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## Reaching Rural Residents to Identify Colorectal Cancer Education and Intervention Targets

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### Abstract

Disparities in cancer screening and care in rural communities warrant the need to determine effective ways to reach, engage, and educate the community residents. The purpose of this cross-sectional study was to pilot methods to engage rural residents in colorectal cancer (CRC) research and education activities and assess knowledge of CRC guidelines, symptoms, and screening behaviors in this sample. The community-engaged research approach was employed to develop and distribute a CRC knowledge and screening behavior assessment using various methods such as email and community drop boxes placed throughout the community. Bivariate analysis assessed the relationship between age and CRC knowledge items. Three hundred ninety-one surveys were returned with most received from community drop boxes (60%) followed by educational events (23%). The most ineffective method to distribute surveys was through community events. Most individuals were knowledgeable of CRC symptoms (70%) and screening facts (67%). Bivariate analysis showed that individuals 50 years or older had significantly more knowledge of CRC risks and screening than those under the age of 50. This study highlights the potential of community drop boxes as an effective method for engaging rural communities. Further, findings from the survey highlight the need to focus CRC education on younger individuals in which CRC incidence has increased.

### Keywords

Colorectal cancer; Rural health, screening; Community engagement

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**Conflict of Interest** The authors declare that they have no conflict of interest.

**Ethical Approval** All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

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## Introduction

Rural residents suffer from higher colorectal cancer (CRC) incidence and mortality rates when compared with their urban counterparts [1, 2]. CRC mortality and incidence rates continue to decline; however, the rates are not declining as quickly for rural residents; therefore the disparities between rural and urban residents persist [3]. Reasons for these disparities are multifaceted, including lack of transportation, long distances to providers, lack of education about screening and treatment, and a deficit of healthcare providers in rural areas [4–8]. Due to the heterogeneity within rural populations that is often overlooked, there are demographic differences, namely age, which serve as predictors of CRC screening. Of CRC screening eligible individuals, older rural residents are more likely to receive screening than their younger counterparts [9–11]. Given the suboptimal screening practices of younger individuals and the unique barriers faced by rural residents, additional effort is needed to understand how to adequately deliver CRC education and screening in rural areas.

Similar to other rural communities in the USA [5, 12, 13], residents residing in rural communities in southern Virginia face CRC disparities (e.g., incidence, mortality). The Pittsylvania/Danville Health District, in particular, has extremely high colorectal cancer (CRC) incidence and mortality rates. Of 35 health districts in the state of Virginia, the Pittsylvania/Danville Health District has some of the worst CRC outcomes ranking 33rd for CRC incidence rates and 35th for CRC mortality rates [14]. CRC incidence and mortality rates for this area exceed those of national rates as well [15]. In 2010, a needs assessment conducted by Massey Cancer Center identified several key barriers to cancer care including limited access to tertiary care and cancer centers, clinician shortages (particularly oncology providers), and minimal community focused cancer education programs [16]. Although not represented in the assessment, understanding CRC knowledge in this population may offer insight into screening behaviors and compliance with screening guidelines [17–20].

The overall goal of this study was to identify education and intervention targets that may improve CRC knowledge and screening behaviors in rural communities. The aims of this study were to (1) pilot a novel method to collect data in previously unengaged rural residents, (2) assess CRC screening behaviors in rural residents, and (3) assess CRC knowledge across multiple domains (e.g., symptoms, screening) in rural residents.

## Methods

### Setting and Sample

The Pittsylvania/Danville Health District, located in southern Virginia, has a population of approximately 106,561 with the majority of residents living in rural counties. Most residents are Caucasian (66%) and have earned a high school or General Education Diploma (GED) (36.5%). The median household income in this area is \$34,624. With only one hospital in the district, many residents travel at least 2 h to seek care in larger academic health centers in Virginia or neighboring North Carolina. There are several cancer screening facilities available to residents; however, there is only one gastroenterology practice.

**CRRC Office and Regional Cancer Task Force**—This study was conducted by the Cancer Research and Resource Center (CRRC), located in Danville, VA, in close collaboration with a regional cancer task force. The mission of the CRRC, a collaboration between Massey Cancer Center and the Tobacco Region Revitalization Committee, is to provide cancer-related information to and coordinate services (e.g., transportation, financial assistance) for the residents of Danville, Martinsville, and the five surrounding counties. The Center has two full-time and one part-time employees; all staff members earned Bachelor of Science degrees and all received basic life support certification. These individuals are responsible for planning and facilitating educational events and trainings for residents and healthcare providers.

