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Rural-Urban Differences in Colorectal Cancer Screening Barriers in Nebraska

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Abstract

Nebraska ranks 36th nationally in colorectal cancer screening. Despite recent increases in CRC screening rates, rural areas in Nebraska have consistently shown lower rates of CRC screening uptake, compared to urban areas. The objective of this study was to investigate reasons for lower CRC screening rates among Nebraska residents, especially among rural residents.

We developed a questionnaire based on Health Belief Model (HBM) constructs to identify factors associated with the use of CRC screening. The questionnaire was mailed in 2014 to adults aged 50–75 years in an urban community in the east and a rural community in the west regions of the state. Multiple logistic regression models were created to assess the effects of HBM constructs, rural residence, and demographic factors on CRC screening use.

Of the 1,200 surveys mailed, 393 were returned (rural n=200, urban n=193). Rural respondents were more likely to perceive screening cost as a barrier. Rural residents were also more likely to report that CRC cannot be prevented and it would change their whole life. In multiple regression models, rural residence, perceived embarrassment, and perceived unpleasantness about screening were significantly associated with reduced odds of receiving colonoscopy. Older age (62 years and older), having a personal doctor, and perceived risk of getting CRC were significantly associated with increased odds of receiving colonoscopy. Interventions to increase uptake of colorectal cancer screening in rural residents should be tailored to acknowledge unique perceptions of screening methods and barriers to screening.

Keywords

Colorectal cancer screening; Health Belief Model; rural population; rural disparities

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Introduction

Colorectal cancer (CRC) is the third leading cause of cancer deaths in the United States. In 2014, an estimated 136,830 new cases were identified and 50,310 deaths were attributed to CRC [1]. From 2007 to 2011, average CRC incidence and mortality rates, were 43.7 and 15.9 per 100,000, respectively [2]. CRC incidence and mortality rates vary widely by sociodemographic factors, such as state, sex, age, and race [1, 3, 4]. CRC survival is often dependent on early detection, thus highlighting the importance of screening uptake [5]. National rates have shown that 5-year survival rates for those diagnosed at the localized stage of CRC are over 90%, compared to 70% survival at the regional stage, and 12.5% at the distant stage [1].

In 2008, the U.S. Preventive Services Task Force (USPSTF) issued an updated recommendation statement on colorectal cancer screening for adults between the ages of 50 and 75 years. USPSTF suggested screening intervals for the general population include: (1) annual fecal occult blood testing (FOBT), (2) sigmoidoscopy every 5 years, with FOBT every 3 years, or (3) colonoscopy every 10 years [6]. Recent data estimate only 65.1% of those aged 50 to 75 years are up-to-date with the 2008 USPSTF screening recommendations [7]. National estimates from 2010 show that 10.4% of adults aged 50 to 75 years had undergone a FOBT in the past year and 0.7% were up-to-date on sigmoidoscopy, in combination with FOBT [7]. Colonoscopy has been shown to be the most common CRC screening method in the U.S., with 61.7% reporting a colonoscopy in the past 10 years [7]. Although U.S. screening rates have increased in recent years, from 46.5% for men and 43.1% for women in 2000 [8], they continue to lag behind screening rates for other cancers, such as breast and cervical [9, 10].

Most recently, national data from 2012 showed that 64.8% of adults in nonmetropolitan areas are up-to-date with CRC screening, compared to 68.7% of metropolitan residents [7]. In addition, nonmetropolitan residents are more likely to have never been screened for CRC, 28.0%, compared to metropolitan residents, 23.9% [7]. Nebraska ranks 36th nationally in colorectal cancer screening, with rates of being up-to-date on any screening and colonoscopy at 60.9% and 58.2%, respectively [7]. As a state, Nebraska has a significant rural population, 35.9% of the state population [11]. This is in contrast to the overall U.S. rural population of 14.6% [11]. CRC screening rates in the state have consistently remained below U.S. averages [12]. Previous studies suggest geographic location to be a determinant of colorectal cancer screening uptake. Residents of rural, or nonmetropolitan, areas often show lower likelihood of being up-to-date on CRC screening [13–16]. The differences reported between rural and urban populations may be attributed to a confluence of factors. Previous research has offered several explanations for the screening disparity among rural residents: older age, lower education level, lack of health insurance, and lack of access to health care and specially-trained physicians [15, 17].

