Published in final edited form as:

Behav Med. 2019 ; 45(3): 221–230. doi:10.1080/08964289.2018.1510365.

Predicting colonoscopy screening behavior and future screening intentions for African Americans over age 50

Lynne B. Klasko-Foster, BA,

University at Buffalo, SUNY, School of Public Health and Health Professions, Department of Community Health and Health Behavior, 3435 Main Street, 312 Kimball Tower, Buffalo, NY 14214

Lina M. Jandorf, MA [Research Professor],

Department of Oncological Sciences, Icahn School of Medicine at Mount Sinai, One Gustave L. Levy Place, Box 1130, New York, NY, 10029, lina.jandorf@mssm.edu

Deborah O. Erwin, PhD [Distinguished Member],

Department of Cancer Prevention and Control, Roswell Park Cancer Institute, Elm and Carlton Streets, Buffalo, NY 14263, deborah.erwin@roswellpark.org

Marc T. Kiviniemi

Department of Community Health and Health Behavior, University at Buffalo, SUNY, School of Public Health and Health Professions, 3435 Main Street, 314 Kimball Tower, Buffalo, NY 14214

Abstract

African Americans experience a disproportionate burden of morbidity and mortality from colorectal cancer, which may be due to low adherence to screening recommendations. Previous studies have found relations between decision making factors and screening behavior, but few have looked at both cognitive and affective factors or within a specifically African American sample. To better understand determinants that drive screening behavior, this study examines affective, cognitive, and social variables as predictors of colonoscopy in an age-eligible African American population. Participants completed surveys assessing affective associations with colonoscopy, perceived benefits and barriers, self-efficacy, knowledge, fear of colonoscopy, perceived risk, and colorectal cancer worry and fear. Regression analysis was used to model decision-making constructs as predictors of screening behavior/intentions. Affective, cognitive, and healthcare experience variables predicted colonoscopy completion and intentions. Provider-level factors and previous cancer screenings predicted prior screening only, but not intentions. Affective and cognitive components of perceived risk were associated with decreased likelihood of colonoscopy behavior, but increased likelihood of colonoscopy intentions. These findings suggest that colonoscopy decision making involves a complex array of both cognitive and affective determinants. This work extends our knowledge of colorectal cancer screening decision making by evaluating the effects of these multiple determinants on screening behavior in an African American sample. Future work exploring the interplay of affect and cognitions as influences on colonoscopy decision making and how healthcare experiences may moderate this effect is needed to develop effective intervention approaches and reduce screening disparities.

Keywords

affective associations; health decision making; colonoscopy; health disparities

Introduction

Colorectal cancer is the second leading cause of cancer deaths among African American adults in the United States (U.S.).¹ In 2015, African Americans reported higher rates of both colorectal cancer incidence (49.2 per 100,000 compared to 40.2 per 100,000 for whites) and mortality (20.5 per 100,000 compared to 14.6 per 100,000 for whites) and were diagnosed at later, more advanced disease stages (24 percent of colorectal cancer diagnoses in African Americans were diagnosed at distant stages compared to 19 percent in whites).^{1,2} These differences may be due to low adherence to colorectal cancer screening recommendations, as African Americans have lower screening rates than non-Hispanic whites¹ and screening has a demonstrated effect on likelihood of survival.³ Given the need to address screening disparities, it is important to understand factors that influence the likelihood of colorectal cancer screening for African American adults.

Disparities in cancer morbidity and mortality are the result of a complex interplay of static and dynamic factors. Static or slower to change factors include low socioeconomic status (SES), culture, social injustice, and poverty. Such factors are associated with differences in screening rates, as these factors make access to screening services more challenging.^{4–6} Especially in the context of these structural and sociodemographic factors, it is important to also examine dynamic, changeable factors that may contribute to colonoscopy screening avoidance. These include affective associations (feelings and emotions)^{7–9} and cognitions (beliefs and knowledge)^{10–14} regarding colonoscopy screening. Self-efficacy and knowledge are noted strong predictors of colonoscopy intentions^{15–20} but not always colonoscopy uptake.^{17,21} Studies examining affective associations with colonoscopy have found that barriers to colonoscopy include fear of pain^{22,23} or complications^{24–26} and fear and embarrassment associated with the colonoscopy procedure.^{27,28} In addition, affective components of fear of colorectal cancer are more complex. Fears of getting colorectal cancer and cancer worry have been identified in different studies as both inhibitors of^{23,28–30} and facilitators of colonoscopy screening.^{31,32} Although substantial evidence exists for relations of both cognitive and affective factors to colonoscopy behavior,^{9,33} few studies examine both types of decision-making factors in an exclusively African American population. One exception is Kiviniemi, Jandorf and Erwin,⁹ who found that positive and negative affective associations with colonoscopy were related to both past screening uptake and future screening intentions, and that affective factors mediated relations between cognitive factors and colonoscopy screening in an African American sample.