The CRRC staff utilized the community-engaged research approach to design and conduct this study. In 2009, the CRRC staff established partners within and surrounding the Danville community. All partners were aware of the cancer disparities that impacted their communities and were invested in addressing these disparities. As a result of these collaborations, the Regional Cancer Task Force was formed. This group, comprised of area universities, hospitals, Susan G. Komen, the American Cancer Society, and other community groups, immediately went to work creating awareness in their communities (Table 1).

### Data Collection

The Southern Virginia Colorectal Cancer Screening survey was developed in 2017 by the Regional Cancer Task Force. This task force felt that an assessment was necessary in order to understand baseline levels of CRC knowledge and screening behaviors in the community; therefore, they designed a survey to assess rural residents' knowledge regarding CRC symptoms, screening recommendations, and screening behavior. Items were adapted from questionnaires and information provided by the American Cancer Society, the American Institute for Cancer Research, the National Cancer Institute, and Center for Disease Control's Screen for Life National Colorectal Cancer Action Campaign. Participants were asked to select the correct responses in each of the educational sections of the survey (e.g., CRC knowledge, CRC symptoms). Screening behaviors for participants over the age of 50 were assessed with three items. We asked if participants have been screened. Follow-up questions asked participants to select reasons why they had (e.g., following screening guidelines, my physician told me to) or had not been screened (e.g., I heard tests were difficult or painful, I am concerned about the costs associated with the tests). Participants were also asked to indicate a preference for receiving follow-up CRC screening information.

The task force was specifically interested in reaching residents who were not usually engaged with community-sponsored events, such as rural community residents. Jointly, the CRRC and the Cancer Task Force developed four strategies to increase community reach to unengaged members: holding educational programs within the community, attending community events of collaborators, strategic placing of community survey boxes throughout the community, and distribution of an online survey. The surveys took approximately 2 min to complete and could be completed using paper and pencil or electronically.

**Educational Events**—Five educational panel discussions were held specifically for the purpose of discussing colorectal cancer screening, prevention through lifestyle habits, and survivorship issues of patient navigation and treatment options. These were held in public libraries, for nursing students at Averett University, and at a local Section 8 housing facilities. Panelists were task force members representing area cancer-related resource organizations and health care facilities.

**Community Events**—Surveys were distributed at a broad range of community events including a YMCA-hosted blood pressure educational fair, Bridge 2 Bridge Danville, a local race supporting cancer awareness and survivors, and at a local food bank. An employee of the CRRC or a task force member attended the community events to distribute and collect completed surveys. To increase response, participants were given the option to complete the survey at home and return via mail or call the CRRC and complete the survey with a staff person over the phone.

**Survey Boxes**—CRRC staff collaborated with community partners to distribute survey “boxes” throughout the community. Task force members identified area organizations that expressed an interest in assisting with survey distribution and collection efforts. Organizations included local libraries, a 24-h gym, and the local housing authorities. A total of 31 survey boxes were placed within these facilities. Each box contained 25 surveys and instructions for survey completion. The local libraries agreed to have a staff person available to read the survey for residents who may require that assistance. Once completed, surveys were returned to the unlocked survey box.

**Online**—Using an existing list of past attendees to the CRRC or other task force partner events, residents who had previously provided an email address received a Survey Monkey link to complete the survey. The email explained the purpose of the survey and invited residents to click the link and complete the survey.

**Survey Items**—The only demographic factor collected from residents was age (< 50 years old, ≥ 50 years old). Knowledge items were categorized into three domains: screening knowledge, symptoms knowledge, and general CRC knowledge. The three screening items assessed individuals’ knowledge on screening guidelines and methods (e.g., some colorectal tests can be taken at home). CRC symptoms were assessed with eight facts (e.g., many people with colon cancer experience no symptoms in the early stages of the disease). Lastly, general CRC knowledge included four facts (e.g., CRC typically strikes people over the age of 50). Participants were given a list of items and received the following prompt, “Of the FACTS below, check off what you know.” They were instructed that multiple answers were allowed. We totaled the items that were checked for each category to get a total score for each domain.

Individuals who completed the survey and provided sufficient contact information were entered into a drawing to receive one of the six prizes; prizes included gift cards and a gift basket. All procedures were approved by the Institutional Review Board at Virginia Commonwealth University.