The Health Belief Model (HBM) is a conceptual framework developed in the 1950s to explain changes in health behaviors. The HBM is comprised of six key constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy [18]. These constructs, and the HBM as a whole, have been commonly used to

explain behaviors related to various types of cancer screening [19–22]. In particular, previous research has shown the HBM to be useful in predicting participation in CRC screening [23–26]. A review of factors that influence CRC screening show an association with screening and the HBM constructs of perceived barriers, perceived benefits, and perceived susceptibility [27]. Despite these potential explanations, studies using the HBM as a framework to contrast CRC screening practices in rural and urban populations are limited [28]. The use of a conceptual model, such as the HBM, is useful in understanding the underlying issues surrounding the screening disparity in rural areas. By examining which constructs explain the low rates of CRC screening use among rural residents, we can begin to identify and develop specific measures to increase screening use in this population.

The purpose of this paper was to examine differences in attitudes, beliefs, and barriers to colorectal cancer screening in rural and urban residents in Nebraska. The primary aims of this study were to: (1) describe and contrast adherence rates to colorectal cancer screening tests among rural and urban populations, and (2) compare agreement with Health Belief Model constructs among rural and urban populations.

Methods

Study design

We conducted a cross-sectional study in 2014 using a mailed survey sent to a random sample of patients from one rural and one urban health system in Nebraska. This study was approved by the University of Nebraska Medical Center Institutional Review Board.

Questionnaire Development

We developed a questionnaire based on the HBM constructs. The questionnaire consisted of 3 parts and contained 43 questions in the areas of: demographic factors, screening test use, and statements about CRC and CRC screening. The USPSTF recommendations for colorectal cancer screening tests were used to guide our assessment of screening history. Based on the recommended screening intervals for each test, participants were asked if they met a particular guideline and if they had ever received the given screening test. For example, “Have you received a colonoscopy in past 10 years, as described above?” Response options to screening history questions were “Yes”, “No”, or “Don’t Know.” For questions about barriers and promoters of CRC screening, we used variables implicated by the literature as potential factors that affect CRC screening, such as: physician recommendations, health insurance status, educational attainment, use of preventive services, and family history [27, 29]. Based on components of the HBM, the questionnaire contained 22 statements about CRC and CRC screening.

These statements drew upon previous studies that have utilized the HBM as a framework for examining CRC screening behaviors [29–32]. Study participants were asked to rate their agreement with constructs from the HBM on a five-point Likert scale, with potential responses ranging from “Strongly Disagree” to “Strongly Agree.” Sample questions include, “I feel uncomfortable talking about colorectal cancer” and “I can prevent myself from getting colorectal cancer.”

Setting and recruitment

Study participants were recruited by mail from one of two health systems located in Nebraska, Regional West Health Services (RWHS) and the University of Nebraska Medical Center (UNMC). RWHS serves as the hub hospital for eight critical access hospitals in 11 counties of the Panhandle region of western Nebraska [33]. 10 of the 11 counties that comprise this region are classified as nonmetropolitan and contain no cities with greater than 10,000 residents, based on 2013 United States Census data [34]. Many of the 11 counties are also classified as Frontier and Remote (FAR), a 4-level classification determined by population size and distance from larger urban areas [35]. Ten counties are classified as FAR level two, or areas with populations up to 25,000 people, and at least 45 minutes away from areas of at least 25,000 people [35]. The rural sample included patients who resided in the ten rural counties only. UNMC and its hospital partner, Nebraska Medicine, are located in Douglas County, with a population of 537,256. This metropolitan county on the eastern border of the state includes Omaha, the largest city in the state.

