Published in final edited form as:

Public Health Nurs. 2013 July ; 30(4): . doi:10.1111/phn.12038.

Validation of Self-Reported Colorectal Cancer Screening Behaviors among Appalachian Residents

Paul L. Reiter, PhD^{1,2,3}, Mira L. Katz, PhD^{1,2,4}, Jill M. Oliveri, DrPH², Gregory S. Young, MS⁵, Adana A. Llanos, PhD², and Electra D. Paskett, PhD^{1,2,3}

¹Division of Cancer Prevention and Control, College of Medicine, The Ohio State University, Columbus, OH

²Comprehensive Cancer Center, The Ohio State University, Columbus, OH

³Division of Epidemiology, College of Public Health, The Ohio State University, Columbus, OH

⁴Division of Health Behavior and Health Promotion, College of Public Health, The Ohio State University, Columbus, OH

⁵Center for Biostatistics, The Ohio State University, Columbus, OH

Abstract

Objectives—We determined the validity of self-reported colorectal cancer (CRC) screening data provided by Appalachian Ohio residents and identified correlates of providing accurate data.

Design—We conducted cross-sectional telephone interviews between September 2009 and April 2010.

Sample—Our study included Appalachian Ohio residents ($n=721$) ages 51–75.

Measurements—We compared self-reported CRC screening data to medical records to determine validity. Multivariable logistic regression was used to identify correlates of providing accurate self-reported screening data.

Results—About 68% of participants self-reported having any CRC screening test within recommended guidelines, while medical records indicated that only 49% were within guidelines (concordance=0.76). Concordance was higher for flexible sigmoidoscopy and FOBT compared to colonoscopy, though sensitivity and positive predictive value were much higher for colonoscopy. Participants overreported CRC screening behaviors for all tests. Participants who had a regular check-up in the last two years (OR=2.78, 95% CI: 1.15-6.73) or self-rated their health as good or better (OR=1.88, 95% CI: 1.12-3.16) were more likely to provide accurate screening data.

Conclusions—Many participants failed to provide accurate CRC screening data, and validity varied greatly across individual CRC screening tests. Future CRC screening studies among Appalachian residents should use medical records, if possible, to determine screening histories.

Correspondence: Paul L. Reiter, PhD, Division of Cancer Prevention and Control, College of Medicine, The Ohio State University, Suite 525, 1590 North High Street, Columbus, Ohio 43201, 614-366-4265 phone, 614-293-5611 fax, Paul.Reiter@osumc.edu.

Email Addresses

Katz: Mira.Katz@osumc.edu, Oliveri: Jill.Oliveri@osumc.edu, Young: Gregory.Young@osumc.edu, Llanos: Adana.Llanos@osumc.edu, Paskett: Electra.Paskett@osumc.edu

Conflicts of Interest

None.

Keywords

Colorectal cancer; Cancer screening; Validity; Appalachia

Introduction

Background

Colorectal cancer (CRC) screening has helped reduce CRC incidence and mortality rates over the past few decades (American Cancer Society, 2011; Centers for Disease Control and Prevention, 2011), but CRC remains the third most common cancer diagnosis among both men and women in the U.S. (American Cancer Society, 2012). In examining CRC screening behaviors, many population-based estimates for the U.S. are based solely on self-reported data collected via telephone surveys (*e.g.*, Behavioral Risk Factor Surveillance System [BRFSS]) or household interviews (*e.g.*, National Health Interview Survey [NHIS]) (Centers for Disease Control and Prevention, National Center for Health Statistics, 2012; Centers for Disease Control and Prevention, 2012). Accurate recall of CRC screening within guidelines may, however, be more difficult compared to screening for other cancers (*e.g.*, breast, cervical, and prostate cancer) due to the larger number of available and recommended CRC screening tests and their varying screening intervals (American Cancer Society, 2011). To help design and evaluate future programs to increase CRC screening, it becomes important to determine the accuracy of self-reported CRC screening data.

