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Colorectal Cancer Screening Uptake's Association with Psychosocial and Sociodemographic Factors among Homeless Blacks and Whites

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Abstract

The homeless represent an extremely disadvantaged population that fare worse than minority groups in access to preventive services and health, and minority groups fare worse than Whites. Early detection screening for colorectal cancer (CRC) saves lives, but empirical data about CRC screening practices among homeless Blacks and Whites are limited. Psychosocial risk factors may serve as a barrier to CRC screening completion among homeless Black individuals. A secondary data analysis of a randomized clinical trial for smoking cessation among homeless smokers was conducted to determine whether psychosocial factors and sociodemographic factors were more highly associated with CRC screening uptake among homeless Blacks than among their White counterparts. Study participants (N = 124) were surveyed on their CRC screening status, sociodemographic variables, and psychosocial correlate measures including anxiety, depression, hopelessness, depression severity, and perceived stress. Associations between these factors were examined with logistic regression. White participants who were currently disabled/unable to work were 6.2 times more likely to ever receive CRC screening than those who were employed. Black participants with public health insurance coverage were 90% less likely to ever obtain CRC screening than participants without health insurance. Black and White participants had similar levels of anxiety symptoms, depression, and hopelessness, yet depression was the only psychosocial variable negatively associated with CRC screening status. Black and White participants with symptoms of depression were 58% less likely to complete screening than those without depression. Mental-health risk and sociodemographic factors may serve as barriers to CRC screening among homeless Blacks and Whites.

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Keywords

cancer early detection; colon cancer; homelessness; mental hygiene; psychosocial deprivations

Introduction

Because routine screening detects colorectal cancer (CRC) at an earlier, more treatable stage, CRC has been described as “the disease no one has to die from” (Pochapin, 2004). Blacks have the highest CRC incidence and mortality rates among all races (American Cancer Society [ACS], 2017, 2016; Siegel et al., 2014), yet screening rates remain low among Blacks, and CRC incidence and mortality rates for Blacks remain higher than those for other groups (ACS, 2016). Homeless individuals represent an extremely disadvantaged population and fare even worse than minority groups with respect to access to health care and preventive services (DeNavas-Walt, Proctor, & Smith, 2008; National Coalition for the Homeless, 2009; Ropers & Boyer, 1987). Although health care access and homelessness are intertwined, only a few researchers have examined cancer screening among the homeless (Asgary et al., 2014; Asgary et al., 2016; Chau et al., 2002; Long et al., 1998; Weinreb et al., 1998). To the authors’ knowledge, even fewer have examined CRC screening frequency among homeless Blacks.

Access to care may not be the only barrier to reducing CRC burden and screening disparities among homeless Blacks. Several sociodemographic characteristics have been associated with CRC screening, including race, age, and disability (ACS, 2017; Gimeno García, 2012), all of which likely influence screening completion outcomes among homeless populations. Non-Hispanic Blacks have lower screening adherence than Whites, which may play a role in CRC screening disparities in Black homeless populations (James et al, 2006). The recommended age range for CRC screening is 50 to 75 (U.S. Preventive Services Task Force [USPSTF], 2016). Older individuals within this range (65–79) have been shown to have the highest rates of adherence (James et al, 2006), but CRC is most frequently diagnosed among adults aged 65 to 74 years (USPSTF, 2016). Thus, age is an important factor in predicting screening nonadherence. In contrast, physical disability, which is prevalent among homeless populations, has been associated with screening adherence even though it may likely pose individual challenges in accessing health care (James et al, 2006). Higher levels of mental health–related risk factors and disorders have also been well documented among homeless individuals (Fazel, Khosla, Doll, & Gedess, 2008; National Coalition for the Homeless, 2009; National Health Care for the Homeless Council, 2011; Weiser et al., 2006; Wojtusik & White, 1998). Individuals with mental health disorders have poorer physical health, and mortality rates among these individuals are greater than in the general population (Beekman, 1997; Hert et al., 2011; Vreeland, 2007; Svendsen, Singer, Foti, & Mauer, 2006). It is likely that among the homeless, psychosocial risk factors such as depression, depression severity, anxiety, perceived stress, and hopelessness may also compromise regular use of preventive services such as cancer screening. However, few researchers have investigated this relationship. Medical mistrust, differences in access to high-quality regular screening, and a lack of timely diagnosis and treatment have been identified as potential CRC screening completion barriers among Blacks (DeSantis et al., 2016; Holden et al., 2010; Wallace et al.,

2013).Untreated poor mental health may serve as an additional barrier to CRC screening uptake among homeless Blacks, making this group particularly vulnerable to low rates of screening. Untreated poor mental health may serve as an additional barrier to CRC screening uptake among homeless Blacks, making this group particularly vulnerable to low rates of screening. Stigma about receiving mental health treatment is greater among Blacks than among other ethnicities (Clement et al., 2015), and Blacks are less likely to receive mental health treatment than Whites (Corrigan et al., 2014; Substance Abuse Mental Health Services Administration, 2012). However, a paucity of research exists explicitly investigating the relationship between psychosocial factors and early detection screening for CRC among homeless Blacks. Thus, the purpose of this study was to determine whether psychosocial factors (i.e., depression, depression severity, anxiety, perceived stress, and hopelessness) and sociodemographic factors were more associated with CRC screening uptake among homeless Blacks than among their White counterparts.

