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## Psychosocial Risk Profiles among Black Male Veterans Administration Patients Non-Adherent with Colorectal Cancer Screening

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### Abstract

**Objective**—This study identifies unique psychosocial characteristics among African American men that put the men at risk for non-adherence to colorectal cancer (CRC) screening (colonoscopy, sigmoidoscopy and FOBT). Subgroups sharing similar psychosocial characteristics may be targeted with specific intervention strategies aimed at increasing participation in screening, which could lead to increased early detection and decreased morbidity and mortality.

**Methods**—The male, African American veterans in our sample (n=260) had a mean age = 57.3 (SD=7.3). Our study employs latent class analysis (LCA), a quantitative-based, audience segmentation method to identify homogeneous subgroups of African American men with similar psychosocial characteristics related to CRC screening, potentially in need of different health information and intervention strategies. Latent class regression was used to examine the relationships among latent class structure and demographic characteristics.

**Results**—There were four psychosocial risk classes across the three screening tests. A significant subset of men had psychosocial characteristics indicative of willingness to be screened for each test (Colonoscopy=21.8%, Sigmoidoscopy=31.5%, FOBT=10.8%), although they were currently non-adherent. Men who received a past screening test, had greater than a high school education, or were married were more likely to be represented in a latent class indicative of being prepared for getting colonoscopy or sigmoidoscopy. Socio-demographic variables were unrelated to FOBT latent class structure.

**Conclusions**—Segmenting our sample of male African American veterans based on psychosocial risk characteristics can inform the development of more precisely targeted interventions for African American men who are non-adherent for CRC screening.

## Keywords

Colorectal cancer screening; Latent Class Analysis; Black men

African Americans bear a disproportionate cancer burden with the highest cancer mortality of any racial/ethnic group (1). Colorectal cancer (CRC) is the third most common cancer among African American women and men (2). During the past 25 years, CRC mortality rates for Whites decreased with no corresponding trend among African Americans (3). Although incidence rates have declined for both African Americans and Whites, the incidence of CRC remains 20% higher in African American than Whites (4).

Despite the known benefits of regular CRC screenings, disparities in CRC screening continue to exist between Whites and African Americans (5–11). A recent report showed an increasing trend in utilization of CRC screening tests (12); however, screening rates for African Americans remain suboptimal and well below the Healthy People 2010 goals that 50% of those eligible should be screened (13) (14).

CRC screening behavior is complex with multiple influencing factors, including personal characteristics such as beliefs about screening and provider level characteristics including physician-patient communication and trust. Furthermore, these factors may have varying and collective impacts across different population subgroups (12,15,16). Several psychosocial characteristics are known to influence cancer screening behavior and have been empirically associated with participation in CRC screening in African Americans. (17). Characteristics positively associated with CRC screening include perceived benefits of screening (18–23) and one's self-efficacy (SE) for completing screening behavior (24), while perceived barriers were negatively associated with completion of screening (25).

Individual tests for screening are also associated with specific psychological predictors. For example, less knowledge about CRC and screening is significantly related to decreased use of both fecal occult blood tests (FOBT) (26–30) and decreased use of sigmoidoscopy (26,31). By contrast, increased self-efficacy has been associated with higher FOBT (32) (33). Notably, African Americans have had lower CRC screening knowledge scores than Whites in several investigations (23,29,30,34–36). Moreover, racial differences in knowledge persist even after controlling for demographics, such as age and education, although those with higher income and higher education did have greater knowledge (27).

The goal of this study is to explore psychosocial and demographic characteristics of African American men who are currently non-adherent with CRC screening according to the recommendations for screening from the American Cancer Society. In the current study, we identify unique risk profiles for each screening test based on CRC screening beliefs. African American men who are non-adherent to CRC screening may differ in beliefs, behavior, and demographics. Subgroups sharing similar psychosocial characteristics may be targeted with specific interventions strategies aimed at increasing participation in screening, which could lead to early detection and decreased morbidity and mortality.

