighborhood conditions may have a causal effect on health by disrupting social networks and creating a sense of powerlessness and fatalism.[54,55]

Several studies have shown that cancer fatalism was high in low-income and minority communities. [56-58] Fatalism is broadly defined as "passively" admitting a lack of personal control,[57] to the belief that one cannot change the outcome of a serious disease.[59] Within the context of this dissertation, fatalism is narrowly focused on cancer, and uses Powe's (1995) definition of cancer fatalism: the belief that cancer is predetermined, caused by divine intervention, or that death from cancer is inevitable.[59,60] Targeting fatalistic beliefs is

important for health education, because fatalism is strongly associated with lower rates of cancer screening.[61,62] For instance, individuals endorsing cancer fatalistic beliefs were less likely to return FOBT kits, less likely to have a Pap test, and had greater odds of not having a recent mammogram.[56]

Public Health Significance

There remains a high prevalence of cancer mortality in low-income minority men and women.[1,3,6,8,63] The Texas Cancer Report found cancer incidence and mortality rates were higher for Non-Hispanic Black and Hispanic men and women, compared to Non-Hispanic White men.[8] The disparity in cancer mortality in low-income minorities indicates a need to concentrate cancer prevention efforts for this population. Cancer screening is a modifiable behavior that can prevent and reduce cancer mortality.[64] However, focusing prevention efforts remains difficult because we still do not fully understand how exposure to environmental factors, such as neighborhood conditions and discrimination, influences people's ability to screen for cancer. By understanding how these factors impact cancer screening, interventionists can improve outreach activities, increase awareness, and develop and disseminate effective interventions that focus on personal and community empowerment.

Specific Aims & Hypotheses

The aim of paper 1 was to examine the association between perceived neighborhood problems and colorectal, cervical and breast cancer screening with a sub-sample of United Way 2-1-1 callers. We hypothesized that perceived neighborhood problems would be associated with lower cancer screening rates, controlling for race, ethnicity, relationship status, insurance, education, and income.

The aim of paper 2 was to examine if perceived neighborhood problems are associated with cancer fatalism, while controlling for insurance, education, income, relationship status, and race and ethnicity. We hypothesized that perceived neighborhood problems will be associated with cancer fatalism.

The aim of paper 3 was to examine if perceptions of discrimination are context-dependent in relation to cancer screening behavior. We hypothesized that perceived medical discrimination will be associated with colorectal, cervical, and breast cancer screening, controlling for insurance, education, and income. We also hypothesized that perceived interpersonal discrimination would be associated with colorectal, cervical, and breast cancer screening, controlling for insurance, education, and income.

METHODS

Study Design

The current study is a secondary analysis of data from a Cancer Prevention Research Institute of Texas (CPRIT)-funded [grant # PP100077 & PP120086] cancer-control intervention with The University of Texas Health Science Center at Houston (UTHealth) School of Public Health and United Way 2-1-1. Briefly, UTHealth School of Public Health (PI Fernandez) collaborated with United Way 2-1-1 to develop, deliver, and evaluate the effectiveness and cost effectiveness of a cancer-control intervention using 2-1-1 phone navigators. The parent study aims were to: 1) estimate cancer control needs and prevalence of cancer risk factors, 2) determine if cancer control navigators can increase cancer screening and prevention services for breast, colon, cervical screening, HPV vaccination, and smoking

cessation, and 3) determine the cost effectiveness of using 2-1-1 navigators to increase cancer control. The parent study [HSC-SPH-10-0241] and current project [HSC-SPH-18-0478] were reviewed and approved by the UTHealth Committee for the Protection of Human Subjects.

Individuals that called 2-1-1 were screened for potential inclusion into the study. Inclusion criteria included any person 18 years of age or older who called 2-1-1, spoke English or Spanish, was not currently in a crisis (disaster or personal), and needed at least one cancer prevention service: fecal occult blood test (FOBT), flexible sigmoidoscopy, colonoscopy, cervical exam, breast exam, HPV vaccine, or smoking cessation. Exclusion criteria included any person younger than 18 years of age who called 2-1-1, spoke a language other than English or Spanish, was currently in crisis (disaster or personal), was calling for another person or to check eligibility for state benefits, or did not need a cancer prevention service.

Dissertation Papers Analytic Samples

To address the aims of the dissertation papers, sub-samples of 2-1-1 callers were drawn from the parent study baseline data. To be included in the parent study and current studies required that participants need at least once cancer prevention service. The current study only examined colorectal, cervical or breast cancer screening. The parent study included 1,661 participants, but during baseline data collection the perceived neighborhood problems scale, Powe cancer fatalism inventory, and perceived discrimination scale were removed to reduce participant burden. Therefore, across all three dissertation papers the sample size changes to reflect the use of current study measures. Participants that were

missing data, or not given study materials were not included in the study analysis. Only participants with complete data for all the study measures were included in the analysis.

Human Subjects

This dissertation project was reviewed and approved by The University of Texas Health Science Center at Houston (UTHealth) School of Public Health Office of Academic Affairs and Student Services. The dissertation study, because it was a secondary analysis of de-identified data was determined to be exempt by the UTHealth Committee for the Protection of Human Subjects [HSC-SPH-18-0478]. The Committee for the Protection of Human Subjects approval letter is presented in the Appendix.

JOURNAL ARTICLE ONE

Association between perceived neighborhood problems and colorectal, cervical, and breast cancer screening among United Way 2-1-1 callers.

Journal of Community Health

Abstract

Socioeconomic disparities are associated with increased cancer mortality. Area-level neighborhood problems have been found to influence cancer screening behavior, but few studies have explored the effects of perceived neighborhood problems on cancer screening. The aim of this project was to examine the association between perceived neighborhood problems and colorectal, cervical and breast cancer screening among United Way 2-1-1 callers. The current study was a cross-sectional analysis of baseline data from a larger CPRIT-funded parent study. We used logistic regression to examine the relationship between perceived neighborhood problems and colorectal, cervical, and breast cancer screening, adjusting for individual-level demographic variables. The results of the unadjusted and adjusted odds ratios indicated that perceived neighborhood problems were not associated with colorectal, cervical, or breast cancer screening. Participants with insurance had higher odds of being screened for colorectal cancer (aOR= 3.28, 95% CI = 1.61, 6.72), cervical cancer (aOR= 2.18, 95% CI = 1.64, 2.92), and breast cancer (aOR= 5.68, 95% CI = 3.42, 9.42). Participants with an annual income below $10,000 had higher odds of being screened for colorectal cancer (aOR= 0.41, 95% CI = 0.17, 0.93).

Introduction

The 2017 Texas Cancer Report (using data from 2010-2014) found that low-income Non-Hispanic Black women had higher breast cancer mortality rates compared to higher income White women.[1] Additionally, low-income Hispanic women had the highest cervical cancer mortality rates (30.0 per 100,000) compared to higher income White women (20.1 per 100,000).[2] Colorectal, cervical, and breast cancer mortality can be reduced with regular cancer screening.[2] Regular screening allows for the early detection of cancer precursors, precancerous lesions, or early stage cancer[3] allowing for early treatment,[4] which is strongly associated with increased survival.[3,5] The U.S. Preventive Services Task Force (USPSTF) has published recommendations for colorectal, cervical, and breast cancer screening. For colorectal cancer, USPSTF recommends adult men and women ages 50-75 years obtain a fecal occult blood test annually, flexible sigmoidoscopy every 5 years or 10 years with a fecal immunochemical test every year, or colonoscopy every 10 years. For cervical cancer, women ages 21-65 years have a cytology (Pap test) every 3 years, and for breast cancer, women ages 50-74 years have a mammogram biennially.[6]

Low-income Hispanics and Non-Hispanic Blacks have lower lifetime screening rates, compared to Non-Hispanic Whites.[7-13] According to 2014 data from the Behavioral Risk Factor Surveillance System, Hispanics and Non-Hispanic Blacks had lower cancer screening rates compared to Non-Hispanic Whites.[14] Meeting cancer screening guidelines varies by socioeconomic status (SES).[15] Lower SES individuals tend to have lower income,[16-18] lower educational achievement,[4] inconsistent employment,[19] and limited access to health insurance.[4,9,20-22] Together these factors are associated with lower rates of cancer

screening.[23,24] Socioeconomic status also restricts where individuals live.[25,26] Lower-income people often live in neighborhoods that have high rates of vandalism, disturbance by neighborhoods, and poor infrastructure.[20,27] Therefore, recent attention has begun to explore how exposure to poor neighborhood problems and perceived neighborhood problems may be related to health.[28,29] While several studies have found that deteriorating neighborhood conditions are associated with higher cancer mortality rates,[15,30,31] few studies have examined how perceptions of neighborhood problems may be associated with cancer screening.

Additionally, the mechanism through which perceived neighborhood problems may influence cancer screening is poorly understood. Daily exposure to problems in poor neighborhoods may contribute to a sense of hopelessness and powerlessness,[15,23] which may lower participation in health preventive behaviors, such as cancer screening.[15] Individuals process and construct beliefs based on environmental conditions.[31,20,32-34] Prior work has found that perceived neighborhood problems can lead to a sense of powerlessness and shape beliefs about cancer risk and efficacy for screening.[15,35,36] For instance, prolonged exposure to poor neighborhoods conditions may lead to "pessimistic expectations" [36] about the efficacy of cancer screening.[37]

There are only two published studies examining the association between perceived neighborhood problems and cancer screening. Beyer and colleagues (2016) found that lower satisfaction with neighborhood problems was associated with decreased likelihood of being screened for colorectal and breast cancer. However, Beyer et al. did not account for the influence of sociodemographic variables. Not accounting for sociodemographic presents a

significant gap in the literature. Halbert and colleagues (2016) found that greater perceived neighborhood problems were associated with decreased likelihood of being screened for colorectal cancer. While these studies establish that perceived neighborhood problems are associated with lower rates of colorectal and breast cancer screening. However, Halbert et al. examined participants' perceptions of their neighborhood walkability and access to food rescores and shopping. While perceptions of walkability offer insight into neighborhood satisfaction, it potentially does not fully capture factors that contribute to neighborhood problems, such as crime, disturbances, and exposure to trash. Thus, the aim of this study was to examine the association between perceived neighborhood problems and colorectal, cervical and breast cancer screening among United Way 2-1-1 callers.