Methods

Study Design

The current study was a secondary analysis of data collected from a community-based sample of 430 homeless adult smokers enrolled in a randomized clinical trial for smoking cessation (Goldade et al., 2011; Okuyemi et al., 2013). For the parent study, participants from eight homeless shelters and transitional housing units in Minneapolis, Minnesota, completed an extensive survey during an hour and a half session. Participants were compensated with $20 gift cards and two bus tokens valued at $3 each. The procedures and measures for the original study were approved and monitored by the University of Minnesota's Institutional Review Board (0708M14444).

The current study focuses on a subset of the original study population, the 124 of the 439 study participants who self-identified as either Black (n =75) or White (n = 49) and who were ≥ 50 years of age. This age group was selected because, at the time of the study, the USPSTF recommended screening for CRC beginning at age 50 (USPSTF, 2008).

Measures

The authors utilized demographic information about the 124 participants as well as their responses to questions about their CRC screening status and psychosocial variables. The demographic data were treated as categorical. Data about psychosocial variables were treated as continuous.

Demographic information—During the survey, the subjects provided information about race/ethnicity, gender, marital status, education level, employment status, monthly income and health care coverage. The researchers then assigned that information to categories: race/ethnicity as Black or White; gender as male or female; marital status as married or not married; education as either having a high school diploma, GED or more than high school, or less than high school; monthly income as ≥ $400 per month or < $400 per month (which included food stamps, paychecks, SSI, and disability); and health care coverage as any coverage or no coverage. Employment status was defined as unemployed/retired, employed

(full-time, part-time, and student), and disabled/unable to work. Health insurance coverage was defined as no insurance coverage, Medicaid/Medicare/Other state program, and private insurance.

CRC Screening Status—CRC screening status was defined as "yes" if the participant answered yes to either of these statements: (1) *A blood stool test is a test that may use a special kit at home to determine whether the stool contains blood. Have you ever had this test using a home kit?*; or (2) *Sigmoidoscopy and colonoscopy are exams in which a tube is inserted in the rectum to view the colon for signs of cancer or other health problems. Have you ever had either of these exams?* Not Sure/Don't Know responses were coded as missing.

Psychosocial Factors—Five psychosocial factors (depression, depression severity, anxiety, perceived stress, and hopelessness) were assessed. Depression was based on Version A of the 3-item Rost–Burnham screener for depression (Rost, Burnam, & Smith, 1993). This measure was developed using two items from the Diagnostic Interview Schedule (Rost et al., 1993). Rost and colleagues (1993) reported that sensitivity for the measure is between 83% and 94%, and the specificity is approximately 90% for detecting major depressive disorder (MDD). Recent persistent depression was defined as a yes response to "In the past year, have you had 2 weeks or more during which you felt sad, blue, or depressed; or when you lost all interest or pleasure in things that you cared about?" or to both of the following questions: (1) "Have you had 2 years or more in your life when you felt depressed or sad most days; even if you felt okay sometimes?"; (2) "Have you felt depressed or sad much of the time in the past year?", and a response of 1 or more to the question "How much of the time during the past week did you feel depressed?" Unless the response was missing, all other responses were coded as not depressed.

Depression severity was based on responses to the patient health questionnaire (PHQ-9), a 9-item depression severity measure. The measure is scored by summing the responses of the 9 items. The score can range from 0 to 27. Based on Kroenke, Spitzer, and Williams (2001), severity was coded as minimal to no severity if the score was less than 4, mild if the score ranged from 5–9, moderate if the score ranged from 10–15, and moderately severe/severe if the score was ≥ 15). The PHQ-9 has demonstrated excellent internal reliability (Cronbach's alpha: .86 to .89) in previous research by Kroenke and colleagues (2001). There is also evidence that PHQ-9 scores > 10 had a sensitivity of 88% and a specificity of 88% for detecting MDD (Kroenke et al., 2001).

The Mini-International Neuropsychiatric Interview (MINI) assessment of generalized anxiety disorder was used to assess the presence of anxiety (Sheehan et al., 1998). Scoring of the MINI generalized anxiety assessment begins with a screening question about anxiety over the last 6 months. A response of no results in a MINI anxiety score of 0. If the response is yes, that item is added to the eight additional dichotomous questions. The score ranges from 0–9, with a higher score corresponding to more anxiety. Previous research indicates that MINI has sensitivity of .80 and specificity of .73 for detecting Generalized Anxiety Disorder (Sheehan et al., 1998).

To measure stress among the participants in the past 30 days, the four-item perceived stress scale developed by Cohen, Kamarack, and Mermelstein (1983) was used. Item responses are on a 5-point Likert scale coded as “Never” = 0, “Rarely” = 1, “Sometimes” = 2, “Often” = 3, and “Very often” = 4. Two of the four items were reverse coded, due to the indirect wording of the questions, in order for the summed score of all four items to result in a higher score corresponding to higher levels of perceived stress. The perceived stress scores range from 0–16. The internal consistency (Cronbach’s alpha) of the perceived stress score ranges from . 60 to .82 (Lee et al., 2012).

