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# A Motivational Interviewing Intervention to Promote CRC Screening:

## A Pilot Study

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## Abstract

**Background:** Appalachian Kentuckians suffer a disproportionate incidence and mortality from colorectal cancer (CRC) and are screened at lower rates (35%) compared with 47% of Kentuckians.

**Objective:** The aim of this study was to evaluate the efficacy of a motivational interviewing intervention delivered by trained Lay Health Advisors on CRC screening.

**Method:** Eligible participants recruited from an emergency department (ED) completed a baseline survey and were randomized to either the control or the motivational interviewing intervention provided by Lay Health Advisors. Follow-up surveys were administered 3 and 6 months after baseline. To evaluate potential differences in treatment and control groups, *t* tests, $X^2$, and Mann-Whitney *U* tests were used.

**Results:** At either the 3- or 6 month assessment, there was no difference in the CRC screening by group ($X^2 = 0.13$, $P = .72$). There was a significant main effect for the study group in the susceptibility to CRC model; regardless of time, those in the intervention group reported approximately 1-point higher perceived susceptibility to CRC, compared with controls (est. $b = 0.68$, $P = .038$). Age and financial adequacy had a significant effect related to CRC screening. Older participants (est. $b = 0.09$, $P = .014$) and those who reported financial inadequacy (est. $b = 2.34$, $P = .002$) reported more screening barriers.

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**Conclusion:** This pilot study elucidated important factors influencing the uptake of CRC for an ED transient population and this may be useful in the design of future interventions using motivational interviewing in EDs.

**Implications for Practice:** Nurses can provide information about CRC screening guidelines and provide referrals to appropriate screening resources in the community.

## Keywords

Appalachian; Colorectal cancer screening; Lay Health Advisors; Motivational interviewing

Kentucky ranks first in the United States for colorectal cancer (CRC) incidence (49.5 cases per 100 000) and fifth for CRC mortality (16.9 deaths per 100 000).[1] Appalachian Kentucky CRC incidence and mortality exceed that of the state of Kentucky's incidence (55.1 cases per 100 000) and mortality (20.2 deaths per 100 000).[1] Most CRCs develop from benign precursor lesions that have remained untreated over a long period; it may take an estimated 10 years for a small polyp to develop into CRC. These precursor lesions can be detected by various screening methods.[2] Screening of average-risk individuals has been shown to significantly reduce CRC incidence and/or mortality in high-quality randomized controlled trials.[3,4] Regular CRC screening should start at age 45 to 50 years for those at average risk. Recommended screening methods include annual fecal occult blood testing, annual fecal immunochemical test, flexible sigmoidoscopy every 5 years, sigmoidoscopy every 5 years with annual stool blood test, and colonoscopy every 10 years.[5–7]

Approximately 35% of rural Appalachian Kentucky residents 50 years or older have had CRC screening in accordance with the US Preventive Services Task Force guidelines compared with 47% of Kentuckians and 65% of individuals in the United States.[8] Multiple factors contribute to the low CRC screening rates in Appalachian Kentucky. Appalachian Kentucky is plagued by limited financial resources, low educational attainment, low levels of health insurance coverage, shortages of healthcare providers, and underfinanced health services, thus leading to inadequate healthcare access and suboptimal preventive healthcare.[9,10] Receiving a healthcare provider's recommendation for CRC screening is a primary predictor for patient adherence with screening guidelines.[11] However, residents of rural communities often are underserved populations because they are not able to regularly access the healthcare system. Persons who do not have a primary care provider (PCP) or other regular source of healthcare are much less likely to engage in cancer screening activities. This limited access to healthcare leads to fewer recommendations for cancer screening and, ultimately, less cancer screening.

Appalachian Kentuckians who may not have access to a regular source of healthcare often present to the emergency department (ED) setting.[12] The ED may be the sole point of contact with the healthcare system for many and offers a unique and rare opportunity to promote cancer screening. The ED setting may offer a "teachable moment," where an individual is ready to accept new information.[13] We used Lay Health Advisors (LHAs) to promote CRC screening in a rural Appalachian Kentucky ED and to provide a culturally tailored motivational interviewing (MI) intervention. Lay Health Advisors are frontline public health workers who have a close understanding of the community.[14] Lay Health

Advisors can serve as role models because they understand the unique cultural issues experienced by rural Appalachian individuals, including both barriers and facilitators to preventive health behaviors.