## METHODS

### Study Population

We relied on data from baseline interviews in a 5-year randomized controlled trial to increase CRC screening in primary care settings. Data collection began in 2004 and was completed in 2008. The analysis for the current study was conducted in 2009 and verified in 2010. Trained data collectors obtained consent and enrolled patients in Veterans

Administration outpatient clinics in Chicago. Medical records of participants who consented were checked to ensure they were eligible for the study with regard to not having been screened for CRC within the past appropriate intervals. Eligible participants completed a computer-assisted telephone interview for baseline data with a trained data collector.

### Theoretical Framework

Measurement and methods related to the current study have been guided by the Health Belief Model (See figure 1). The HBM is a psychological model that posits that perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy are related to a person's preparedness to act on a particular health behavior. The health belief model has been used to assess CRC screening behavior among African Americans in past studies (37).

### Measurement

Screening adherence was assessed according to American Cancer Society guidelines (38). Men were categorized as non-adherent if they were over age 50 and had not had an FOBT within the past 12 months; a sigmoidoscopy within that past 5 years; or a colonoscopy in the past 10 years.

We contend that patients' clinical experiences differ significantly with regard to the three commonly recommended tests for CRC screening — fecal occult blood test (FOBT), sigmoidoscopy, and colonoscopy. As a result, a person's psychosocial characteristics related to CRC screening such as confidence or self efficacy (SE); perceived barriers; and benefits to obtaining each test to complete screening may vary by procedure. To participate in FOBT, for example, the patient performs the non-invasive procedure by collecting stool on his own at home. This is a qualitatively different experience than being subjected to an invasive procedure performed by a provider, which also requires bowel preparation, travel to an outpatient facility, and in the case of colonoscopy, conscious sedation. As a result, we developed a separate self-efficacy measure for each of the three CRC screening tests (33). Measures used were previously validated and demonstrated good internal consistency reliability (33,39). Internal consistency reliability was also re-verified and established as appropriate among our sample of African American men. Due to rigorous data collection and follow-up and procedures, no measure contained missing data. The following internal consistency reliability estimates are for the sample of African American men in the current study. Response items are: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree and don't know unless noted otherwise.

*Colorectal Cancer Screening Knowledge:* of guidelines, risk, and early detection of CRC has 4 items. 1. Do people with colon cancer usually have to have part of their colon removed (Yes, No, Don't know)?, 2. Which of the following is recommended for people 50 years and older? (Yearly stool blood test yearly sigmoidoscopy, Don't know), 3. Which of the following is recommended for people 50 years and older?(Colonoscopy every 10 years, Colonoscopy every 2 years, Colonoscopy every year, Colonoscopy only when symptoms occur, Don't know),4. When colon polyps (lumps or growths) are found, how many are cancerous? (Most are cancerous, Most are not cancerous, About half are cancerous, Don't know).

*Perceived Susceptibility:* an individual's perceived risk of developing CRC, has 3 items: I will get colon cancer, I will get colon cancer in the next few years, I will get colon cancer sometime during my lifetime. Cronbach's alpha = .80.

*Perceived Barriers:* perceived obstacles that inhibit or prevent an individual from completing a screening test: 7 items on FOBT, 7 on sigmoidoscopy. (1) Fear of finding

something wrong will keep you from having a sigmoidoscopy. (2) Time will keep you from having a sigmoidoscopy. (3) Feeling anxious because you don't really understand what will be done will keep you from having a sigmoidoscopy. (4) Pain will keep you from having a sigmoidoscopy. 5. The cost will keep you from having a sigmoidoscopy. (6) Not having symptoms will keep you from having a sigmoidoscopy. (7) Following a special diet of clear liquids will keep you from having a sigmoidoscopy; and 9 items on colonoscopy; (1) Fear you might find out that something is wrong would keep you from having a colonoscopy. 2. Being embarrassed would keep you from having a colonoscopy. 3. Being anxious because you don't really understand what will be done would keep you from having a colonoscopy. 4. Pain would keep you from having a colonoscopy. 5 Transportation problems would keep you from having a colonoscopy. 6. Cost would keep you from having a colonoscopy. 7. Not having any symptoms would keep you from having a colonoscopy. 8 Following a special diet and taking a laxative would keep you from having a colonoscopy. 9 The possibility of bleeding or tearing of the colon would keep you from having a colonoscopy. Cronbach's alpha = .85, .67, and .89, respectively.