Several recent studies have examined the validity of self-reported CRC screening data and found concordance levels over 70% and generally higher levels of sensitivity than specificity (for having any CRC screening test) (Bastani et al., 2008; Jones, Mongin, Lazovich, Church, & Yeazel, 2008; Khoja, McGregor, & Hilsden, 2007; Partin et al., 2008; Shokar, Vernon, & Carlson, 2011; Vernon et al., 2008). Results across individual CRC screening tests have varied, with sensitivity tending to be higher for colonoscopy compared to fecal occult blood test (FOBT) and flexible sigmoidoscopy. A few of these studies focused on populations with high rates of CRC incidence and mortality (*e.g.*, African Americans) or other underserved populations (*e.g.*, Hispanics) (Bastani et al., 2008; Shokar et al., 2011). However, one population at high risk for CRC that has not yet been examined in this context is the Appalachian population.

Appalachia is a geographic region comprised of 420 counties that extends from New York south to Mississippi. About 25 million people live in Appalachia, with a higher proportion of residents having lower socioeconomic status than the rest of the country (Pollard & Jacobsen, 2011; Pollard & Jacobsen, 2012). Appalachia is a traditionally underserved region that still lacks adequate access to healthcare in several areas (PDA, Inc., and the Cecil B. Sheps Center for Health Services Research, 2012). Many cancer-related disparities exist in Appalachia, including CRC. Age-adjusted CRC incidence rates are higher among both Appalachian males (66.7 vs. 59.7 per 100,000 persons) and females (47.8 vs. 43.6 per 100,000 persons) compared to national rates (Wingo et al., 2008). These incidence rates for Appalachia are similar to those for racial and ethnic groups with the highest CRC incidence rates in the U.S. (American Cancer Society, 2011). CRC mortality rates are also higher among white Appalachian males and females (84% of Appalachian residents are non-Hispanic white (Pollard & Jacobsen, 2011)) compared to non-Appalachian whites (Armstrong et al., 2004).

Past studies have examined CRC screening behaviors among Appalachian residents, producing a wide range of estimates for being within recommended screening guidelines for any CRC test (32%-67%) (Bardach, Schoenberg, Fleming, & Hatcher, 2012; Curry et al.,

2011; Fleming, Love, & Bennett, 2011; Katz et al., 2011; Tessaro, Mangone, Parkar, & Pawar, 2006). The variation is likely due in part to inaccuracies in self-reported data, as all but one of the studies relied exclusively upon self-reports of screening behavior. Appalachian residents tend to have inadequate knowledge about CRC and recommended CRC screening tests (Bardach et al., 2012; Feltner, Ely, Whitler, Gross, & Dignan, 2012; Tessaro et al., 2006), suggesting that inaccuracies in self-reported data may be substantial. The current report examined the validity of self-reported CRC screening data among residents of Appalachian Ohio. Although our study focused on residents of only one portion of Appalachia, we believe the results provide important initial insight into the validity of such data among residents of this geographic region.

Research Questions

We address two research questions: 1) What is the validity of self-reported CRC screening data compared to medical records among residents of Appalachian Ohio?; and 2) What are the correlates of providing accurate self-reported CRC screening data?

Methods

Design and Sample

The current report addresses a secondary aim of a study designed to implement and evaluate a community-based media intervention to increase rates of CRC screening among residents of Appalachian Ohio. The secondary aim and focus of this report is to determine the validity of participants' self-reported CRC screening data. In doing so, we examined data from baseline surveys that were conducted prior to intervention implementation (the intervention will not be described further in this report). Baseline data collection occurred between September 2009 and April 2010. The Institutional Review Board at the authors' institution approved the study.