Motivational interviewing is a valuable resource that can be implemented to influence behavior and change in cancer control and prevention research.[15–17] Motivational interviewing has been applied in various health promotions and behavior changes in cancer prevention, including promotion of mammography and CRC screening.[18–20] Motivational interviewing is a highly effective, goal-oriented method for enhancing internal motivation to change a behavior. Rather than inciting fear or simply providing well-intentioned advice, MI seeks to explore and resolve ambivalence.[21]

This pilot study was theoretically grounded in the Health Belief Model (HBM). The HBM is a theoretical framework commonly used to study a variety of health behaviors by considering an individual's perception of the threat posed by a problem (susceptibility, severity), the benefits of avoiding the threat, and the factors that influence the decision to act (barriers, cues to action, and self-efficacy).[22] For this pilot, we focused on rural Appalachian Kentuckians' attitudes related to CRC screening benefits, barriers, and susceptibility. The purpose of this study was to pilot a tailored MI intervention to promote CRC screening in a rural Appalachian Kentucky ED and to assess the effects of the intervention on perceived susceptibility, benefits, and barriers to CRC screening and subsequent completion of CRC cancer screening.

## Methods

### Study Design

A pilot randomized control trial compared an MI intervention group and a control group. Participants completed a baseline survey and were then randomized to receive (1) the CRC screening MI intervention provided by an LHA or (2) cancer screening brochures (control group). A telephone follow-up survey was administered 3 and 6 months after baseline.

Randomization: The randomization scheme was developed by the principal investigator and the research team using REDCap randomization. Participants were randomized based on their assigned number in REDCap.

### Setting and Sample

This study was conducted at an Eastern Kentucky regional medical center ED. The medical center is the largest rural hospital in Northeastern Kentucky and serves a population of more than 160 000 from 12 Eastern Kentucky counties. Data were collected from March 2015 to April 2017. Participants were persons in no apparent distress who were being treated in the ED for nonurgent complaints or persons not being treated who were waiting in the ED for family or friends. Accompanying individuals were eligible to be in the study because we wanted to leverage the heightened attention of both patients and their companions to provide an opportunity for cancer education and to deliver cancer screening interventions. Emergency department visits may present a "teachable moment" where individuals may be more open to feedback and suggestions regarding their behaviors.[13] Individuals are more

likely to make health changes when they are approached during key times when their attention is focused on their health, such as when they or a friend or family member is in the ED. Inclusion criteria were being older than 50 years, being of rural Appalachian resident, having no history of CRC, able to speak and understand English, and not having completed any of the following CRC tests: (1) fecal occult blood testing within the past year, (2) flexible sigmoidoscopy within the past 5 years, or (3) colonoscopy within the past 10 years. Interested persons were screened for eligibility, and persons meeting inclusion criteria were invited to participate.

### Control (Standard of Care)

Participants randomized to the control group were given cancer screening brochures about cancer screening services provided at the hospital. These brochures were routinely available in the ED waiting room.

### Intervention

Two LHAs who received extensive training in the use of MI delivered the MI intervention. Potential participants were approached by the LHA in the ED waiting area after they had been triaged and identified by the triage nurse as not requiring urgent care or as they were waiting in the ED for others not requiring urgent care. Once eligibility was determined, the LHA escorted the participant to a private area of the ED for the informed consent process and the baseline interview. The baseline questionnaire included contact information to reach the participant at a later time. Participants were randomized to either the control group or the intervention group. Participants assigned to the intervention group were engaged in a brief CRC screening MI session (≤10 minutes) administered by the LHA. The MI technique allowed the LHA to explore CRC screening barriers based on the participant's personal priorities. Participants discussed relevant barriers to CRC screening, and the LHAs explored and resolved ambivalence regarding CRC screening. For example, one participant might need to explore a financial barrier related to CRC screening, whereas another participant's barrier might be the fear of CRC screening results. The LHA and participant then created a written action plan based on the MI session. The written action plan is a summary and reflection of the participant's MI session, including any articulated actions that will be undertaken to plan and complete CRC screening. The LHA provided a copy of the action plan to the participant and scheduled a follow-up MI session to occur within 1 week by telephone to review and reflect upon the content of the initial MI session.

