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Predictors of Colorectal Cancer Screening among African American Men Living with HIV

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Abstract

African American men living with HIV are at high risk of colorectal cancer (CRC). Screening to detect CRC is associated with a reduced risk of CRC mortality. However, little is known about CRC screening predictors in this population. This study examined the relation of self-efficacy, a potential mediator of screening that interventions could target, to CRC screening. It also investigated several variables that might identify subpopulations of African American men non-adherent to CRC screening recommendations. We report a secondary analysis on baseline data from a randomized controlled trial of a health promotion intervention for African American men living with HIV. Before their intervention, they completed measures of CRC screening, self-efficacy, marital status, age, education, and adherence to physical activity guidelines and were assessed for obesity. A total of 270 African American men aged 45 to 88 (*Mean* = 55.07;

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Authors' contributions

Terri-Ann Kelly: Writing-Original draft preparation; Writing-review & editing; **Soojong Kim:** Formal analysis, Writing-review & editing. **Loretta Sweet Jemmott:** Conceptualization, Writing-review & editing, Funding acquisition. **John B. Jemmott III:** Conceptualization, Methodology, Validation, Data curation, Writing-review & editing, Supervision, Project Administration, Funding acquisition.

Declarations

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics Approval

Not applicable

Consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data material

Not applicable

Code availability

Not applicable

$SD = 6.46$) living with HIV participated. About 30% reported CRC screening in the past six months. Multiple logistic regression revealed greater CRC screening self-efficacy and meeting physical activity guidelines were associated with receiving CRC screening. Obese men and men reporting higher education were less likely to report screening. Age and marital status were unrelated to screening. The results of this study suggest CRC screening rates may be low among African American men living with HIV, and interventions targeting self-efficacy may improve their screening uptake. Moreover, public-health efforts to increase screening should prioritize interventions with subpopulations of African American men living with HIV who are physically inactive and obese.

Keywords

African American; early detection of cancer; obesity; colonic neoplasms; mass screening

Introduction

Colorectal cancer (CRC) ranks third for cancer-related deaths among men and women in the United States [1]. Each year, there are approximately 140,000 newly diagnosed cases and 53,000 deaths from CRC [2]. When compared by sex and race/ethnicity, CRC incidence and mortality rates are higher in African American men [3]. Increasing age is the most critical risk factor for CRC [4]. Still, African Americans are often diagnosed with CRC at an earlier age [5]. Moreover, they are more likely to have advanced-stage CRC [5].

CRC screening is useful for detecting colorectal polyps and cancers [6]. Screening to detect CRC early is associated with a reduced risk of death from CRC [7, 8]. The 5-year relative survival rate for early-stage CRC that has not metastasized is about 90% [2]. According to the American Cancer Society, adults aged 45 and older with an average risk of CRC should undergo regular screening [9]. However, despite their high risk for advanced-stage CRC, African Americans have low screening rates [7].

Given the importance of screening to identifying cancer early, a population that public health efforts should include in screening is African Americans living with HIV. Indeed, screening people living with HIV for cancers is becoming an increasingly important part of HIV care. Antiretroviral therapy has sharply decreased the incidence of and mortality from AIDS-related cancers, occasioning prolonged survival among people with HIV. As people live longer with HIV, the incidence of and mortality from non-AIDS defining cancers is increasing. Thus, people living with HIV have an increased risk of cancer, including CRC, by virtue of the age-related risk for these cancers. For African Americans aging with HIV, their age-related increased risk accompanies their already elevated race-related risk.

Despite the high risk for CRC in people with HIV, evidence suggests a low uptake of CRC screening. For instance, a retrospective chart review revealed that only 25% of average-risk patients diagnosed with HIV had a screening colonoscopy in the last ten years [10]. A review of electronic medical records found that, despite significantly more visits with their primary care provider, patients aged 50 or older diagnosed with HIV were less likely to have ever had a CRC screening test than age- and gender-matched HIV-negative

controls [11]. Consistent with this study, a comprehensive review of the literature found that CRC screening rates were significantly lower among patients living with HIV than the general population of patients [12]. Accordingly, research to understand the determinants of screening in people living with HIV, especially African American men, is urgently needed. No studies have examined CRC screening predictors among African American men living with HIV, to our knowledge. This study, addressing this gap in the literature, examined potential CRC screening predictors among African American men living with HIV.