Recruitment of potential subjects occurred between August and October 2014. Some of the approaches recommended in Dillman's Tailored Design Method were used to encourage responses [36]. Participants were mailed an introductory letter explaining the purpose of the study, followed by the questionnaire with return envelope, and a follow-up reminder. Recruitment materials were mailed in intervals of approximately five business days. To encourage participation, subjects were offered a $5 gift card for completion and return of the questionnaire.

We identified 600 potential subjects from each selected health system, for a total sample population of 1,200 individuals. Based on an expected response rate of approximately 30% and 5% sampling error, the targeted sample size was 380. Participants were eligible if they: (1) were aged 50 to 75 years old, (2) had visited one of the participating health systems at least once in the past five years, and (3) resided in the selected 10 county, rural region or Douglas County. Simple random selection from the eligible health system populations was used to develop our study sample.

Statistical methods

We produced descriptive statistics for all variables to describe characteristics of the study population, stratified by rural and urban classifications. Chi-square tests were used to determine differences among these groups. Responses to HBM-related questions were dichotomized as either 'Disagree' or 'Agree' and examined for differences among rural and urban groups, using chi-square tests. We performed bivariate analysis to determine potentially significant associations between CRC screening outcomes and independent variables. Variables significant at $p < 0.15$ were included in additional analysis. Multiple logistic regression analysis was conducted, using the backward selection method, to examine the effect of sociodemographic variables, HBM constructs, and medical history on likelihood of being up-to-date on colorectal cancer screening. All analyses were performed in SAS software 9.3 [37].

Results

Participant characteristics

Completed questionnaires were received from 393 subjects, for a final response rate of 32.8%. Of these respondents, 200 (50.9%) individuals were from a rural county and 193 (49.1%) were from an urban county. Table 1 shows the sociodemographic characteristics of respondents. The mean age of subjects was 62.5 years, with a range from 50 to 75 years. Urban respondents were older than rural respondents (63.4 years vs 61.7 years; $p = 0.014$). A majority of respondents were female (70.1%), currently married (70.4%), white (95.6%), and non-Hispanic (96.4%). Educational attainment was significantly different among the rural and urban populations. In urban respondents, 75.5% had completed more than high school, compared to 65.0% in the rural population ($p = 0.023$).

Medical and screening history

The vast majority of respondents (97.9%) had some form of health insurance and had one person they identify as their personal doctor or health care provider (90.8%). Only 86.9% of those from a rural county had someone they consider a personal doctor, compared to 94.8% of those from an urban county ($p = 0.007$). Rural residents were also less likely to have visited a doctor in the last 12 months for a checkup (74.7% vs 90.2%; $p < 0.001$). Participants were asked to recall if they asked their health care provider, or were asked by their health care provider, about tests to detect CRC. Overall, about half of respondents (48.9%) indicated that their health care provider discussed CRC screening with them while only one in five respondents (24.2%) had asked their health care provider about CRC screening.

Respondents were also asked to provide information about relevant medical and CRC screening history. For the entire sample, four respondents (1.0%) had been diagnosed with colorectal cancer and 12.8% had an immediate family history of CRC. Significantly more urban residents (52.1%) reported ever having a polyp or growth removed from their colon, compared to 28.3% of rural residents ($p < 0.001$). Overall, FOBT was the second most commonly reported screening method, with 47.6% of respondents reported ever having an FOBT, but only 10.0% up-to-date on FOBT recommendations. Sigmoidoscopy was the least common screening method, just 27.1% of respondents reported ever having a sigmoidoscopy, and only 14.6% were up-to-date on screening recommendations. Urban residents were significantly more likely to have ever undergone a colonoscopy (88.6% vs 71.9%; $p < 0.001$) and be up-to-date on colonoscopy recommendations (87.5% vs 71.9%; $p < 0.001$). Based on participant responses, we calculated if they had ever received any form of CRC screening or were up-to-date on any form of CRC screening. No significant differences were observed among those who have ever received CRC screening, (90.7% vs 84.9%; $p = 0.081$) but rural residents were less likely than urban residents to be up-to-date on any form of CRC screening (88.1% vs 74.4%; $p < 0.001$).