Methods

Parent Study

The current study is a secondary analysis of data from a Cancer Prevention Research Institute of Texas (CPRIT)-funded [grant # PP100077 & PP120086] cancer-control intervention with The University of Texas Health Science Center at Houston (UTHealth) School of Public Health and United Way 2-1-1. Briefly, UTHealth School of Public Health (PI Fernandez) collaborated with United Way 2-1-1 to develop, deliver, and evaluate the effectiveness and cost effectiveness of a cancer-control intervention using 2-1-1 phone navigators. The parent study aims where: 1) estimate cancer control needs and prevalence of cancer risk factors, 2) determine if cancer control navigators can increase cancer screening and prevention services for breast, colon, cervical screening, HPV vaccination, and smoking cessation, and 3) determine the cost effectiveness of using 2-1-1 navigators to increase cancer

control. The parent study [HSC-SPH-10-0241] and current project [HSC-SPH-18-0478] were reviewed and approved by the UTHealth Committee for the Protection of Human Subjects.

Individuals that called 2-1-1 were screened for potential inclusion into the study. Inclusion criteria included any person 18 or older who called 2-1-1, who spoke English or Spanish, was not currently in a crisis (disaster or personal), and needing at least one cancer prevention service: fecal occult blood test (FOBT), flexible sigmoidoscopy, colonoscopy, cervical exam, breast exam, HPV vaccine, or smoking cessation. Exclusion criteria included any person younger than 18 who called 2-1-1, spoke another language other than English or Spanish, currently in crisis (disaster or personal), calling for another person or to check eligibility for state benefits, or did not need a cancer prevention service.

All eligible and consenting participants completed a baseline assessment; then were randomly assigned to general referral group or cancer control phone navigation. Participants assigned to the general referral group (usual care) got referrals for relevant screening or prevention needs. Participants assigned to the cancer control navigation received referrals plus cancer control navigation. Navigators worked collaboratively with participants to identify needs and barriers to services; and helped to coordinate solutions, such as making appointments.

Analytic Sample

The current study's analytic sample was drawn from the parent study baseline data. Inclusion into the parent study and current study required that participants need at least one cancer prevention service. The parent study included 1,661 participants. Participants that were missing data from the primary outcome variable for this study (perceived neighborhood

characteristics) were removed from the analytic sample, resulting in a sample of 1,556 participants.

Measures

Dependent variables. The current study cancer screening were coded based on 2010 USPSTF cancer screening guidelines. Colorectal cancer screening (CRCS) was measured by asking participants when was their most recent colorectal [colonoscopy, sigmoidoscopy, or fecal occult blood test (FOBT)], cervical (Pap smear), or breast (breast) screening.

For colorectal cancer screening, men and women age 50 years or older who had never had a sigmoidoscopy, colonoscopy or FOBT; or had not had sigmoidoscopy in the last 5 years, or a colonoscopy in the last 10 years, or had no FOBT in the last year were coded as unscreened (which included those never screened and those overdue for CRCS). (0). Participants that reported having either a sigmoidoscopy in the last 5 years, colonoscopy in the last 10 years, or FOBT in the last year were coded as screened (1).

For breast cancer screening, women 40 years or older who had never had a mammogram, had never had not had one within the past year, or were not sure were coded as not screened (0). Participants that had a mammogram in the last year were coded as screened (1).

For cervical cancer screening, women 18 years of age or older; who never had a Pap test or were not sure, or who had been previously tested, but not in the last year were coded as not screened (0). Women 18 years of age or older that had a Pap test in the previous year were coded as screened (1).

Independent Variable. The neighborhood problems scale was used to assess participant's perceptions of their neighborhood problems.[38] The neighborhood problem scale has 10-items, with responses on a 3-point Likert scale, ranging from 1 "not a problem", 2 "somewhat a problem", and 3 "a problem." Participants were given a series of problems that could arise in their neighborhoods. Sample items included "Litter in the streets," "Disturbances by neighbors or youngsters" and "Vandalism." Neighborhood problems were computed by summing individual items; with higher scores indicating more neighborhood problems (scores range from 7 to 20). The scale has been shown to have good internal consistency (α=0.79).[38] Within the current study, the neighborhood problem scale had good internal consistency (α=0.85).

Control Variables. Education was measured by asking "What is your highest level of education?" Participants were provided with categories to select from: less than high school; high school or general equivalency diploma (GED); vocational technical (2-year Associate degree/some college); Bachelor's degree or higher [referent].

Insurance was measured by asking participants what type of insurance they had: private insurance (self-pay or employer provided), public insurance (Medicare, Medicaid), military health insurance (Tricare, Veterans Affairs, Champ-VA), other government programs, or uninsured (no insurance coverage of any type). For this study, all private and public insurance were recoded as Insured [referent].

Race was self-reported, and participants were given racial categories to select from: "White, Black or Non-Hispanic Black, American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, Vietnamese." Ethnicity was self-reported, and participants were asked if

they self-identified as Hispanic, Latino, or Spanish-origin. The race variable was recoded to Non-Hispanic White [referent], Non-Hispanic Black, and Hispanic. Participants that self-identified as American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, or Vietnamese were excluded from the study analysis due to small representation.

Income was measured asking participants "What was your total household income in 2010?" Participants were given a range of income levels from "Under $10,000-$15,000; $15,001-$25,000; $25,001- $30,000, $30,001-$35,000, $35,000- $40,000, $40,001 or greater." Because a majority of participants had a yearly income below $30,000, the income variable was recoded to: none-$10,000, $10,001-$20,000, $20,001 and more [referent].

Statistical Analysis

Descriptive statistics were calculated separately for each analysis (colorectal, cervical, and breast cancer screening). Bivariate statistics were conducted to examine the difference between participants screened and not screened. To address the main study aim, three separate unadjusted logistic regression were fitted to test the association between perceived neighborhood problems and colorectal, cervical, and breast screening. Then adjusted multivariate logistic regression models were fitted to test the association between perceived neighborhood problems and cancer screening, controlling for individual level-SES and demographics. The data were analyzed using Stata version 15.1.[39]

Results

Demographic characteristics are presented in Table 1. Participants eligible for colorectal cancer were primarily Non-Hispanic Black (59%) and women (87%). More than half of the sub-sample had no insurance (60%), and 38% had a high school degree or GED.

Participants eligible for cervical cancer screening were primarily Hispanic (48%) and Non-Hispanic Black (44%), did not have insurance (63%), and had a high school degree or GED (46%). Participants eligible for breast cancer screening were primarily Hispanic (40%) and Non-Hispanic Black (49%), uninsured (57%), and had a high school degree or GED (45%). On average, Non-Hispanic white participants (M = 10.59, SD = 3.47) reported slightly more neighborhood problems (M = 10.85, SD = 3.24) than Non-Hispanic Black participants (M = 10.59, SD = 3.47) and more neighborhood problems than Hispanic participants (M = 8.45, SD = 2.56) [scores ranged from 7 to 21].

Bivariate results are presented in Table 2. The results indicated that Non-Hispanic Black participants were less likely to be screened for colorectal, cervical, and breast cancer than Non-Hispanic Whites or Hispanics. There was also a significant difference between insured and uninsured participants across all types of cancer screening.

Unadjusted (OR) and adjusted odds ratios (aOR) are presented in Tables 3, 4, and 5. The unadjusted odds ratios indicate that perceived neighborhood problems were not significantly associated with colorectal screening, breast cancer screening, or cervical screening. The adjusted odds ratios also indicated that perceived neighborhood problems were not associated with colorectal, cervical, or breast cancer screening. Insured participants had higher odds of being screened for colorectal cancer (aOR= 3.28, 95% CI = 1.61, 6.72), cervical cancer (aOR= 2.18, 95% CI = 1.64, 2.92), and breast cancer (aOR= 5.68, 95% CI = 3.42, 9.42) than uninsured participants. Additionally, participants that had an annual income below $10,000 had greater odds of being screened for colorectal cancer (aOR= 0.41, 95% CI = 0.17, 0.93).

Discussion

The aim of the study was to examine the association between perceived neighborhood problems on colorectal, cervical, and breast cancer screening. The results of the unadjusted and adjusted odds ratios suggest that perceived neighborhood problems are not associated with colorectal, cervical, or breast cancer screening among 211 callers. These findings are inconsistent with past work showing a direct effect of perceived neighborhood problems on cancer screening.[15,30]

Participants that reported incomes below $10,000 annually had increased likelihood of being screened for colorectal cancer, without considering the influence of insurance status. This finding is consistent with past work that shows that low-income individuals access safety net and subsidized programs and thus may be more likely to have recent screening than individuals at higher incomes but potentially less insurance.[8,40] For example, low-income individuals can enroll in Medicaid or receive low-cost or free cancer screenings from national programs (e.g., Centers for Disease Control and Prevention's Colorectal Cancer Program).[8,41] However, Medicaid and assistance programs typically target people with little to no income, therefore, higher income individuals (i.e., those who report annual incomes of $20,000 or more in the current sample) may not qualify for Medicaid or assistance.

Health insurance (private or public) was a significant factor influencing cancer screening in the current sample, which is consistent with prior cancer screening literature.[11,42,43] Increasing access to health insurance is a key propriety for reducing cancer mortality. Public policy should continue to focus on creating programs that offer low-income individuals access to affordable health insurance.

