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Economic Evaluation of Interventions to Increase Colorectal Cancer Screening at Federally Qualified Health Centers

Florence K. L. Tangka, PhD[1], **Sujha Subramanian, PhD**[2], **Sonja Hoover, MPP**[2], **Amy DeGroff, PhD**[1], **Djenaba Joseph, MD**[1], **Faye L. Wong, MPH**[1], **Lisa C. Richardson, MD, MPH**[1]

[1]Centers for Disease Control and Prevention, Atlanta, GA, USA

[2]RTI International, Waltham, MA, USA

Abstract

The Centers for Disease Control and Prevention (CDC) has a long-standing commitment to increase colorectal cancer (CRC) screening for vulnerable populations. In 2005, the CDC began a demonstration in five states and, with lessons learned, launched a national program, the Colorectal Cancer Control Program (CRCCP), in 2009. The CRCCP continues today and its current emphasis is the implementation of evidence-based interventions to promote CRC screening. The purpose of this article is to provide an overview of four CRCCP awardees and their federally qualified health center partners as an introduction to the accompanying series of research briefs where we present individual findings on impacts of evidence-based interventions on CRC screening uptake for each awardee. We also include in this article the conceptual framework used to guide our research. Our findings contribute to the evidence base and guide future program implementation to improve sustainability, increase CRC screening, and address disparities in screening uptake.

Keywords

colorectal cancer; cancer screening; economic evaluation

BACKGROUND

Federally qualified health centers (FQHCs) are important providers of care for underserved populations. According to the U.S. Health Resources and Services Administration (n.d.), their health centers generally provide care to one third of adults in poverty. Although the Affordable Care Act has improved access for colorectal cancer (CRC) screening, CRC screening uptake is much lower in FQHCs compared to the national average. In 2018, 44.1% of the age-eligible population at FQHCs (National Colorectal Cancer Roundtable, n.d.) compared to 67.0% of the U.S. population (Centers for Disease Control and Prevention [CDC], 2020) were up-to-date with CRC screening.

Address correspondence to Florence K. L. Tangka, Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Highway, NE, Mailstop S107-4, Atlanta, GA 30341-3717, USA; ftangka@cdc.gov.

The CDC has a long-standing commitment to increase screening for vulnerable populations with low levels of CRC screening. In 2005, the CDC began a demonstration in five states to determine the feasibility of a national CRC screening program, the Colorectal Cancer Screening Demonstration Program (Seeff et al., 2008). With lessons learned from the Colorectal Cancer Screening Demonstration Program, in 2009 CDC launched the Colorectal Cancer Control Program (CRCCP) with the objective of increasing CRC screening uptake among individuals aged 50 to 75 years through provision of screening services and promotion of screening (Joseph et al., 2011). Beginning in fiscal year 2015, the emphasis of the CRCCP shifted from screening to implementation of evidence-based interventions (EBIs), and CDC funded 30 state health departments, academic medical centers and universities, and a tribal organization to help health systems implement interventions to reduce disparities in CRC screening (DeGroff et al., 2018). CDC and RTI International then partnered with a select number of awardees to conduct economic evaluations to assess the cost-effectiveness of the EBIs (Subramanian et al., 2020; Tangka et al., 2019).

The EBIs are activities recommended by The Community Preventive Services Task Force in its *Guide to Community Preventive Services* (*The Community Guide*; Sabatino et al., 2012) to improve uptake in CRC screening. Interventions include patient and provider reminders, provider assessment and feedback, and reduction of structural barriers. Additional activities, including patient navigation and provider and patient incentives, do not yet have sufficient evidence to be recommended by *The Community Guide* and are considered “supporting activities.”

This article provides an overview of four awardees and their FQHC partners as an introduction to the accompanying series of research briefs where we present individual findings on impacts of EBIs on CRC screening uptake for each awardee. We also include the conceptual framework used to guide our research. Results contribute to the evidence base and guide future program implementation to improve sustainability, increase CRC screening, and address disparities in screening uptake.