Health Belief Model constructs

Table 2 shows the statements about colorectal cancer and colorectal cancer screening presented to participants, with their responses dichotomized into ‘Agree’ or ‘Disagree.’ Self-

efficacy, perceived benefits, perceived barriers, and perceived severity constructs had at least one statement with responses that significantly differed between rural and urban groups. Urban residents were significantly more likely to agree with the following statements: can prevent myself from getting colorectal cancer (55.8% vs 41.3%; $p < 0.004$), wouldn't worry as much about colorectal cancer with regular screening (77.9% vs 66.5%; $p = 0.012$), and wouldn't live longer than 5 years if diagnosed with colorectal cancer (15.5% vs 8.2%; $p = 0.028$). Rural residents were significantly more likely to agree with the following statements: regular checkups to detect colorectal cancer cost too much (34.7% vs 18.0; $p < 0.001$) and colorectal cancer would change my whole life (68.9% vs 56.1%; $p = 0.010$).

Multivariate analysis

We produced multiple logistic regression models (Table 3) to determine the association between HBM constructs medical history, sociodemographic characteristics, and CRC screening. Models were created to examine factors that affect likelihood of being up-to-date for each of the three CRC screening tests and up-to-date for any CRC screening test. After adjusting for other variables, rural residence was associated with lower likelihood of being up-to-date on colonoscopy [Odds Ratio (OR) = 0.43; 95% CI = 0.24–0.78] and up-to-date with any CRC screening (OR = 0.40; 95% CI = 0.22–0.75). Age, over 62 years, was associated with increased likelihood of colonoscopy (OR = 2.00; 95% CI = 1.13–3.56) and male gender was associated with receiving any type of CRC screening (OR = 2.27; 95% CI = 1.10–4.75). Participants who identified one individual as their personal doctor were more likely to have a recent colonoscopy (OR = 2.46; 95% CI = 1.08–5.60) and be up-to-date on any type of CRC screening (OR = 3.18; 95% CI = 1.37–7.41). Participants who reported their health care provider discussed CRC screening at their last checkup were significantly more likely to have received a FOBT (OR = 3.92; 95% CI = 1.72–8.93) and sigmoidoscopy (OR = 2.52; 95% CI = 1.25–5.08). Those who have had polyps or growths removed were more likely to be up-to-date on sigmoidoscopy (OR = 4.37; 95% CI = 2.15–8.89).

Multiple logistic regression results showed three HBM constructs were positively associated with CRC screening. Individuals who stated they would feel good with regular CRC screening were more likely to be up-to-date on colonoscopy (OR = 2.04; 95% CI = 1.13–3.70) and any screening (OR = 2.15; 95% CI = 1.16–3.97). Participants who agreed that regular CRC screening would make them worry more, were more likely to be up-to-date on sigmoidoscopy (OR = 3.47; 95% CI = 1.11–10.87). Those who stated they were more likely than average to develop CRC were also more likely to be up-to-date on colonoscopy (OR = 3.72; 95% CI = 1.27–10.88) and any screening (OR = 4.37; 95% CI = 1.32–14.48).

Five HBM constructs were determined to be negatively associated with likelihood of being up-to-date on CRC screening. Likelihood of sigmoidoscopy was negatively associated with being able to recognize bowel changes (OR = 0.28; 95% CI = 0.11–0.72) and belief that problems from CRC would last a long time (OR = 0.38; 95% CI = 0.20–0.76). Belief that tests to detect CRC would be unpleasant was negatively associated with being up-to-date on colonoscopy (OR = 0.45; 95% CI = 0.24–0.85) and any screening (OR = 0.32; 95% CI = 0.18–0.60). An additional barrier to recent colonoscopy was perceived embarrassment of

screening (OR = 0.38; 95% CI = 0.18–0.78). Finally, participants who thought regular screening takes too much time were less likely to be up-to-date on any screening (OR = 0.34; 95% CI = 0.15–0.78).