In addition to intrapersonal factors, such as affect and cognition, social and cultural factors in the patient-provider relationship contribute to general avoidance of the healthcare system and, in turn, cancer screening disparities. Patient-provider communication and patient trust of healthcare providers are strong predictors of adherence to medical recommendations.^{34,35} Patients reporting greater engagement in discussions about screening with a primary care

provider are more likely to adhere to screening.^{16,36} In a recent qualitative study, unscreened African Americans at increased risk of colorectal cancer frequently reported mistrust of providers resulting in avoidance of the health care system as the reason for not getting screened.³⁷ Qualitative results from another study indicated that African Americans do not trust the healthcare system or healthcare providers to prioritize patients over health plan payers' expectations, leading to patient disbelief in the benefits of screening.³⁸

In sum, African Americans are less likely than non-Hispanic whites to be adherent to screening guidelines. While prior studies have modeled many of the included social cognitive constructs as predictors of colorectal cancer screening in the general population, it is unknown which specific factors drive screening behavior for African Americans. In this study, we examine the relationship between modifiable cognitive and affective decision-making factors and measures of provider trust to colonoscopy screening behavior and future intentions in African American residents of New York State. For those at average risk, early detection of colorectal cancer through routine surveillance is recommended starting at age 50. By a substantial margin, most individuals in the U.S. are screened for colorectal cancer via colonoscopy.^{39,40,41} In New York State, 97% of screening adherent individuals had a colonoscopy in the past 10 years.⁴² As colonoscopy is the most prevalent screening modality and the gold standard for colorectal cancer screening,⁴³ only colonoscopy past screening behavior and future intentions are the outcome variables of interest in this study.

Methods

Participants

The analyses reported here includes participants ages 50-85 who self-identified as African American or black (n=1,633) from a larger randomized controlled trial (RCT) of colorectal cancer screening interventions (total sample size for RCT was n=2,655). Participants were recruited in partnership with faith-based and other community-based civic organizations in the New York City and Buffalo, NY metropolitan areas.

Procedure

The larger RCT from which these analyses were drawn tested intervention strategies for increasing African Americans' colonoscopy screening rates. All data reported in this study reflect cross-sectional baseline measures collected before delivery of the interventions. Data collection took place within groups at community sites (e.g., churches, community centers). The research team obtained an IRB approved waiver of written consent. The staff member conducting each program facilitated a group oral informed consent process. Participants received an IRB information sheet to read along as the staff person read each section and answered any questions. Participants verbally consented to participate in the study*.

Consenting participants completed baseline paper and pencil questionnaires, and responded to measures embedded in PowerPoint slides via audience response system (ARS) remote keypads.^{44,45} For the ARS questionnaire, participants were each given a wireless device and

*54 programs completed a written informed consent process prior to the IRB approval of the waiver of written consent.

indicated answers by clicking a button on the device to correspond with a set of response options projected on a screen and read out loud (for low literacy participants). Store gift cards (\$5) were given to each individual at the end of the program as a participation incentive in Buffalo; in New York City, participants received round trip public transportation fare. To further incentivize participants to remain until the end of the educational intervention session, at both sites a raffle was held for a \$25 retail gift card. All study procedures were IRB approved.

Measures

Cognitive Decision-making constructs

Perceived Benefits and Barriers.: These scales were developed using triangulation of methods including extensive literature review, focus groups, and modification of existing, validated cancer screening beliefs scales⁴⁶. Prior to use for this study, these perceived benefits and barriers scales were tested in two populations. Resultant psychometrics from those studies include internal consistencies for benefits and barriers separately at or above Chronbach's $\alpha = 0.70$ and appropriate construct validity as evidenced by exploratory factor analysis showing unidimensionality for both barriers and benefits, with factor loadings above 0.60 for all benefits items and 0.40 for all barriers items. In the present study, participants responded to items assessing perceived benefits and barriers to colonoscopy uptake.⁴⁷ Respondents indicated level of agreement with five benefits (e.g. "A colonoscopy will decrease my chances of dying from colorectal cancer") and 10 barriers (e.g. "The cost would keep me from having a colonoscopy") using a 5-point scale with endpoints of 1=strongly disagree and 5=strongly agree. The means of the benefit items and barrier items, respectively, were used to create summary measures (benefits $\alpha=0.65$; barriers $\alpha=0.79$).

Self-efficacy.: Self-efficacy was assessed using a 7-item measure adapted from Champion's mammography self-efficacy scale⁴⁶. Original scale psychometrics included good internal consistency (Cronbach's $\alpha=0.87$) and test-retest reliability of 0.53. Confirmatory factor analysis indicated that all items were significantly correlated with latent self-efficacy to get a screening test. In the present study, these items were modified to measure colonoscopy self-efficacy. Respondents reported degree of agreement with each item (e.g. "I can make an appointment for my colonoscopy") using a 5-point scale with endpoints: 1=strongly disagree and 5=strongly agree. The mean of the items served as the measure of self-efficacy ($\alpha=0.93$).

Colorectal cancer knowledge.: Participants answered 8 items assessing knowledge of colorectal cancer and colorectal cancer screening.⁴⁸ Response options included "true", "false" and "don't know" (e.g. "If colorectal cancer is found at an early stage, the chances of being cured are very good", "I would feel it if I had a growth in my colon"). The number of correctly answered items served as the measure of knowledge.

Cognitively-based perceived risk.: Cognitively-based perceived risk was assessed using two independent items measuring the participant's subjective report of absolute risk of colorectal cancer ("What do you think are the chances that you will have colorectal cancer in your lifetime?") and comparative risk of colorectal cancer ("Compared to other people of

your age and gender, how likely are you to have colorectal cancer at some point in your life?”).³¹ Response options for the absolute risk measure were on a 5-point scale with endpoints 1=very low and 5=very high. Response options for the comparative risk measure included 1=less likely than average, 2=equally likely, 3=more likely than average.