The research team ensured ongoing fidelity by holding a monthly teleconferencing meeting with the LHAs to review MI strategies; during this meeting, we ensured that LHAs were using the prepared MI scripts for guidance during MI encounters, discussed any issues that may have been encountered during the use of MI in the field, answered questions, and addressed concerns.[15] Development and implementation of the MI fidelity protocols for this study have been previously published.[15] All protocols were approved by the university's institutional review board. Participants were mailed a $25 gift card after completion of the intervention.

## Measures

### Sociodemographic and Healthcare Access

In addition to sociodemographic questions (age in years, marital status, years of education, financial adequacy), health insurance status was assessed with the item, “Do you have any form of health insurance?” Primary healthcare access was assessed with the question, “Do you have a PCP or a healthcare professional you see regularly for care?”

### Financial Adequacy

Financial adequacy was assessed with the question, “Considering the amount of money that comes into your household for you to live on, would you say that you are (*a*) comfortable, have more than enough to make ends meet; (*b*) have enough to make ends meet; (*c*) do not have enough to make ends meet; (*d*) decline to answer.” Responses were recoded into a dichotomous variable (financial adequate and financial inadequate), with participants who reported comfortable, have more than enough, and have enough to make ends meet coded as financially adequate, whereas participants who reported do not have enough to make ends meet were coded as financially inadequate. Individuals who declined to answer were not included in the analysis for financial adequacy.

### HBM Constructs (Benefits, Susceptibility, and Barriers Checklists)

The benefits of CRC screening, susceptibility to CRC, and barriers to CRC screening were measured by scales based on Champion’s HBM scale for benefits, susceptibility, and barriers. These scales were modified for CRC by replacing breast cancer screening with CRC screening. These scales have been previously tested for validity and reliability, and for this study, each scale used a 4-point Likert format, with responses ranging from 1, “strongly disagree,” to 4, “strongly agree.”[23,24] In this study, the reliability Cronbach’s $\alpha$ for the 3 subscales were 0.71, 0.67, and 0.86, respectively, for the 3 domains: perceived susceptibility, perceived benefits, and perceived barriers. Four survey items measured perceived CRC screening benefits, which were defined as those related to the perceived positive outcomes of obtaining CRC screening such as increased chances of early detection, better treatment options, and increased chance of survival.[25] Thirteen items assessed perceived barriers to CRC screening, which were defined as emotional, physical, or structural concerns related to CRC uptake, including pain, fear of radiation, and cost.[25] Five items evaluated perceived CRC susceptibility, which was defined as beliefs of personal threat or harm related to CRC.[24]

### CRC Screening History

Participants were asked whether they had ever had any type of CRC screening(s).

### Screening Status Post-Intervention

Three and 6 months after the intervention period, participants were contacted by telephone and asked, “Have you had a CRC screening in the past 3 or 6 months or since we talked to you in the ED?” with options of yes or no. We also asked if the participant had scheduled

a visit with a healthcare provider to have CRC screening; if they had not, we asked if they intended to be screened for CRC in the next 6 months.

### Outcomes

The primary study outcomes were completion of CRC screening and changes in perceived benefits, barriers, and susceptibility to CRC. All outcome measures were assessed in the baseline questionnaire and in the follow-up (3 and 6 months) questionnaires.

### Data Analysis

Descriptive statistics were used to characterize the participants' demographics; CRC screening rates; and perceived benefits, barriers, and susceptibility to CRC. The 2-sample $t$ test, $\chi^2$ test of association or Fisher exact test, and Mann-Whitney $U$ test were used to evaluate potential differences in dichotomous or categorical variables between the intervention and control groups. Repeated-measures modeling was used to evaluate changes in susceptibility to CRC and benefits and barriers of CRC screening, adjusting for baseline demographic characteristics (age, gender, financial comfort, insurance type, and whether they had a regular PCP). Each original model measured the main effects of time and study group (intervention/control) and their interaction. The treatment-by-time interaction was not significant for any of the models, and therefore, the main effects models were interpreted. All data analysis was conducted using SAS for Windows, version 9.4, with an $\alpha$ level of 0.05.