Finally, responses to a two-item measure of hopelessness were assessed (Everson et al., 1996). Both 5-point Likert items were reverse-coded as “Strongly Disagree” = 0, “Somewhat disagree” = 1, “Cannot say” = 2, “Somewhat agree” = 3, and “Strongly agree” = 4 and summed together. The scores range from 0 to 8.

Statistical Analyses—Descriptive statistics for all measures were calculated. Continuous variables were summarized as means and standard errors, and categorical variables as frequencies and proportions. To compare distributions of the study variables, the descriptive statistics were first stratified by race/ethnicity and CRC screening status. Chi-squared tests of association were conducted to determine if there were bivariate associations between race/ethnicity and the study variables.

The demographic variables and psychosocial factors were tested as separate groups for collinearity. Marital status was excluded from this analysis because only four participants were married. The research team employed logistic regression to estimate the magnitude of the bivariate associations between demographic covariates, psychosocial factors, and CRC screening status. Data were analyzed using Stata version 14.1 for Windows (StataCorp, 2016).

Results

Of the 124 study participants, 61% were Black and 82% were male. More than three-quarters (77%) of the participants were high school graduates, had a GED, or had more than a high school diploma or GED. Sixty percent were unemployed and 31% were disabled. With respect to health insurance, 72% of the participants had no coverage. Additional participant characteristics, stratified by race/ethnicity, are displayed in Table 1.

Race was significantly associated with employment status ($p = .02$): 77% of White participants and 50% of Black participants were employed. Almost 38% of Black participants were disabled/unable to work, as compared with 19% of the White participants. Among Black participants, 18% reported an income of more than $400 per month compared to 35% of White participants ($p = .05$).

Among the sample, 47.6% reported they had been screened for CRC (Table 2). The prevalence of ever having CRC screening was highest among participants who were unemployed (54%) or disabled/unable to work (42%)($p = .01$). Among participants who had ever completed CRC screening, 78% had no health insurance coverage and 15% had private insurance.

In univariate logistic regression analyses stratified by race, employment status was associated with CRC screening status in the overall population (Table 3), but this differed between Black participants, who had no association between employment status and CRC screening status (OR = 1.6, 95% CI: 0.6, 4.4), and White participants, among whom those who were currently disabled were 6.2 (95% CI: 1.1, 34.3) times more likely to have ever completed CRC screening than those who were currently unemployed.

Current health insurance coverage was associated with CRC screening status overall (Table 3), but again this differed between Black and White participants. Whereas current health insurance coverage was not associated with CRC screening status among White participants (OR = 0.64, 95% CI: 0.13, 3.1), Black participants with Medicaid, Medicare, or another state program for health insurance coverage were 90% less likely to have obtained CRC screening than participants without health insurance. Finally, in this univariate analysis, none of the psychosocial factors were associated with CRC screening status.

In multivariable logistic regression analyses, depression was the only variable significantly associated with CRC screening status (Table 4). Participants with depression were 58% (OR = 0.42, 95% CI: 0.19, 0.96) less likely to have completed CRC screening than participants without depression. Based on comparisons of the Akaike Information Criterion (AIC) for each model in Table 4, Model 1 was the best fit with the lowest AIC.

Discussion

The CRC screening completion rate for the current study's Minnesota-based sample was 48%, which is higher than the 29.1% reported in the studies by Asgary et al. (2014) in New York City and the 23% reported by Chau and colleagues (2002) among their homeless population in Los Angeles. It is important consider that the current study sample's CRC screening completion rate may only apply to the homeless population in Minnesota and result from the well-coordinated healthcare programs for the homeless in both Ramsey and Hennepin counties. However, these screening rates are significantly below Minnesota's statewide CRC screening average (73%) and well below the National Colorectal Cancer Roundtable's goal of increasing CRC screening rates across the nation to 80% by 2018 (Meester et al., 2015; MN Community Measurement, 2017). Because it is important to identify potential barriers contributing to CRC screening among homeless individuals, the purpose of this investigation was to determine the associations between sociodemographic factors, CRC screening uptake, and psychosocial factors among homeless Blacks as compared with their White counterparts. Logistic regression findings indicated that three factors were significantly associated with CRC screening among the study sample: current employment status, current health insurance coverage, and depression.

Being disabled or unable to work was positively associated with CRC screening status in this study. However, in the stratified analysis, employment status, specifically disabled or unable to work, was only associated with CRC screening status among White participants. One potential reason may be that those who were disabled or unable to work had Supplemental Security Income (SSI) that assisted with travel to medical appointments and payment for out-of-pocket medical expenses. These results are consistent with a study

conducted by James and colleagues who found that disability was associated with CRC screening adherence (James et. al., 2006), possibly because of disabled patients' increased contact with the health care system. However, disability was only associated with CRC screening status among the total population and White participants. Two factors may explain the lack of association between disability and screening status among Blacks: First, Black men are less likely to visit their health care provider than White men (Brittain et al., 2012); and second, Whites in general who are not up to date on CRC screening are more likely to receive a physician recommendation to be screened compared to Blacks (James et al., 2006). However, these results that White race and disability determined screening outcomes should be interpreted with caution because of the small sample sizes and unstable odds ratios. If future studies replicate this finding, the relationship between employment status and CRC screening status should be considered in the context of preventive and primary care challenges often faced by individuals with disability.