*Perceived Benefits:* the perception of positive outcomes associated with each test has 3 items FOBT 1. Having a stool blood test will help you find colon cancer early. 2. Having a stool blood test will help you not worry as much about colon cancer. 3. Finding colon cancer early means that the treatment may not be as bad. 3 on sigmoidoscopy Median:12): 1. A sigmoidoscopy will help you find colon cancer early. 2. A sigmoidoscopy will decrease your chances of dying from colon cancer. 3. A sigmoidoscopy will help you not worry as much about colon cancer, and 3 on colonoscopy 1. A colonoscopy will help find colon cancer early. 2. A colonoscopy will decrease your chances of dying from colon cancer. 3. A colonoscopy will help you not worry as much about colon cancer. Cronbach's alpha = .72, .65, and .74, respectively.

*Perceived Self-Efficacy:* confidence in one's ability to complete each test: 7 items on FOBT You can obtain a stool blood test kit. You can follow the instructions that come with the stool blood test kit. You can collect three separate stool samples. You can mail the sample back to the lab or doctor's office. You can complete a stool blood test even if you don't know what to expect. You can complete a stool blood test if you really want to. You can find a store to buy a stool blood test. 13 on sigmoidoscopy 1. You can make an appointment for a sigmoidoscopy. 2. You can take the laxative to cleanse your bowel for the sigmoidoscopy. 3. You can go without eating solid foods the day before the sigmoidoscopy. 4. You can find transportation to get to the clinic to have a sigmoidoscopy. 5. You can get a sigmoidoscopy even if you are worried about the results. 6. You can get a sigmoidoscopy even if you don't know what to expect. 7. You can find a way to cover the cost of a sigmoidoscopy. 8. You can talk to your health care provider about your sigmoidoscopy 9. You can follow instructions to prepare for a sigmoidoscopy.10. You can arrange other things in your life to have a sigmoidoscopy. 11. You can have a sigmoidoscopy if you really want to. 12. You can find time to cleanse out your bowel before a sigmoidoscopy. 13. You can deal with the fear of having a sigmoidoscopy. And 12 on colonoscopy 1. You can make an appointment to have a colonoscopy. 2. You can drink only clear liquids for a day before the colonoscopy. 3. You can find transportation to get to the clinic to have a colonoscopy. 4. You can find someone to drive you home after the colonoscopy. 5. You can cover the cost of a colonoscopy if necessary. 6. You can get a colonoscopy even if you are worried about the results. 7. You can talk to your health care provider about your concerns regarding the colonoscopy. 8. You can follow instructions to prepare for a colonoscopy. 9. You can have a colonoscopy even if you don't know what to expect. 10. You can find time to cleanse your bowel for the colonoscopy. 11. You can take time out your daily activities to have a colonoscopy. 12. You can have a colonoscopy even if you are anxious. Cronbach's alpha = .78, .88 and .92, respectively.

*Provider Trust*: the Primary Care Assessment Survey subscale on trust in provider (40), has 7 items: 1. I can tell my doctor anything, even things I might not tell anyone else. 2. My doctor sometimes pretends to know things when he/she is really not sure. 3. I completely trust my doctor's judgments about my medical care. 4. My doctor cares more about holding down costs than about doing what is needed for my health. 5. My doctor would always tell me the truth about my health, even if there was bad news. 6. My doctor cares as much as I do about my health. 7. If a mistake was made in my treatment, my doctor would try to hide it from me. Higher scores indicate more favorable perceptions. Cronbach's alpha = .83.

Demographic characteristics including age, educational status (less than high school, high school or greater), marital status (married or partnered versus un-married/un-partnered), employment status (working part or full time versus not working), and past screening status (had colonoscopy, Sigmoidoscopy, or FOBT in the past) were also collected. Means and standard deviations for all scales can be found in table 2.

## Analysis

Descriptive statistics were employed to examine demographic characteristics among the Black men in our study. Chi-square tests assessed the relationship between past screening history and demographic characteristics. Means and standard deviations were calculated for each CRC screening related psychosocial construct. T-tests were assessed the relation between age and past screening history.