Appalachian Ohio is a 32 county region in southern and eastern Ohio with a population of more than 2 million residents (Pollard & Jacobsen, 2012). It is a mostly rural area with demographic characteristics similar to those of Appalachia as a whole (Pollard & Jacobsen, 2012). Appalachian Ohio has higher CRC incidence and mortality rates than non-Appalachian Ohio for both males and females (Appalachia Community Cancer Network, 2010). We obtained lists of residents ages 51–99 living in 12 Appalachian Ohio counties from a commercial vendor. We randomly selected residents from these lists to contact for possible participation. More males than females were represented in these lists, so we used a proportional sampling scheme that reflected the county gender proportions from the 2000 Census (U.S. Census Bureau, 2012). We mailed selected residents a recruitment letter, consent form, HIPAA authorization form, and answer choices to be used during telephone interviews. We notified these residents that a study interviewer would call them for a telephone survey. Trained interviewers called potential participants and first assessed study eligibility. Eligibility criteria included: ages 51–75; ability to read and speak English without assistance and provide informed consent; resident of a study county; working telephone number at home; no prior history of CRC, familial/hereditary cancer syndrome (*e.g.*, Lynch syndrome), polyps, or inflammatory bowel disease (*e.g.*, Crohn's disease); no contraindications to CRC screening; and not pregnant.

Interviewers obtained informed consent from eligible individuals and conducted baseline surveys. Telephone surveys lasted about 15 minutes, and participants were sent a \$10 gift card after survey completion. We also sent participants a medical record release form that gave study staff permission to contact their physicians to confirm past CRC screening behaviors. We sought permission for all physicians identified by participants as current

regular physicians. After receiving signed medical record release forms, study staff contacted physicians' offices to request information about participants' CRC screening histories. Interviewers completed baseline surveys with 1106 Appalachian Ohio residents (cooperation rate=35% (American Association for Public Opinion Research, 2011)). We report data on 721 (65%) of these participants who had their screening histories confirmed by medical records. We collected and managed data using Teleform software and REDCap electronic data capture tools (Harris et al., 2009).

Measures

We developed survey items based on previous CRC screening research (McAlearney et al., 2008). Interviewers collected data on participants' CRC screening behaviors, including receipt of FOBT, flexible sigmoidoscopy, and colonoscopy. For each test, the survey used up to three items to assess screening behavior. Interviewers first asked participants if they ever had a particular screening test. If participants indicated they had received a test, they were asked the date of their most recent test. Participants who could not provide a date were asked a third question that provided categorical interval responses about when their most recent test occurred (*e.g.*, less than one year ago). Interviewers provided participants with brief, standardized informative statements about each CRC screening test to assist with recall.

For both survey and medical records data, we classified participants as being within or outside of the recommended CRC screening guidelines by the American Cancer Society (ACS) (American Cancer Society, 2013). We examined four separate CRC screening outcomes based on ACS guidelines in place at the time of data collection (American Cancer Society, 2013): 1) FOBT in the last year; 2) flexible sigmoidoscopy in the last five years; 3) colonoscopy in the last 10 years; and 4) any CRC screening test within recommended guidelines. The ACS guidelines used are similar to those of the U.S. Preventive Services Task Force (U.S. Preventive Services Task Force, 2008).

Interviewers asked participants to compare their lifetime risk of getting CRC to other men/women of their age (much lower/somewhat lower/about the same or somewhat higher/much higher) and their amount of worry about getting CRC (not at all or a little/moderately/quite a bit/extremely)(Lipkus et al., 2000). Participants indicated if they were aware that any CRC screening tests exist, anyone ever encouraged them to have a CRC screening test, and whether they ever asked a doctor to order a CRC screening test. We also assessed whether participants had ever been asked by a doctor to have a CRC screening test. We asked participants at what age a healthy person (*i.e.*, at average risk for CRC) should start having CRC screening tests, from which we classified people as correct (indicated age 50) or incorrect (all other responses)(American Cancer Society, 2013).

For participants who reported receiving a CRC screening test, we created a variable indicating whether they were able to provide a date (at least the year) for their most recent screening test (yes or no). We created this variable because we believed that participants able to provide screening dates may provide more accurate self-reported CRC screening data. The baseline survey also collected data on several other health-related and demographic characteristics (Table 1).