## Data Analysis

Data were cleaned by Regional Cancer Task Force members and cross-checked by VCU investigators. Descriptive statistics, specifically, frequencies, were performed to summarize survey findings.

Participants were grouped according to whether they were over 50 or under 50 during the time of the survey. We described the associated characteristics of the participants using three domains: screening, symptoms, and general CRC knowledge. Bivariate comparison was conducted using Pearson's chi-square tests for categorical variables. Statistical analyses were conducted using STATA/MP (version 12.1; StataCorp LP), and 2-sided  $p$  values are presented.

## Results

### Survey Receipt

A total of 391 surveys were returned from participants. Most participants completed the paper-based survey (85%) as opposed to the electronic version. The survey boxes yielded the greatest number ( $n = 241$ ) of surveys. There was a fairly even distribution across the locations; 39% of surveys were from fitness centers and 12% of surveys were received from community health educators. Figure 1 displays how survey receipt varied across the four data collection methods and highlights survey receipt from the various locations of the survey boxes. There was a total of 13 community events which yielded 39 surveys; 3 events did not yield any surveys. Of the surveys completed, 69% included contact information and those individuals were entered into a drawing for a prize.

### CRC Knowledge

Of all CRC screening items, approximately 83% of individuals reported that the American Cancer Society suggests that people start colorectal screening at 50 years of age, or younger if at-risk or if African American. However, only 53.4% of participants were aware that some colorectal tests can be taken at home. With regard to CRC symptom knowledge, most individuals were aware that blood in the stool or stool that looks like black tar (89.4%) is a common symptom, while only 57.6% reporting know that an individual may feel the need to have a bowel movement that is not relieved by doing so. Lastly, regarding general CRC knowledge, most participants were aware that catching CRC early can save your life and/or greatly reduce associated costs and recovery time (80.4%). The general knowledge fact that individuals selected least was that CRC typically strikes people over the age of 50 (56.9%).

In bivariate analysis, individuals over the age of 50 were more knowledgeable about home testing for CRC (63.1%,  $p = 0.000$ ), ACS screening guidelines with regard to age of screening (86.6%,  $p = 0.006$ ), and the benefits of high fiber diets for CRC prevention (77.9%,  $p = 0.046$ ) (Table 2). Older individuals were also more aware than their younger counterparts that CRC is preventable (81.1%,  $p = 0.000$ ) and that CRC almost always develops from precancerous polyps (74.2%,  $p = 0.000$ ). There were no significant differences by age with regard to knowledge about CRC symptoms.

## Screening Behaviors

Of the total sample, 55.5% were at least 50 years of age. Of these study participants, 67% reported that they had received colorectal screening. Key reasons for screening were physician recommendation (72%) followed by individuals reporting that they follow all screening tests guidelines (46%) and family history of cancer.

A substantial proportion of individuals (33%) had not been screened. Reasons for non-adherence to screening guidelines were not having a family history (38%), no physician recommendation (37%), and the belief that screening was for people with symptoms (25%).

All participants were asked if they were interested in receiving follow-up contact from a health professional knowledgeable about cancer; 23% or 90 participants requested information. Many of these individuals were non-screeners. Eight individuals did not provide enough contact information; therefore, CRRC staff could not follow up with these individuals. CRRC staff worked to follow up with respondents and successfully reached 44 individuals. Follow-ups resulted in two gastroenterologist referrals and one referral to the Southern Area Agency on Aging to provide transportation to a colonoscopy appointment.

## Discussion

This study provided invaluable insight into effective methods to engage and assess the needs of our community. As distance is always a potential barrier to engaging rural communities, implementing innovative methods, such as the survey boxes, enables and empowers community members to engage in research without the inhibition of such barriers. As survey receipt from survey boxes exceeded other methods, it is evident that the most effective method to get information to our community members is by taking it to them. The survey boxes and the online surveys also allowed participants the opportunity to complete the surveys at their most convenient times. Additionally, regarding our educational events, we recognize the importance of leveraging such events for engagement and research recruitment for future endeavors. The three community events resulted in no survey provision. This may have been due to the nature of these events, as the focus did not pertain to health or health education (e.g., annual race, weekly farmer's market). Therefore, it may be less beneficial to attempt to engage community members at non-health-related events.