We fit latent class analysis models (LCA) to summarize psychosocial factors related to FOBT, sigmoidoscopy, and colonoscopy. LCA, a finite mixture model, is a statistical technique used to identify subgroups of individuals in a set of two or more mutually exclusive and exhaustive latent classes based on multiple observed variables. LCA segments a population by estimating the optimal number of latent classes necessary to represent heterogeneity across individuals in their responses to colorectal cancer screening psychosocial factors. Specifically, two parameters are estimated: 1) Gamma parameters, which are class membership probabilities and identify how many men are expected to be in each latent class and 2) Rho parameters: item response probabilities that represent the probability of endorsement of a particular item with each class. Model selection is achieved by evaluating a combination of the  $G^2$  statistic, degrees of freedom, the Akaike Information Criteria (AIC), the Bayesian Information Criterion (BIC), and interpretation of the models. Classes are assigned descriptive labels based on the characteristics of item response probabilities. In the process to label classes, every variable in each class is designated as high and low. If the item response probability (rho parameter) was greater than 0.70 for that item in the given class, it was designated as high. If the item response probability was less than 0.70 for that item in the given class, it was designated as low. If the rho parameter estimate is close to 0.50, we assumed that the particular item was not a distinguishing characteristic of the class or did not contribute to the characterization of the class. Classes were then given a descriptive name based on the characteristics of the rho parameters in each class.

LCA models with covariates were fit (separately for each cancer screening test) to assess the relationship among psychosocial risk latent class membership, past screening behavior, and socio-demographic variables. For all analyses, screening beliefs, knowledge, and self-efficacy measures were represented as dichotomous variables (high versus low). In order to fit the LCA models, each measure was dichotomized based on the median response after examining the distribution of each item. Age was controlled for in all models. All LCA models were run with SAS proc LCA/LTA (<http://methodology.psu.edu>).

Subsequently, posterior probabilities for each model were calculated in order to assign each person to a class. Class assignment for each individual was then compared across each CRC screening test to determine if men were in similar classes for each of tests. Based on assigned class, cross-tabulations were assessed for concordance/discordance (e.g. prepared for FOBT and prepared for sigmoidoscopy and colonoscopy) across screening tests. Because classes across screening tests were not identical and thus not necessarily comparable, we assessed the prepared versus unprepared classes across models.

## RESULTS

The majority of men were between 50 and 65 years of age (93.6%) and approximately 20 percent (20.9%) were currently married. The majority have greater than a high school diploma (60.1%). Less than 15% of the sample had a previous colonoscopy (14.8%) or sigmoidoscopy (14.3%). Approximately 36% had a past FOBT. Men who had a past CRC screening history were on average four years older than men who had never been screened ( $p$ -value for  $t$ -test=0.0003). Past screening history and demographic characteristics, including marital, work or educational status, were unrelated across all three CRC tests.

Latent Class Models: Four class models provided the best fit across each of the three screening tests — FOBT, sigmoidoscopy, and colonoscopy

Latent class membership probabilities (gamma estimates) or the proportion of African American men expected to be in each class are presented in Table 3. Table 4 displays the percentage of men expected to be in each latent class in relation to demographic covariates.

### FOBT Latent Class Structure ( $G^2=26.3$ , $df =36$ )

Class 1(Unprepared) is characterized by low perceived susceptibility, low health care provider trust, low knowledge, low perceived FOBT benefits, and low self-efficacy for receiving FOBT screening. Perceived barriers were not a definitive characteristic of this class.

Class 2 (Low Barriers & Benefits): is characterized by low perceived susceptibility, high health care provider trust, low perceived FOBT benefits, low perceived barriers and high self-efficacy for receiving FOBT screening. Knowledge was not a definitive characteristic of this class.

Class 3 (Low Self-Efficacy/Trust & High Barriers): is characterized by low perceived susceptibility, low health care provider trust, a combination of high and low knowledge, high perceived FOBT benefits, high perceived barriers and low self-efficacy for receiving FOBT. Knowledge was not a definitive characteristic of this class.