Analytic Strategy

We compared self-reported and medical record CRC screening data to calculate the following estimates for each screening outcome: 1) concordance=proportion of instances when self-reports match medical records; 2) sensitivity=proportion of instances when participants with medical records documentation of a test reported having the test; 3)

specificity=proportion of instances when participants with no medical records documentation of a test reported not having the test; 4) positive predictive value (PPV)=proportion of instances when participants who reported having a test had medical records documentation of the test; and 5) negative predictive value (NPV)=proportion of instances when participants who reported not having a test had no medical records documentation of the test. We classified estimates as excellent (>0.90), good (>0.80), fair (>0.70), or poor (<0.70) (Tisnado et al., 2006), with confidence intervals calculated using the Clopper-Pearson method (Clopper & Pearson, 1934). We also calculated the “report-to-records ratio,” defined as the total number of self-reported tests versus the actual number documented by medical records (Vernon et al., 2008). This is a measure of net bias in self-reports, with values >1.0 indicating overreporting and values <1.0 indicating underreporting. The ratio was estimated using a generalized estimating equation approach with a log link function (Liang & Zeger, 1986).

Among participants who self-reported being within recommended guidelines for any CRC screening test, we used logistic regression to identify correlates of providing accurate screening data. Variables associated with accuracy in univariable analyses ($p<0.05$) were entered into a multivariable model to produce adjusted odds ratios (ORs) and 95% confidence intervals (CIs). We limited regression analyses to participants who self-reported being within recommended guidelines for any CRC screening test because we wanted to identify correlates of accurately reporting that a test was received. Analyses used SAS Version 9.2 (SAS Institute; Cary, NC), and statistical tests were two-tailed with a critical alpha of 0.05.

Results

Participant Characteristics

Most participants were female (59%), non-Hispanic white (97%), married or living as married (79%), had at least some college education (59%), and reported a household income of less than \$60,000 (57%) (Table 1). The mean age of participants was 61.8 years old (standard deviation [SD]=6.8). A majority of participants had private health insurance only (51%), self-rated their health as good or better (85%), and were never smokers (54%). Few participants believed they were at higher risk of CRC compared to people of the same age and gender (11%), and half reported worrying about getting CRC (50%). Most participants were aware of CRC screening tests (89%), though just over half knew healthy individuals should start having CRC screening tests at age 50 (55%).

CRC Screening Data

About 68% of participants self-reported having any CRC screening test within recommended guidelines (Table 2). Participants most commonly self-reported having a colonoscopy within recommended guidelines (64%), with fewer reporting an FOBT (8%) or flexible sigmoidoscopy (4%). Medical records indicated that only 49% of participants were within guidelines for any CRC screening test, resulting in fair concordance (0.76). Sensitivity (0.95) and NPV (0.93) were excellent for this outcome, while specificity (0.58) and PPV (0.69) were poor. Participants overreported receipt of any CRC screening test within recommended guidelines (report-to-records ratio=1.38, 95% CI: 1.30–1.47).

Concordance estimates for each individual screening test were excellent or good, but concordance was higher for flexible sigmoidoscopy (0.96) and FOBT (0.90) compared to colonoscopy (0.80). Specificity was also higher for flexible sigmoidoscopy (0.96) and FOBT (0.93) than colonoscopy (0.65). Conversely, sensitivity was excellent for colonoscopy (0.96) and poor for flexible sigmoidoscopy (0.17) and FOBT (0.32). PPV was

fair for colonoscopy (0.71) and poor for flexible sigmoidoscopy (0.04) and FOBT (0.17). NPV was excellent for each individual test (all 0.95). Participants overreported receipt of individual CRC screening tests, with report-to-records ratios ranging from 1.35 (95% CI: 1.27–1.43) for colonoscopy up to 4.50 (95% CI: 1.91–10.61) for flexible sigmoidoscopy.