## Results

### Sample Characteristics

A total of 190 eligible adults 50 years or older, waiting for non-urgent care or accompanying an individual in the ED of the rural Appalachian hospital, were enrolled in the study and individually randomized to intervention (n = 95) and control (n = 95) groups (Table 1). Of those, 73 (38.4%) had either 3- or 6-month follow-up data, including 33 from the intervention group and 40 from the control group. Specifically, 51 had data for 2 time points, baseline and 3-month follow-up (intervention, 27 and control, 24), whereas 22 had data for all 3 time points, baseline and 3- and 6-month follow-up (intervention, 6, control, 16). The remaining 117 (61.6%) participants were lost to follow-up. In comparing those who remained in the study for at least 1 follow-up survey with those lost to follow-up, women ($P = .02$) and those who were at the ER for a reason other than seeking care for themselves ($P < .001$) or accompanying a friend or family member ($P < .001$) were more likely to have continued in the study. These groups did not differ on any other sociodemographic variables examined in the study.

The mean (SD) age of participants was 57.8 (8.7) years, and most were female (59%) and White (98%). More than half (52%) of the participants were married and almost two-thirds (65%) had a high school education. Most participants had a PCP (88%), were accompanying someone to the ER for nonurgent care (59%), and had government-funded health insurance (77%). More than one-half of the sample (53%) reported struggling to "make ends meet" financially. Only 4.8% of participants had ever completed CRC screening and they all

had received a colonoscopy for CRC screening and were out of compliance at the time of recruitment into the study. The HBM constructs of perceived susceptibility, perceived benefits, and perceived barriers were assessed with values from 1 (strongly agree) to 4 (strongly disagree). The susceptibility to CRC subscale had a mean (SD) score of 12.5 (1.9), benefits of CRC screening subscale had a mean (SD) score of 12.5 (1.6), and barriers to CRC screening subscale had a mean (SD) score of 27.8 (4.0). The susceptibility subscale ranges from 4 to 20, benefits subscale range was 4 to 16, and the barriers subscale range was 4 to 52. There were no differences in any of these variables between treatment and control participants.

### Primary Outcome: Obtaining a CRC Screening at Follow-up

For the 73 participants (33 intervention, 40 control) with follow-up data at either the 3- or 6-month assessment, there was no difference in the rate of CRC screening by study group ($\chi^2 = 0.13$, $P = .72$). Among participants in the intervention group, 12% received CRC screening (n = 4 at 3 months), whereas 15% of those in the control group received CRC screening (n = 4 at 3 months, n = 2 at 6 months).

### HBM Constructs (Benefits, Susceptibility, and Barriers Checklists)

In the repeated-measures analysis of HBM constructs over time, the interaction between study group and time was not significant for any of the models; therefore, the main effects models were presented (see Table 2). There was a significant main effect for the study group in the susceptibility to CRC model: regardless of time and adjusting for demographic variables, those in the intervention group reported approximately 1-point higher susceptibility to CRC compared with the control group (est. $b = 0.68$, $P = .038$). Related to barriers to CRC screening, there was a significant effect for age and financial adequacy. Older participants (est. $b = 0.09$, $P = .014$) and those who reported financial inadequacy (est. $b = 2.34$, $P = .002$) had more barriers to CRC screening. There was no effect of study group, time, or any demographic characteristics on the benefits of CRC screening model.

## Discussion

This study piloted a tailored MI intervention to promote CRC screening among individuals in no apparent distress who are being treated in the ED for nonurgent complaints or those waiting in the ED for other individuals. Persons who visit the ED for nonurgent complaints are often part of a vulnerable group less likely to have a PCP to recommend CRC screening and are also likely to be older adults, underemployed or unemployed, and without health insurance coverage for preventive screening or other routine healthcare.[26] This MI intervention was designed to address the most common barriers that rural Appalachian Kentuckians might face to obtaining CRC screening. There are several significant findings that emerged from this study. First, participants using the ED to receive routine healthcare and non-urgent care were not receiving CRC screening that was in compliance with US Preventive Services Task Force CRC screening recommendations. The screening rate among the participants in this study was far below the 70.5% CRC screening utilization goal set by Healthy People 2020 for individuals aged 50 to 75 years.[27] In 2018, 70% of adults in