Self-efficacy for CRC screening.

One such potential predictor of CRC screening is self-efficacy, the belief that one has the skills to implement a behavior required to produce desired outcomes [13, 14]. Self-efficacy predicts whether people change their behavior and, therefore, would be useful in interventions to increase CRC screening [13, 14]. Research indicates self-efficacy is associated with CRC screening intention [15, 16] and receipt of CRC screening [16, 17, 18, 19]. For instance, a telephone interview study of African Americans found that the likelihood of CRC screening increased with greater self-efficacy [18]. Also, lower self-efficacy for CRC screening is related to greater fear of colonoscopy among African Americans and Hispanics [20].

Self-efficacy is a modifiable factor, meaning it can be targeted in interventions to increase CRC screening uptake. Research to understand better the non-modifiable characteristics of African American men living with HIV associated with CRC screening is also needed. Such an understanding can help direct public health efforts toward those African American men living with HIV who are most at risk of non-adherence to CRC screening guidelines. These non-modifiable factors may include marital status, education, age, physical activity adherence, and obesity based on the literature. These variables may identify subpopulations at risk of non-adherence to screening that screening interventions should target.

Non-modifiable correlates of CRC screening.

Marriage is linked to improved CRC screening [21, 22], particularly in men [23]. For example, married men have higher colonoscopy rates than unmarried men (61% versus 52%, $p=0.023$), but women's rates do not differ by marital status [23].

Education is also linked to CRC screening, which is lower among people with less than a high school education than among college graduates [24]. Other studies have found that higher education is associated with greater CRC screening uptake [19]. One study found that those with education less than ninth grade were less likely to receive CRC screening [25]. Another study reported that increasing education predicted higher adherence among Whites, but only undergraduate completion did so among Blacks [26]. In another study researchers found that highly educated patients were more likely to adhere to CRC screening recommendations [22].

Older age is associated with increased CRC screening [21, 22, 27, 28] and intention for CRC screening [29]. People ages 65 or older were more likely to have CRC screening [30]. A study found that people ages 50 to 54 were less likely to receive CRC screening [25]. A telephone interview study of African Americans also found that the likelihood of CRC

screening increased with older age [18]. However, a prospective study found that age was unrelated to CRC screening one year later in patients who a primary care provider had seen [31].

A review of the literature found that preventive health behaviors are related to an increased CRC screening uptake [32]. For example, people who have quit smoking have higher CRC screening rates. Receiving regular checkups or having a usual source of care are related to higher rates of screening uptake. Adherence to other preventive behaviors, including flu shots, prostate cancer screening in men, and breast and cervical cancer screening in women, has also been positively associated with CRC screening uptake [30, 32]. Greater engagement in physical activity is related to increased CRC screening [33, 34, 35]. Similarly, a study found that adherence to follow-up exams in patients with a positive fecal occult blood test was higher among physically active patients [36]. Physical activity is of particular interest because physical inactivity is a behavioral risk factor for CRC [37, 38, 39].

Cross-sectional studies have revealed inconsistent findings on the relation of obesity to having received CRC screening. Obesity was associated with lower CRC screening rates among patients in Swiss University primary care settings [40]. However, obesity was not related to receipt of colonoscopy screening in the US among low-income Latino and African American patients receiving navigation [41]. A large cross-sectional study of African Americans and white Americans found that body mass index (BMI) was unrelated to CRC screening among whites. However, it was related to screening rates among African Americans [42]. In contrast, a large prospective study of patients a primary care provider saw in New York City found that morbid obesity was associated with a lack of CRC screening one year later [31].