There are a two potential reasons perceived neighborhood problems were not related to cancer screening. First, the present study did not account for family structure. Women from single-parent households or families with a female head of household have been shown to have more unfavorable views of their neighborhoods than women from two-parent households or families with a male head of household.[44] It is possible that family structure may alter perceptions of neighborhood problems. We suggest that future studies examine the influence family structure has on perceptions of neighborhood problems. Second, the influence of personal determinants was not examined in the present study analysis. Personal level determinants, such as knowledge about cancer and treatment options, misconceptions or fear regarding treatment procedures, low perceived risk (i.e., no family history of cancer, lack of current symptoms), denial, fatalism, language barriers, low health literacy, and perceived cultural beliefs about cancer, are highly predictive of cancer screening and may moderate the relationship between perceived neighborhood problems and cancer screening.[5,13,45-54] Future studies should consider the interaction between other psychosocial variables and perceived neighborhood problems.

Limitations

There are several limitations to the current study. To be included in the parent and current study, participants needed at least one cancer control service, thus the study sample may not be representative of the general population. Cancer screening was measured by self-report, which is subject to reporting error or recall bias. We did not adjust for length of time living in the neighborhood. It is possible that length of time living in the neighborhood will lead to greater perceived neighborhood problems. The study sample consisted primarily of

women, which limits our ability to understand how neighborhood problems affect men's cancer screening behavior. There is evidence that men perceive their neighborhoods differently from women. Men report greater exposure to crime and victimization,[55] but women perceive their neighborhoods as more dangerous and less cohesive.[44] Future studies should attempt to enroll more men to fully understand how perceptions of neighborhood problems are related to cancer screening.

Conclusions

Understanding the connection between perceived neighborhood problems and cancer screening uptake is important because beliefs such as these may be more difficult to intervene upon through interventions focused on changing knowledge and beliefs solely and not on making environmental change. Future research is needed to fully explore the effects of neighborhood problems on cancer prevention behaviors, which could facilitate the development of cancer prevention programs targeting low-income individuals. Public policy needs to continue to increase programs that increase access to health insurance. By increasing access to health insurance, low-income individuals potentially have greater access to cancer control services.

Table 1. Demographic and socioeconomic characteristics of Houston 2-1-1 callers not screened for colorectal, cervical, and breast cancer.

Variables	Colorectal (*n*=316) N (%)	Cervical (*n*=984) N (%)	Breast (*n*=594) N (%)
Gender			
Male	39 (12.3)	572 (100)	594 (100)
Female	277 (87.7)	-	-
Race and Ethnicity			
Non-Hispanic White	30 (11.0)	71 (9.0)	54 (10.4)
Hispanic	81 (30.0)	395 (48.0)	209 (40.4)
Non-Hispanic Black	161 (59.2)	363 (44.0)	254 (49.1)
Insurance coverage			
Private/Public	125 (40.0)	359 (37.0)	258 (44.0)
Uninsured	190 (60.3)	623 (63.4)	335 (57.0)
Education			
Less than HS	82 (26.0)	235 (24.0)	134 (23.0)
HS or GED	121 (38.4)	451 (46.0)	267 (45.2)
Voc/Tech (AA)/Some college	99 (31.4)	261 (27.0)	164 (28.0)
BA or above	13 (4.1)	33 (3.4)	26 (4.4)

Income			
None – $10,000	163 (54.0)	462 (50.0)	104 (47.0)
$10,001 - $20,000	99 (32.7)	336 (36.3)	84 (38.0)
$20,001 or More	41 (14.0)	129 (14.0)	35 (16.0)
Perceived Neighborhood problems x Cancer screening	M (*SD*) (*n* =212)	M (*SD*) (*n* =713)	M (*SD*) (*n* =339)
Perceived Neighborhood Problems	9.73 (2.84)	9.66 (3.21)	9.55 (3.02)

Note: Voc is vocational school, Tech is technical school.

Table 2. Bivariate associations between participant characteristics and not being screened for colorectal, cervical, and breast cancer among a sub-sample of 2-1-1 callers.

Characteristics	Screened N (%)	Not Screened N (%)	χ^2
Colorectal Screening (*n* = 316)			
Sex			
Male	16 (19.2)	39 (12.3)	1.11
Female	158 (91.0)	277 (88.0)	
Race and Ethnicity			
White Non-Hispanic	18 (11.5)	30 (11.0)	15.19**
White Non-Hispanic	21 (13.38)	81 (30.0)	
Non-Hispanic Black	118 (75.2)	161 (59.2)	
Insurance			
Public/Private	143 (82.1)	190 (60.3)	24.67**
Uninsured	31 (17.8)	125 (39.3)	
Education			
Less than HS	39 (22.4)	82 (26.0)	4.64
HS or GED	68 (39.1)	121 (38.4)	
Voc/Tech/Some college	52 (30.0)	99 (31.4)	
BA or above	15 (9.0)	13 (4.1)	
Cervical Screening (*n* = 984)			
Race and Ethnicity			
White Non-Hispanic	36 (7.3)	71 (9.0)	11.84**
Hispanic	193 (39.15)	395 (48.0)	
Non-Hispanic Black	264 (54.0)	363 (44.0)	
Insurance			
No insurance	240 (42.0)	623 (63.4)	67.03**
Public/Private	331 (58.0)	359 (36.56	
Education			
Less than HS	235 (24.0)	132 (23.2)	0.36
HS or GED	451 (46.0)	263 (46.1)	
Voc/Tech/Some college	261 (27.0)	153 (27.0)	
BA or above	33 (3.4)	22 (4.0)	
Breast Cancer Screening (*n* = 594)			

Race and Ethnicity			
Non-Hispanic White	54 (10.4)	18 (9.0)	14.00**
Hispanic	209 (40.4)	56 (27.1)	
Non-Hispanic Black	254 (49.1)	133 (64.3)	
Insurance			
Public/Private	184 (79.0)	335 (56.5)	83.20**
No insurance	50 (21.4)	258 (43.51)	
Education			
Less than HS	134 (23.0)	70 (30.4)	7.95*
HS or GED	267 (45.2)	82 (35.2)	
Voc/Tech/Some college	164 (28.0)	70 (30.0)	
BA or above	26 (4.4)	11 (5.0)	

*p < .05 **p < .001. Note: Income was measures in 2010. Voc is vocational school, Tech is technical school.

Table 3. Adjusted odds ratios of the association between perceived neighborhood problems and colorectal screening (N=276).

Variables	OR (95% CI)	aOR (95% CI)
Perceived neighborhood problems	1.07 (0.99, 1.16)	1.08 (0.98, 1.17)
Insurance	3.03 (1.94, 4.77)	3.38** (1.16, 6.72)
Income		
None-$10,000	0.60 (0.34, 1.01)	0.40* (0.17, 0.93)
$10,000 -$20,000	0.77 (0.44, 1.36)	0.57 (0.24, 1.29)
Education		
Less than HS	0.41 (0.17, 0.95)	0.56 (0.16, 1.96)
HS or GED	0.49 (0.22, 1.08)	0.77 (0.25, 2.41)
Some College	0.46 (0.20, 1.03)	0.58 (0.18, 1.83)
Relationship status	0.03 (0.94, 4.77)	0.83 (0.37, 1.88)
Race and Ethnicity		
Hispanic	0.43** (0.20, 0.92)	0.79 (0.25, 2.51)
Non-Hispanic Black	1.22 (0.65, 2.29)	1.39 (0.57, 3.42)

*p < .05 **p < .001. Note: Insurance referent group uninsured. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Relationship referent group was married/Living with someone. Race/Ethnicity referent group was Non-Hispanic White.

Table 4. Adjusted odds ratios of the association between perceived neighborhood problems and cervical screening (N =963)

Variables	OR (95% CI)	aOR (95% CI)
Perceived neighborhood problems	1.01 (0.97, 1.05)	1.03 (0.99, 1.08)
Insurance	2.39 (1.93, 2.95)	2.18** (1.64, 2.92)
Income		
None-$10,000	0.84 (0.65, 1.15)	0.85 (0.54, 1.33)
$10,000 - $20,000	0.98 (0.91, 1.35)	0.99 (0.63, 1.54)
Education		
Less than HS	0.85 (0.47, 1.50)	0.72 (0.33, 1.57)
HS or GED	0.87 (0.50, 1.53)	0.96 (0.46, 2.02)
Some College	0.88 (0.49, 1.56)	0.77 (0.36, 1.63)
Relationship status	1.10 (0.88, 1.37)	0.98 (0.69, 1.38)
Race and Ethnicity		
Hispanic	0.96 (0.62, 1.49)	1.43 (0.80, 2.54)
Non-Hispanic Black	1.43 (0.93, 2.20)	1.45 (0.85, 2.50)

*p < .05 **p < .001. Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Relationship referent group was married/Living with someone. Race/Ethnicity referent group was Non-Hispanic White.

Table 5. Adjusted odds ratios of the association between perceived neighborhood problems and breast screening (N=498)

Variables	OR (95% CI)	aOR (95% CI)
Perceived neighborhood problems	1.06 (1.00, 1.12)	1.03 (0.96, 1.10)
Insurance	4.77** (3.36, 6.80)	5.68* (3.42, 9.42)
Income		
None-$10,000	0.89 (0.56, 1.40)	0.83 (0.43, 1.63)
$10,000 -$20,000	1.03 (0.64, 1.65)	0.90 (0.50, 1.93)
Education		
Less than HS	1.23 (0.58, 2.64)	2.13 (0.67, 6.72)
HS or GED	0.73 (0.34, 1.53)	1.61 (0.53, 4.82)
Some College	1.01 (0.47, 2.15)	1.72 (0.56, 5.26)
Relationship status	1.20 (0.84, 1.72)	0.82 (0.47, 1.45)
Race and Ethnicity		
Hispanic	0.80 (0.43, 1.48)	1.08 (0.47, 2.47)
Non-Hispanic Black	1.57 (0.88, 2.78)	1.43 (0.69, 2.97)

*p < .05 **p < .001. Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Relationship referent group was married/Living with someone. Race/Ethnicity referent group was Non-Hispanic White.

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JOURNAL ARTICLE 2

Perceived Neighborhood Problems and Cancer Fatalism among a Sub-Sample of United Way 2-1-1 Callers.