Affective decision-making constructs

Affective associations.: Participants completed a modified version of a measure of affective attitude components⁴⁹. Originally, these scales were developed as general scales and empirically tested using different attitude objects. Reliability was consistent across attitude objects and internal consistency was strong (all α equal to or greater than 0.86). Exploratory factor analysis showed affective constructs to be distinct from cognitions and attitudes. Modifications were made to separate positive and negative affective states as construct validity is higher in unipolar affect scales⁵⁰ and to remove items previously shown to not relate to screening uptake.⁹ Affective associations were assessed by asking respondents to think about colonoscopy and then report agreement with four positive affective states (e.g. “Do you feel relaxed?”), and five negative affective states (“Do you feel sad?”) on a 5-point scale with endpoints 1=not at all and 5=extremely. Specific items were selected from the standard measure based on a pilot study conducted with a similar population.⁹ Internal consistency reliability for the positive and negative affective association scales was positive $\alpha=0.90$ and negative $\alpha=0.85$.

Affectively-based perceived risk.: Participants answered two questions measuring affective components of risk, namely cancer fear and cancer worry from the Health Information National Trends Survey (2005). In separate questions, respondents indicated how worried [afraid] they were about getting colorectal cancer at some point in life. Response options for both questions were on a 5-point scale, with endpoints 1=not at all and 5=extremely.

Fear of colonoscopy.: Fear of colonoscopy was assessed using 6-items measuring fear associated with a variety of aspects of the colonoscopy process (prep, procedure, results)^{29,51} (e.g. “How fearful are you of the procedure being painful?”). Response options were on a 5-point scale with endpoints 1=not at all and 5=extremely. Previous work has found high internal consistency reliability for this measure in both screened and unscreened samples (Cronbach’s $\alpha=0.85$). In the present study, the mean of the items served as a measure of colonoscopy fear ($\alpha=0.85$).

Healthcare experience variables

Provider and healthcare system experiences.: Participants responded to four independently assessed measures from the Physician Trust Scale.⁵² Participants were asked a) During the past 12 months, was there any time when you had a medical problem that you put off, postponed, or did not seek medical care? b) During the past 12 months, was there any time when you did not follow a doctor’s advice or treatment plan, get a recommended test, or see a doctor you were referred to? For these questions, participants were given response options “yes” “no” and “don’t know”. For this analysis, “don’t know” responses were not included. Physician trust was measured utilizing the question, “I trust my doctor/provider to put my medical needs above all other considerations when treating my medical

problems” on a 5-point scale with endpoints 1=strongly disagree and 5=strongly agree. Lastly, participants were also asked to rate satisfaction with their regular provider (1=dissatisfied, 2=neutral, 3=satisfied).

Other cancer screening. Male respondents were asked if they had ever been screened for prostate cancer [by either prostate antigen testing (PSA) or digital rectal exam (DRE)]. Female respondents were asked if they had ever had a Pap test, clinical breast exam, or mammogram. All participants included were age 50 or older at the time of data collection; thus, all respondents meet age criteria for prostate or breast and cervical cancer screenings. Response options included “yes”, “no”, and “don’t know”. “Don’t know” responses were coded as no.

Screening behavior and intentions—Participants were asked if they had ever had a colonoscopy; response options were dichotomous (yes, no; adapted from ⁵³). Those participants who responded that they had never had a colonoscopy were asked how likely they were to have a colonoscopy in the next 12 months. Intentions were assessed on a 5-point scale with endpoints: 1=not at all and 5=extremely.

Sociodemographic covariates—Participants reported their age, gender, annual household income (within 8 categories, ranging from less than \$10,000 to over \$50,000), educational achievement, health insurance status, marital status, country of origin and current employment status.

Analysis Strategy

SPSS version 24 was used for all analyses. Analysis was restricted to participants ages 50 to 85 given that colonoscopy screening guidelines for average risk individuals encourage screening between ages 50-75 and this research is concerned with past screening behavior. In addition; only those who attended an educational session and self-identified as African American/black/Afro-Caribbean met inclusion criteria. For this analysis, participants were divided into two subgroups: 1) all participants ages 50 to 85, regardless of screening history, 2) participants eligible for colonoscopy screening in the next two years (both previously screened and never screened). Participants eligible for upcoming colonoscopy screening with a previous colorectal cancer diagnosis were excluded. Analyses were conducted both including and excluding participants that were eligible for a colonoscopy in the next two years and up to date on fecal occult blood testing (FOBT) (n=45). As FOBT adherence made no difference to the results of this study, all participants meeting inclusion criteria and eligible for an upcoming colonoscopy are included here. Each affective and cognitive decision-making construct, provider-level measure, and previous cancer screening was modeled separately as a predictor of screening behavior using logistic regression for all participants, as the outcome of past screening behavior was assessed with a dichotomous variable. The relation between affective and cognitive decision-making constructs and healthcare experiences and future screening intentions was examined by linear regression with participants eligible for screening currently or in the near future. Sociodemographic variables were modeled as predictors of screening behavior and screening intentions. Significant demographic predictors were controlled for in each of the aforementioned

univariable analyses. As univariable findings were consistent in significance and magnitude to the multivariable findings, univariable findings are presented below.