Correlates of Accurate Self-Reported Data

Among participants who self-reported being within recommended guidelines for any CRC screening test ($n=486$; six participants were excluded due to missing data on potential correlates), those who self-rated their health as good or better were more likely to provide accurate self-reported CRC screening data than those who self-rated their health as fair or poor (71% vs. 58%, $p<0.05$ in univariable analyses) (Table 3). Univariable analyses also indicated that participants who had received a regular check-up in the last two years were more likely to provide accurate self-reported CRC screening data (70% vs. 48%, $p<0.05$). Both variables remained statistically significant in the multivariable model. Participants who self-rated their health as good or better (OR=1.88, 95% CI: 1.12–3.16) or had received a regular check-up in the last two years (OR=2.78, 95% CI: 1.15–6.73) were more likely to provide accurate self-reported screening data.

Discussion

Appalachia is a geographic region with elevated CRC incidence and mortality rates among both males and females compared to the rest of the U.S. (Armstrong et al., 2004; Wingo et al., 2008), yet the accuracy of self-reported CRC screening data among Appalachian residents is unknown. Among residents of Appalachian Ohio, we found fair concordance between self-reported and medical records data for receipt of any CRC screening test within recommended guidelines. Sensitivity and NPV estimates for this outcome were higher than those for specificity and PPV, as participants tended to overreport history of any CRC test. This pattern of findings is consistent with past studies among other populations (Bastani et al., 2008; Khoja et al., 2007; Partin et al., 2008; Shokar et al., 2011) and has important implications for CRC screening research among Appalachian residents.

Our findings suggest that existing CRC screening estimates for Appalachian residents, which are mostly based on self-reported data, may be inflated. This is highly concerning given the mediocrity of the estimates (32%–67% within guidelines for any CRC screening test (Bardach et al., 2012; Fleming et al., 2011; Katz et al., 2011; Tessaro et al., 2006)) and the high CRC burden among residents of Appalachia. It is important that future CRC screening studies in Appalachia use medical records in examining CRC screening behaviors, if at all possible. The possibility of incomplete medical records exists, but medical records provide more complete information on CRC screening behavior compared to self-reported data (Schenck et al., 2007). Although the use of medical records might prove challenging for community-based studies, it will allow for better planning and evaluation of interventions designed to improve CRC screening rates among residents of Appalachia.

The validity of self-reported data varied greatly across individual CRC screening tests. Sensitivity and PPV were higher for colonoscopy compared to both FOBT and flexible sigmoidoscopy, while specificity was lower for colonoscopy. These findings mostly coincide with those from past studies (Bastani et al., 2008; Jones et al., 2008; Khoja et al., 2007; Partin et al., 2008; Shokar et al., 2011; Vernon et al., 2008), but it is worth noting that our estimates of sensitivity and PPV for FOBT and flexible sigmoidoscopy were noticeably lower than all previous estimates (Baier et al., 2000; Bastani et al., 2008; Hall et al., 2004; Hiatt et al., 1995; Jones et al., 2008; Khoja et al., 2007; Lipkus et al., 2003; Madlensky, McLaughlin, & Goel, 2003; Mandelson et al., 2000; Partin et al., 2008; Shokar et al., 2011; Vernon et al., 2008). History of FOBT or flexible sigmoidoscopy was not common among

participants, which may partly explain our findings, but it is also possible that Appalachian residents especially struggle to accurately report use of these tests. Confusion between flexible sigmoidoscopy and colonoscopy likely affected the estimates for flexible sigmoidoscopy (Greisinger, Hawley, Bettencourt, Perz, & Vernon, 2006), while difficulty recalling how recent a test was may have affected FOBT estimates (Vernon et al., 2008). We provided participants with information about each test during data collection to improve recall, but such brief descriptions may not be sufficient. Research is needed to explore strategies for collecting more accurate self-reported CRC screening data among Appalachian residents. This can help improve the validity of CRC screening estimates for studies where medical record documentation is not possible or feasible as a data source.