Ethnicity & Disease

Abstract

Perceived neighborhood problems may diminish the belief that people have control over their lives, which can potentially lead to fatalistic beliefs. Cancer fatalism, as defined by Powe, is the belief that cancer is predetermined, caused by divine intervention, or that death from cancer is inevitable. The aim of this study was to examine the association between perceived neighborhood problems and cancer fatalism among a sub-sample of United Way 2-1-1 callers. The current study was a cross-sectional analysis of baseline data from a larger study testing the effects of cancer control phone navigation on increasing cancer control behaviors among 2-1-1 callers. Using multiple regression, the current study examined the association between perceived neighborhood problems and cancer fatalism. Perceived neighborhood problems were associated with fatalism [R^2 = .21, $F(11, 556) = 13.09$, $p < 0.0001$]. Perceived neighborhood problems accounted for 36% of the variability in cancer fatalism, controlling for SES and demographics. Prior research has found that perceived neighborhood problems may contribute to a sense of powerlessness, and shape beliefs about cancer risk and screening. Future research should continue to explore how perceived neighborhood problems contribute to cancer fatalism.

Introduction

Despite an uptake in cancer screening across Texas, Non-Hispanic Blacks and Hispanics continue to have lower life-time cancer screening rates, compared to Whites.[1-3] Lower cancer screening rates among low-income Non-Hispanic Blacks and Hispanics may be related to education, [2] income,[4-6] relationship status,[7] and fatalistic beliefs.[8-11] Several articles have shown individuals with more education, access to insurance, in a current relationship, and higher income have greater odds of being screened for cervical, colorectal, and breast cancer.[12-19] Additionally, a consistent body of research has shown that cancer fatalism is an important factor in lower uptake of cancer screening among Non-Hispanic Blacks and Hispanics.[9,10,20-24] Powe's (1995) defines cancer fatalism as the belief that cancer is predetermined, caused by divine intervention, or that death from cancer is inevitable.[24,25] Fatalistic beliefs toward preventing and surviving cancer and having a family history of cancer[26] can alter an individual's beliefs about the benefits of cancer screening.[20] Several primary studies and systematic reviews have shown that cancer fatalism is a stronger predictor of lower cancer screening rates.[10,20,22,27] For example, Latinas who reported greater cancer fatalism were less likely to return fecal occult blood test (FOBT) kits,[20] and report lower utilization of cervical and breast screening.[28] Additionally, a qualitative study by Sharf and colleagues (2005) found that individuals with greater cancer fatalism were less likely to seek treatment or adhere to treatment recommendations.[29]

The association between cancer fatalism and cancer screening is established in the literature. [10,20,24,30] However, researchers caution "against identifying fatalism" (p., 311) as the key factor in lower cancer screening rates without taking into consideration the broader environment where low-income individuals live.[20] Low-income people are more likely to

endorse fatalistic beliefs, compared to high-income people.[10,20,28,31,32] Powe (1996) states cancer fatalism is associated with poverty.[25] Low-income individuals often have inadequate or no health insurance [1,2,33,34] and live in neighborhoods characterized by vandalism, garbage, and disturbances from neighbors.[5,35,36] Together, these factors including the negative perceptions of these neighborhood problems might contribute to fatalistic beliefs.

Although the relationship between perceived neighborhood problems and cancer fatalism has not previously been studied, there are studies that document the relationship between neighborhood problems and cancer screening and cancer outcomes. For example, a systematic review by Pruitt et al. (2007) found that individuals living in low-income neighborhoods (measured by assessing area-level poverty) had lower rates for cancer screening.[18] Palumbo et al. (2016) found that women living in disadvantage neighborhoods, (defined as living 100% below the federal poverty line, living in crowded housing, and experiencing high unemployment) had more severe breast cancer prognosis.[37] Additionally, Beyer and colleagues (2016) and Halbert (2016) found that perceptions of neighborhood problems were associated with lower rates of cancer screening.[38,39] These results suggest objective and perceived neighborhood problems can influence cancer screening.

Missing from the literature is an examination of the influence of perceived neighborhood problems on cancer fatalism. Examining perceptions of neighborhood problems potentially offers insight into how individuals process and construct beliefs based on their perceptions of their neighborhoods. It is possible that structurally induced environmental factors are experienced and interpreted, and then acted upon by the individual.[40] The production and reproduction of harsh neighborhood problems experienced by the individual may ultimately

influence beliefs about prevention behaviors. For example, Organista and colleagues found that Latino men who have sex with men living in poor neighborhoods believed they could not affect the outcome of HIV, and thus were less likely to be tested for sexually transmitted diseases of HIV.[41,42]

Several summary articles have documented that prolonged exposure to poor living conditions can lead to internalized negative beliefs, [43-46] potentially reducing one's capacity to cope with stress and increase feelings of vulnerability, which theoretically constrains individuals' decision-making; creating a system that determines how goals are selected and determines which "actions and responses seem appropriate, and which ones are possible."[47] Consequently, individual's prolonged feelings of vulnerability may potentially lead to the adoption of fatalistic beliefs.[6,48] Thus, the aim of the current analysis is to examine if perceived neighborhood problems are associated with cancer fatalism, while controlling for the influence of insurance, education, income, relationship status, and race and ethnicity.

Methods

Parent Study

The current study is a secondary analysis of data from a Cancer Prevention Research Institute of Texas (CPRIT) funded [grant # PP100077 & PP120086]cancer-control intervention with The University of Texas Health Science Center at Houston (UTHealth) School of Public Health and United Way 2-1-1. Briefly, UTHealth School of Public Health (PI Fernandez) collaborated with United Way 2-1-1 to develop, deliver, and evaluate the effectiveness and cost effectiveness of a cancer-control intervention using 2-1-1 phone navigators. The parent study aims where: 1) estimate cancer control needs and prevalence of

cancer risk factors, 2) determine if cancer control navigators can increase cancer screening and prevention services for breast, colon, cervical screening, HPV vaccination, and smoking cessation, and 3) determine the cost effectiveness of using 2-1-1 navigators to increase cancer control. The parent study [HSC-SPH-10-0241] and current project [HSC-SPH-18-0478] were reviewed and approved by the UTHealth Committee for the Protection of Human Subjects.

Individuals that called 2-1-1 were screened for potential inclusion into the study. Inclusion criteria included any person 18 or older who called 2-1-1, who spoke English or Spanish, was not currently in a crisis (disaster or personal), and needing at least one cancer prevention service: fecal occult blood test (FOBT), flexible sigmoidoscopy, colonoscopy, cervical exam, breast exam, HPV vaccine, or smoking cessation. Exclusion criteria included any person younger than 18 who called 2-1-1, spoke another language other than English or Spanish, currently in crisis (disaster or personal), calling for another person or to check eligibility for state benefits, or did not need a cancer prevention service.

All eligible and consenting participants completed a baseline assessment; then were randomly assigned to general referral group or cancer control phone navigation. Participants assigned to the general referral group (usual care) got referrals for relevant screening or prevention needs. Participants assigned to the cancer control navigation received referrals plus cancer control navigation. Navigators worked collaboratively with participants to identify needs

Analytic Sample

The current study's analytic sample was drawn from the parent study baseline data (N = 1,661). Inclusion into the parent study and current study required that participants need at

least one cancer prevention service. To reduce participant burden, only some participants were asked to complete measures of perceived neighborhood problems and cancer fatalism. Therefore, some of the participants in the baseline sample had missing data for the main outcome variables of this study and were excluded. Resulting in a sample of 899 participants for this study.

Measures

Dependent variable. Cancer fatalism was assessed by the Powe Cancer Fatalism Inventory. The scale is an 11-item questionnaire assessing four aspects of cancer fatalism "predetermination, pessimism, fear and inevitable death". [24] The Powe Cancer Fatalism Inventory has been shown to be a reliable scale in prior work with African-Americans (α = 0.84) [24] and Hispanics (α = 0.81).[49] Within the current study sample the scale was found to have similar reliability for both Non-Hispanic Blacks and Hispanics (α = 0.80).

Independent variables. The neighborhood problems scale was used to assess participant's perceptions of their neighborhood quality. The neighborhood problem scale has 10-items, with responses on a 3-point Likert scale, ranging from 1 "not a problem", 2 "somewhat a problem", 3 "a problem". Participants were given a series of problems that could arise in their neighborhoods. Sample items included: "litter in the streets" and "disturbances by neighbors or youngsters". Neighborhood problems are computed by summing individual items; with higher scores indicating more neighborhood problems. The scale has been shown to have good reliability (α=0.79).[50] Within the current sample, the neighborhood problem scale had similar reliability to prior work (α=0.85).

Control variables. Education was measured by asking "What is your highest level of education?" Participants were provided with categories to select from: less than high school; high school or general equivalency diploma (GED); vocational technical (2-year associate's degree/some college); Bachelor's degree or higher [referent].

Insurance was measured by asking participants what type of insurance they had: private insurance (self-pay or employer provided), public insurance (Medicare, Medicaid), military health insurance (Tricare, Veterans Affairs, Champ-VA), Other Government Programs, or Uninsured (no insurance coverage of any type). Private and public insurance were combined [referent], and no insurance. Participants were asked if they were married, divorced, living with someone, or single. The relationship variable was recoded to married or living with someone [referent] or single.

Participants were given racial categories to select from: "White, Black or Non-Hispanic Black, American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, Vietnamese." Ethnicity was self-reported, and participants were asked if they self-identified as Hispanic, Latino, or Spanish-origin. The race variable was recoded to Non-Hispanic White [referent], Non-Hispanic Black, and Hispanic. Participants that self-identified as American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, Vietnamese were excluded from the study analysis due low representation.

Income was measured asking participants "What was your total household income in 2010?" Participants were given a range of income levels from "Under $10,000-$15,000; $15,001-$25,000; $25,001-$30,000; $30,001-$35,000; $35,000-$40,000; $40,001 or greater."

Because a majority of participants had a yearly income below $30,000, the income variable was recoded to: none-$10,000, $10,001-$20,000, $20,001 and more [referent].