Kentucky aged 50 to 75 years reported being up to date with CRC screening.[28] In our sample of participants visiting an Appalachia ED for nonurgent care, just 4.8% reported having ever completed any type of CRC screening. This disparity between the Healthy People target goal and the rate of CRC screening in the study participants suggests that this group of individuals is at high risk for underutilization of CRC screening and therefore are at risk of later stage detection of CRC. The completion of CRC screening by less than 5% of the study population was low despite 88% of the participants reporting having a PCP, thus highlighting that having a PCP was not adequate to ensure CRC screening in this population. Other studies have suggested that individuals' increased trust in their PCP[29] and an increased number of visits with a PCP[30] are positively correlated with increased CRC screening. Our findings emphasize the need for innovative CRC screening promotion among rural Appalachian Kentuckians.

There was a small significant effect for susceptibility to CRC among the intervention group compared with the control group. According to the HBM, participation in a preventive behavior is likely to occur if an individual (1) perceives susceptibility to the condition, (2) perceives consequences of the condition to be serious, and (3) believes that there is an obtainable action, with greater benefits than barriers, to reduce the risk of developing the condition.[22] This is consistent with literature that shows that perceived susceptibility to cancer is a precursor to engagement in cancer screening and that lack of risk perception may be a barrier to cancer screening uptake. Kentuckians' (n = 2263) most commonly identified barriers to CRC screening are their attitudes and beliefs.[10] Healthcare providers and LHAs should provide CRC risk information to promote individuals' accurate perceptions regarding CRC susceptibility while informing them of the benefits of CRC screening and the lower CRC morbidity and mortality associated with following recommended CRC screening.

Older individuals and those who reported financial inadequacy reported more barriers to CRC screening in this study. Although the screening guidelines for CRC, breast, cervical, and lung cancer are different, studies have shown an association between older age and cancer screening. Contrary to our finding, reported CRC screening among a national sample was lower among younger age group (50-64 years) compared with 65 to 75 years.[31] Breast cancer screening use was lower among younger women aged 50 to 59 years.[32] Similarly, cervical cancer screening completion was lowest among younger individuals 21 to 30 years.[31]

According to the National Cancer Institute, advancing age is the highest risk factor for cancer. Older adults and socioeconomically disadvantaged populations have been found to also have increased barriers affecting uptake of breast, cervical cancer, and lung screening.[33–35] The median age at CRC diagnosis is 68 years.[36] Older adults may suffer disparate mortality because of late CRC diagnosis as a sequela of CRC screening barriers. Interventions for older adults should be tailored to address barriers specific to these populations. Interventions that reduce structural and system-level barriers to CRC, including one-on-one interactions and patient reminders, and that aim at making the screening process easier, especially for target population,[37] will be useful for older adults.

In the United States, a person's socioeconomic status affects his/her ability to obtain healthcare.[38] In addition, populations with lower incomes are more likely to engage in behaviors that increase their cancer risk, such as smoking, poor nutrition intake, and lack of adequate physical activity.[38] Individuals encountering barriers to CRC screening may lack access to other preventive care and early intervention, resulting in increased morbidity and more costly treatment at late stages of illness. Financial adequacy has been identified as a barrier in other cancer screenings.[31,32] Uninsured individuals and persons without a usual source of care had lower screening use. Data from 2015 National Health Interview Survey indicate that factors associated with lower mammography use include poverty and lack of insurance coverage.[31] Cervical cancer screening use was lowest among uninsured women, whereas lowest CRC screening use was reported by persons without a usual source of healthcare (26.3%) and persons who were uninsured (25.1%).[31]

Access to healthcare is very important for these vulnerable populations, given that many healthcare systems have shifted from external to self-determined screening, with the individual expected to play a greater role in screening decisions.[39] Healthcare providers have an integral role in CRC screening as indicated by Knight and colleagues'[10] findings that 27% of Kentuckians identified their healthcare provider's lack of CRC screening recommendation as a barrier to CRC screening. Recommendations for evidence-based CRC screening should be provided not only by PCPs but also by healthcare providers in other settings where disadvantaged populations may be accessing care, such as the ED. To increase CRC screening, interventions should focus on older and socioeconomic disadvantaged individuals to remove barriers for these vulnerable population groups. In particular, interventions should focus on access to healthcare and individual, healthcare provider, and healthcare system level barriers that may influence use of necessary healthcare and screening.