Results

Participant demographics

Participant demographics are reported in Table 1. For the total sample, participants were mostly female, mean age 65.9, born in the United States, unemployed, not currently married, had some college education, and earned less than \$25,000 a year. Additionally, over 90% of the sample had a regular health care provider and health insurance, and almost three quarters of the sample had been screened for prostate, cervical and/or breast cancer. The study eligible sub-sample had a significantly higher proportion of male participants compared to the full sample, were slightly younger (mean age 64.7), less likely to be married, less likely to have a college degree, lower annual income, less likely to have a regular healthcare provider and less likely to be screened for other cancers. The relation between demographic characteristics and likelihood of colonoscopy screening was assessed. Older age (OR=1.05 [95% CI:1.04, 1.08], $p<0.001$), female gender (OR=1.77 [95% CI:1.26, 2.21], $p<0.05$), greater income (OR=1.17 [95% CI:1.11, 1.24], $p<0.001$), and having health insurance (OR=2.80 [95% CI:1.59, 5.61], $p<0.01$) were associated with higher odds of having been previously screened at baseline. Among the study eligible sub-set of the sample, only younger age ($b=-0.17$, $SE=0.01$, $p<0.001$) was predictive of future screening intentions.

Social cognitive predictors of colonoscopy screening behavior

Relations between social cognitive predictors and past colonoscopy behavior can be found in Table 2. Both cognitive and affective factors predicted colonoscopy screening behavior. Perceived benefits, self-efficacy to screen, colonoscopy knowledge, and positive affective associations with colonoscopy screening were related to increased likelihood of uptake. Conversely, perceived barriers, fear of colonoscopy, perceived comparative risk, negative affective associations with screening, cancer worry, and cancer fear were related to decreased likelihood of uptake. Notably, only perceived absolute risk did not significantly predict past screening behavior. After controlling for age, gender, income, and health insurance status, perceived benefits, negative affective associations with colonoscopy and cancer worry were no longer significant; however, these predictors maintained the same direction and magnitude from the univariable results.

Provider-level predictors of colonoscopy screening behavior

As can be seen in Table 3, positive experiences with the healthcare system were related to colonoscopy adherence. Trusting one's healthcare provider to have positive intentions and being satisfied with one's provider were also related to increased colonoscopy completion, while a history of not following medical advice was associated with decreased likelihood of screening. Reluctance to use the healthcare system was also associated with decreased odds of screening colonoscopy, but was only marginally significant. Additionally, having had a PSA, DRE, Pap test, clinical breast exam and/or a mammogram was associated with greater likelihood of colonoscopy screening (Table 4).

Social cognitive predictors of colonoscopy screening intentions

Results for linear regression analysis to estimate predictors of colonoscopy intentions for the subset of participants eligible for colonoscopy in the next year are presented in Table 5. While both cognitive and affective factors were predictive of colonoscopy intentions in this subsample, fewer predictors of future screening intentions were significant than predictors of past colonoscopy behavior. Perceived benefits, self-efficacy to screen, colonoscopy knowledge, perceived absolute risk, positive affective associations, and cancer fear were positively associated with screening intentions, whereas greater perceived barriers were associated with decreased screening intentions.

Provider level predictors of colonoscopy screening intentions

For analyses involving provider-level predictors of colonoscopy intentions, only study eligible participants that reported having a regular healthcare provider were included (n=463). While most of the participants in the study eligible subsample did report having a regular primary care provider, none of the healthcare experience or other cancer screening variables were significant predictors of colonoscopy intentions.

Discussion:

Both affective and cognitive factors as well as healthcare experiences predicted past colonoscopy screening completion, suggesting that colonoscopy screening decision making involves a complex array of intrapersonal, interpersonal, community, and institutional determinants. Provider-level factors and having been screened for other cancers predicted prior colonoscopy screening only, but not colonoscopy screening intentions. Note that affective and cognitive components of perceived risk had opposite relations to past colonoscopy screening vs. future intentions. For past behavior, lower risk was related to prior colonoscopy screening behavior, whereas individuals perceiving themselves at higher risk were more likely to intend to get colonoscopy screening. This is likely due to the fact that receiving a negative colonoscopy screening result leads to perceiving oneself at lower risk, while for the unscreened, perceiving risk is a motivator of plans to screen.

As much of the work on colonoscopy behavior and intentions presents only cognitive or affective predictors, or only examines a few colonoscopy adherence predictors, this work extends our knowledge of colorectal cancer screening decision-making by evaluating a wider range of factors in the same study. For both behavior and intentions, many of the cognitive predictors were the same: benefits, self-efficacy and knowledge increased the likelihood of colonoscopy screening and intentions and barriers decreased the likelihood for both. For the cognitive risk measures, comparative risk (perceiving your risk of cancer as higher than others) predicted past colonoscopy screening behavior, while higher absolute risk (believing that you are likely to get cancer in your lifetime) predicted intentions. A plausible explanation is that those who have already been screened have more knowledge about their absolute risk (by virtue of having had a positive or negative result) and have formed beliefs about how they compare to others, while never screened or non-adherent participants have less of an anchor. Again, the act of regular screening reduces perceived risk by virtue of increasing personally-tailored risk information.