CONCEPTUAL FRAMEWORK AND ECONOMIC EVALUATION METHODS

Figure 1 presents our conceptual framework. Using a socioecological model, the framework guides the economic evaluations conducted to assess the effectiveness and cost-effectiveness of multi-level and multi-component interventions to increase CRC uptake. Interventions can be put in place at the community, health system or clinic, provider, and individual levels. In our studies, two sites used multi-level interventions (at the patient and provider levels), while two others implemented multi-component interventions (multiple interventions) at the patient level.

Interventions can result in changes in screening uptake (effectiveness measure) but at the same time alter the cost or resource needs. Therefore, it is important to assess not only the incremental effectiveness (increase in CRC screening uptake due to intervention) but also the incremental cost (change in resource needs due to the intervention) to assess cost-effectiveness of the intervention. These analyses can be used to evaluate additional resources required to implement and sustain the interventions and to conduct comparative assessment

across different sets of interventions using measures such as cost per person successfully screened. The interventions can have separate economic impacts at each level as shown in Figure 1. For the CRCCP evaluation, we conducted analyses using the programmatic perspective (costs incurred at the clinics, CRCCP awardee, and partner organization levels to implement the interventions) and, therefore, focused on the economic impacts at the community, health system, and provider levels. We did collect details on the cost of implementing individual-level interventions but did not collect the costs borne by patients to receive CRC screening and follow-up care.

Systematic economic evaluations require several types of data elements and measures collected at multiple levels of the interventions, including the following:

1. *Process and Outcome Measures*: To examine effectiveness of the EBIs implemented, CDC and RTI collected process and outcome measures from the health centers. Each health center submitted process measures that were dependent on the type of EBIs implemented. Examples of process measures included number of fecal immunochemical test (FIT) kits distributed and number of patients flagged for reminders. CDC and RTI also collected outcome measures, including FIT kit return rates and CRC screening completion rates.

2. *Cost Measures*: We included all resources used to implement interventions at the clinic, CRCCP awardee, and partner organization level so we could perform a comprehensive economic evaluation. To collect cost data on a variety of activities and items (e.g., implementation of EBIs, processing of laboratory tests, and costs of incentives), we tailored a previously developed cost assessment tool (Subramanian et al., 2009; Subramanian et al., 2013; Subramanian et al., 2011; Tangka et al., 2013; Tangka et al., 2017). All four awardees collected cost data retrospectively from either all or a sample of all of their partner health centers using a cost tool customized for their interventions.

To calculate cost by activity, we asked the health centers for a list of staff who worked on implementing EBIs, their salaries, and the number of hours each staff person worked on specific activities related to implementing the specific interventions at the health centers. For example, health centers reported on the time required to identify patients eligible for CRC screening, prepare provider and/or patient reminders, follow up with patients (via telephone or mail) about completing screening, and provide navigation to encourage diagnostic colonoscopy completion. We focused on costs related only to the specific time frame of implementing the interventions (e.g., when interventions began). In addition, we collected nonlabor costs for implementation activities, such as printing of brochures, postage for mailings, and staff travel. With this information, we calculated costs by activities (e.g., cost of tracking, cost of reminder calls) and aggregated the costs into various categories.

Using the cost and effectiveness measures, we were able to calculate the incremental cost per person successfully screened to evaluate the impact of the interventions using short-term cost-effectiveness metrics.

INTERVENTIONS, CRCCP AWARDEES, AND PARTNER CLINICS

EBIs were supported by funding received from the CDC's CRCCP, other external sources, and internal health system resources. CRCCP funds were allocated by awardees to implement EBIs recommended by *The Community Guide*, and funds from other sources were used to test interventions that currently do not have sufficient evidence to be recommended by *The Community Guide*. For example, when FQHCs implemented incentives, other sources of funding were used because incentive payment is not currently among *The Community Guide's* recommended interventions.