Statistical Analysis

Data screening was performed on the study variables to check for missing data and to ensure cancer fatalism and neighborhood problems scales met assumptions for multiple linear regression.[51] The Cancer Fatalism Inventory and Neighborhood Scale had a slight positive skews. However, the items were not transformed, because multiple regression is a robust test to small violations of the assumption of normality.[51] Linearity and homoscedasticity were tested using scatter plots, and multicollinearity was assessed using variance inflations factor (VIF). VIF scores greater than 10 indicate issues with multicollinearity.[51] Pearson's correlations was conducted to examine the relationship between study variables and control variables. A bivariate linear regression was used to assess the direct relationship between perceived neighborhood problems and cancer fatalism. Then a multiple regression was conducted to test the association between perceived neighborhood problems and cancer fatalism, control for the effects of race and ethnicity and income, education, insurance status, marital status, and employment. Stata/SE 15.1 was used for all analyses.

Results

Among the sample of 899 211 callers, a majority were women (93.7%) and either unmarried or not in a current relationship (73.1%). The average age was 42 (M= 41.4, SD = 13.0). About half of the sample had a least a high school diploma or GED (45.9%) and a

yearly income under $15,000 (70.1%). More than half of the sample had no insurance (52.0%).

Pearson's correlations were performed to assess the relationship between cancer fatalism and perceived neighborhood problems. There was a small positive correlation between perceived neighborhood problems and cancer fatalism, (r= 0.25, $p < 0.01$). Bivariate results are presented in Table 1. The results indicated that Non-Hispanic Black participants were less likely to be screened for colorectal, cervical, and breast cancer than Non-Hispanic Whites or Hispanics. There was also a significant difference between participants with insurance and no insurance across all types of cancer screening. Bivariate linear regression showed that perceived neighborhood problems significantly predicted cancer fatalism [R^2 = .12, $F(1, 897) = 122.81$, $p < 0.0001$], explaining 34% of the variance of cancer fatalism.

To address the main study aim, a simultaneous multiple regression was performed, adjusting for income, education, insurance, relationship status, and race and ethnicity. Perceived neighborhood problems association with cancer fatalism remained significant [R^2 = .21, $F(11, 563) = 13.09$, $p < 0.0001$], and accounted for 33% of the variability in cancer fatalism. Standardized and unstandardized regression coefficients are presented in Table 3

Discussion

The aim of this study was to examine the association between perceived neighborhood problems and cancer fatalism. Perceived neighborhood problems were significantly associated with cancer fatalism. This finding is important because low-income and minority people are often left with little choice but to live in segregated overcrowded neighborhoods, which exposes them to interpersonal crime (e.g., robberies, assaults), social disorganization,

and environmental contaminants.[5,36,37,50,52-57] These harsh living conditions potentially constrain people's beliefs that they can modify their lives, or modify their health. Several studies have found that poverty is associated with the fatalistic beliefs.[10,20,28,31,32] In this study, we controlled for demographic variables such as income and insurance and the relationship between perceived neighborhood problems and cancer fatalism remained. This indicates perceived neighborhood problems are independently associated with cancer fatalism. While we cannot say that perceived neighborhood problems lead to the construction of fatalistic beliefs, the results do suggest that poor environmental conditions may have a role in fatalistic beliefs.

Perceived neighborhood problems[38,39] and cancer fatalism[10,20,24,30] and have both been independently linked to lower utilization of cancer prevention services. However, what is not well understood is how fatalistic beliefs are established. Some conceptualizations of fatalism imply that it is a social construction primarily influenced by culture and family. The current study proposes that exposure to poor neighborhood conditions can also potentially lead to the development of fatalistic beliefs. Since fatalistic beliefs negatively influence cancer screening, a thorough understanding of what influences these beliefs is a key step in the development of interventions to increase screening. This is the first study to establish a relationship between perceived neighborhood problems and cancer fatalism.

These novel findings can potentially aid in the development of cancer prevention programs for low-income communities. Understanding how individuals' perceptions of their neighborhoods are associated with cancer fatalism is essential in understanding the

mechanisms for how neighborhood conditions may influence cancer screening.[10,20] This understanding can inform the development of cancer prevention programs.

Limitations

A major limitation to the current study is the use of cross-sectional data, which limits our ability to make causal inferences about the relation between perceived neighborhood problems and cancer fatalism. Prior cross-sectional studies suggest that harsh living conditions were associated with feelings of vulnerability,[40-42,47,58-62] we cannot say that perceived neighborhood problems lead to the development of fatalistic beliefs about cancer screening. Future studies should collect longitudinal data to determine if perceived neighborhood problems contribute to the development of cancer fatalism. Another limitation is that our study may have failed to assess other important factors influencing both perceived neighborhood and cancer fatalism. For example, Bustillo and colleagues (2017) found that medical mistrust was associated with fatalistic attitudes about cancer.[4,63] Therefore, future studies should explore other potential factors that are associated with fatalism.

Another limitation of the current study is that to be included in the study, participants were required to need at least one-cancer control service to be included. Thus, the sample includes only individuals who were non-adherent to at least one cancer screening and may not represent the larger population which would include adherent and non-adherent individuals. Finally, the study controlled for race and ethnicity. Prior work has shown that cancer fatalism differs by race and ethnicity.[8] Future studies should explore the differences between racial and ethnic groups.

Conclusion

In summary, the current study found that perceived neighborhood problems were associated with cancer fatalism. The study is an important contribution to the cancer literature because it begins to explore the mechanisms that potentially contribute to fatalistic beliefs. Powe (1996, 1997, 2003) has asserted that fatalistic beliefs are potentially modifiable by tailoring interventions that focus on community empowerment. Therefore, interventionists should consider influence of perceived neighborhood problems when developing cancer control programs, and work with community partners to build community efficacy to reduce fatalistic beliefs.[64]

Table 1. Regression analysis summary for perceived neighborhood problems predicting cancer fatalism (n = 568)

Variable	B	*SE* B	t	*p*	95% CI	
PNP	2.30	0.24	9.44	0.00	1.82	2.77
Insurance	-0.38	0.27	-1.40	0.16	-0.91	0.15
Income						
None to $10,000	0.11	0.38	0.29	0.77	-0.65	0.88
$10,000 to $20,000	0.11	0.39	0.29	0.77	-0.65	0.87
Education						
Less than HS	-0.59	0.82	-0.71	0.48	-2.20	1.03
HS or GED	-0.62	0.80	-0.78	0.44	-2.20	0.95
Some College	-0.16	0.80	-0.20	0.84	-1.74	1.42
Employment						
Unemployed	0.91	0.28	3.27	0.00	0.36	1.46
Relationship Status						
Race and Ethnicity	0.19	0.29	0.67	0.51	-0.38	0.76
Hispanic	-1.92	0.50	-3.79	0.00	-2.91	-0.92
Non-Hispanic Black	-0.54	0.49	-1.11	0.27	-1.50	0.42

R^2 = .21. *p < .05. **p < .01. ***p < .001.

Note: PNP is perceived neigbhorhood problems. Insurance referent group no insurance. Income was measured in 2011, referent group was $20,000 or more. Education referent group was bachelor's degree or higher. Employment referent group was employed full-time. Relationship referent group was married/living with someone. Race/Ethnicity referent group was Non-Latino White.

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JOURNAL ARTICLE 3

Perceptions of discrimination and cancer screening.

Cancer Causes Control

Abstract

The published literature includes mixed results about the association between perceptions of discrimination and cancer screening. Thus, the purpose of this study was to examine the independent effects of perceived medical and interpersonal discrimination on colorectal, cervical, and breast screening. The current study was a cross-sectional analysis of baseline data from a larger study testing the effects of cancer control phone navigation on increasing cancer control behaviors among 2-1-1 callers. We used logistic regression to examine the relationship between perceived interpersonal and medical discrimination and colorectal, cervical, and breast screening, adjusting for individual-level SES and demographics. Perceived medical discrimination was associated with a reduced likelihood of being screened for colorectal cancer screening (OR=0.59; 95% CI 0.31, 0.99), but not cervical or breast cancer screening. Perceived interpersonal discrimination was not associated with colorectal, cervical, and breast screening. Additionally, participants that had insurance had higher odds of being screened for cervical cancer (aOR= 2.33, 95% CI = 1.79, 3.03), breast cancer (aOR= 5.84, 95% CI = 3.72, 9.17), and colorectal cancer (aOR= 0.28, 98% CI= 0.14, 0.55). The results suggest that perceptions of discrimination may be contextually dependent when examining cancer screening.

Introduction

Cancer mortality continues to disproportionally affect Non-Hispanic Black and

Hispanic.[1-3] The 2017 Texas Cancer report (data collected from 2010 – 2014) found that Non-Hispanic Black men and women had a 14% higher cancer mortality rate compared to Non-Hispanic white men and women (death rate ratio, 1.14; 95% CI: 1.13 - 1.15).[4] Hispanic women also continue to have higher cervical cancer mortality rates, compared to White women.[5] Cancer mortality is largely attributed to lower uptake of cancer prevention services (i.e., cancer screening).[6-12]

Regular cancer screening can reduce cancer mortality through the early detection of cancer precursors,[5] which improve 5-year survival rates.[13] The U.S. Preventive Services Task Force (USPSTF) published cancer recommendations. For colorectal cancer, USPSTF recommends adult men and women ages 50-75 obtain a fecal occult blood test annually, flexible sigmoidoscopy every 5 years or 10 years with a fecal immunochemical test every year, or colonoscopy every 10 years. For cervical cancer, women ages 21-65 have a cytology every 3 years, and for breast cancer, women ages 50-74 have a breast screening biennially.[14]

Across the cancer literature attention is being focused on the role of racial discrimination as a barrier to cancer screening.[15-22] Discrimination, real or perceived, is unfair treatment at an interpersonal level (racial or discriminatory interactions between persons), medical level (discrimination by a healthcare provider or within a healthcare system) and system level (workplace, governmental policies, and laws).[23-25]

While some researchers report associations between discrimination and lower rates of colorectal, cervical, and breast cancer screening,[20,26-28] other researchers report no association.[9,29-33] The literature remains mixed if perceptions of discrimination have an independent effect on cancer screening.[22,34,35] Those researchers finding no association

between discrimination and cancer screening suggest that income, education, and health insurance better explained adherence to fecal occult blood (FOBT) tests,[33] colonoscopy/sigmoidoscopy, [36] and cervical screening.[26] These conflicting results across the literature suggest that we do not fully understand how perceptions of discrimination are related to cancer screening.

