

---

# Client-Directed Interventions to Increase Community Access to Breast, Cervical, and Colorectal Cancer Screening

## A Systematic Review

Roy C. Baron, MD, MPH, Barbara K. Rimer, DrPH, Ralph J. Coates, PhD, Jon Kerner, PhD, Geetika P. Kalra, MPH, Stephanie Melillo, MPH, Nancy Habarta, MPH, Katherine M. Wilson, PhD, Sajal Chattopadhyay, PhD, Kimberly Leeks, MPH, PhD, and the Task Force on Community Preventive Services

---

**Abstract:** Most major medical organizations recommend routine screening for breast, cervical, and colorectal cancers. Screening can lead to early detection of these cancers, resulting in reduced mortality. Yet not all people who should be screened are screened, either regularly or, in some cases, ever. This report presents the results of systematic reviews of effectiveness, applicability, economic efficiency, barriers to implementation, and other harms or benefits of interventions designed to increase screening for breast, cervical, and colorectal cancers by increasing community access to these services. Evidence from these reviews indicates that screening for breast cancer (by mammography) has been increased effectively by reducing structural barriers and by reducing out-of-pocket client costs, and that screening for colorectal cancer (by fecal occult blood test) has been increased effectively by reducing structural barriers. Additional research is needed to determine whether screening for cervical cancer (by Pap test) can be increased by reducing structural barriers and by reducing out-of-pocket costs, whether screening for colorectal cancer (fecal occult blood test) can be increased by reducing out-of-pocket costs, and whether these interventions are effective in increasing the use of other colorectal cancer screening procedures (i.e., flexible sigmoidoscopy, colonoscopy, double contrast barium enema). Specific areas for further research are also suggested in this report.  
(*Am J Prev Med* 2008;35(1S):S56–S66) © 2008 American Journal of Preventive Medicine

---

### Introduction

Cancer is a major public health problem in the U.S. In 2003, more than 1,290,000 people were diagnosed with cancer and more than 556,000 died of cancer.<sup>1,a</sup> This included more than 55,000 men

---

From the Community Guide Branch, National Center for Health Marketing (Baron, Kalra, Melillo, Habarta, Chattopadhyay, Leeks) and Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion (Coates, Wilson), CDC, Atlanta, Georgia; University of North Carolina School of Public Health (Rimer), Chapel Hill, North Carolina; and National Cancer Institute, National Institutes of Health (Kerner), Bethesda, Maryland. Author affiliations are shown at the time the research was conducted.

The names and affiliations of the Task Force members are listed at the front of this supplement and at [www.thecommunityguide.org](http://www.thecommunityguide.org).

Address correspondence to Roy C. Baron, MD, MPH, Community Guide Branch, CDC, 1600 Clifton Road NE, MS E-69, Atlanta GA 30333. E-mail: [rbaron@cdc.gov](mailto:rbaron@cdc.gov).

Address reprint requests to Shawna L. Mercer, MSc, PhD, The Guide to Community Preventive Services, CDC, 1600 Clifton Road NE, MS E-69, Atlanta GA 30333. E-mail: [SMercer@cdc.gov](mailto:SMercer@cdc.gov).

<sup>a</sup>Numbers of cancer diagnoses are based on the most current reports of observed cases from cancer registries in CDC's National Program of Cancer Registries and NCI's Surveillance, Epidemiology, and End Results Program. Numbers of deaths are from CDC's National Vital Statistics Program.

and women who died from colorectal cancer, 41,000 women from breast cancer, and nearly 4000 women from cervical cancer. According to a 2003 report from the Institute of Medicine's National Cancer Policy Board,<sup>2</sup> each year 4475 deaths from breast cancer, 3644 deaths from cervical cancer, and 9632 deaths from colorectal cancer could be prevented if all eligible Americans received appropriate cancer screening services. Yet the 2005 National Health Interview Survey of U.S. adults<sup>3</sup> found that only 67% of women aged  $\geq 40$  years reported having had mammograms within the previous 2 years, and 78% of women aged  $\geq 18$  reported Pap tests within the previous 3 years. Among adults aged  $\geq 50$ , only 50% reported ever having screening endoscopies and only 17% reported having a fecal occult blood test (FOBT) within the previous 2 years. Lower rates were observed among American Indians and Alaska Natives; people of Asian, Latino, or Hispanic ethnicity; African Americans (endoscopy, only); and among poor and less-educated populations. Rates for recommended screenings tend to be lower among individuals without a usual source of health care, without health insurance, and among recent immi-

grants to the U.S.<sup>4</sup> At the same time, efforts to maximize control of breast, cervical, and colorectal cancers through screening face the additional challenge of assuring that cancer screening, once initiated, is repeated at recommended intervals.<sup>5,6</sup> Increasing use of these screening tests at recommended intervals and reducing inequalities in screening use are important steps toward reducing cancer morbidity and mortality.<sup>2</sup>