Although these studies examined self-efficacy and several non-modifiable factors as potential predictors of CRC screening uptake, they did not focus on African Americans living with HIV. This article reports a study that tested the hypothesis that self-efficacy would be associated with CRC screening among African American men aged 45 and older living with HIV. This study is a secondary analysis of a randomized controlled trial (RCT) testing a health promotion intervention for African American men living with HIV. The data are from the baseline assessment before the participants received any intervention. Besides examining self-efficacy, the study also tested whether marital status, age, education, adherence to physical activity guidelines, and obesity are related to CRC screening in this population.

Methods

The Institutional Review Board of the University of Pennsylvania reviewed and approved the study. All participants gave their informed consent before enrolling in the study. Participants volunteered for an RCT on the efficacy of a health promotion intervention for African American men aged 40 years or older living with HIV by increasing their physical activity and healthy diet behaviors. Recruitment was conducted based on the CFAR Clinical Core Adult/Adolescent Database at the University of Pennsylvania. This database contains information on people living with HIV who agreed to be contacted for research

participation. In addition, providers at the University of Pennsylvania's Presbyterian HIV Clinic, the Drexel University/Partnership Clinics, and AIDS service organizations in Philadelphia referred patients. We also placed ads for participant recruitment in a local newspaper and on social media sites, including Facebook, Twitter, and Craigslist.

The study's eligibility criteria included men who were 40 or older, identified themselves as Black or African American, and were receiving antiretroviral therapy (ART) for HIV. Referral of an HIV care provider or proof of a prescription for ART verified that participants were receiving ART for HIV. We excluded men whose blood pressure was 180/110 mm Hg or higher or who participated in any intervention trials targeting physical activity, diet, or prostate or CRC screening in the past 12 months. We also excluded men who were planning to relocate during the next 18 months or did not have a mailing address since they would be challenging to follow for post-intervention collection.

Measures

We administered self-report assessments via audio computer-assisted self-interviewing (ACASI). ACASI integrates data quality-control measures into the data-collection process, improving the integrity of the data. ACASI also enhances the quality of self-report data from low literacy respondents. The method may encourage more accurate reporting than face-to-face interviews or paper-and-pencil surveys [43, 44].

We assessed CRC screening by asking, "In the past 6 months, have you been screened for colon cancer?" The participants could answer this question with either "No" or "Yes."

We measured CRC screening self-efficacy with a 6-item scale on completing screening for CRC in the next six months. Participants indicated how confident they are in performing a series of tasks (e.g., "Receive a colon cancer screening in the next 6 months?") based on a 3-point scale (1, "not at all confident or sure;" to 3, "very confident or sure.") The score was the mean of the items ($\alpha = .92$), with higher scores indicating greater self-efficacy levels.

We gauged marital status with a binary variable indicating whether the participants were married (yes, no). Education was measured with the question, "What is the highest grade of school you completed?" The response options were "no formal schooling," "less than a high school diploma," "a high school diploma (or GED)," "some college or a 2-year degree," "4-year college degree," or "post-graduate work" [45].

We constructed adherence to physical activity guidelines based on three open-ended items the Centers for Disease Control and Prevention [46] developed: On how many of the past 7 days, did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar vigorous physical activities? On how many of the past 7 days, did you exercise or participate in physical activity for at least 30 minutes that did not make you sweat and breathe hard, such as walking, slow bicycling, skating, pushing a lawnmower, or anything else that caused small increases in breathing or heart rate? On how many of the past 7 days, did you exercise to strengthen or tone your muscles, such as push-ups, sit-ups, or weightlifting? We defined minutes of moderate-to-vigorous physical

activity as the sum of the number of days of moderate-aerobic physical activity times 30 min and the number of days of vigorous-aerobic physical activity times 20 min times 2 since min of vigorous physical activity count twice as much as min of moderate physical activity. We categorized the participants as meeting the guideline if in the past 7 days they engaged in muscle-strengthening activity on at least 2 days and if they engaged in at least 150 min of moderate-to-vigorous physical activity in the past seven days [47, 48].