Discussion

This study revealed several important findings that point to differences in CRC screening behaviors among rural and urban populations. First, colonoscopy rates were significantly higher in the urban population of this study. Second, significant differences were observed in agreement with HBM statements related to attitudes toward CRC and associated screening methods. Finally, multivariate analysis revealed several factors, including rural residence, to have an effect on the likelihood of being up-to-date on CRC screening tests.

Disparities in CRC screening rates among rural and urban populations have been examined in a limited capacity among previous studies. Anderson and colleagues hypothesized that travel time to colonoscopy providers may affect screening rates. Analysis of population-based data showed rural classification to have a negative impact on screening rates, yet travel time was not a significant factor for being up-to-date on CRC screening [38]. Young and colleagues also examined proximity to health facilities, based on zip code, and found no association with screening rates [39]. This evidence points to other factors, aside from physical distance, as an explanation for the disparity in rural and urban CRC screening rates. To our knowledge, this is one of the first studies to use a questionnaire based on the HBM as a conceptual framework to identify differences in perceptions toward CRC screening and use between rural and urban patients. Previous rural disparity research on CRC screening did not use a theoretical model or lacked a comparison group [38–41].

Several studies have used the HBM as a framework to assess and predict CRC screening behaviors in a variety of populations [23, 24, 31, 32, 42]. A review of studies that have examined determinants of CRC found several components of the HBM to be influential [27]. The HBM construct of perceived barriers was shown to have the greatest influence on screening behavior. Our findings show that several statements representing a perceived barrier were significant. Rural individuals were almost twice as likely to agree that screening to detect CRC costs too much. Perceived cost, in combination with a lack of insurance, has been implicated as a potential barrier to CRC screening [43]. Despite this, the overwhelming majority of survey respondents reported health insurance coverage. A provision of the Affordable Care Act (ACA) requires health insurance plans offer coverage of preventive services, such as colonoscopy, without cost-sharing [44]. Misinformation and lack of knowledge of ACA benefits and changes have been demonstrated as potential barriers to successful implementation of the reforms [45]. Further study of this factor as an explanation for the significantly higher perception of cost as a barrier to CRC screening among rural residents is warranted.

Results of multivariate analysis showed three additional perceived barrier statements to be associated with CRC screening. Feelings of embarrassment with CRC screening has been shown as a significant barrier to screening, especially colonoscopy [26, 32]. Although the rural population in this study reported higher agreement with the embarrassment factor, no

significant difference was found. Multivariate analysis also showed individuals who agreed that CRC screening is embarrassing were significantly less likely to be up-to-date on colonoscopy recommendations.

Self-efficacy has been demonstrated to have a positive effect on CRC screening behaviors [46]. We found that rural residents in this study were significantly less likely to agree that they could prevent themselves from getting CRC. Differences in perceived benefits of screening, such as reduced worry of developing CRC, were found among the rural and urban populations. Urban residents were significantly more likely to agree that regular CRC screening would reduce their worry. Increased uptake of CRC screening has been linked with reduced worry in previous research [47]. Regression models showed the perceived benefit of feeling good with regular screening to be a positive predictor of being up-to-date on colonoscopy and overall CRC screening. A study of over 5,000 patients who had undergone a colonoscopy showed those with no family history of CRC or polyps may not be aware of the benefits screening offers [48]. This is an important factor to account for when seeking to increase CRC screening rates in a population.

We found two perceived severity statements that differed based on residence. Rural residents were significantly more likely to agree that CRC would change their whole life, yet less likely to agree that they would not live longer than five years if they developed CRC. Perceived severity has not been shown to be a consistent predictor of screening behavior [27]. Perceived susceptibility was a strong predictor CRC screening in this study. Those who believed they were more likely than average to develop CRC were also more likely to be up-to-date on colonoscopy recommendations. Tessaro and colleagues showed that perception of CRC risk was strongly associated with being up-to-date on screening recommendations [42].