Class 4 (Prepared) is characterized by high perceived susceptibility, high health care provider trust and knowledge, high perceived FOBT benefits, low perceived barriers and high self-efficacy for receiving FOBT screening.

### Sigmoidoscopy Latent Class Structure:( $G^2=57.9$ , $df =43$ )

Class 1 (Unprepared) is characterized by participants with low perceived susceptibility, low health care provider trust, low knowledge, low perceived sigmoidoscopy benefits, high perceived barriers and low self-efficacy for receiving sigmoidoscopy screening.

Class 2 (Low Benefits, Trust, Self-Efficacy) is characterized by high perceived susceptibility, low health care provider trust, low perceived sigmoidoscopy benefits, and low

self-efficacy for receiving sigmoidoscopy screening. Knowledge and barriers were not definitive characteristics of this class.

Class 3 (High Susceptibility) is characterized by participants who have high perceived susceptibility, high perceived sigmoidoscopy benefits, low perceived barriers and high self-efficacy for receiving sigmoidoscopy screening. Knowledge and trust were not definitive characteristics of this class.

Class 4 (Prepared) is characterized by participants who have low perceived susceptibility, high health care provider trust, low perceived barriers and high self-efficacy for receiving sigmoidoscopy screening. Knowledge and perceived benefits were not a definitive characteristic of this class.

### Colonoscopy Latent Class Structure ( $G^2=34.7$ , $df =36$ )

Class 1 (Unprepared) is characterized by participants with low perceived susceptibility, low health care provider trust, low knowledge, low perceived colonoscopy benefits, low perceived barriers, and low self-efficacy for receiving colonoscopy screening.

Class 2 (High Barriers/Low Self Efficacy) is characterized by participants with low perceived susceptibility, low knowledge, high trust in health care providers, low perceived colonoscopy benefits, high barriers, and low self-efficacy for obtaining colonoscopy.

Class 3 (Low Benefits/Barriers/Self-Efficacy) is characterized by participants who have high trust in health care providers, low perceived colonoscopy benefits, and low perceived barriers to and low self-efficacy for obtaining colonoscopy. Knowledge and susceptibility were not definitive characteristics of this class.

Class 4 (Prepared) is characterized by participants with low perceived susceptibility who have high trust, have high perceived benefits and high self-efficacy for obtaining colonoscopy. Knowledge and perceived barriers was not definitive characteristics of this class.

**Latent Class Structure and Demographic Variables**—Table 4 displays the relationship among latent class structure for each screening test, past screening history and demographic variables. For each screening test, the p-value represents the level of significance for a test of differences in latent class structure among levels of the covariate. Since covariates are all binary, this p-value can be interpreted as the result for a t-test in which the response variable is the latent class variable.

Socio-demographic variables were unrelated to FOBT latent class structure. For colonoscopy, latent class structure differed by marital status and past screening behavior: For sigmoidoscopy, men who received a past sigmoidoscopy and men who were married were more likely to be represented in a *Prepared for Screening* class. Additionally, men who have greater than a high school education are more likely to be in a *Prepared for Screening* class. Similarly married men and men who had received a past colonoscopy had risk profiles with more men in a *Prepared for Screening* class compared to men who are not married and who had never been screened.

**Is latent class membership consistent across tests?**—Tables 5a–c display the number of participants assigned to similar classes across screening test. Only six men were prepared for colonoscopy but were reportedly unprepared for completing FOBT. Thirty-eight were prepared for both sigmoidoscopy and colonoscopy and sixty were unprepared for

both. Nine men indicated that they were prepared to complete an FOBT but were not prepared to have a colonoscopy (table 5a).

Twenty-one men were prepared for colonoscopy but were reportedly unprepared for sigmoidoscopy. Thirty-four were prepared for both sigmoidoscopy and colonoscopy. Four men indicated that they were prepared to participate in sigmoidoscopy but not prepared to have a colonoscopy (table 5b).

Sixteen men were prepared for sigmoidoscopy but were reportedly unprepared to purchase an FOBT test. Thirty-four were prepared for both sigmoidoscopy and FOBT. Three men indicated that they were prepared to participate in sigmoidoscopy but not prepared to complete an FOBT test (table 5c).