For the current study, 31% of the homeless participants were disabled, and nearly a quarter (23%) lacked at least a high school diploma or GED. In view of the strong association between severe disabilities and preventable hospital admission (Payne et al., 2013), the aforesaid parallels between the present study and James et al. (2006) may suggest a potential route to better understanding of the low CRC screening uptake among homeless adults. Future studies should aim to determine reasons for the potential Black-White differences in CRC screening status among those disabled or unable to work in homeless populations. Only 18% of the homeless Black participants, but 35% of the homeless White participants, reported an income > $400 per month. This income disparity may contribute to homeless Blacks often lacking a usual source of care or health insurance (Asgary et al., 2014; Chau et al., 2002; Lebrun-Harris et al., 2013) and should be further explored.

Other studies examining the relationship between health insurance coverage and CRC screening status among the homeless have found results counter to those in this study. In the study conducted by Asgary and colleagues (2014), an evaluation of medical records of 443 men and women (ages 50–85) at two shelter-based clinics serving low-income and homeless individuals in New York City was conducted to assess CRC screening status. Although nearly 90% of the ethnically diverse participants were insured in this retrospective study, only 29% of these insured participants were current with their CRC screening, and no association between insurance status and CRC uptake was found in a bivariate analysis. In addition to the possible role of SSI, this finding may be attributable to poor patient-provider communication during counseling sessions, or to medical mistrust. A great deal of medical mistrust among Blacks has been warranted by the legacy of previous medical research abuses, such as the Tuskegee Syphilis Study in which 400 Black men were denied treatment for syphilis, as well as concerns about being treated as a "guinea pig" that frequently emerge in studies of Blacks' attitudes toward any form of involvement with the fields of medicine and research (Born et al., 2009; Corbie-Smith, 1999; Thomas, 1991). Accordingly, effective patient-centered communication should be utilized by physicians to increase CRC screening uptake, and build trust and rapport with homeless Black patients (Epstein & Street, 2007).

Black and White participants had similar levels of depression, anxiety symptoms, and hopelessness. Depression was the only psychosocial variable negatively associated with

CRC screening status. This finding is consistent with some research (Holden et al., 2014; Kodl et al., 2010), but in contrast with other studies reporting no association between depression and CRC screening (Carney, Allen, & Doebbeling, 2002; Owusu, Quinn, & Wang, 2015). For instance, a recent study reported an odds ratio of 1.37 indicating depression was positively associated with CRC screening (Owusu et al., 2015). In addition, Owusu and colleagues (2015) reported no differences by race in terms of the association between depression and CRC screening. The inconsistencies observed in these studies may reflect the use of different measures of depression. For instance, in the present study, the Rost-Burnam Depression Screener detected an association with CRC screening, while the PHQ-9 did not. In part, this could result from the fact that the Rost-Burnam Depression Screener assesses the past year, whereas the PHQ-9 assesses the past two weeks. Moreover, the PHQ-9 assesses the duration of specific symptoms of depression (e.g., difficulty concentrating, poor appetite), whereas the Rost-Burnam Depression Screener asks about feeling sad, blue, or depressed. Future studies should attempt to use consistent measures in order to permit more accurate comparisons across studies.

The prevalence of depressive symptoms in this study is consistent with some prior research (Fazel, Khosla, Doll, & Geddes, 2008). The assessment of depression could be improved by including a diagnosis from a trained clinician who combines self-report measures with a brief clinical interview. This approach would allow for a more in-depth assessment of depressive symptoms as they related to impairments in functioning. Furthermore, there is a dearth of research assessing depressive symptoms among individuals who are homeless. Future research should investigate whether assessments can be improved by including more specific items related to the experience of homelessness.

Inconsistencies may also be explained by studies not including covariates, such as hospital visits, in their analyses. For example, Kodl and colleagues (2010) noted a positive association between depression and CRC screening when hospital visits were included, and an inverse relationship between depression and CRC screening when hospital visits were excluded. It is possible that studies reporting a positive association between mental health disorders and CRC screening are explained by the fact that a homeless person with a mental health disorder may have more contact with health professionals than an individual without a mental health disorder. Given that the current study observed an inverse relationship between depression and CRC screening, it is plausible that homeless individuals with depression did not have greater hospital visits than those without depression. Although hospital visit information was not available for the current study, future research on mental health and CRC screening should also consider assessing hospital visits.

This investigation was not without limitations. First, there was only a small proportion of participants that met the eligibility criteria of the present study. Though wide confidence intervals indicate that some of the estimates, especially in the stratified analyses, may not be stable, the authors still found significant associations. In a post hoc power calculation using the study results for Model 1, the present study's sample achieved 58% power to detect an association between depression and CRC screening status. Conducting a larger study of the association, and including non-smokers, would improve the precision of the estimates in future research. Next, no theoretical framework drove the current study, but Self-

Determination Theory by Deci and Ryan (2000) served as the bases of the motivational interviewing in the parent study. While it is possible that CRC screening may have occurred during a time when participants were not homeless or in a better life position, 87.0% of participants who had a CRC screen within the past 3 years had also been without regular or permanent place to live for 3 years or less. Therefore, participants in the study were likely to have been screened for CRC while they were living in homelessness. Lastly, the study was limited to homeless adults from a single metropolitan area in the upper Midwest of the U.S., all of whom were smokers (they had smoked at least one cigarette per day in the past 7 days and at least 100 cigarettes in their lifetime). However, our study participants' characteristics are comparable to those of homeless populations in other areas (Wilder Foundation, 2013), and the study was designed with minimal exclusion criteria in order to enhance the findings' validity.