Similar to cognitive components, the affective components of risk (cancer worry and cancer fear) are associated with both past colonoscopy screening behavior and future intentions. Participants with higher levels of cancer worry and higher levels of cancer fear were less likely to have completed a colonoscopy. We see the opposite relation with screening intentions, as more cancer fear predicts greater colonoscopy screening intentions. A key difference could be that past behavior is reported retrospectively. Thus, previously screened participants are reporting on their affect and cognitions after being screened whereas those who have not been recently screened are reporting on affect before screening. Therefore, the reduced affectively-based perceived risk for the screened participants is likely because they are using the information from their past experience with screening to inform their risk perceptions; while those who are due for screening are motivated by fear and worry to get a colonoscopy and the desire to have more information about their own risk for colorectal cancer.

For participants eligible for colonoscopy that have never been screened or have not been screened within the past ten years, addressing cancer worry and fear may be important intervention components, especially when paired with cognitive factors such as benefits, barriers, self-efficacy, and knowledge. In a randomized controlled trial examining the efficacy of affective messages on colonoscopy intentions, Dillard and colleagues found that introducing an affective component to screening interventions reduced cognitive barriers, increased cancer risk perceptions and ultimately increased screening interest.⁵⁴ Similarly, this research finds that both cognitive and affective factors are salient to a non-adherent population. Future research addressing the interplay of these factors may shed light on how these components can be used in practice to increase screening participation for African Americans. Given the focus of this work, all participants in this study were African American. These research questions should be evaluated in other populations to see if these findings extend to other racial/ethnic groups.

Limitations

There are limitations to the study that should be noted. This analysis used study baseline data only and due to the cross-sectional nature of the research, no causal interpretations can be made from any of the predictors examined and discussed. Colonoscopy was the primary outcome measure of this study as it is the most common in both the United States and New York State; however, participants involved in this study may have been screened using a less invasive test or first line test, such as FOBT.

Participants were divided into two subgroups: 1) all participants ages 50 to 85, regardless of previous screening behavior, 2) participants that are eligible for screening within the next two years. This second group includes participants that have never been screened and any participant that has been screened eight or more years ago all via colonoscopy and includes those who had been screened for colorectal cancer with a different test (such as fecal immunochemical testing). Predictors of colonoscopy intentions may be different for those who have experienced a colonoscopy compared to those who have not. Also, affective predictors such as disgust may be more important predictors of behavioral avoidance and non-adherence to annual home stool sampling guidelines than for those who have had a

colonoscopy but not followed up within the recommended time period. Thus, it will be important for future research to parse out these differences so intervention strategies can be designed to include cognitive and affective factors that are most salient to groups based on screening status and type of colorectal cancer screenings.

We did not exclude participants who had a previous cancer diagnosis other than colorectal cancer or with first-degree relatives with colorectal cancer. These individuals may be aware that they are at heightened risk of colorectal cancer and may not rely on the same decision-making constructs as an average risk population. Additionally, as provider-level factors for study eligible participants were assessed only in participants reporting a primary care provider, analyses may have been underpowered. Given the nature of the data and inclusive sampling strategy, we did not have enough participants screened by methods other than colonoscopy or at higher objective risk for colorectal cancer to stratify by these variables. It would be valuable in future work to consider oversampling on the aforementioned characteristics and for participants that have never been screened in particular to better understand colorectal cancer behavioral avoidance and to see how the patterns described in this study differ or remain the same at the interpersonal and provider levels.

Conclusion:

Collectively, these findings suggest that a myriad of factors play a role in predicting screening behavior and intentions for African Americans. A better understanding of the relation between cognitive and affective risk factors may further explain how affect and cognitions work together to impact colonoscopy decision-making and how healthcare experience may moderate this effect.

Acknowledgement:

This study was supported by National Institutes of Health/National Cancer Institute grant R01 CA171935. The authors kindly acknowledge the extensive support of the community members of New York and the First Ladies of Western New York (FLOW) for their contributions to the science and data collection for this study. An earlier version of this data was presented as a poster at the Ninth AACR Conference on the Science of Cancer Health Disparities, Fort Lauderdale, FL, September 2016.

References

1. Cancer Facts and Figures 2016. Atlanta: American Cancer Society;2016.
2. Colorectal Cancer Rates by Race and Ethnicity. 2015 <https://www.cdc.gov/cancer/colorectal/statistics/race.htm> Accessed June 16, 2016.
3. Force USPST, Bibbins-Domingo K, Grossman DC, et al. Screening for Colorectal Cancer: US Preventive Services Task Force Recommendation Statement. JAMA. 2016;315(23):2564–2575. [PubMed: 27304597]
4. Brittain K, Christy SM, Rawl SM. African American patients' intent to screen for colorectal cancer: Do cultural factors, health literacy, knowledge, age and gender matter? J Health Care Poor Underserved. 2016;27(1):51–67. [PubMed: 27182187]
5. May FP, Bromley EG, Reid MW, et al. Low uptake of colorectal cancer screening among African Americans in an integrated Veterans Affairs health care network. Gastrointest Endosc. 2014;80(2): 291–298. [PubMed: 24674351]
6. Braveman P, Gruskin S. Defining equity in health. J Epidemiol Community Health. 2003;57(4):254–258. [PubMed: 12646539]