In this article, we focus on the following awardees: West Virginia University, University of Chicago, California Department of Public Health, and Kentucky Department for Public Health (Table 1). Each awardee implemented multicomponent interventions recommended by *The Community Guide*. West Virginia University worked with its FQHC partners to implement provider assessment and feedback in addition to at least one other EBI. We focused on sites that added patient reminders to increase FIT kit return rates (Conn et al., 2020). The University of Chicago and Heartland Health Centers in Chicago implemented a provider reminder system based on the electronic medical records but input manually. This intervention, implemented at the health system level, was supplemented with patient reminders and provider assessment and feedback across eight clinic sites (Kim et al., 2020). The California Department of Public Health with its partner, Neighborhood Healthcare, implemented a provider incentive program (payments were offered to support staff at the clinics when predetermined screening targets were met), including patient and provider reminders, to supplement ongoing interventions (Barajas et al., 2020). The Kentucky Department for Public Health and its partner, Little Flower Clinic, instituted a $10 patient incentive along with patient navigation and reminders to increase FIT kit return rates (Hardin et al., 2020).

In Table 2, we describe selected demographics of the four participating FQHCs and their patient populations. The patient populations are aged 50 to 75 and considered age-eligible for CRC screening. West Virginia University partnered with nine FQHCs, all of which had between one and four clinics. The University of Chicago partnered with Heartland Health Centers, an FQHC with eight clinics in the metro area. California partnered with Neighborhood Healthcare, an FQHC with nine clinics. Kentucky partnered with Little Flower Clinic, an FQHC with one clinic. On average across all awardees, females comprised more than half of the eligible population. Racial and ethnic diversity varied across clinic sites. Uninsured or self-pay population made up between 9.4% and 28.8% of the eligible population. Little Flower Clinic in Kentucky is a designated "homeless clinic" due to the large percentage of its patient population experiencing homelessness.

IMPLICATIONS FOR INCREASING CRC SCREENING UPTAKE

All four interventions described in this article were successful in increasing CRC screening uptake for low-income and underserved populations and offer lessons for FQHCs seeking guidance to improve CRC screening uptake. Each study involved multicomponent interventions and offered lessons for successful implementation and scale-up of future

programs to increase CRC screening uptake. Details are presented in the accompanying research briefs (Barajas et al., 2020; Conn et al., 2020; Hardin et al., 2020; Kim et al., 2020). Table 2 shows the summary cost data from each study.

West Virginia University's patient reminder interventions increased the average FIT kit return rate by 19.6 percentage points (Conn et al., 2019). The average total incremental cost per FIT kit returned across all nine FQHCs was $60.18, but incremental cost per person screened varied widely. An important lesson learned through this economic implementation study is that clinics with health information systems enabling identification and tracking of eligible patients with minimal effort were able to implement patient reminder interventions at a lower cost.

The collaboration between the University of Chicago and Heartland health system in the Chicago area (Kim et al., 2019) resulted in a 21.2 percentage point increase in CRC screening uptake, which translated into an additional 283 screens (over the 21-month implementation period) completed at an implementation cost of $144.65 per additional screen. The reminders were implemented using a manual process, which was labor-intensive and could potentially cost less in the future if automated processes are available to implement the provider reminder system.

Results presented by Neighborhood Healthcare in California and Little Flower Clinic in Kentucky provided valuable evidence that incentives implemented as part of multicomponent EBIs successfully motivated providers and patients to increase CRC screenings (Barajas et al., 2020; Hardin et al., 2020). The addition of provider incentives in the California health system led to modest increases in their FIT kit return rates (average of 3.6 percentage points), possibly because of their already high baseline FIT kit return rate of 75%. However, the incentives offered to support staff (e.g., medical assistants, phlebotomists, front office staff, lab technicians) resulted in more individuals screened (an average increase of 111 screens per month) at an implementation cost of $66.79 in incentive payments for each additional person screened. The patient incentives offered by Little Flower Clinic resulted in a 25.9 percentage point increase in return rates with an incremental implementation cost (includes patient navigation, reminders, FIT kit processing cost, and incentives) of $127.83 per additional person screened.