## DISCUSSION

In this study, we demonstrated that distinct subgroups of African American men differ in characteristics related to each CRC screening test. We accomplished this by employing a group-based analytic approach that generates a multivariable description of individuals who are members of a subgroup. Our approach allowed us to determine complex combinations of risk factors that relate to CRC screening. African American men who are non-adherent to CRC screening are not a homogenous group; in fact, they exhibit different profiles and patterns of risk.

We found substantial latent classes across all three screening tests that were characterized as “prepared for test” in terms behavioral and knowledge characteristics known to encourage CRC screening, despite the fact that the men were currently non-adherent with CRC screening. Therefore, in some cases, even when African American men are knowledgeable about CRC and CRC screening, have limited barriers and have high self-efficacy and perceived benefits, they may not participate in screening.

Our findings are consistent with and empirically support previous investigations. Previous investigations have attempted to address disparities by seeking better understanding of populations that underutilize cancer screening tests. Fyffe and colleagues (41) found that African American men were deterred from CRC screening due to fear of the procedure, negative experiences with the health care system (both of which are considered barriers) and a general lack of motivation for screening. Similarly, Greiner and colleagues (42) found that among African American men, hope and a positive attitude toward screening and trust in the health care system promoted CRC test completion; in addition to fear of cancer and cancer screening procedures, discouraged screening.

Additionally, marital status, education, and past screening behavior relate to CRC screening risk profiles. Demographic factors such as higher education and higher income have been found to be associated with increased CRC screening (21,43). However, consistent associations between CRC screening and demographic characteristics such as age, gender, and marital status have otherwise not been evidenced, especially among African American men (44,45).

By detecting levels of risk by subgroup and type of screening procedure, we addressed concerns about treating a population as a homogeneous group, while considering the perceptions of three very different procedures grouped under the rubric of CRC screening. While a few studies have examined test preferences (46), additional research is needed to better understand preferences for each type of screening test, as well as which factors are related to uptake of specific tests such as FOBT. In our findings, psychosocial factors differed by screening test. Preferences for specific types of tests are important distinctions to



make prior to the development of educational programs designed to increase screening with a given population.

Identification of risk profiles across discrete subgroups allows interventions to target those at highest risk within a population. Landsdrop-Volegaar and colleagues (2009) (47) found that tailoring CRC screening guidelines could potentially help to decrease disparities between African American and Whites. Hawley and colleagues (48) found that CRC screening preferences differ by race and ethnicity and are based on the characteristics of the attributes of the test itself. African American men, for example, were found to prefer colonoscopy over FOBT and sigmoidoscopy when provided with information about attributes of all three tests.

A study by Holt and colleagues (49) argues that audience segmentation techniques such as focus groups can be used as a means to provide tailored information and interventions to distinct population subgroups in order to improve cancer screening outcomes. Similarly, Williams-Piehot (50) used audience segmentation strategies to identify profiles of men's health information style based on characteristics related to independence in health decision making among men participating in prostate cancer screening. Information style was associated with uptake of subsequent health information delivered during an intervention. Our study also adds to previous findings by identifying risk profiles specific to each CRC screening test.

Few published reports on self-efficacy relate to different types of screening tests, and no known studies investigate self-efficacy for specific screening tests among African American men. Another key finding from this study is the differences in the significant beliefs and knowledge associated with each test. As evident from Table 3, there are differences in the beliefs between Classes 2 and 3 for each screening test. For example, sigmoidoscopy Class 2 is characterized by low benefits and self-efficacy, and colonoscopy Class 2 is characterized by high barriers and low-self-efficacy. Sigmoidoscopy Class 3 is characterized by low susceptibility, while colonoscopy Class 3 respondents had significantly low benefits, barriers, and self-efficacy. Additionally, our results (table 5) demonstrated that while an individual is prepared for one test (e.g. sigmoidoscopy), he may not be prepared for a different test (e.g. colonoscopy). Findings speak to the necessity to target education to like-groups to make health messaging more relevant. Although messages tailored to the individual are better remembered and acted on (51), creating tailoring programs is expensive. Many tailored programs tested are proprietary or developed to work within one clinic or health system. Targeting messages to appropriate groups allows for messages to be relevant and yet can be applied to larger segments of clinic populations that share similar beliefs. These findings also shed new light on the fit of the Health Belief Model in cancer screening research. Knowledge that has been an integral part of the HBM [37] was not related to any screening test in this study. While these results will need to be replicated and confirmed for the purposes of adapting existing theoretical frameworks, it is important to note that our results point to an emerging trend in cancer screening research to examine variables that go beyond cognitive beliefs and knowledge, especially for minority populations (52). Many studies, including this one, rely on narrowly defined determinants of behavior in a specific relationship to one another, entirely isolated from social context (52). In breast cancer screening, for example, colonialism; discrimination and racism; health care experiences in home country and the United States; religious and spiritual orientations; causes of illness; and perceptions of the body all attenuated the cognitive HBM variables (53).