We constructed obesity as a binary variable. We categorized a BMI ≥ 30 as obese and a BMI < 30 as not obese. Research coordinators measured the participants' weight and height to determine their BMI. Weight, to the nearest 0.1 kg, was measured in light clothing without shoes using a calibrated scale. Height was measured to the nearest 0.1 cm using a standard height indicator. We calculated BMI as weight (kilograms) divided by height in meters squared.

Statistical Analysis Plan

To summarize the participants' sociodemographic characteristics, we used descriptive statistics. Pearson product-moment correlation coefficients assessed bivariate relations among CRC screening variables and other variables. A multiple logistic regression model was used to examine CRC screening self-efficacy, obesity, education, physical activity, marital status, and age considered together as colon cancer screening predictors. We conducted all analyses using SAS 9.4.

Results

Table 1 shows the participants' sociodemographic characteristics. The average age of participants was 55.14 ($SD = 6.47$). About 74% had obtained at least a high school diploma, and 12% reported being married. About 16% met the physical activity guideline, and 30% were obese. About 30% reported screening for CRC in the last six months.

We first examined correlations among CRC screening, screening self-efficacy, and the non-modifiable factors relevant to CRC screening. As shown in Table 2, self-reports of a CRC screening in the past six months was positively correlated with CRC screening self-efficacy and adherence to the physical activity guidelines ($r = .14, p = .023$) and negatively correlated with education level ($r = -.13, p = .031$) and obesity ($r = -.12, p = .047$). These results indicate that participants who expressed greater self-efficacy for screening and reported regular physical activity were more likely to receive the cancer screening, while obese participants or those with higher levels of education were less likely to do so. Other correlations were not statistically significant, as reported in Table 2.

We also examined associations between the CRC screening potential predictors and self-reported screening using the multiple logistic regression analysis, as shown in Table 3. The results indicate that screening self-efficacy is positively related to CRC screening ($OR = 1.90, 95\% CI [1.10, 3.27], p = .021$), controlling for obesity, age, education, physical activity, and marital status. The results also reveal positive associations of adherence to physical activity guidelines and negative associations of obesity ($OR = 0.53, 95\% CI [0.28, 0.98], p = .044$) and education ($OR = 0.69, 95\% CI [0.52, 0.91], p = .010$) with CRC

screening, consistent with the zero-order correlation findings. Neither age nor marital status was related to CRC screening, as shown in Table 3.

Discussion

This study aimed to examine whether self-efficacy was related to CRC screening among African American men aged 45 and older living with HIV. A second purpose was to determine whether non-modifiable variables might suggest subpopulations at risk for non-adherence to screening based on marital status, age, education, adherence to physical activity guidelines, and obesity. The zero-order correlations and the multiple logistic regression results concurred in revealing that self-efficacy had a positive relation to CRC screening. Also, men who reported adherence to physical activity guidelines were more likely to get screened, whereas those who were obese were less likely to get screened. Moreover, participants with higher education had a lower likelihood of getting colon cancer screening. Marital status and age were unrelated to CRC screening in either the zero correlations or the multiple logistic regression.

The finding that self-efficacy is related to CRC screening is consistent with prior studies [16, 17, 18, 19], as are the results tying physical activity to screening [33, 34, 35]. We found that obesity is related to a lack of screening, but the literature on this is mixed. Consistent with our results, some studies report obesity is related to increased screening in African Americans [42]. Others found no relation in low-income Latino and African American patients receiving navigation [41].

The education results are surprising given that studies often find that people with higher education report more rather than less positive health behaviors, including CRC screening [19, 24, 25]. One might speculate that men traditionally are action-oriented or problem solvers; therefore, educated men may perceive screening as a sign of weakness. Fear of the potential outcomes associated with a CRC diagnosis, about which the more educated might be more aware, is also a possible explanation for this result.

In contrast to previous studies reporting that being married is associated with a greater likelihood of CRC screening, especially in men [23], we found that this was not the case in African American men living with HIV. The reason for this difference in findings is unclear. Other studies also have provided evidence that age is related to screening, specifically that older men are more likely to be screened [21]. There was no relation in our study. Additional research is needed to confirm age is unrelated to CRC screening among African American men age 45 and older living with HIV.