Findings from these studies will strengthen the evidence base for EBIs recommended by *The Community Guide* as well as those (e.g., incentives) that do not have enough support yet to be recommended. Although these studies all used a pre–post design without a concurrent comparison group, all sites reported detailed implementation procedures that strengthen confidence in the findings. CDC will continue to collaborate with the CRCCP awardees and their partner health systems to assess the generalizability of these findings to other settings and to quantify the potential long-term impacts on cost and patient outcomes of scaling up these interventions using microsimulation modeling studies.

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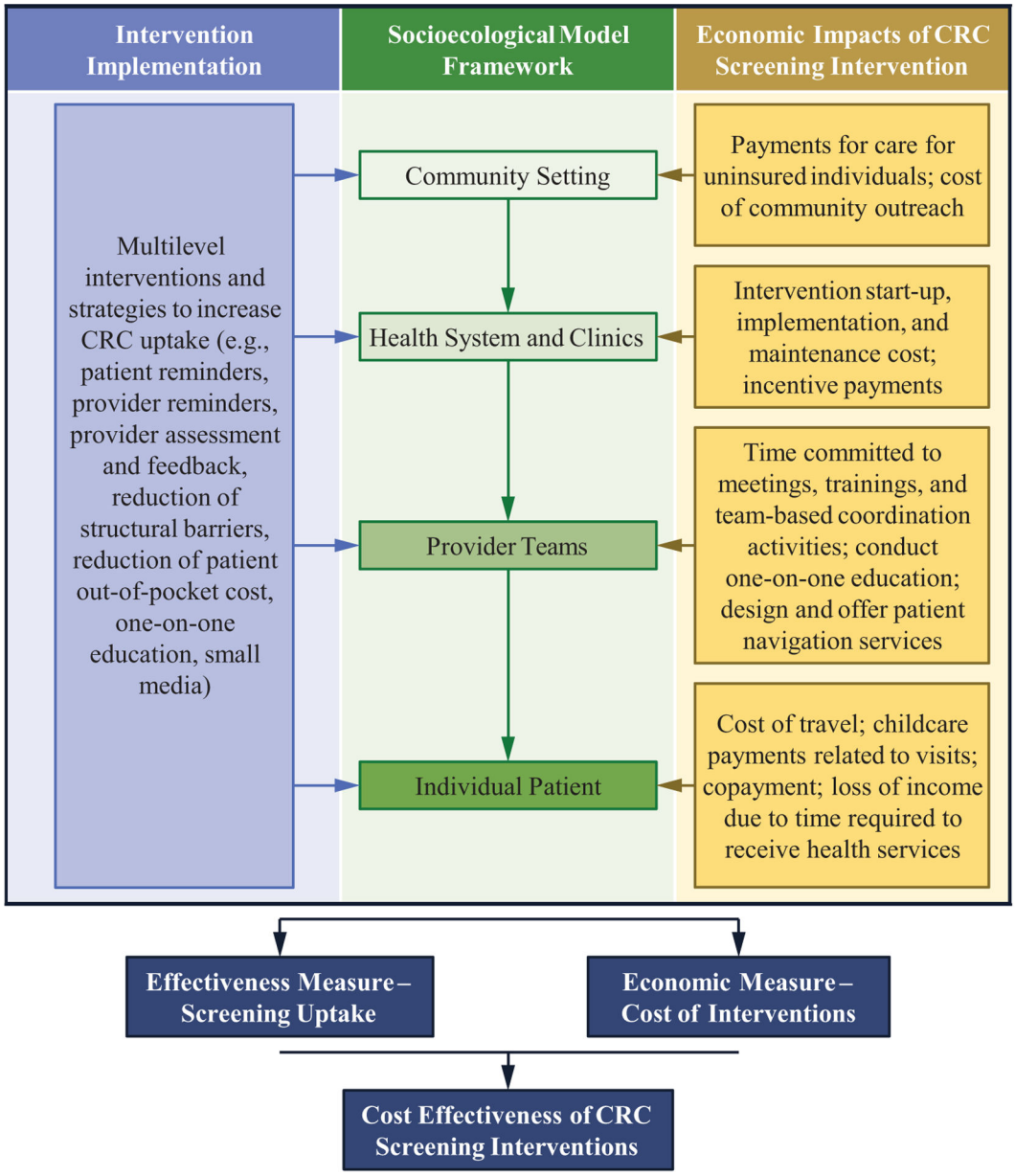