Access to care and physician recommendations have also been shown as strong predictors of CRC screening behavior [13, 49]. No significant differences were found in physician recommendations for CRC screening among the two populations in this study. Our analysis found that urban residents were more likely to identify one individual as their personal health care provider. Multivariate analysis showed having a personal health care provider was significantly associated with being up-to-date on colonoscopy. Previous studies have identified having a usual source of health care as a strong predictor of CRC screening [8, 50, 51]. Given that rural residents in this study were less likely than urban residents to identify one person as their personal health care provider, this may be a differentiating factor in screening rates among the two populations.

Our study has a few limitations. The use of individuals who have visited a health system in the past 5 years as a study population limits the generalizability of results beyond populations that share similar characteristics. In addition, survey respondents were primarily white, although this is similar to the overall Nebraska population and relatively common in rural settings.

Based on the results of this study, future areas of research should include a focus on applying HBM constructs to individual screening methods, particularly colonoscopy and FOBT, and contrast findings with rural and urban populations. Increased focus on FOBT

may be an avenue to increase rural uptake of screening, as individuals may be more likely to follow FOBT recommendations than colonoscopy recommendations [52]. In addition, gaining a deeper understanding of how ACA reforms are influencing the use of preventive services will ensure potential disparities in CRC screening can be identified.

Together, the outcomes of this study show there may be several underlying factors that affect how rural and urban residents perceive CRC screening. Our finding that rural residence was negatively associated with being up-to-date colonoscopy and overall CRC screening recommendations highlights the importance of recognizing differences in screening uptake of rural and urban populations. Given the increased focus, at national and state levels, on improving CRC screening rates, it is important to further understand and adapt to these differences. These results support the notion that public health messaging and interventions to promote CRC screening should be tailored to focus on rural populations, when applicable. Successful interventions may incorporate a focus on improving patient-physician relationships, promotion of screening benefits, explanation of risk factors for development of CRC, and bring attention to existing resources that offer low-cost screening options.

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Table 1

Survey respondent characteristics and medical history

	Rural (n=200)	Urban (n=193)	P-Value
Characteristics	**(%)**	**(%)**	
Age* Mean (SD)	61.7 (7.0)	63.4 (7.1)	**0.014**
Sex			0.597
Female	143 (71.9)	134 (69.4)	
Male	56 (28.1)	59 (30.6)	
Marital Status			0.076
Currently married	149 (74.5)	128 (66.3)	
Not currently married	51 (25.5)	65 (33.7)	
Education*			**0.023**
Greater than high school	128 (65.0)	145 (75.5)	
High school graduate or less	69 (35.0)	47 (24.5)	
Hispanic	9 (4.6)	5 (2.7)	0.307
Race			0.068
White	194 (97.5)	179 (93.7)	
Non-white	5 (2.5)	12 (6.3)	
Health insurance status			0.965
Uninsured	4 (2.0)	4 (2.1)	
Insured	193 (98.0)	187 (97.9)	
Identify one individual as personal doctor*			**0.007**
No	26 (13.1)	10 (5.2)	
Yes	172 (86.9)	183 (94.8)	
Time since last checkup**			**< 0.001**
Within 12 months	148 (74.7)	174 (90.2)	
Longer than 12 months	50 (25.3)	19 (9.8)	
Asked about CRC tests at last checkup*			**0.039**
No	140 (71.4)	152 (80.4)	
Yes	56 (28.6)	37 (19.6)	
Doctor discussed CRC tests at last checkup			
No	98 (52.1)	95 (50.3)	0.758
Yes	91 (48.1)	94 (49.7)	
Ever had polyps removed**			**< 0.001**
No	137 (71.7)	91 (47.9)	
Yes	54 (28.3)	99 (52.1)	
Family history of CRC			0.561
No	163 (86.2)	158 (88.3)	
Yes	26 (13.8)	21 (11.7)	