7. Reynolds LM, Consedine NS, Pizarro DA, Bissett IP. Disgust and behavioral avoidance in colorectal cancer screening and treatment: a systematic review and research agenda. *Cancer Nurs*. 2013;36(2):122–130. [PubMed: 23047793]
8. Reynolds LM, McCambridge SA, Bissett IP, Consedine NS. Trait and state disgust: an experimental investigation of disgust and avoidance in colorectal cancer decision scenarios. *Health Psychol*. 2014;33(12):1495–1506. [PubMed: 24447190]
9. Kiviniemi MT, Jandorf L, Erwin DO. Disgusted, embarrassed, afraid: Affective associations relate to uptake of colonoscopy screening in an urban, African American population. *Annals of Behavioral Medicine*. 2014;48:112–119. [PubMed: 24500079]
10. Pelto DJ, Sly JR, Winkel G, Redd W, Thompson HS, Itzkowitz SH, Jandorf L. Predicting Colonoscopy Completion Among African American and Latino/a Participants in a Patient Navigation Program. *Journal of Racial and Ethnic Health Disparities*. 2015;2(1):101–111. [PubMed: 25893157]
11. Wang HL, Christy SM, Skinner CS, et al. Predictors of stage of adoption for colorectal cancer screening among African American primary care patients. *Cancer Nurs* 2014;37(4):241–251. [PubMed: 24145250]
12. Christy SM, Perkins SM, Tong Y, et al. Promoting colorectal cancer screening discussion: a randomized controlled trial. *Am J Prev Med* 2013;44(4):325–329. [PubMed: 23498096]
13. Kiviniemi MT, Bennett A, Zaiter M, Marshall JR. Individual-level factors in colorectal cancer screening: a review of the literature on the relation of individual-level health behavior constructs and screening behavior. *Psychooncology*. 2011;20(10):1023–1033. [PubMed: 21954045]
14. Kiviniemi MT, Hay JL, James AS, et al. Decision Making about Cancer Screening: An Assessment of the State of the Science and a Suggested Research Agenda from the ASPO Behavioral Oncology and Cancer Communication Special Interest Group. *Cancer Epidem Biomar* 2009;18(11):3133–3137.
15. Halbert CH, Barg FK, Guerra CE, et al. Cultural, economic, and psychological predictors of colonoscopy in a national sample. *J Gen Intern Med* 2011;26(11):1311–1316. [PubMed: 21732197]
16. Halbert CH, Melvin C, Briggs V, et al. Neighborhood Satisfaction and Colorectal Cancer Screening in a Community Sample of African Americans. *J Community Health*. 2016;41(1):38–45. [PubMed: 26184107]
17. Sohler NL, Jerant A, Franks P. Socio-psychological factors in the Expanded Health Belief Model and subsequent colorectal cancer screening. *Patient Educ Couns* 2015;98(7):901–907. [PubMed: 25892503]
18. Ojinnaka C, Vuong A, Helduser J, et al. Determinants of variations in self-reported barriers to colonoscopy among uninsured patients in a primary care setting. *J Community Health*. 2015;40(2):260–270. [PubMed: 25096763]
19. Gwede CK, William CM, Thomas KB, et al. Exploring disparities and variability in perceptions and self-reported colorectal cancer screening among three ethnic subgroups of U. S. Blacks. *Oncol Nurs Forum*. 2010;37(5):581–591. [PubMed: 20797950]
20. Chen CC, Basch CE, Yamada T. An evaluation of colonoscopy use: implications for health education. *J Cancer Educ* 2010;25(2):160–165. [PubMed: 20094829]
21. Basch CH, Basch CE, Zybert P, Wolf RL. Failure of Colonoscopy Knowledge to Predict Colonoscopy Uptake. *J Community Health*. 2016;41(5):1094–1099. [PubMed: 27098522]
22. May FP, Almario CV, Ponce N, Spiegel BM. Racial minorities are more likely than whites to report lack of provider recommendation for colon cancer screening. *Am J Gastroenterol* 2015;110(10):1388–1394. [PubMed: 25964227]
23. Sly JR, Edwards T, Shelton RC, Jandorf L. Identifying barriers to colonoscopy screening for nonadherent African American participants in a patient navigation intervention. *Health Educ Behav* 2013;40(4):449–457. [PubMed: 23086556]
24. Weaver KE, Ellis SD, Denizard-Thompson N, Kronner D, Miller DP. Crafting Appealing Text Messages to Encourage Colorectal Cancer Screening Test Completion: A Qualitative Study. *JMIR Mhealth Uhealth*. 2015;3(4):e100. [PubMed: 26537553]