Similar to our findings, screening interventions in the ED and other ambulatory settings have been shown to be feasible but still pose some challenges. In an ED-based screening intervention for breast and cervical cancer, after being triaged by an ED nurse, low-income patients presenting with nonurgent complaints were offered a Papanicolaou test and clinical breast examination and/or referred for follow-up mammography. Onsite screening completion rates were low primarily because of eligibility and Papanicolaou test refusal; however, cancer detection rates were comparable with other ED programs and non-ED settings. Completion rates for mammography were even lower most likely because of low-intensity engagement for follow up.[40] In another study, for a cervical cancer screening intervention placed in an inpatient hospital setting, a dedicated part-time screening nurse offered a Papanicolaou test to women admitted to the hospital. Patients who refused a Papanicolaou test noted having primary care options for screening. The researchers found that the high-grade squamous intraepithelial lesions rates for the mostly younger, uninsured, high-risk (previous abnormal Pap, history of sexually transmitted infection, and HIV positive) inpatient cohort were nearly 5 times that of patients seen in the outpatient clinics.[41] Emergency department and other ambulatory placed screening interventions should be further explored to reach high-risk populations.

Most (59%) of the study participants were individuals accompanying others to the ED, and 88.4% of the participants reported having a PCP. Based on the data collected, it is unclear if these population characteristics relate to the identified barriers to CRC screening. It is important to keep this in mind for planning future studies and possibly introduce questions that could capture this information at baseline. Other studies have found that increased access to PCPs led to increased rates of CRC screening.[42] Women and those who listed their initial reason for ER visit as other (compared with both seeking care for themselves or accompanying a friend or family member) were more likely to have participated in at least 1 of the follow-up surveys. Researchers should pay attention to retention of men in research studies and address any cynicism or apprehension toward clinical trials.[43] Based on our findings, it may be that individuals seeking care for themselves or accompanying a friend or family may find it difficult to continue in the clinical trial because of other obligations. Participants may find that taking time to participate in research may interfere with family and work obligations.[43]

Using LHAs in the ED provides an opportunity to fill a gap in CRC screening recommendation, information, and related communication for individuals who are under or never screened and may not have received a healthcare provider's recommendation for CRC screening. Lay Health Advisors can provide individuals a more individualized and culturally tailored experience in navigating the CRC screening process than traditional healthcare providers may be able to provide. Lay Health Advisors work to address health disparities across many chronic diseases and to improve health by providing education and advocacy services, addressing an individual's barriers to care, and linking and navigating patients to and throughout the healthcare system and to financial and community resources.[44] It is feasible for LHAs to use MI and it is valuable for promoting cancer screening in underserved populations. The MI training can enhance the skills of LHAs who have a pivotal role in community-based prevention research and allows for an expansion of that role to include a powerful and proven tool that has previously been used only by trained professionals.[15]

The MI intervention is client centered and helps individuals acknowledge and resolve any ambivalence they might have to change.[17] In this study, there was no difference in the rate of CRC screening by study group. The failure of the intervention to make a significant difference in the intervention group may indicate that intervention dose was not intense enough to affect CRC screening for this population.[26] According to Menon and colleagues,[45] another reason for lack of MI efficacy may be that for some study participants, talking about why they did not want to get screened or not being ready to get screened actually enhanced and strengthened their lack of motivation, readiness, or confidence to get screened. The results of MI intervention have been mixed, with some researchers reporting significant change in cancer screening and other health behavior screening[46–48] and other results in consonance with our study, reporting that MI intervention did not produce a significant increase in cancer screening.[19,45] Motivational interviewing holds promise for increasing CRC screening but warrants further studies to determine how to improve intervention efficacy and mechanism of action or the intervention dose required for increased CRC screening uptake.