FIGURE 1. Conceptual Framework to Conduct Economic Evaluation to Assess CRC Uptake Using a Socioecological Model

Note. CRC = colorectal cancer.

TABLE 1

Overview of CRCCP Awardees, Interventions, and Data Collected

Awardee	Multilevel and multicomponent interventions	Types of data collected[a]
West Virginia University	FIT kit distribution with patient reminders by phone and/or mail	Process measures: number of FIT kits distributed, patients flagged for reminder calls, reminder calls made Outcome measures: FIT return rates, FITs returned after reminder calls were made, and positive FITs Cost data: activity-based data collected retrospectively from nine health centers
University of Chicago	Provider reminder system supplemented with patient reminders (for FIT kit returns and screening colonoscopy) and provider assessment and feedback	Process measure: CRC order rate (FITs and screening colonoscopy) Outcome measure: CRC screening completion rates Cost data: activity-based data collected retrospectively at health system level
California Department of Public Health	Provider and patient reminders, $25 incentives per support staff based on CRC screening increase, FIT kit distribution and reduction of structural barriers	Process measures: Number of FIT kits distributed Outcome measures: Number of FIT kits returned within 2 months, number of patients with positive FITs, number who completed follow-up diagnostic colonoscopies within 90 days of a positive FIT and after 90 days, amount of bonus payments, FIT kit return rates Cost data: activity-based data collected retrospectively from three representative health centers
Kentucky Department for Public Health	FIT kit distribution with patient navigation, phone and mailed reminders, and a $10 patient incentive (a grocery/gas card) with the return of a completed FIT	Process measures: number of FIT kits distributed, number of patient reminders made by phone, number of patients receiving incentives Outcome measures: FIT kit return rate; the increase in return rate, additional number of individual screens Cost data: activity-based data collected retrospectively from one health center

Note. CRC = colorectal cancer; CRCCP = Colorectal Cancer Control program; FIT = fecal immunochemical test.

[a]We collected cost data (e.g., activity-based, total costs) retrospectively from all sites.

TABLE 2

Descriptives of FQHCs and Patients Eligible for Colorectal Cancer Screening (Age 50–75) in West Virginia, Chicago, California, and Kentucky

Descriptive	West Virginia University/multiple FQHCs[a]	University of Chicago/Heartland Health Centers[a,b]	California/Neighborhood Healthcare[a]	Kentucky/Little Flower Clinic
No. of FQHCs and clinics	9 FQHCs with 1–4 clinics each	FQHC with 8 clinics	FQHC with 9 clinics	FQHC with 1 clinic
Female (%)	60.2	52.2	60.1	59.8
White (%)	96.0	29.2	78.0	97.5
Hispanic (%)	n/r	29.2	36.2	n/r
Uninsured or self-pay (%)[c]	9.7	28.8	16.1	9.4
Cost ($)	60.18 (average total additional cost per FIT kit returned)	144.65 (EBI implementation cost per additional screen)	66.79 (EBI implementation cost per additional person screened)	127.83 (EBI implementation cost per additional person screened)

Note. FQHC = Federally Qualified Health Centers; EBI = evidence-based intervention; FIT = fecal immunochemical test; n/r = not reported.

[a]Average across health centers.

[b]Black/African American patients 29.4%, White 29.2%, Hispanic 29.2%, Asian 8.8%.

[c]The programs reported the distribution of the FQHCs' insurance coverage. We combined the categories of uninsured and self-pay.