Despite these limitations, this is one of the first studies to report on psychosocial factors affecting CRC screening uptake among homeless Blacks, a segment of the population that is potentially at higher risk for CRC than others. Depressive symptoms among homeless Blacks may compromise their physical health through lack of motivation to access preventive services or a lack of focus on prevention from treatment providers. Future research can reveal how addressing mental-health and sociodemographic barriers can facilitate equity in CRC screening rates among homeless populations.

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References

American Cancer Society. Cancer facts & figures for African Americans 2016–2018. 2016. Retrieved from http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-047403.pdf

American Cancer Society. Colorectal cancer facts & figures 2017–2019. 2017. Retrieved from https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/colorectal-cancer-facts-and-figures/colorectal-cancer-facts-and-figures-2017-2019.pdf

Asgary R, Alcabes A, Feldman R, Garland V, Naderi R, Ogedegbe G, Sckell B. Cervical Cancer Screening Among Homeless Women of New York City Shelters. Maternal and Child Health. 2016:1–8.

Asgary R, Garland V, Jakubowski A, Sckell B. Colorectal cancer screening among the homeless population of New York City shelter-based clinics. American Journal of Public Health. 2014; 104(7):1307–1313. [PubMed: 24832144]

Beekman A, Penninx B, Deeg D, Ormel J, Braam A, Van Tilburg W. Depression and physical health in later life: results from the Longitudinal Aging Study Amsterdam (LASA). Journal of Affective Disorders. 1997; 46(3):219–231. [PubMed: 9547118]

Born W, Engelman K, Greiner KA, Bhattacharya SB, Hall S, Hou Q, Ahluwalia JS. Colorectal cancer screening, perceived discrimination, and low-income and trust in doctors: A survey of minority patients. BMC Public Health. 2009; 9(1):363. [PubMed: 19781085]

Brittain K, Loveland-Cherry C, Northouse L, Caldwell CH, Taylor JY. Sociocultural differences and colorectal cancer screening among African American men and women. Oncology Nursing Forum. 2012; 39(1):100–7. [PubMed: 22201660]

Carney CP, Allen J, Doebbeling BN. Receipt of clinical preventive medical services among psychiatric patients. Psychiatric Services. 2002; 53(8):1028–1030. [PubMed: 12161681]

Chau S, Chin M, Chang J, Luecha A, Cheng E, Schlesinger J, Gelberg L. Cancer risk behaviors and screening rates among homeless adults in Los Angeles County. Cancer Epidemiology Biomarkers & Prevention. 2002; 11(5):431–438.

Clement S, Schauman O, Graham T, Maggioni F, Evans-Lacko S, Bezborodovs N, Thornicroft G. What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. Psychological medicine. 2015; 45(01):11–27. [PubMed: 24569086]

Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. Journal of Health and Social Behavior. 1983; 24:385–396. [PubMed: 6668417]

Corbie-Smith G, Thomas SB, Williams MV, Moody-Ayers S. Attitudes and beliefs of African Americans toward participation in medical research. Journal of General Internal Medicine. 1999; 14:537–46. [PubMed: 10491242]

Corrigan PW, et al. The impact of mental illness stigma on seeking and participating in mental health care. Psychological Science in the Public Interest. 2014; 15(2):37–70. [PubMed: 26171956]

DeNavas-Walt, C., Proctor, BD., Smith, J. Income, poverty, and health insurance coverage in the United States: 2007. 2008. Retrieved from https://www.census.gov/prod/2008pubs/p60-235.pdf

DeSantis CE, Siegel RL, Sauer AG, Miller KD, Fedewa SA, Alcaraz KI, Jemal A. Cancer statistics for African Americans, 2016: Progress and opportunities in reducing racial disparities. CA: a cancer journal for clinicians. 2016

Epstein, RM., Street, RL. Patient-centered communication in cancer care: promoting healing and reducing suffering. Bethesda, MD: National Cancer Institute; 2007. [NIH Publication No. 07-6225]

Everson SA, Goldberg DE, Kaplan GA, Cohen RD, Pukkala E, Tuomilehto J, Salonen JT. Hopelessness and risk of mortality and incidence of myocardial infarction and cancer. Psychosomatic Medicine. 1996; 58(2):113–121. [PubMed: 8849626]

Fazel S, Khosla V, Doll H, Geddes J. The prevalence of mental disorders among the homeless in western countries: systematic review and meta-regression analysis. PLoS Med. 2008; 5(12):e225. [PubMed: 19053169]

Gimeno García AZ. Factors influencing colorectal cancer screening participation. Gastroenterology Research and Practice. 2012:1–8. doi:0.1155/2012/483417.