Participants who had not had a recent medical check-up or self-rated their health as fair or poor were less likely to provide accurate self-reported CRC screening data. It is possible that individuals without a recent check-up are less familiar or less interested in health-related issues. This may make it more difficult for them to accurately recall if and when they had a CRC screening test. Individuals who self-rated their health as fair or poor may undergo more frequent testing for various medical conditions, leading to confusion about which tests they have received and when they received them. Our results suggest that using medical records to determine CRC screening behaviors may be particularly important when studying populations who do not receive regular preventive care or have poorer self-rated health. Interestingly, age and education level were not correlated with providing accurate self-reported CRC screening data, as past research has generally found higher education and younger age associated with higher accuracy (Hall et al., 2004; Lipkus et al., 2003; Partin et al., 2008).

Study strengths include the use of a population-based sample and a focus on residents of a geographic area with elevated CRC incidence and mortality rates. Our sample is similar to the overall Appalachian Ohio population on several demographic characteristics (*e.g.*, race/ethnicity, employment status, and income (Pollard & Jacobsen, 2012)), and our estimates for self-reported CRC screening behaviors are comparable to the 2010 BRFSS estimates for Ohio (FOBT in the last year: 8% vs. 12%; colonoscopy in the last 10 years: 64% vs. 58% (Joseph, King, Miller, Richardson, & Centers for Disease Control and Prevention, 2012)). These similarities give us confidence in the representativeness of our study sample, even though some individuals may have avoided answering their telephones after receiving the study recruitment letter. Our study had some additional limitations. We required participants to have a working telephone number at home, but most U.S. households still have landlines (Blumberg & Luke, 2011). Few participants had received a flexible sigmoidoscopy or FOBT test compared to colonoscopy. The study recruitment letter sent to potential participants prior to calling for the baseline survey may have affected self-report CRC screening data. The generalizability of our findings to all of Appalachia is unknown since participants were recruited from 12 of the 32 counties in Appalachian Ohio. Future research is needed in other portions of Appalachia to determine if potential differences exist within this geographic region. It is possible that medical records were incomplete for some participants, as medical record review was limited to physicians identified by participants as their current regular physicians. The cooperation rate for baseline surveys was modest but similar to previous research that validated self-reported CRC screening data (Vernon et al., 2008).

Many Appalachian residents failed to provide accurate CRC screening data, and overreporting was apparent for all tests examined. Appalachian residents who self-rated their health as fair or poor or who had not received a regular check-up in the last two years particularly struggled to provide accurate self-reported data. Existing CRC screening estimates for Appalachian residents may be inflated, as most are based on self-reported data. Future studies examining CRC screening among Appalachian residents should use medical

records, if possible, to determine participants' screening histories. Although this might prove challenging for community-based studies, the use of medical records will allow for better planning and evaluation of interventions designed to improve CRC screening rates among residents of Appalachia.

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Table 1

Characteristics of participants from Appalachian Ohio (n=721)

	n (%)
<i>Demographic Characteristics</i>	
Age (years) ^a	61.83 (6.79)
Gender	
Female	426 (59)
Male	295 (41)
Race / Ethnicity	
White, Non-Hispanic	699 (97)
Other	21 (3)
Marital Status	
Divorced / Widowed / Separated / Never Married	148 (21)
Married / Living as Married	573 (79)
Education Level	
High School Degree or Less	292 (41)
Some College or More	428 (59)
Employment Status	
Unemployed / Disabled	116 (16)
Retired / Volunteer	301 (42)
Employed Full or Part Time	303 (42)
Household Income	
<\$60,000	413 (57)
\$60,000	219 (30)
Not Reported	89 (12)
<i>Health-Related Characteristics</i>	
Health Insurance	
Uninsured	62 (9)
Public Insurance Only	86 (12)
Private Insurance Only	365 (51)
Public and Private Insurance	208 (29)
Self-Rated Health	
Poor / Fair	109 (15)
Good / Very Good / Excellent	611 (85)
Smoking Status	
Never Smoker	385 (54)
Former Smoker	259 (36)
Current Smoker	74 (10)
Medical Condition that Require Regular Medical Visits	
No	209 (29)
Yes	510 (71)
Regular Check-up in Last Two Years	