Even given the limitations of using only the HBM, our study employs a quantitative-based, audience segmentation method to identify homogeneous subgroups of African American

men potentially in need of different health information and intervention strategies, setting the stage targeted education to increase CRC screening. Fisher and colleagues speak eloquently to the need to leverage the culture of individuals, groups and organizations to optimize health interventions (54). Segmenting groups for targeted education may well be an innovative way to increase cancer screening behaviors.

Incorporating and accounting for patients' preferences into screening intervention programs may increase screening adherence among racial and ethnic minorities. By evaluating psychosocial risk profiles surrounding each CRC test among African American men who are at non-adherent with screening, future investigations may target subgroups within the African American population at highest risk for non-adherence. Participation in screening leading to early detection may address disparities by improving CRC treatment and survival outcomes for African American men compared to other racial/ethnic groups.

This study has several limitations. First, our participants were patients at a VA Medical Center and may, therefore, not represent the full spectrum of community dwelling African-Americans. Men in the VA system may have increased access to care compared to the general population. African American men who are un- or under-insured may differ in their psychosocial risk profiles due to limited access to CRC screening. Secondly, the data is cross sectional; therefore, causal inference regarding the association between screening risk profile and actual screening behavior is not possible.

In sum, African American men who are non-adherent with CRC screening are not a homogeneous group. Non-adherence is a multidimensional construct that manifest in multiple ways. In the current study, we segmented African American men based on psychosocial characteristics related to CRC screening. While more distinct or intensive interventions may be targeted for risk subgroups, it is imperative to include the entire population in screening.

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**Figure 1.**  
Health Belief Model for Psychosocial Factors Related to CRC Screening

**Table 1**

Sample demographic and CRC screening characteristics (n = 260).

Variable	%
Education	
Less than HS Diploma	39.9
HS diploma or more	60.1
Age	
50–65	93.6
Over 65	6.4
Married	20.9
Employed	18.1
Past CRC screening	
FOBT	35.9
Sigmoidoscopy	14.3
Colonoscopy	14.8

**Table 2**

Psychosocial characteristics related to CRC screening

<b>Variable</b>	<b>Mean(SD)</b>
Perceived Susceptibility	11.0(3.5)
Provider Trust	26.7(5.5)
Knowledge	1.4(0.89)
Benefits	
FOBT	12.7(1.9)
Sigmoidoscopy	12.2(2.3)
Colonoscopy	12.2(2.5)
Barriers	
FOBT	15.5(5.8)
Sigmoidodcopy	16.3(5.9)
Colonoscopy	20.3(7.1)
Self-Efficacy	
FOBT	28.7(3.5)
Sigmoidodcopy	49.3(5.9)
Colonoscopy	49.2(6.2)



**Table 3**

Latent classes and membership probabilities (n = 260).