25. Ghevariya V, Duddempudi S, Ghevariya N, Reddy M, Anand S. Barriers to screening colonoscopy in an urban population: a study to help focus further efforts to attain full compliance. *Int J Colorectal Dis* 2013;28(11):1497–1503. [PubMed: 23666513]
26. Khankari K, Eder M, Osborn CY, et al. Improving colorectal cancer screening among the medically underserved: a pilot study within a federally qualified health center. *J Gen Intern Med* 2007;22(10):1410–1414. [PubMed: 17653808]
27. Consedine NS, Ladwig I, Reddig MK, Broadbent EA. The many faeces of colorectal cancer screening embarrassment: preliminary psychometric development and links to screening outcome. *Br J Health Psychol* 2011;16(3):559–579. [PubMed: 21722276]
28. Pitts SBJ, Lea CS, May CL, et al. “Fault-line of an Earthquake”: A Qualitative Examination of Barriers and Facilitators to Colorectal Cancer Screening in Rural, Eastern North Carolina. *J Rural Health*. 2013;29(1):78–87. [PubMed: 23289658]
29. Miller SJ, Izkowitz SH, Redd WH, Thompson HS, Valdimarsdottir HB, Jandorf L. Colonoscopy-specific fears in African Americans and Hispanics. *Behav Med* 2015;41(2):41–48. [PubMed: 24621051]
30. Murphy CC, Lewis CL, Golin CE, Sandler RS. Underuse of surveillance colonoscopy in patients at increased risk of colorectal cancer. *Am J Gastroenterol* 2015;110(5):633–641. [PubMed: 25384901]
31. Moser RP, McCaul K, Peters E, Nelson W, Marcus SE. Associations of perceived risk and worry with cancer health-protective actions: data from the Health Information National Trends Survey (HINTS). *J Health Psychol* 2007;12(1):53–65. [PubMed: 17158840]
32. Choi E, Lee YY, Suh M, et al. Associations of perceived risk and cancer worry for colorectal cancer with screening behaviour. *J Health Psychol* 2016.
33. Knight JR, Kanotra S, Siameh S, Jones J, Thompson B, Thomas-Cox S. Understanding Barriers to Colorectal Cancer Screening in Kentucky. *Prev Chronic Dis* 2015;12:E95. [PubMed: 26086608]
34. Katz ML, James AS, Pignone MP, et al. Colorectal cancer screening among African American church members: a qualitative and quantitative study of patient-provider communication. *BMC Public Health*. 2004;4:62. [PubMed: 15601463]
35. O’Malley AS, Sheppard VB, Schwartz M, Mandelblatt J. The role of trust in use of preventive services among low-income African-American women. *Prev Med* 2004;38(6):777–785. [PubMed: 15193898]
36. Mosen DM, Feldstein AC, Perrin NA, et al. More comprehensive discussion of CRC screening associated with higher screening. *Am J Manag Care*. 2013;19(4):265–271. [PubMed: 23725359]
37. Griffith KA, Passmore SR, Smith D, Wenzel J. African Americans With a Family History of Colorectal Cancer: Barriers and Facilitators to Screening. *Oncology Nursing Forum*. 2012;39(3):299–306. [PubMed: 22543388]
38. Greiner KA, Born W, Nollen N, Ahluwalia JS. Knowledge and perceptions of colorectal cancer screening among urban African Americans. *Journal of general internal medicine : official journal of the Society for Research and Education in Primary Care Internal Medicine*. 2005;20(11):977–983.
39. Klabunde CN, Cronin KA, Breen N, Waldron WR, Ambs AH, Nadel MR. Trends in Colorectal Cancer Test Use among Vulnerable Populations in the United States. *Cancer Epidem Biomar* 2011;20(8):1611–1621.
40. Klabunde CN, Joseph DA, King JB, White A, Plescia M. Vital Signs: Colorectal Cancer Screening Test Use - United States, 2012. *Mmwr-Morbid Mortal W*. 2013;62(44):881–888.
41. Sauer AG, Siegel RL, Jemal A, Fedewa SA. Updated Review of Prevalence of Major Risk Factors and Use of Screening Tests for Cancer in the United States. *Cancer Epidemiol Biomarkers Prev* 2017;26(8):1192–1208. [PubMed: 28515109]
42. Behavioral Risk Factor Surveillance System Survey Data. In: Services DoHaH, ed. Atlanta, Georgia: U.S.: Centers for Disease Control and Prevention; 2015.
43. Uraoka T, Hosoe N, Yahagi N. Colonoscopy: is it as effective as an advanced diagnostic tool for colorectal cancer screening? *Expert Rev Gastroenterol Hepatol* 2015;9(2):129–132. [PubMed: 25252803]

44. Jandorf L, Bursac Z, Pulley L, Trevino M, Castillo A, Erwin DO. Breast and cervical cancer screening among Latinas attending culturally specific educational programs. *Prog Community Health Partnersh* 2008;2(3):195–204. [PubMed: 20208198]
45. Sudarsan NR, Jandorf L, Erwin DO. Multi-site implementation of health education programs for Latinas. *Journal of Community Health*. 2011;36(2):193–203. [PubMed: 20652382]
46. Champion V, Skinner CS, Menon U. Development of a self-efficacy scale for mammography. *Res Nurs Health*. 2005;28(4):329–336. [PubMed: 16028267]
47. Rawl SM, Champion V, Menon U, Loehrer PJ, Vance GH, Skinner CS. Validation of scales to measure benefits of and barriers to colorectal cancer screening. *Journal of Psychosocial Oncology*. 2001;19(3):47–63.
48. Jandorf L, Braschi C, Ernstoff E, et al. Culturally targeted patient navigation for increasing african americans' adherence to screening colonoscopy: a randomized clinical trial. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*. 2013;22(9):1577–1587.
49. Crites SL, Fabrigar LR, Petty RE. Measuring the affective and cognitive properties of attitudes: Conceptual and methodological issues. *Personality and Social Psychology Bulletin*. 1994;20(6): 619–634.
50. Kiviniemi MT. Stucture and content of affective association with health behaviors: is the behavior 'good OR bad' or 'good AND bad'. *Psychology and Health*. 2017.
51. Manne SL, Coups EJ, Markowitz A, et al. A randomized trial of generic versus tailored interventions to increase colorectal cancer screening among intermediate risk siblings. *Ann Behav Med* 2009;37(2):207–217. [PubMed: 19418107]
52. Anderson LA, Dedrick RF. Development of the Trust in Physician Scale - a Measure to Assess Interpersonal-Trust in Patient-Physician Relationships. *Psychol Rep* 1990;67(3):1091–1100. [PubMed: 2084735]
53. Vernon SW, Meissner H, Klabunde C, et al. Measures for ascertaining use of colorectal cancer screening in behavioral, health services, and epidemiologic research. *Cancer Epidemiology, Biomarkers, and Prevention*. 2004;13(6):898–905.
54. Dillard AJ, Fagerlin A, Dal Cin S, Zikmund-Fisher BJ, Ubel PA. Narratives that address affective forecasting errors reduce perceived barriers to colorectal cancer screening. *Soc Sci Med* 2010;71(1):45–52. [PubMed: 20417005]