## Limitations

The primary limitation of the study was the high attrition, with more than 50% of the baseline sample lost to follow-up. We were able to retain 51 and 22 participants at the 3- and 6-month follow-up, respectively Although we were able to recruit 190 eligible individuals from the ED, contacting them for follow-up proved to be challenging, primarily resulting from a lack of accurate or current contact information. Many participants could not be reached because of disconnected phones, which may be due to the nature of participants who use the ED as a primary source of healthcare. Many participants had a subsidized telephone through the lifeline federal government assisted program.[49] This program provides a basic cell phone with a predetermined amount of airtime minutes, typically between 350 and 500 free minutes for use each month.[50] It may be that these individuals rationed the use of call minutes because they did not pick or return calls from the research team. For all future studies requiring a follow-up, eligibility criteria will include having access to a personal cell phone that would be operational throughout the course of the project and a cell phone number for a friend or relative through whom the participant can be reached in an effort to reduce participant attrition due to lost follow-up. Also, the research team will obtain Health Insurance Portability and Accountability Act authorization to access medical records to obtain updated telephone numbers to contact participants lost to follow-up and to check for any updated information on CRC screening. Further research is needed to explore better ways to avoid high attrition rates of participants in ED-based cancer screening interventions.

In addition, we included participants waiting for nonurgent treatment at a single Appalachian ED and this may limit generalizability and applicability to other EDs and geographical environments. This may have introduced a confounder that could not be measured and adjusted for in the analysis.

### Implications for Practice

Nurses have a unique role in prevention, given their increased contact with patients and their families. Nurses can provide information about CRC screening guidelines and provide referrals to appropriate screening resources in the community. Nurses, particularly nurse practitioners in primary care settings, are highly qualified and have expertise to target high-risk populations to identify opportunities for providing CRC counseling to improve knowledge on CRC risk susceptibility and severity while providing resources for patients to overcome barriers to CRC screening. Nurses can use MI as a clinical communication skill to elicit patients' personal motivations for changing behavior to promote health[51] and cancer preventive screening.

Nurse researchers are well positioned to be involved in research to develop and test CRC screening promotion and risk reduction interventions among Appalachian Kentuckians and other vulnerable populations. Researchers and interventionists should incorporate information related to cancer susceptibility in interventions for CRC screening promotion. Cultural practices such as communication norms and expectations influence patients' understanding and talk about CRC screening[52]; therefore, researchers should continue to leverage the LHAs in intervention delivery because they have a close understanding of the

community[14] and are aware of the unique cultural issues experienced by rural Appalachian individuals, including both barriers and facilitators to preventive health behaviors.

## Conclusion

This study highlighted that CRC screening among rural Appalachian Kentuckians was low and well below national benchmarks and the state average. Appalachian Kentuckians continue to suffer cancer disparities and remain at risk for late detection of CRC. Interventions should focus on targeting older and financially disadvantaged individuals who report more barriers to CRC screening and may have elevated risk for CRC. Motivational interviewing delivered by LHAs is feasible and shows promise for CRC screening promotion. Further research is recommended to understand how to improve MI intervention efficacy and appropriate dose required for CRC screening uptake. Also, future research should assess CRC screening recommendations and uptake among individuals attending ambulatory setting and compare with individuals attending EDs for similarities or differences in CRC screening recommendation and uptake.

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**Table 1 •**

Descriptive Summary of Study Variables and Comparison by Group at Baseline (N = 190)