An array of community- and systems-based interventions are available to programs and planners for use in promoting cancer screening.<sup>7,8</sup> These interventions can target clients (client-directed), providers (provider-directed), or both, each either directly or through the healthcare system. Many of these interventions also have been applied in other areas of public health, but their effectiveness, applicability, and cost effectiveness in increasing cancer screening rates are either not clearly established or not completely understood.

The *Guide to Community Preventive Services (Community Guide)*, developed by the independent, nonfederal Task Force on Community Preventive Services (Task Force), has conducted systematic reviews on the effectiveness, applicability, economic efficiency, barriers to implementation, and other harms or benefits of community interventions to increase screening for breast, cervical, and colorectal cancers.<sup>7</sup> The conceptual approach to and selection of interventions for these reviews focused on three primary strategies to close screening-related gaps: increasing community demand for cancer screening services, reducing barriers to access, and increasing delivery of these services by healthcare providers. The first two strategies encompass client-directed approaches intended to influence client knowledge, motivation, access, and decision to be screened at appropriate intervals. The third strategy encompasses provider-directed approaches to reduce missed opportunities to recommend, order, or deliver cancer screening services at appropriate intervals. Evidence from these reviews provides the basis for Task Force recommendation of interventions in each of these strategic areas as well as for identifying additional research needs.

In this report, evidence is reviewed on the effectiveness of reducing structural barriers and reducing out-of-pocket costs to clients, two classes of client-directed interventions intended to increase community access to screening recommended for early detection of breast cancer (mammography); cervical cancer (Pap test); and colorectal cancer (guaiac-based FOBT, flexible sigmoidoscopy, colonoscopy, double-contrast barium enema).<sup>9-12</sup> Client-directed interventions designed to increase community demand for these services are reviewed in an accompanying article.<sup>13</sup> Two types of provider-directed interventions to increase screening delivery are also reviewed in an accompanying article<sup>14</sup>; other provider-directed interventions and multicomponent (combinations of) interventions will be reviewed in future publications.

The use of *community* will usually refer to a group of individuals who share one or more characteristics,<sup>15</sup> in this case the potential to benefit from one or more cancer screening services. *Community* is also used in reference to a setting or in combination with “community healthcare worker,” in which case the intent is locale, neighborhood, or other geopolitical unit.