	n (%)
No / Don't Know	55 (8)
Yes	666 (92)
Perceived Risk of CRC	
Much Lower / Somewhat Lower / About the Same	645 (89)
Somewhat Higher / Much Higher	76 (11)
Worry About Getting CRC	
Not at All	364 (50)
A Little / Moderately / Quite a Bit / Extremely	357 (50)
Aware of CRC Screening Tests	
No / Don't Know	78 (11)
Yes	643 (89)
Knew CRC Screening Should Begin at Age 50	
No	324 (45)
Yes	397 (55)
Ever Encouraged to Get CRC Screening Test	
No / Don't Know	306 (42)
Yes	415 (58)
Ever Asked Doctor to Order a CRC Screening Test	
No / Don't Know	633 (88)
Yes	88 (12)
Ever Asked by Doctor to Have a CRC Screening Test	
No / Don't Know	133 (18)
Yes	588 (82)

Note. Totals may be less than stated sample size due to missing data. Percents may not sum to 100% due to rounding. CRC = colorectal cancer.

^aContinuous variable with overall mean (SD) reported.

Table 2Validity of self-reported CRC screening data among Appalachian Ohio residents (*n*=721)

	Self-Report n (%)	MR n (%)	Concordance (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Report-to-Records Ratio (95% CI)
Any Test ^a	492 (68)	356 (49)	0.76 (0.73-0.80)	0.95 (0.93-0.97)	0.58 (0.53-0.63)	0.69 (0.65-0.73)	0.93 (0.88-0.96)	1.38 (1.30-1.47)
FOBT	58 (8)	31 (4)	0.90 (0.88-0.93)	0.32 (0.17-0.51)	0.93 (0.91-0.95)	0.17 (0.09-0.29)	0.97 (0.95-0.98)	1.87 (1.27-2.75)
Flexible Sigmoidoscopy	27 (4)	6 (1)	0.96 (0.94-0.97)	0.17 (0.00-0.64)	0.96 (0.95-0.98)	0.04 (0.00-0.19)	0.99 (0.98-1.00)	4.50 (1.91-10.61)
Colonoscopy	458 (64)	340 (47)	0.80 (0.77-0.83)	0.96 (0.93-0.98)	0.65 (0.60-0.70)	0.71 (0.67-0.75)	0.95 (0.91-0.97)	1.35 (1.27-1.43)

Note. CRC = colorectal cancer, MR = medical records, PPV = positive predictive value, NPV = negative predictive value, CI = confidence interval, FOBT = fecal occult blood test.

^a Any CRC screening test within recommended guidelines (*i.e.*, FOBT in last year, flexible sigmoidoscopy in the last five years, or colonoscopy in the last 10 years)

Table 3

Correlates of providing accurate self-reported CRC screening data (n=486)