| | Range | Total Sample (N = 190 | Treatment (n = 95) | Control (n = 95) | *P* |
|---|---|---|---|---|---|
| Age, mean (SD), y | | 57.8 (8.7) | 57.5 (8.2) | 58.5 (9.2) | .27 |
| Gender | | | | | .08 |
| Male | | 78 (41.0) | 33 (34.7) | 45 (57.4) | |
| Female | | 112 (59.0) | 62 (65.3) | 50 (52.6) | |
| Race | | | | | .31 |
| White | | 186 (97.9) | 92 (96.8) | 94 (99.0) | |
| Other | | 4 (2.1) | 3 (3.2) | 1 (1.0) | |
| Marital status | | | | | .31 |
| Married | | 97 (51.6) | 45 (47.9) | 52 (55.3) | |
| Not married | | 91 (48.4) | 49 (52.1) | 42 (44.7) | |
| Education | | | | | |
| Less than high school | | 55 (29.1) | 27 (28.7) | 28 (29.5) | |
| High school | | 122 (64.6) | 63 (67.0) | 59 (62.1) | |
| College | | 12 (6.3) | 4 (4.3) | 8 (8.4) | |
| Financial adequacy | | | | | .26 |
| Adequate | | 65 (47.4) | 36 (52.2) | 29 (42.7) | |
| Inadequate | | 72 (52.6) | 33 (47.8) | 39 (57.3) | |
| Health insurance | | | | | .59 |
| Uninsured | | 4 (2.1) | 3 (3.2) | 1 (1.0) | |
| Government | | 145 (76.7) | 71 (75.5) | 74 (77.9) | |
| Private | | 40 (21.2) | 20 (21.3) | 20 (21.1) | |
| Primary care provider | | | | | .65 |
| Yes | | 168 (88.4) | 85 (89.5) | 83 (87.4) | |
| No | | 22 (11.6) | 10 (10.5) | 12 (12.6) | |
| Ever had CRC screening | | | | | .30 |
| Yes | | 9 (4.8) | 3 (3.2) | 6 (6.4) | |
| No | | 180 (95.2) | 92 (96.8) | 88 (93.6) | |
| Reason for ED visit | | | | | .33 |

| | Range | Total Sample (N = 190 | Treatment (n = 95) | Control (n = 95) | *P* |
|---|---|---|---|---|---|
| Seeking care for yourself | | 54 (28.4) | 30 (31.6) | 24 (25.3) | |
| Accompanying other | | 112 (59.0) | 51 (53.7) | 61 (64.2) | |
| Other | | 24 (12.6) | 14 (14.7) | 10 (10.5) | |
| Susceptibility to CRC, mean (SD) | 4–20 | 12.5 (1.9) | 12.7 (2.0) | 12.2 (1.9) | .09 |
| Benefits of screening, mean (SD) | 4–16 | 12.5 (1.6) | 12.5 (1.5) | 12.5 (1.7) | .86 |
| Barriers to screening, mean (SD) | 4–52 | 27.8 (4.0) | 28.1 (4.2) | 27.5 (3.8) | .30 |

Data are n (%), unless otherwise stated.

Abbreviations: CRC, colorectal cancer; ED, emergency department.

**Table 2 •**

Repeated-Measures Analysis of Health Behavior Model Constructs Between Intervention and Control Groups Over Time (n[a] = 134)

| | Susceptibility to CRC | | | Benefits of Screening | | | Barriers to Screening | | |
|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **Est. *b*** | **SE** | ***P*** | **Est. *b*** | **SE** | ***P*** | **Est. *b*** | **SE** | ***P*** |
| Age | 0.01 | 0.02 | .39 | −0.01 | 0.01 | .24 | 0.09 | 0.03 | .014 |
| Male gender | 0.20 | 0.33 | .55 | −0.24 | 0.25 | .35 | 0.30 | 0.70 | .67 |
| Primary care provider | 0.03 | 0.49 | .96 | 0.42 | 0.37 | .26 | −1.40 | 1.04 | .18 |
| Financial adequacy | −0.06 | 0.34 | .86 | 0.31 | 0.95 | .74 | −2.34 | 0.71 | .002 |
| Insurance | | | | | | | | | |
| Government vs none | 0.53 | 1.19 | .66 | 0.37 | 0.90 | .68 | 0.91 | 2.52 | .72 |
| Private vs none | 0.75 | 1.25 | .55 | 0.32 | 0.95 | .74 | 3.25 | 2.64 | .22 |
| Treatment group | 0.68 | 0.32 | .038 | 0.13 | 0.24 | .58 | 0.62 | 0.68 | .37 |
| Time | | | | | | | | | |
| 3 mo vs baseline | −0.18 | 0.32 | .56 | −0.33 | 0.25 | .18 | 0.89 | 0.68 | .19 |
| 6 mo vs baseline | 0.07 | 0.33 | .83 | −0.12 | 0.26 | .64 | 1.35 | 0.71 | .06 |

Abbreviation: CRC, colorectal cancer.

[a]Only those with complete data on all covariates are included in the regression model.