A potential reason the perceived discrimination literature remains mixed is related to its measurement. Perceived discrimination is often measured as general or everyday discrimination,[21,27,30-33,37-43] which potentially assumes that discrimination is interpreted uniformly. While prolonged exposure to racial discrimination can lead to a sustained process of internalized negative beliefs,[44,45] and a heightened stress response,[18,21,30,46] there is limited evidence that perceptions of discrimination are interpreted uniformly. Instead it is possible that perceptions of discrimination are contextually dependent; wherein individuals' interpretations of discriminatory acts in a healthcare setting may have a larger impact on cancer screening than interpretations of discriminatory acts in a non-healthcare setting.[19] Thus it is important to assess the influence of perceived discrimination in specific contexts.

There are no published studies that distinguish between distinct types of discrimination in relation to cancer screening. Therefore, the aim of the study was to examine how perceived medical and interpersonal discrimination are independently associated with cancer screening.

Methods

Study Design.

The current study is a secondary analysis of data from a Cancer Prevention Research Institute of Texas (CPRIT) funded [grant # PP100077 & PP120086] cancer-control

intervention with The University of Texas Health Science Center at Houston (UTHealth) School of Public Health and United Way 2-1-1. Briefly, UTHealth School of Public Health (PI Fernandez) collaborated with United Way 2-1-1 to develop, deliver, and evaluate the effectiveness and cost effectiveness of a cancer-control intervention using 2-1-1 phone navigators. The parent study aims where: 1) estimate cancer control needs and prevalence of cancer risk factors, 2) determine if cancer control navigators can increase cancer screening and prevention services for breast, colon, cervical screening, HPV vaccination, and smoking cessation, and 3) determine the cost effectiveness of using 2-1-1 navigators to increase cancer control. The parent study [HSC-SPH-10-0241] and current project [HSC-SPH-18-0478] were reviewed and approved by the UTHealth Committee for the Protection of Human Subjects.

Individuals that called 2-1-1 were screened for potential inclusion into the study. Inclusion criteria included any person 18 or older who called 2-1-1, who spoke English or Spanish, was not currently in a crisis (disaster or personal), and needing at least one cancer prevention service: fecal occult blood test (FOBT), flexible sigmoidoscopy, colonoscopy, cervical exam, breast exam, HPV vaccine, or smoking cessation. Exclusion criteria included any person younger than 18 who called 2-1-1, spoke another language other than English or Spanish, currently in crisis (disaster or personal), calling for another person or to check eligibility for state benefits, or did not need a cancer prevention service.

All eligible and consenting participants completed a baseline assessment; then were randomly assigned to general referral group or cancer control phone navigation. Participants assigned to the general referral group (usual care) got referrals for relevant screening or prevention needs. Participants assigned to the cancer control navigation received referrals

plus cancer control navigation. Navigators worked collaboratively with participants to identify needs and barriers to services; and helped to coordinate solutions, such as making appointments.

Analytic Sample

The current study's analytic sample came from the parent study baseline data (N= 1,661). Not all baseline participants responded to the discrimination scale; it formed part of the initial baseline questionnaire but was subsequently omitted to reduce participant burden. Only participants who had responded to the discrimination scale are included in the current study, resulting in a sample of 1,113.

Measures

Dependent variables. Cancer screening variables were coded using USPSTF 2010 cancer screening guideliness. Colorectal cancer screening (CRCS) was measured by asking participants when was their most recent last colonoscopy, sigmoidoscopy, or fecal occult blood test (FOB), cervical (Pap smear), or breast (breast) screening. Men and women age 50 and older who had never had a sigmoidoscopy, colonoscopy or FOBT; or had not had sigmoidoscopy in the last 5 years, or a colonoscopy in the last 10 years, or had no FOBT in the last year were coded as unscreened (which included those never screened and those overdue for CRCS). (0). Participants that reported having either a sigmoidoscopy in the last 5 years, colonoscopy in the last 10 years, or FOBT in the last year were coded as screened (1).

For breast, women 40 years or older who had never had a mammogram or were not sure; or not had one within the past year were coded as not screened (0). Participants that had a mammogram in the last year were coded as screened (1).

For cervical cancer screening (Pap), women 18 years of age or older; who never had a Pap test or not sure, or had been previously tested, but not in the last year were coded as not screened (0). Women 18 years of age or older that had a Pap test in the previous year were coded as screened (1). Cervical cancer screening was lowered to capture women aged 18 to 20.

Independent Variable. The independent variables of perceived interpersonal and medical discrimination were two items from Krieger and colleagues (2005) perceived racial and ethnic discrimination scale.[23] The items assessed if participants had experienced or perceived racial or ethnic discrimination at an interpersonal or medical level in the last 5 years (yes or no).[19] Interpersonal discrimination was measured by asking if participants had experienced racial discrimination "While on the street or in public setting?" Medical discrimination was measured by asking if participants had experienced racial discrimination "Accessing or while getting medical care?"

Control Variables. Insurance was measured by asking participants what type of insurance they had: private insurance (self-pay or employer provided), public insurance (Medicare, Medicaid), military health insurance (Tricare, Veterans Affairs, Champ-VA), Other Government Programs, or Uninsured (no insurance coverage of any type). Private and public insurance was combined [referent], and no insurance.

Race was self-reported, and participants were given racial categories to select from: "White, Black or Non-Hispanic Black, American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, Vietnamese." Ethnicity was self-reported, and participants were asked if they self-identified as Hispanic, Latino, or Spanish-origin. The race variable was recoded to

Non-Hispanic White [referent], Non-Hispanic Blacks, and Hispanic. Participants that self-identified as American Indian or Alaska Native, Chinese, Filipino, Japanese, Korean, Vietnamese were excluded from the study analysis due to small representation.

Education was measured by asking "What is your highest level of education?" Participants were provided with categories to select from: less than high school; high school or general equivalency diploma (GED); Vocational technical (2-year Associates degree/some college); Bachelor's degree or higher [referent].

Income was measured asking participants "What was your total household income in 2010?" Participants were given a range of income levels from "Under $10,000-$15,000; $15,001-$25,000; $25,001- $30,000, $30,001- $35,000, $35,000- $40,000, $40,001 or greater." Because a majority of participants had a yearly income below $30,000, the income variable was recoded to: none-$10,000, $10,001-$20,000, $20,001 and more [referent].

Statistical Analysis

Descriptive statistics were calculated separately for participants that were not screened for colorectal, cervical, and breast screening. Chi-square tests (χ^2) of independence were used to examine the relation between participants that were screened or not screed for cancer, demographics characteristics, interpersonal and medical discrimination. To address the main study aim, unadjusted logistic regressions were performed to test the direct association between perceived interpersonal and medical racial discrimination on colorectal, cervical, and breast. Then, adjusted multivariate logistic regression models were fitted to

control for the effects of education, insurance, and income. All data was analyzed using Stata version 15.1.[47]

Results

Demographic characteristics are presented in Table 1. Participants eligible for colorectal cancer were majority Non-Hispanic Black (59%) and majority women (87%). More than half of the sub-sample had no insurance (60%), and 38% had a high school degree or GED. Participants eligible for cervical cancer were majority for cervical cancer were majority Hispanic women (48%) and Non-Hispanic Black women (44%), did not have insurance (63%), and had a high school degree or GED (46%). Participants eligible for breast cancer were majority Hispanic women (40%) and Non-Hispanic Black women (49%), did not have insurance (57%), and had a high school degree or GED (45%). Non-Hispanic Black participants reported greater perceived medical racial discrimination (25.0%) than Hispanic participants (11.1%), but Hispanics reported greater interpersonal discrimination (92.4%) than Non-Hispanic Black participants (69.1%).

Bivariate results are presented in Table 2. The results indicated that Non-Hispanic Black participants were less likely to be screened for colorectal, cervical, and breast cancer than Non-Hispanic Whites or Hispanics. There was also a significant difference between participants with insurance and no insurance across all types of cancer screening.

The unadjusted odds ratios indicated that there were no significant associations between perceived medical or interpersonal discrimination and cancer screening (Tables 3-7). When insurance, income, and education were entered into the logistic regression models, perceived medical discrimination was associated with lower odds of colorectal cancer

screening (aOR=0.59; 95% CI 0.31, 0.99), but not cervical or breast screening. Adjusted odds ratios showed that perceived interpersonal discrimination was not associated with colorectal, cervical or breast screening. Participants that had insurance had higher odds of being screened for cervical cancer (aOR= 2.33, 95% CI = 1.79, 3.03), breast cancer (aOR= 5.84, 95% CI = 3.72, 9.17), and colorectal cancer (aOR= 0.28, 98% CI= 0.14, 0.55).

Discussion

The aim of the study was to examine the association between perceived medical and interpersonal discrimination on colorectal, cervical, and breast cancer screening. Perceived medical discrimination was found to be associated with colorectal cancer screening, but not cervical or breast cancer screening. This finding partially supports the hypothesis that medical discrimination is associated with colorectal screening. Interpersonal discrimination was not found to be associated with cancer screening.

The lack of association between medical discrimination and cervical or breast screening is not consistent with prior evidence, which has shown that perceived medical discrimination was associated with lower odds of being screened for breast, and cervical screening.[26] There are a two possible explanations for the current study findings. First, it is possible explanation of differences in our findings as compared to others is that our sample was made up primarily of women. Past evidence has suggested that men and women have different interpretations of discriminatory acts.[23,48] Women have been found to underestimate encounters with discrimination, leading to lower reports of racial discrimination.[49] It is possible that women interpret discrimination as gender bias, which may account for lower utilization of cervical and breast screening. Within the context of the study's current findings, this may potentially

explain why medical discrimination was not related to cervical or breast screening. Future research should examine the connection between perceptions of gender bias and discrimination.