Significant differences were noted between individuals 50 years of age and older and those 49 years of age and younger. Individuals under the age of 50 were not as aware of the recommended screening age as those 50 and over. This is of great importance as the American Cancer Society (ACS) now recommends CRC screening at age 45 [21]. Further, this group was not as aware as their older counterparts that CRC is preventable. These findings highlight a need to target younger populations for CRC education, particularly as individuals are being diagnosed at younger ages [22, 23]. Education efforts targeting younger individuals may also serve to benefit older individuals as studies show positive findings, particularly in parent-child dyads, with regard to younger individuals motivating their older counterparts to seek screening for cancer [24]. A majority of participants were knowledgeable of cancer symptoms and CRC screening guidelines; however, many were unaware of home screening kits. Notably, younger individuals were less knowledgeable of



this screening mechanism. Along with educating rural residents about the availability of home screening kits, mailing screening kits and instruction to individuals, particularly those living in rural areas, may increase screening rates [25].

While this study offers a unique approach to engage rural residents in CRC knowledge, there are limitations to note. Although unlikely, it is possible that individuals could complete multiple surveys, particularly those that were completed via survey boxes. The potential of this occurrence was limited by offering participants an opportunity to win a drawing; this required participants to include their name and contact information on the survey.

Findings from this effort highlight the importance of provider recommendations to promote cancer prevention and screening. The high colorectal cancer incidence and mortality rates in the Pittsylvania/Danville health district, like many rural areas, warrant immediate action and attention. While the screening rate for this health district closely mirrors national rates, improvement is warranted [26]. Furthermore, insufficient numbers of providers in rural areas, such as many areas located in the Pittsylvania/Danville Health District, added pressure and burden on providers to educate and treat a large number of patients in such a limited amount of time and with limited resources [27, 28]. More focused efforts to recruit and retain providers are necessary to alleviate such burdens. Additionally, training providers, possibly through brown bag lunch seminars, and supplying provider offices with cancer prevention and screening materials may result in more opportunities for providers to engage in these discussions with patients [29]. Lastly, given the importance of a provider recommendation for screening uptake, there may be opportunities to leverage electronic health records to prompt providers screen their patients on a more consistent basis.

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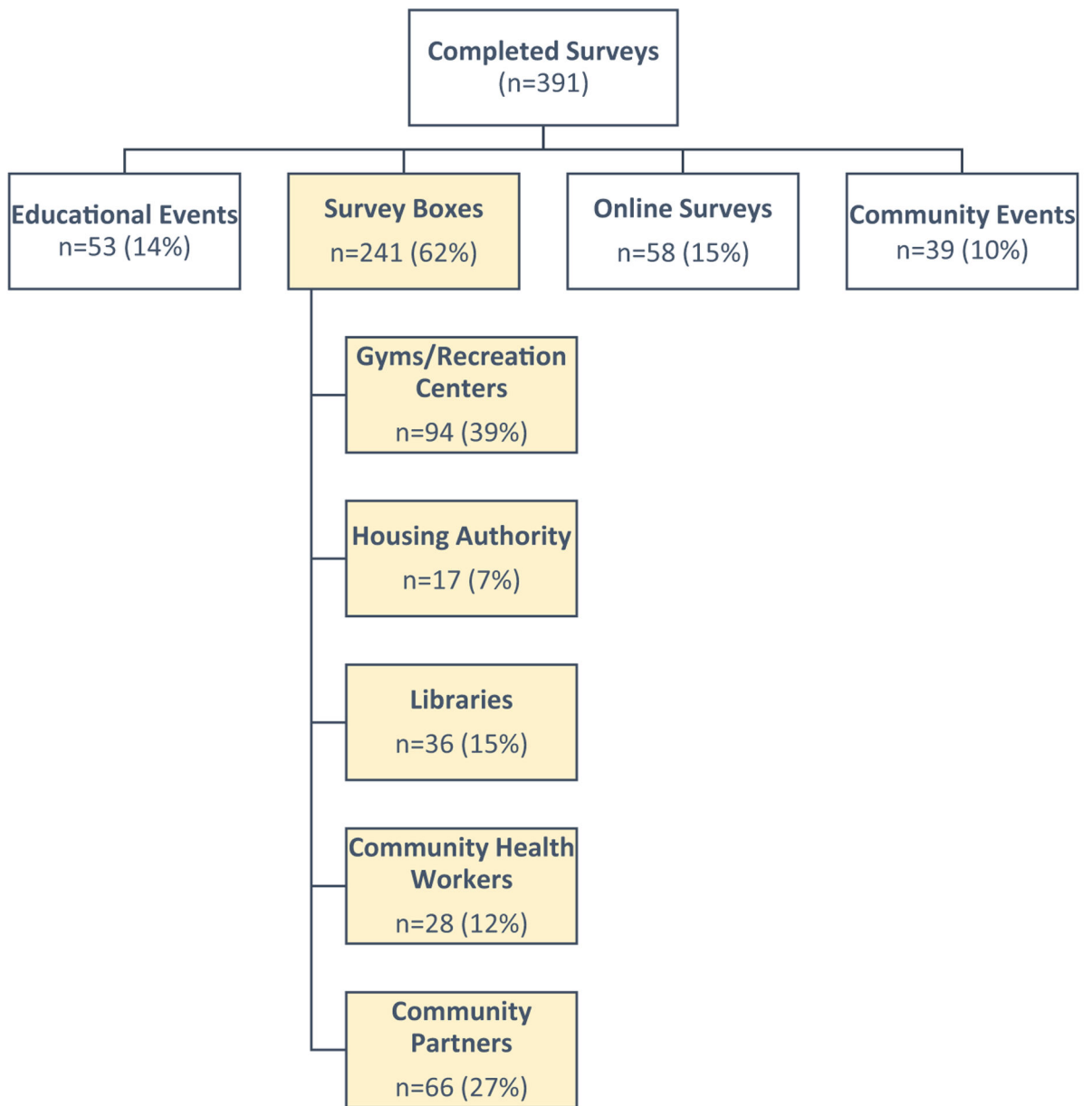
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**Fig. 1.**  
Colorectal cancer survey receipt schema