The findings for physical activity guidelines adherence and obesity are of particular interest. Of course, they suggest that men who do not meet the physical activity guidelines and those who are obese need intervention to encourage screening. However, these subpopulations are of interest for another reason: physical inactivity [37, 38, 39] and obesity [49, 50] are risk factors for CRC. Moreover, among people who develop CRC, being physically inactive or obese is associated with lower overall and disease-specific survival [51]. These

are additional reasons why it would be essential to encourage CRC screening in African American men living with HIV who are physically inactive or obese.

Study limitations & strengths

The present study has several limitations. The use of a cross-sectional design prevents us from establishing causality. For instance, it is possible that screening for CRC may increase CRC screening self-efficacy, rather than the reverse. Future studies using a prospective design can establish temporal precedence of self-efficacy in relation to screening. Most important, RCTs of interventions designed to increase self-efficacy could help establish causation. The study is a secondary analysis of an RCT on African American men living with HIV who volunteered for a health promotion intervention study in Philadelphia, PA. Therefore, the results may not generalize to other populations of African American men living with HIV. The use of self-reports, which can be inaccurate because of participants' forgetting or social desirability response bias, is also a limitation of this study. Future research using objectively documented CRC screening would address this concern.

Despite these limitations, this study provides useful information on CRC screening among African American men aged 45 or older, a population at risk for CRC morbidity and mortality that underutilizes CRC screening. For those who would develop interventions to increase screening in this population, this study suggests that these interventions should target cancer screening self-efficacy. Enhancing self-efficacy may be necessary to achieve CRC screening uptake among African American men living with HIV. The study also suggests public health efforts should prioritize interventions and campaigns for physically inactive and obese African Americans living with HIV. Research along these lines may help reduce morbidity and mortality from CRC in this population.

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Table 1.

Baseline characteristics of African American men living with HIV, Philadelphia, PA

Characteristics (N=270)	
Age, Mean (SD)	55.14 (6.47)
Education, n (%)	
No formal schooling	7 (3)
Less than a high school diploma	63 (23)
A high school diploma (or GED)	100 (37)
Some college or a 2-year degree	80 (30)
4-year college degree	11 (4)
Post-graduate work	9 (3)
Married, n (%)	33 (12)
Meeting the physical activity guideline, n (%)	42 (16)
Obesity, n (%)	82 (30)
Colon cancer screening in the last 6 months, n (%)	82 (30)

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Table 2.

Zero-order correlations (p value) among variables, African American men living with HIV, Philadelphia, PA, N = 270

Measure	Colon cancer screening	Screening self-efficacy	Age	Education	Married	Physical activity	Obesity
Screening self-efficacy	.13 (.027)						
Age	-.02 (.736)	-.05 (.394)					
Education	-.13 (.031)	.07 (.250)	.06 (.304)				
Married	.01 (.809)	.09 (.126)	.06 (.294)	.10 (.095)			
Physical activity	.14 (.023)	.04 (.542)	.03 (.658)	.03 (.636)	-.03 (.666)		
Obesity	-.12 (.047)	-.04 (.511)	-.08 (.209)	-.05 (.458)	-.04 (.449)	-.06 (.316)	
Mean	1.30	2.52	55.14	2.20	0.11	0.16	0.30
Standard deviation	0.46	0.56	6.47	1.04	0.32	0.36	0.46
Possible range	1-2	1-3	45-88	0-5	0-1	0-1	0-1

Table 3.

Multiple logistic regression analysis of predictors of colon cancer screening, African American men living with HIV, Philadelphia, PA, N = 270

Predictor	Odd ratio [95% CI]	<i>p</i> value
Screening self-efficacy	1.90 [1.10, 3.27]	.021
Obesity	0.53 [0.28, 0.98]	.044
Education	0.69 [0.52, 0.91]	.010
Physical activity	2.20 [1.10, 4.42]	.026
Married	1.15 [0.50, 2.66]	.749
Age	0.99 [0.95, 1.04]	.779

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