Second, the current study did not account for the effect of coping strategies and social support. Since perceived racial discrimination has been conceptualized as a source of chronic stress;[50-52] having coping strategies and social support may buffer the effects of discrimination.[37] For instance, Flores et al (2008) and Park et al (2018) found that coping strategies and social support moderated the effects of discrimination on self-rated health. Thus, future studies should consider the effects of coping strategies and social support when examining the association between perceived discrimination and cancer screening.

Perceived medical discrimination was associated with a reduced likelihood of being screened for colorectal cancer. This finding is consistent with past findings that found that perceived medical discrimination was associated with cancer screening.[9] For instance, Byrd and colleagues (2007) found that lower utilization of cervical screenings was associated with ethnic insensitivity by doctors. The study results support the need for researchers to clearly define the type discrimination people are experiencing when examining the association between perceptions of discrimination and cancer screening. Future studies should continue to explore the context in which discrimination occurs to fully understand the effect perceptions of discrimination have on cervical and breast cancer screening.

Limitations

The results of the study should be interpreted considering the following limitations. First, all the study measures were self-reported, which is subject to recall, disclosure, and

interpretation bias.[23] This bias is particularly important because perceptions of discrimination are based on *post-hoc* interpretations of discriminatory acts.[25] Recall bias limits our ability to determine if participants accurately or completely recollect past interactions with physicians. It is possible that participant's recollections have changed over time, or have potentially been influenced by current life events.

Second, there currently is no gold standard for measuring perceptions of discrimination. Krieger and colleagues recommend using multi-item measures of discrimination, but there is no evidence suggesting the number of items needed to accurately assess perceptions of discrimination. However, since we did use single items to measure perceptions of medical and interpersonal discrimination, it is difficult to determine the precision and reliability of the items.

Third, the current study cannot account for the potential influence of physician recommendation on cancer screening. Physician recommendation has been found to be highly predictive of being screened for cancer, especially in minority communities.[53-55] Moreover, prior evidence has shown that women are less likely to receive physician recommendations for cancer screening. It is possible that individuals interpret not receiving a recommendation for screening as a discriminatory act. Future studies should examine how individual interpret not receiving a physician recommendation.

Finally, the current study sample consisted mostly of women. It is possible that men contextualize discrimination differently from women, and have different responses.[56] For example, Borrell and colleagues found that the association between discrimination and self-rated health was stronger for men than women.[57] Therefore, we cannot conclude that

discrimination is experienced or internalized in the same way among men and women.

Conclusion

While additional research on the association between context and perceived discrimination is necessary, our findings provide evidence that perceived medical discrimination is associated with lower colorectal cancer screening. This may indicate the need to develop provider and clinic staff interventions that focus on cultural competency and reductions in discriminatory beliefs and actions. This could potentially increase cancer prevention services for minority men and women.

Table 1. Demographic and socioeconomic characteristics of Houston 2-1-1 callers not screened for colorectal, cervical, and breast cancer.

Variables	Colorectal (*n*=316) n (%)	Cervical (*n*=984) n (%)	Breast (*n*=594) n (%)
Gender			
Male	39 (12.3)	572 (100)	594 (100)
Female	277 (87.7)	-	-
Race and Ethnicity			
Non-Hispanic White	30 (11.0)	71 (9.0)	54 (10.4)
Hispanic	81 (30.0)	395 (48.0)	209 (40.4)
Non-Hispanic Black	161 (59.2)	363 (44.0)	254 (49.1)
Insurance coverage			
Public/Private	125 (40.0)	359 (37.0)	258 (44.0)
No insurance	190 (60.3)	623 (63.4)	335 (57.0)
Education			
Less than HS	82 (26.0)	235 (24.0)	134 (23.0)
HS or GED	121 (38.4)	451 (46.0)	267 (45.2)
Voc/Tech (AA)/Some college	99 (31.4)	261 (27.0)	164 (28.0)
BA or above	13 (4.1)	33 (3.4)	26 (4.4)
Income			
None – $10,000	163(54.0)	462 (50.0)	104 (47.0)
$10,001 - $20,000	99 (32.7)	336 (36.3)	84 (38.0)
$20,001 or More	41 (14.0)	129 (14.0)	35 (16.0)

Note: Income was measures in 2010. Voc is vocational school, Tech is technical school

Table 2. Bivariate associations between participant characteristics and not being screened for colorectal, cervical, and breast cancer among a sub-sample of 2-1-1 callers.

Characteristics	Screened N (%)	Not Screened N (%)	χ^2
Colorectal Screening (*n* = 316)			
Sex			
Male	16 (19.2)	39 (12.3)	1.11
Female	158 (91.0)	277 (88.0)	
Race and Ethnicity			
Non-Hispanic White	18 (11.5)	30 (11.0)	15.19**
Hispanic	21 (13.38)	81 (30.0)	
Non-Hispanic Black	118 (75.2)	161 (59.2)	
Insurance			
No insurance	31 (17.8)	125 (39.3)	24.67**
Public/Private	143 (82.1)	190 (60.3)	
Education			
Less than HS	39 (22.4)	82 (26.0)	4.64
HS or GED	68 (39.1)	121 (38.4)	
Voc/Tech/Some college	52 (30.0)	99 (31.4)	
BA or above	15 (9.0)	13 (4.1)	
Cervical Screening (*n* = 984)			
Race and Ethnicity			
Non-Hispanic White	36 (7.3)	71 (9.0)	11.84**
Hispanic	193 (39.15)	395 (48.0)	
Non-Hispanic Black	264 (54.0)	363 (44.0)	
Insurance			
No insurance	240 (42.0)	623 (63.4)	67.03**
Public/Private	331 (58.0)	359 (36.56	
Education			
Less than HS	235 (24.0)	132 (23.2)	0.36
HS or GED	451 (46.0)	263 (46.1)	
Voc/Tech/Some college	261 (27.0)	153 (27.0)	
BA or above	33 (3.4)	22 (4.0)	
Breast Screening (*n* = 594)			
Race and Ethnicity			
Non-Hispanic White	54 (10.4)	18 (9.0)	14.00**
Hispanic	209 (40.4)	56 (27.1)	
Non-Hispanic Black	254 (49.1)	133 (64.3)	

Insurance			
Public/Private	184 (79.0)	335 (56.5)	83.20**
No insurance	50 (21.4)	258 (43.51)	
Education			
Less than HS	134 (23.0)	70 (30.4)	7.95*
HS or GED	267 (45.2)	82 (35.2)	
Voc/Tech/Some college	164 (28.0)	70 (30.0)	
BA or above	26 (4.4)	11 (5.0)	
Perceived interpersonal discrimination x Colorectal Cancer Screening			
No	162 (77.1)	74 (71.8)	1.04
Yes	48 (23.0)	29 (28.2)	
Perceived interpersonal discrimination x Cervical Cancer Screening			
No	321 (80.5)	568 (80.0)	0.10
Yes	78 (20.0)	145 (20.3)	
Perceived interpersonal discrimination x Breast Cancer Screening			
No	123 (75.0)	322 (81.1)	2.64
Yes	41 (25.0)	75 (19.0)	
Perceived medical discrimination x Colorectal Cancer Screening			
No	70 (68.0)	165 (78.2)	3.85*
Yes	33 (32.0)	46 (21.8)	
Perceived medical discrimination x Cervical Cancer Screening			
No	331 (83.0)	565 (79.1)	2.39
Yes	68 (17.0)	149 (21.0)	
Perceived medical discrimination x Breast Cancer Screening			
No	131 (78.4)	301 (76.4)	0.60
Yes	36 (22.0)	93 (23..6)	

*p < .05 **p < .001. Note: Income was measures in 2010. Voc is vocational school, Tech is technical school.

Table 3. Odds Ratio and Adjusted Odds Ratios of the association between perceived medical discrimination and colorectal cancer screening (N=314).

Variables	OR	aOR
Perceived medical discrimination	0.61 (0.36, 1.01)	0.55* (0.31, 0.99)
Insurance	0.33** (0.21, 0.52)	0.28** (0.14, 0.55)
Income		
None-$10,000	1.69 (0.99, 2.90)	0.33 (0.04, 2.89)
$10,000 - $20,000	1.28 (0.73, 2.26)	0.33 (0.04, 2.90)
Education		
Less than HS	1.10 (0.66, 1.84)	0.82 (0.41, 1.62)
HS or GED	0.93 (0.60, 1.46)	1.04 (0.50, 2.20)
Some College	0.45 (0.20, 1.03)	0.42 (0.14, 1.26)

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

Table 4. Odds Ratio and Adjusted Odds Ratios of the association between perceived medical discrimination and cervical cancer screening (N= 1113).

Variables	OR	aOR
Perceived medical discrimination	1.14 (0.82, 1.50)	0.72 (0.51, 1.00)
Insurance	2.40** (1.94, 2.95)	2.33** (1.79, 3.03)
Income		
None-$10,000	0.84 (0.61, 1.15)	0.63 (0.34, 1.16)
$10,000 - $20,000	0.98 (0.71, 1.35)	0.78 (0.41, 1.47)
Education		
Less than HS	0.96 (0.72, 1.28)	1.06 (0.76, 1.47)
HS or GED	0.99 (0.77, 1.28)	0.98 (0.68, 1.43)
Some College	1.14 (0.64, 2.02)	1.08 (0.53, 2.24)

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

Table 5. Odds Ratio and Adjusted Odds Ratios of the association between perceived medical discrimination and breast cancer screening (N=561).

Variables	OR	aOR
Perceived medical discrimination	0.88 (0.58, 1.38)	0.83 (0.51, 1.34)
Insurance	4.77** (3.25, 6.79)	5.84** (3.72, 9.17)
Income		
None-$10,000	0.92 (0.63, 1.24)	0.97 (0.29, 3.28)
$10,000 - $20,000	0.92 (0.63, 1.24)	1.12 (0.32, 3.85)
Education		
Less than HS	1.22 (0.82, 1.83)	0.64 (0.38, 1.07)
HS or GED	0.72 (0.50, 1.04)	0.81 (0.46, 1.43)
Some College	0.99 (0.46, 2.11)	0.50 (0.17, 1.43)

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

Table 6. Odds Ratio and Adjusted Odds Ratios of the association between perceived interpersonal discrimination and colorectal cancer screening (N=313).