	Rural (n=200)	Urban (n=193)	P-Value
Characteristics	**(%)**	**(%)**	
FOBT in last year			0.116
No	170 (87.6)	172 (92.5)	
Yes	24 (12.4)	14 (7.5)	
Sigmoidoscopy in last 5 years and FOBT in last 3 years			0.868
No	160 (85.1)	156 (85.7)	
Yes	28 (14.9)	26 (14.3)	
Colonoscopy in last 10 years**			**< 0.001**
No	56 (28.1)	24 (12.5)	
Yes	143 (71.9)	168 (87.5)	
CRC screening up-to-date*			**< 0.001**
No	51 (25.6)	23 (11.9)	
Yes	148 (74.4)	170 (88.1)	

* $p < 0.05$

** $p < 0.01$

Table 2

Agreement with Health Belief Model constructs

	Rural (n=200)	Urban (n=193)	P-Value
	(% who agree with statement)		
Self-efficacy			
Know how to get regular screening	89.0	91.1	0.489
Confident could schedule screening	94.5	93.2	0.591
Can recognize abnormal bowel changes	88.9	89.5	0.852
Can prevent myself from getting CRC**	41.3	55.8	**0.004**
Benefits			
Will be able to detect CRC early with screening	82.4	82.6	0.955
Would feel good with regular screening	71.5	77.9	0.147
Wouldn't worry as much with regular screening*	66.5	77.9	**0.012**
Regular screening detects CRC early	91.4	89.4	0.504
Regular screening decreases chance of dying	84.0	88.3	0.222
Barriers			
Feel uncomfortable talking about CRC	27.5	22.0	0.207
Regular screening will make me worry	7.0	7.9	0.748
Regular screening will be embarrassing	16.5	11.1	0.120
Regular screening takes too much time	9.0	8.9	0.973
Screening will be unpleasant	36.5	37.4	0.859
Screening costs too much**	34.7	18.0	< **0.001**
Susceptibility			
Extremely likely will get CRC	7.1	7.4	0.921
Will get CRC in future	6.2	5.3	0.679
More likely than average to get CRC	13.3	13.8	0.891
Severity			
Thought of CRC scares me	60.1	60.1	0.983
Problems from CRC would last long time	64.8	59.8	0.311
CRC would change whole life*	68.9	56.1	**0.010**
Would not live longer than 5 years with CRC*	8.2	15.5	**0.028**

* $p < 0.05$

** $p < 0.01$

Table 3

Variables associated with being up-to-date on colorectal cancer screening tests

	FOBT	Sigmoidoscopy	Colonoscopy	Any screening
Predictor variables	**O.R (95% C.I.)**	**O.R (95% C.I.)**	**O.R (95% C.I.)**	**O.R (95% C.I.)**
Rural residence			0.43 (0.24–0.78)**	0.40 (0.22–0.75)**
Over age 62			2.00 (1.13–3.56)*	
Male (gender)				2.27 (1.10–4.75)*
Have a personal health care provider			2.46 (1.08–5.60)*	3.18 (1.37–7.41)**
Doctor discussed CRC screening at last check-up	3.92 (1.72–8.93)**	2.52 (1.25–5.08)*		
Had polyps removed		4.37 (2.15–8.89)**		
Can recognize abnormal bowel changes		0.28 (0.11–0.72)**		
Would feel good with regular screening			2.04 (1.13–3.70)*	2.15 (1.16–3.97)*
Regular screening makes me worry more		3.47 (1.11–10.87)*		
Screening will be embarrassing			0.38 (0.18–0.78)**	
Screening takes too much time				0.34 (0.15–0.78)*
Extremely likely to get CRC	2.82 (1.03–7.74)*			
Screening will be unpleasant			0.45 (0.24–0.85)*	0.32 (0.18–0.60)**
More likely than average to get CRC			3.72 (1.27–10.88)*	4.37 (1.32–14.48)*
Problems from CRC would last long time		0.38 (0.20–0.76)**		

* $p < 0.05$

** $p < 0.01$