	No. Accurate in Reporting CRC Screening ^a / Total No. in Category (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
<i>Demographic Characteristics</i>			
Age (1-year increase)	N/A	1.02 (0.99-1.05)	--
Gender			
Female	200/284 (70)	1.16 (0.78-1.71)	--
Male	136/202 (67)	ref.	--
Race / Ethnicity			
White, Non-Hispanic	325/468 (69)	1.45 (0.55-3.81)	--
Other	11/18 (61)	ref.	--
Marital Status			
Divorced / Widowed / Separated / Never Married	57/89 (64)	ref.	--
Married / Living as Married	279/397 (70)	1.33 (0.82-2.15)	--
Education Level			
High School Degree or Less	127/183 (69)	ref.	--
Some College or More	209/303 (69)	0.98 (0.66-1.46)	--
Employment Status			
Unemployed / Disabled	43/71 (61)	0.72 (0.41-1.26)	--
Retired / Volunteer	162/223 (73)	1.24 (0.81-1.89)	--
Employed Full or Part Time	131/192 (68)	ref.	--
Household Income			
<\$60,000	181/270 (67)	ref.	--
\$60,000	110/154 (71)	1.23 (0.80-1.89)	--
Not Reported	45/62 (73)	1.30 (0.71-2.40)	--
<i>Health-Related Characteristics</i>			
Health Insurance			
Uninsured	10/18 (56)	ref.	--
Public Insurance Only	34/60 (57)	1.05 (0.36-3.02)	--
Private Insurance Only	172/244 (70)	1.91 (0.72-5.04)	--
Public and Private Insurance	120/164 (73)	2.18 (0.81-5.88)	--
Self-Rated Health			
Poor / Fair	41/71 (58)	ref.	ref.
Good / Very Good / Excellent	295/415 (71)	1.80 (1.07-3.02) *	1.88 (1.12-3.16) *
Smoking Status			
Never Smoker	183/270 (68)	ref.	--
Former Smoker	124/177 (70)	1.11 (0.74-1.68)	--
Current Smoker	29/39 (74)	1.38 (0.64-2.96)	--
Medical Condition that Require Regular Medical Visits			

	No. Accurate in Reporting CRC Screening ^a / Total No. in Category (%)	Univariable OR (95% CI)	Multivariable OR (95% CI)
No	92/135 (68)	ref.	--
Yes	244/351 (70)	1.07 (0.70-1.63)	--
Regular Check-up in Last Two Years			
No / Don't Know	10/21 (48)	ref.	ref.
Yes	326/465 (70)	2.58 (1.07-6.21) [*]	2.78 (1.15-6.73) [*]
Perceived Risk of CRC			
Much Lower / Somewhat Lower / About the Same	295/429 (69)	ref.	--
Somewhat Higher / Much Higher	41/57 (72)	1.16 (0.63-2.15)	--
Worry About Getting CRC			
Not at All	163/241 (68)	ref.	--
A Little / Moderately / Quite a Bit / Extremely	173/245 (71)	1.15 (0.78-1.69)	--
Aware of CRC Screening Tests			
No / Don't Know	30/44 (68)	ref.	--
Yes	306/442 (69)	1.05 (0.54-2.04)	--
Knew CRC Screening Should Begin at Age			
50			
No	151/214 (71)	ref.	--
Yes	185/272 (68)	0.89 (0.60-1.31)	--
Ever Encouraged to Get CRC Screening			
Test			
No / Don't Know	105/162 (65)	ref.	--
Yes	231/324 (71)	1.35 (0.90-2.02)	--
Ever Asked Doctor to Order a CRC			
Screening Test			
No / Don't Know	284/409 (69)	ref.	--
Yes	52/77 (68)	0.92 (0.54-1.54)	--
Ever Asked by Doctor to Have a CRC			
Screening Test			
No / Don't Know	14/24 (58)	ref.	--
Yes	322/462 (70)	1.64 (0.71-3.79)	--
Participant Able to Provide Date of CRC			
Screening Test			
No	126/195 (65)	ref.	--
Yes	210/291 (72)	1.42 (0.96-2.10)	--

Note. Logistic regression analyses included participants who self-reported being within recommended guidelines for any CRC screening test. Six of these participants were excluded due to missing data on potential correlates. Multivariable model did not include variables with dashes (--). CRC = colorectal cancer, OR = odds ratio, CI = confidence interval, ref. = referent group, N/A = not applicable due to variable being continuous.

^aAny CRC screening test within recommended guidelines (*i.e.*, FOBT in last year, flexible sigmoidoscopy in the last five years, or colonoscopy in the last 10 years)

*
p<0.05