Variables	OR	aOR
Perceived interpersonal discrimination	1.35 (0.82, 2.22)	1.38 (0.81, 2.37)
Insurance	0.33** (0.21, 0.52)	0.28** (0.15, 0.53)
Income		
None-$10,000	1.69 (0.99, 2.90)	0.35 (0.04, 3.01)
$10,000 -$20,000	1.29 (0.73, 2.26)	0.36 (0.04, 3.18)
Education		
Less than HS	1.10 (0.66, 1.83)	0.82 (0.41, 1.65)
HS or GED	0.93 (0.60, 1.46)	1.07 (0.51, 2.25)
Some College	0.45 (0.20, 1.03)	0.50 (0.17, 1.46)
Race/Ethnicity		

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

Table 7. Odds Ratio and Adjusted Odds Ratios of the association between perceived interpersonal discrimination and cervical cancer screening (N= 1112).

Variables	OR	aOR
Perceived interpersonal discrimination	0.99 (0.775, 1.30)	1.06 (0.76, 1.47)
Insurance	2.39** (1.94, 2.95)	2.25** (1.73, 2.93)
Income		
None-$10,000	0.84 (0.62, 1.15)	0.61 (0.33, 1.11)
$10,000 - $20,000	0.98 (0.70, 1.26)	0.77 (0.41, 1.45)
Education		
Less than HS	0.96 (0.72, 1.28)	1.08 (0.78, 1.51)
HS or GED	0.99 (0.77, 1.27)	1.02 (0.69, 1.47)
Some College	1.14 (0.64, 2.02)	1.02 (0.49, 2.11)

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

Table 8. Odds Ratio and Adjusted Odds Ratios of the association between perceived interpersonal discrimination and breast cancer screening (N=561).

Variables	OR	aOR
Perceived interpersonal discrimination	0.75 (0.50, 1.11)	0.82 (0.50, 1.34)
Insurance	4.78** (3.35, 6.80)	5.71** (3.64, 8.98)
Income		
None-$10,000	0.89 (0.56, 1.40)	1.02 (0.30, 3.43)
$10,000 -$20,000	1.03 (0.64, 1.64)	0.80 (0.45, 1.42)
Education		
Less than HS	1.22 (0.82, 1.83)	0.66 (0.39, 1.11)
HS or GED	0.72 (0.50, 1.04)	0.80 (0.45, 1.42)
Some College	0.99 (0.46, 2.11)	0.46 (0.15, 1.35)

*p < .05 **p < .001.

Note: Insurance referent group no insurance. Income referent group is $20,000 and more. Education referent group was bachelor's degree or higher. Race/Ethnicity referent group was Non-Hispanic White.

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CONCLUSION

Increasing cancer screening is essential to lowering cancer mortality. [2,4,5,19] However, cancer mortality rates continue to disproportionately affect minorities, compared to Whites.[65-68] Non-Hispanic Blacks have a mortality rate 25% higher than Non-Hispanic Whites, and Latinas have the highest cervical cancer incidence and mortality rates compared to non-Latina Whites.[2,4,19] Cancer morality disparity is largely explained by lower lifetime screening rates among minority men and women.[4,54,66,69] According to data from the Behavioral Risk Factor Surveillance System (2014), Hispanics and Non-Hispanic Blacks had lower cancer screening rates, compared to Non-Hispanic Whites.[54] Thus, the aim of this dissertation was to explore the factors that contribute to lower cancer screening rates among a community of United Way 2-1-1 callers.

The aim of paper 1 was to examine the association between perceived neighborhood problems and colorectal, cervical and breast cancer screening. The results of the multivariate logistic regression suggested perceived neighborhood problems were not associated with colorectal, cervical, or breast screening. The only statistically significant variable associated with being screened was having health insurance. This finding is consistent with prior literature showing that access to health insurance is associated with higher cancer screening rates. Policy makers should continue to focus on increasing access to affordable insurance to ensure individuals get screened for cancer. Additionally, future projects should continue to explore how perceptions of environmental conditions shape low-income community members behavior.

The aim of paper 2 was to examine if perceived neighborhood problems were associated

with cancer fatalism, while controlling for the influence of insurance, education, income, relationship status, and race and ethnicity. Perceived neighborhood problems accounted for 36% of the variability in cancer fatalism, controlling for SES and demographics. The result provide insight into factors that are related to caner fatalism. Interventions should account the influence of perceived neighborhood problems having on the construction of health beliefs when developing cancer control program.

The aim of paper 3 was to examine how perceived medical and interpersonal discrimination are independently associated with cancer screening. It was hypothesized that perceived medical discrimination would be associated with colorectal, cervical, and breast cancer screening, controlling for insurance, education, and income. It was also hypothesized that perceived interpersonal discrimination would not be associated with colorectal, cervical, and breast cancer screening, controlling for insurance, education, and income. Perceived medical discrimination was associated with a reduced likelihood of being screened for colorectal cancer screening, but not cervical or breast cancer screening. Perceived interpersonal discrimination was not associated with colorectal, cervical, and breast cancer screening. Participants with insurance had higher odds of being screened for cancer. The results highlighted the importance of examining perceptions of discrimination in the context it occurred. Because the first hypothesis was not fully supported, more research is needed to understand how medical discrimination is related to cervical and breast cancer screening. It is recommended that researchers examine how gender and perceived discrimination is related to cervical and breast cancer screening.

Implications for Research, Policy and Practice

Access cancer screening is difficult for low-income individuals because they have limited resources. It is essential that we continue to examine factors contributing to lower cancer screening rates for low-income minorities. The results of this dissertation contribute to researcher and policy by showing that socioeconomic status, perceived discrimination, and perceived neighborhood problems help explain differences in rates of cancer screening. While perceived neighborhood problems were not related to cancer screening, the relationship with cancer fatalism suggest that perceptions of harsh environmental conditions potentially contribute to cancer disparities. Researchers should continue to explore how exposure to harsh environmental conditions shape individual's beliefs and behaviors. Understanding this relationship will allow for the development of community-based support program help to reduce the effects of harsh environmental conditions and increase access to cancer prevention services.[66,67]

The continued growth of ethnically and low-income communities poses a significant challenge to healthcare providers culturally competent care. The results of this dissertation suggest that medical discrimination, real or perceived, was related to lower odds of being screened for colorectal cancer. Thus, it is recommended that we focus on creating policy and programs that target cultural competency of physicians. Cultural competency is key in providing quality health care and increasing access to preventive services for low-income minority communities. Physicians that are culturally competent can potentially reduce cancer disparities for low-income minority communities.

There is a need to continue to explore the connection between perceived environmental

factors and cancer screening uptake. Future research is needed to fully explore the effects of neighborhood conditions on cancer prevention behaviors, which could facilitate the development of cancer prevention programs targeting low-income individuals. Public policy needs to continue to increase programs that increase access to health insurance. By increasing access to health insurance, low-income individuals potentially have greater access to cancer control services.

APPENDICES

Appendix A: Perceived Neighborhood Problems Scale

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1 “Not a problem” 2 “Somewhat a problem” 3 “Serious problem”

1. Litter in the streets
2. Smell and fumes
3. Walking around after dark
4. Noise from traffic or other homes
5. Lack of entertainment (cafes, movie theaters, bars, etc.)
6. Traffic and road safety
7. Places to shop
8. Vandalism
9. Disturbances by neighbors or youngsters

Appendix B: Acculturation scale

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1 “Only Spanish” 2 “More Spanish than English” 3 “Both Equally” 4 “More English than Spanish” 5 “Only English”

10. In general, what language do you read and speak?
11. What was the language(s) you used as a child?
12. What language(s) do you usually speak at home?
13. In which language(s) do you usually think?
14. What languages(s) do you usually speak with your friends?

Appendix C: Powe Cancer Fatalism Inventory

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1 “Yes” 2 “No” 3 “Don’t know”

1. If someone has cancer, it is already too late to do anything about it.
2. Someone can smoke all her life, and if he or she is not meant to get cancer, they won’t get it?
3. If someone is meant to get cancer, he or she will get it no matter what they do.
4. If someone gets cancer it was meant to be.
5. If someone gets cancer, that’s the way he or she was meant to die.
6. Getting checked for cancer makes people think about dying.
7. Some people don’t want to know they have cancer because they don’t want to know they are dying.
8. If someone gets cancer, it doesn’t matter when he or she finds out about it, they will still die.
9. If someone gets cancer, a lot of different treatments don’t make any difference.
10. If someone is meant to have cancer, it doesn’t matter what the doctors tell him or her to do, they will still get cancer anyway.
11. Cancer kills most people who get it.

Appendix D: UTHealth Committee for the Protection of Human Subjects approval letter

[HSC-SPH-18-0478]

Committee for the Protection of Human Subjects
6410 Fannin Street, Suite 1100
Houston, Texas 77030

Dr. Jayson Rhoton
UT-H - SPH - Health Promotion & Behavioral Science

June 11, 2018 HSC-SPH-18-0478 - *A secondary analysis exploring personal and environmental determinants for cancer screening.*

The above-named project is determined to qualify for exempt status according to 45 CFR 46.101(b)

***CATEGORY #4** : Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.*

CHANGES: Should you choose to make any changes to the protocol that would involve the inclusion of human subjects or identified data from humans, please submit the change via iRIS to the Committee for the Protection of Human Subjects for review.

INFORMED CONSENT DETERMINATION:

Waiver of Consent Granted

HEALTH INSURANCE PORTABILITY and ACCOUNTABILITY ACT (HIPAA):

Exempt from HIPAA

STUDY CLOSURES: Upon completion of your project, submission of a study closure report is required. The study closure report should be submitted once all data has been collected and analyzed.

Should you have any questions, please contact the Office of Research Support Committees at 713-500-7943.

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