Goldade K, Whembolua GL, Thomas J, Eischen S, Guo H, Connett J, Okuyemi KS. Designing a smoking cessation intervention for the unique needs of homeless persons: a community-based randomized clinical trial. Clinical Trials. 2011; 8(6):744–754. [PubMed: 22167112]

Hert M, Correll CU, Bobes J, Cetkovich-Bakmas M, Cohen D, Asai I, Leucht S. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World psychiatry. 2011; 10(1):52–77. [PubMed: 21379357]

Holden DJ, Jonas DE, Porterfield DS, Reuland D, Harris R. Systematic review: enhancing the use and quality of colorectal cancer screening. Annals of internal medicine. 2010; 152(10):668–676. [PubMed: 20388703]

Holden AE, Ramirez AG, Gallion K. Depressive symptoms in Latina breast cancer survivors: A barrier to cancer screening. Health Psychology. 2014; 33(3):242. [PubMed: 23730722]

James TM, Greiner K, Ellerbeck EF, Feng C, Ahluwalia JS. Disparities in colorectal cancer screening: a guideline-based analysis of adherence. Ethnicity & disease. 2006; 16(1):228–233. [PubMed: 16599375]

Kodl MM, Powell AA, Noorbaloochi S, Grill JP, Bangerter AK, Partin MR. Mental health, frequency of healthcare visits, and colorectal cancer screening. Medical care. 2010:934–939. [PubMed: 20706162]

Kroenke K, Spitzer R, Williams J. The PHQ-9: validity of a brief depression severity measure [Electronic version]. Journal of General Internal Medicine. 2001; 16(9):606–13. [PubMed: 11556941]

Lebrun-Harris LA, Baggett TP, Jenkins DM, Sripipatana A, Sharma R, Hayashi AS, Ngo-Metzger Q. Health status and health care experiences among homeless patients in federally supported health centers: findings from the 2009 patient survey. Health services research. 2013; 48(3):992–1017. [PubMed: 23134588]

Lee EH. Review of the psychometric evidence of the perceived stress scale. Asian Nursing Research. 2012; 6(4):121–127. [PubMed: 25031113]

Long HL, Tulsky JP, Chambers DB, Alpers LS, Robertson MJ, Moss AR, Chesney MA. Cancer screening in homeless women: attitudes and behaviors. Journal of health care for the poor and underserved. 1998; 9(3):276–292. [PubMed: 10073209]

Meester RG, Doubeni CA, Zauber AG, Goede SL, Levin TR, Corley DA, Lansdorp-Vogelaar I. Public health impact of achieving 80% colorectal cancer screening rates in the United States by 2018. Cancer. 2015; 121(13):2281–2285. [PubMed: 25763558]

MN Community Measurement. 2016 health equity of care report. 2017. Retrievable from http://mncm.org/wp-content/uploads/2017/02/2016-Health-Equity-of-Care-Report-2.2.2017.pdf

National Coalition for the Homeless. Health Care and Homelessness. 2009. Retrieved from http://www.nationalhomeless.org/factsheets/health.html

National Health Care for the Homeless Council. Homelessness & health: What's the connection?. 2011. Retrieved from http://www.nhchc.org/wp-content/uploads/2011/09/Hln_health_factsheet_Jan10.pdf

Okuyemi KS, Goldade K, Whembolua GL, Thomas JL, Eischen S, Guo H, Jarlais DD. Smoking characteristics and comorbidities in the power to quit randomized clinical trial for homeless smokers. Nicotine & Tobacco Research. 2013; 15(1):22–28. [PubMed: 22589422]

Owusu D, Quinn M, Wang KS. Alcohol Consumption, Depression, Insomnia and Colorectal Cancer Screening: Racial Differences. International journal of high risk behaviors & addiction. 2015; 4(2)

Parks, J., Svendsen, D., Singer, P., Foti, ME., Mauer, B. Morbidity and mortality in people with serious mental illness. Alexandria, VA: National Association of State Mental Health Program Directors (NASMHPD) Medical Directors Council; 2006. p. 25

Payne RA, Abel GA, Guthrie B, Mercer SW. The effect of physical multimorbidity, mental health conditions and socioeconomic deprivation on unplanned admissions to hospital: a retrospective cohort study. Canadian Medical Association Journal. 2013; 185(5):E221–E228. [PubMed: 23422444]

Pochapin, MB. What Your Doctor May Not Tell You About (TM): Colorectal Cancer: New Tests, New Treatments, New Hope. Grand Central Publishing; 2004.

Ropers RH, Boyer R. Perceived health status among the new urban homeless. Social science & medicine. 1987; 24(8):669–678. [PubMed: 3603089]

Rost K, Burnam MA, Smith GR. Development of screeners for depressive disorders and substance disorder history. Medical care. 1993; 31(3):189–200. [PubMed: 8450677]

Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist. 2000; 55(1):68. [PubMed: 11392867]

Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Dunbar GC. The Mini-International Neuropsychiatric Interview (MINI): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Journal of clinical psychiatry. 1998

Siegel R, Ma J, Zou Z, Jemal A. Cancer statistics, 2014. CA: A Cancer Journal for Clinicians. 2014; 64(1):9–29. [PubMed: 24399786]

StataCorp. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP; 2016.