**Table 1**

Regional cancer task force organizations

Organization	Facility type
American Cancer Society	Non-profit
Averett University	Higher education
Cancer Research and Resource Center—Danville	Education
Centra Medical Group	Healthcare
Cherrystone Missionary Baptist Association	Religious organization
Danville Family YMCA	Community/non-profit organization
Danville-Pittsylvania Cancer Association	Community/non-profit organization
Danville Redevelopment and Housing Authority	Government agency/housing
Sovah Health	Healthcare
Hargrave Military Academy	Education
Susan G. Komen for the Cure and Pittsylvania County Breast Health Ambassador	Non-profit
Martinsville Henry County Coalition for Health and Wellness	Community/non-profit organization
PATHS, Inc.	Healthcare (federally qualified health center)
Tyton BioSciences	Technology/manufacturing
Virginia Department Health	State government agency/healthcare
Southern Area Agency on Aging	Community/non-profit organization
University of Virginia Cancer Center	Higher education
Public Libraries—Blue Ridge Regional; Danville; Halifax County South Boston; Pittsylvania County	Government agency

**Table 2**

Correct responses to survey items by age

	< 50 years of age (%)	50 years of age (%)	p value
CRC screening			
Some CRC tests can be taken at home	36.8	63.1	0.000 <sup>§</sup>
ACS recommends screening at age 50	75.9	86.6	0.006 <sup>‡</sup>
Catching CRC early can save your life and/or greatly reduce associated costs and recovery time	75.3	80.6	0.202
CRC symptoms			
Change in bowel habits	73.0	79.3	0.146
Many people with colon cancer experience no symptoms in the early stages	60.3	67.7	0.129
A feeling that you need to have a bowel movement that is not relieved by doing so	54.0	54.4	0.944
Blood in the stool or stools that look like black tar	81.6	87.1	0.135
Loss of appetite	56.3	55.3	0.840
Pain in the belly or a feeling of fullness	70.7	66.4	0.361
Unexplained weight loss	67.8	64.5	0.494
Constant tiredness, fatigue	65.5	61.3	0.389
General CRC knowledge			
CRC is preventable and can be successfully treated if detected early	64.4	81.1	0.000 <sup>§</sup>
A diet high in fiber reduces risk of getting CRC	69.0	77.9	0.046 <sup>‡</sup>
CRC typically strikes people over the age of 50	52.3	58.5	0.218
CRC almost always develops from precancerous polyps	51.7	74.2	0.000 <sup>§</sup>

<sup>‡</sup>  $p < 0.05$

<sup>‡</sup>  $p < 0.01$

<sup>§</sup>  $p < 0.001$