<b>Latent Class</b>	<b>% Expected in Each Class</b>	<b>Standard Error</b>
<b>Colonoscopy</b>		
Unprepared	35.2%	0.08
High Barriers& Low Self Efficacy	13.2%	0.05
Low Benefits, Barriers & Self- Efficacy	30.0%	0.11
Prepared	21.8%	0.10
<b>Sigmoidoscopy</b>		
Unprepared	10.6%	0.08
Low Benefits and Self-Efficacy	52.4%	0.10
Low Susceptibility	7.5%	0.06
Prepared	31.5%	0.07
<b>FOBT</b>		
Unprepared	42.0%	0.10
Low Barriers & Benefits	15.5%	0.16
Low Self-Efficacy & High Barriers	31.7%	0.15
Prepared	10.8%	0.08

**Table 4**

Latent Class membership by socio-demographic characteristic

Screening test	Work Status		Marital Status		Level of Education		Past Screening	
	Working	Not Working	Married	Not Married	< HS	HS & >	No	Yes
<b>Percent of Black Men Expected to Belong to Each Latent Class (se)</b>								
<b>Colonoscopy</b>	P=NS		<b>P=0.03</b>		P=NS		<b>P=0.02</b>	
Unprepared	33%(0.09)	49%(0.7)	42%(0.08)	38%(0.09)	41%(0.08)	35%(0.08)	24%(0.11)	25%(0.07)
High Barriers & Low Self-Efficacy	17%(0.08)	26%(0.10)	8%(0.07)	32%(0.10)	9%(0.05)	10%(0.04)	30%(0.10)	26%(0.09)
Low Benefits, Barriers & Self-Efficacy	27%(0.08)	11%(0.07)	23%(0.11)	23%(0.09)	29%(0.10)	30%(0.09)	28%(0.10)	27%(0.07)
Prepared	23%(0.08)	14%(0.09)	27%(0.07)	7%(0.08)	21%(0.10)	25%(0.08)	8%(0.07)	22%(0.10)
<b>Sigmoidoscopy</b>	P= NS		<b>P= 0.03</b>		<b>P= 0.02</b>		<b>P= 0.05</b>	
Unprepared	20%(0.14)	13%(0.04)	10%(0.08)	25%(0.03)	15%(0.05)	25%(0.11)	14%(0.08)	6%(0.03)
Low Benefits and Self-Efficacy	34%(0.22)	54%(0.09)	40%(0.06)	45%(0.13)	55%(0.09)	25%(0.08)	46%(0.13)	30%(0.06)
Low Susceptibility	18%(0.08)	14%(0.11)	16%(0.11)	11%(0.05)	12%(0.06)	32%(0.12)	11%(0.08)	46%(0.11)
Prepared	28%(0.09)	19%(0.08)	34%(0.13)	19%(0.10)	8%(0.20)	8%(0.07)	19%(0.10)	18%(0.13)
<b>FOBT</b>	P=NS		P=NS		P=NS		P=NS	
Unprepared	22%(0.08)	37%(0.10)	30%(0.05)	44%(0.09)	34%(0.08)	37%(0.07)	38%(0.08)	43%(0.15)
Low Barriers & Benefits	25%(0.10)	18%(0.09)	25%(0.09)	21%(0.10)	17%(0.08)	13%(0.12)	17%(0.08)	13%(0.12)
Low Self-Efficacy & High Barriers	38%(0.08)	27%(0.08)	30%(0.09)	21%(0.09)	24%(0.10)	20%(0.09)	20%(0.12)	24%(0.20)
Prepared	15%(0.10)	18%(0.09)	15%(0.06)	4%(0.06)	16%(0.08)	30%(0.15)	16%(0.15)	20%(0.15)

**Table 5a–c**

Hard Assignment and Concordance among Classes across Screening Test: Note the full sample size is 260. Missing cases were in classes that were not comparable (identical) between tests.

<b>5a. Number of men in concordant/discordant classes</b>	<b>FOBT unprepared</b>	<b>FOBT prepared</b>
Colonoscopy unprepared	60	9
Colonoscopy Prepared	6	38
<b>5b. Number of men in concordant/discordant classes</b>	<b>Sigmoidoscopy unprepared</b>	<b>Sigmoidoscopy Prepared</b>
Colonoscopy unprepared	0	4
Colonoscopy Prepared	21	34
<b>5c. Number of men in concordant/discordant classes</b>	<b>FOBT unprepared</b>	<b>FOBT prepared</b>
Sigmoidoscopy unprepared	38	3
Sigmoidoscopy Prepared	16	34