Substance Abuse Mental Health Services Administration. Results from the 2011 National survey on drug use and health: summary of national findings. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2012. NSDUH series H-44, HHS publication no. (SMA) 12-4713

Thomas SB, Quinn SC. Public health then and now the Tuskegee syphilis study, 1932 to 1972: implications for HIV education and aids risk education programs in the black community. Am J Public Health. 1991; 81:1498–505. [PubMed: 1951814]

Wallace DAC, Baltrus PT, Wallace TC, Blumenthal DS, Rust GS. Black white disparities in receiving a physician recommendation for colorectal cancer screening and reasons for not undergoing screening. Journal of health care for the poor and underserved. 2013; 24(3):1115. [PubMed: 23974385]

Weinreb L, Goldberg R, Perloff J. Health characteristics and medical service use patterns of sheltered homeless and low-income housed mothers. Journal of general internal medicine. 1998; 13(6):389–397. [PubMed: 9669568]

Weiser SD, Riley ED, Ragland K, Hammer G, Clark R, Bangsberg DR. Brief report: Factors associated with depression among homeless and marginally housed HIV-infected men in San Francisco. Journal of General Internal Medicine. 2006; 21(1):61–64. [PubMed: 16423125]

Wilder Foundation. Homelessness in Minnesota Findings from the 2012 statewide homeless study. 2013. Retrieved from http://www.wilder.org/wilder-research/publications/studies/homelessness%20in%20minnesota%202012%20study/homelessness%20in%20minnesota%20-%20findings%20from%20the%202012%20statewide%20homeless%20study.pdf

Wojtusik L, White MC. Health status, needs, and health care barriers among the homeless. Journal of Health Care for the Poor and Underserved. 1998; 9(2):140–152. [PubMed: 10073199]

U.S. Preventive Services Task Force. Screening for colorectal cancer: US Preventive Services Task Force Recommendation Statement. Annals of internal medicine. 2008; 149(9):627. [PubMed: 18838716]

U.S. Preventive Services Task Force. Screening for Colorectal Cancer: US Preventive Services Task Force Recommendation Statement. Journal of the American Medical Association. 2016; 315(23): 2564.doi: 10.1001/jama.2016.5989 [PubMed: 27304597]

Vreeland B. Bridging the gap between mental and physical health: A multidisciplinary approach. Journal of Clinical Psychiatry. 2007

Table 1

Participant Characteristics by Race.

		Race		
	Total	**Black**	**White**	***P****
Total, n (%)	124 (100)	75 (60.5)	49 (39.5)	
Male	102 (82.3)	63 (84.0)	39 (79.6)	0.53
Not Married (N=122)	118 (96.7)	71 (94.7)	44 (100.0)	0.16
HS/GED or more	95 (76.6)	55 (73.3)	40 (81.6)	0.29
Employment Status				0.02
Unemployed	73 (60.3)	37 (50.0)	42 (76.6)	
Employed	11 (9.1)	9 (12.2)	--	
Disabled/Unable to Work	37 (30.6)	28 (37.8)	9 (19.2)	
Health Coverage (N=123)				0.57
No insurance coverage	89 (72.4)	56 (75.7)	33 (67.4)	
Medicaid, Medicare, other state program	18 (14.6)	10 (13.5)	8 (16.3)	
Private insurance	16 (13.0)	8 (10.8)	8 (16.3)	
Income > $400/m	35 (28.2)	9 (18.4)	26 (34.7)	0.05
Depression (Rost-Burnam) (N=123)	64 (52.0)	37 (56.9)	27 (46.6)	0.25
Depression severity (N=123)				0.56
None	44 (33.3)	18 (30.0)	23 (35.4)	
Mild	27 (22.0)	16 (27.6)	11 (16.9)	
Moderate	27 (22.0)	12 (20.7)	15 (23.1)	
Moderately Severe/Severe	28 (22.8)	12 (20.7)	16 (24.6)	
General Anxiety score, mean ± SE	3.9 ± 0.34	4.1 ± 0.46	3.4 ± 0.52	0.31
Perceived Stress Scale, mean ± SE	6.5 ± 0.29	6.7 ± 0.40	6.1 ± 0.42	0.30
Hopelessness, mean ± SE	2.27 ± 0.21	2.1 ± 0.26	2.6 ± 0.37	0.25

Table 2

Participant Characteristics by CRC Screening Status.

		CRC Screening		
	Total ***N*** **(%)**	**Yes** ***n*** **(%)**	**No** ***n*** **(%)**	***P value***
Total	124 (100)	59 (47.6)	65 (52.4)	
Male	102 (82.3)	49 (83.1)	53 (81.5)	0.83
Black	75 (60.5)	36 (61.0)	39 (60.0)	0.91
Not Married	118 (96.7)	54 (94.7)	64 (98.5)	0.24
HS/GED or more	95 (76.6)	48 (81.4)	47 (72.3)	0.24
Employment Status				0.01
Unemployed	73 (60.3)	31 (54.4)	42 (65.6)	
Employed	11 (9.1)	--	9 (14.1)	
Disabled/Unable to Work	37 (30.6)	24 (42.1)	13 (20.3)	
Health Coverage				0.05
No insurance coverage	89 (72.4)	46 (78.0)	43 (67.2)	
Medicaid, Medicare, other state program	18 (14.6)	--	14 (21.9)	
Private insurance	16 (13.0)	9 (15.3)	7 (10.9)	
Income > $400/m	35 (28.2)	19 (32.2)	16 (24.6)	0.35
Depression (Rost-Burnam) (*N*=123)	64 (52.0)	37 (56.9)	27 (46.6)	0.25
Depression severity (*N*=123)				0.56
None	44 (33.3)	18 (30.0)	23 (35.4)	
Mild	27 (22.0)	16 (27.6)	11 (16.9)	
Moderate	27 (22.0)	12 (20.7)	15 (23.1)	
Moderately Severe/Severe	28 (22.8)	12 (20.7)	16 (24.6)	
General Anxiety score, mean ± SE	3.9 ± 0.34	3.6 ± 0.53	4.0 ± 0.45	0.56
Perceived Stress score, mean ± SE	6.5 ± 0.29	6.8 ± 0.46	6.2 ± 0.37	0.27
Hopelessness score, mean ± SE	2.3 ± 0.21	2.5 ± 0.32	2.1 ± 0.28	0.29

Table 3

Univariate Logistic Regressions: Odds of CRC Screening Status* Stratified by Race.