Table 1:

Participant characteristics

		Total (n=1633)		Study eligible (n=510)	
		N	M (SD) or %	N	M (SD) or %
Gender *	Male	346	21.19	125	24.51
	Female	1287	78.81	385	75.49
Age *		1633	65.9 (9.1)	510	64.7 (9.7)
Country of birth	United States	1328	81.32	429	84.12
	Other	305	18.68	81	15.88
Currently employed	Yes	365	22.35	106	20.78
	No	1268	77.65	404	79.22
Marital status *	Unmarried	1269	77.71	413	80.98
	Married	364	22.29	97	19.02
Highest education level *	Less than high school	260	15.92	90	17.65
	High school or GED	498	30.50	161	31.57
	Some college	517	31.66	168	32.94
	College degree	358	21.92	91	17.84
Income *	< \$25,000	1067	65.4	369	72.35
	\$25,000 - \$50,000	389	23.8	101	19.80
	> \$50,000	177	10.8	40	7.85
Health status					
Have regular medical provider *	Yes	1533	93.9	457	89.61
	No	100	6.1	53	10.39
Insurance status	Yes	1556	95.3	489	95.88
	No	77	4.7	21	4.12
Screened for other cancers (e.g., prostate, breast, cervical) *	Yes	1190	72.9	337	66.08
	No	443	27.1	173	33.92

* ANOVA showed significant difference by condition (all p's <0.05)

Table 2:

Relation of social cognitive constructs to prior screening status – univariable results: participants ages 50-85 (n=1633)

Cognitive Factors		
Predictor	OR (95% CI)	p Value
Benefits	1.21 (1.03, 1.41)	<0.05
Barriers	0.42 (0.35, 0.51)	<0.001
Self-efficacy	1.65 (1.43, 1.89)	<0.001
Knowledge	1.22 (1.11, 1.35)	<0.001
Perceived absolute risk	0.93 (0.82, 1.05)	0.22
Perceived comparative risk	0.82 (0.68, 0.98)	<0.05
Affective Factors		
Predictor	OR (95% CI)	p Value
Positive affective associations	1.26 (1.12, 1.41)	<0.001
Negative affective associations	0.84 (0.72, 0.98)	<0.05
Fear of colonoscopy	0.46 (0.39, 0.53)	<0.001
Perceived risk (worry)	0.85 (0.76, 0.96)	<0.01
Perceived risk (afraid)	0.83 (0.74, 0.92)	<0.01

Table 3:

Relation of healthcare experiences to prior screening status: participants ages 50-85 (n=1633)

Predictor	OR (95% CI)	<i>p</i> Value
Healthcare system usage (reluctance)	0.76 (0.57, 1.02)	0.07
Physician trust – not following doc's advice	0.66 (0.50, 0.88)	<0.01
Physician trust – doc's intentions	1.17 (1.05, 1.31)	<0.01
Physician satisfaction	1.54 (1.19, 1.99)	<0.01

Table 4:

Relation of screening for other cancers to colonoscopy screening behavior: participants ages 50-85 (n=1633)

Predictor	OR (95% CI)	<i>p</i> Value
Digital Rectal Exam	14.44 (7.37, 28.33)	<0.001
Prostate Antigen Testing	3.74 (1.86, 7.53)	<0.001
Clinical Breast Exam	5.11 (3.26, 8.03)	<0.001
Mammogram	8.41 (4.25, 16.67)	<0.001
Pap Testing	4.02 (2.45, 6.59)	<0.001

Table 5:

Relation of social cognitive constructs to pre-intervention screening intentions: study eligible participants (n=510)

Cognitive Factors			
Predictor	β	SE	<i>p</i> Value
Benefits	0.16	0.09	<0.001
Barriers	-0.18	0.09	<0.001
Self-efficacy	0.13	0.08	<0.05
Knowledge	0.09	0.05	<0.05
Perceived absolute risk	0.11	0.06	<0.05
Perceived comparative risk	0.02	0.10	0.69
Affective Factors			
Predictor	β	SE	<i>p</i> Value
Positive affective associations	0.11	0.06	<0.05
Negative affective associations	-0.06	0.10	0.24
Fear of colonoscopy	-0.03	0.08	0.69
Perceived risk (worry)	0.08	0.06	0.07
Perceived risk (afraid)	0.10	0.06	<0.05