	Total		Black		White	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
HS/GED or more	1.7	(0.71, 3.9)	2.8	(0.9, 8.4)	0.65	(0.15, 2.8)
Employment Status						
Employed	0.30	(0.06, 1.5)	0.13	(0.01, 1.2)	1.8	(0.10, 30.7)
Disabled/Unable to Work	2.5	(1.1, 5.7)	1.6	(0.60, 4.4)	6.2	(1.1, 34.3)
Health Coverage						
Medicaid, Medicare, other state program	0.27	(0.08, 0.87)	0.10	(0.01, 0.8)	0.64	(0.13, 3.1)
Private insurance	1.2	(0.41, 3.51)	1.44	(0.31, 6.6)	1.1	(0.23, 5.0)
Income > $400/m	1.5	(0.66, 3.2)	1.1	(0.44, 2.9)	2.7	(0.59, 12.4)
Depression	0.66	(0.32, 1.3)	0.69	(0.28, 1.7)	0.59	(0.18, 1.9)
Depression Severity						
Mild	1.9	(0.69, 5.0)	1.3	(0.36, 4.9)	3.3	(0.66, 16.0)
Moderate	1.0	(0.38, 2.7)	1.3	(0.38, 4.7)	0.61	(0.12, 3.2)
Severe	0.96	(0.36, 2.5)	1.3	(0.39, 4.6)	0.41	(0.07, 2.5)
Perceived stress	1.1	(0.95, 1.2)	1.1	(0.99, 1.3)	0.92	(0.76, 1.1)
Hopelessness	1.1	(0.93, 1.3)	1.1	(0.93, 1.4)	1.0	(0.82, 1.3)
Anxiety	0.97	(0.89, 1.1)	1.0	(0.89, 1.1)	0.92	(0.78, 1.1)

*Defined as self-reporting fecal occult blood test or self-reporting sigmoidoscopy or colonoscopy.

OR, estimated odds ratio; CI, confidence interval.

Table 4

Logistic Regressions: Psychosocial Variables and CRC Screening Status.

	Model 1		Model 2		Model 3		Model 4	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Race	1.19	(0.52, 2.72)	1.26	(0.54, 2.91)	1.17	(0.51, 2.68)	1.28	(0.55, 2.96)
HS/GED or more	2.12	(0.78, 5.77)	1.91	(0.71, 5.16)	1.93	(0.72, 5.13)	1.99	(0.74, 5.37)
Employment Status								
Employed	0.20	(0.03, 1.14)	0.22	(0.04,1.32)	0.30	(0.05, 1.73)	0.29	(0.05, 1.63)
Disabled/Unable to Work	3.65	(1.31, 10.1)	3.08	(1.11, 8.60)	3.24	(1.21, 8.70)	2.95	(1.09, 8.01)
Health Coverage								
Medicaid, Medicare, other state program	0.43	(0.12, 1.58)	0.39	(0.11, 1.41)	0.43	(0.12, 1.52)	0.39	(0.33, 2.41)
Private insurance	2.00	(0.60, 6.71)	2.06	(0.61, 6.90)	2.15	(0.65, 7.06)	2.44	(0.72, 8.21)
Income > $400/m	1.05	(0.40, 2.76)	0.99	(0.35, 2.79)	0.86	(0.32, 2.36)	0.89	(0.33, 2.41)
Depression	0.43	(0.19, 0.96)	-	-	-	-	-	-
Depression Severity								
Mild			1.78	(0.58, 5.51)	-	-	-	-
Moderate			1.15	(0.39, 3.41)	-	-	-	-
Severe			0.65	(0.22, 1.97)	-	-	-	-
Perceived stress					1.02	(0.90, 1.16)	-	-
Hopelessness							1.11	(0.93, 1.32)
Anxiety								
AIC	1.36		1.41		1.40		1.39	

	Model 5	
	OR	**95% CI**
Race	1.23	(0.54, 2.82)
HS/GED or more	2.02	(0.75, 5.43)
Employment Status		

	Model 5	
	OR	**95% CI**
Employed	0.25	(0.04, 1.42)
Disabled/Unable to Work	3.35	(1.23, 9.07)
Health Coverage		
Medicaid, Medicare, other state program	0.44	(0.12, 1.57)
Private insurance	2.17	(0.65, 7.19)
Income > $400/m	0.92	(0.34, 2.50)
Depression	-	-
Depression Severity		
Mild	-	-
Moderate	-	-
Severe	-	-
Perceived stress	-	-
Hopelessness	-	-
Anxiety	0.95	(0.14, 1.42)
AIC	1.39	

OR, estimated odds ratio; CI, confidence interval.