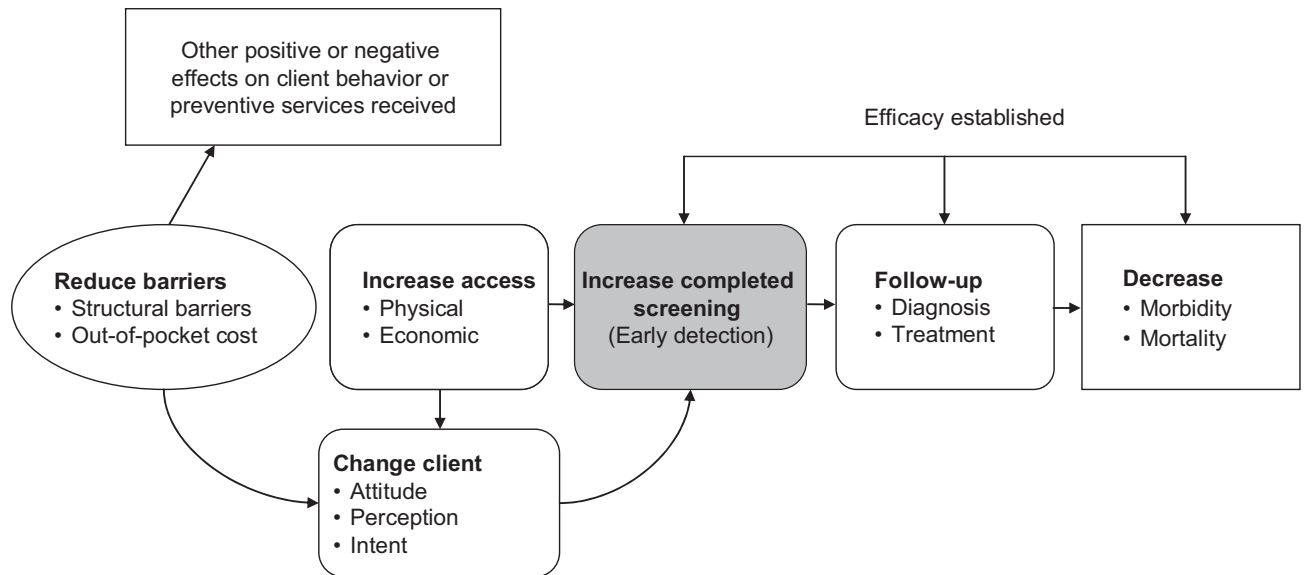
## Methods

General methods for conducting *Community Guide* systematic reviews have been described in detail.<sup>16,17</sup> Specific methods for conducting reviews of interventions to increase breast, cervical, and colorectal cancer screening are described elsewhere in this supplement.<sup>8</sup> That description includes the overall literature search of primary scientific publications through November 2004, selection of the 244 candidate studies satisfying general inclusion criteria for the cancer screening reviews, and specific criteria (suitability of study design and quality of execution<sup>16</sup>) applied to the final selection of qualifying studies for each review (see Results sections). In this section, methodologic issues are briefly discussed, specific to classes of interventions covered in this article, that is, those designed to increase access for clients who have difficulty obtaining cancer screening services—reducing structural barriers and reducing out-of-pocket costs to clients—for which 25 of the 244 candidate studies were considered for review. A summary of the results and other details of the final qualifying studies for each intervention review are available at [www.thecommunityguide.org/cancer](http://www.thecommunityguide.org/cancer).

The analytic model (Figure 1), similar to other constructs used in *Community Guide* cancer screening intervention reviews,<sup>7,8,13,14</sup> shows hypothesized relationships between interventions to increase community access, a series of intermediate steps, and ultimate (desired) health outcomes. Completed screening (shaded) is the outcome of primary interest in these reviews. Although completed screening is an intermediate step in the model, it provides the basis for evaluation of intervention effectiveness because of established links to the health outcome of ultimate interest: decreased mortality from breast, cervical, and colorectal cancers.<sup>9-12</sup>

Interventions to increase community access are directed toward age-eligible populations with the goal of increasing adherence to screening recommendations. The systematic review development team (the team)<sup>7</sup> postulated that by reducing common structural (physical) or economic barriers, these interventions have the potential to increase accessibility of cancer screening services for community members. This, in turn, would lead to increased test completion and early detection and, ultimately, reduce cancer morbidity and mortality. Alternatively, these interventions might influence client intent by modifying attitudes about screening services or by diminishing perceived barriers. The model also indicates that these interventions may result in other benefits and harms, such as positive or negative effects on other health behaviors or use of healthcare services.

Although several recommended screening procedures are also used for diagnostic or therapeutic purposes (i.e., mammography, colorectal endoscopy, and double contrast barium enema), reference to them in these reviews relates specifically to the screening application.



**Figure 1.** Analytic framework: client-directed interventions to increase community access to cancer screening services. (Oval indicates interventions; rectangles with rounded corners indicate mediators or intermediate outcomes; shaded rectangle is the intermediate outcome measuring intervention effectiveness; and clear rectangle indicates ultimate [desired] health outcomes.)

Intervention effectiveness was evaluated by comparing pre- and post-intervention screening practices in the study groups with those in groups receiving no intervention. For each study, measure of effect was represented as percentage point (i.e., absolute) change (from a baseline or comparison value) in completed screening attributable to the intervention.

In general, to answer questions about whether particular interventions are effective, *Community Guide* systematic reviews consider data from all available studies of sufficient quality that compare outcomes in a group exposed to an intervention with outcomes in a group either concurrently or historically unexposed (or less exposed) to the intervention.<sup>16,17</sup> Consistent with many groups that focus on population-based or public health interventions,<sup>18</sup> this approach is broadly inclusive of a range of study designs.

As noted elsewhere in this supplement,<sup>7,8</sup> client-related barriers can differ by screening test and by population subgroup. Therefore, effectiveness, applicability, and economic efficiency of client-directed interventions were reviewed separately for breast, cervical, and colorectal cancers. Other positive or negative effects, barriers to implementation, and areas needing further research were also considered.

### Results: Reducing Structural Barriers

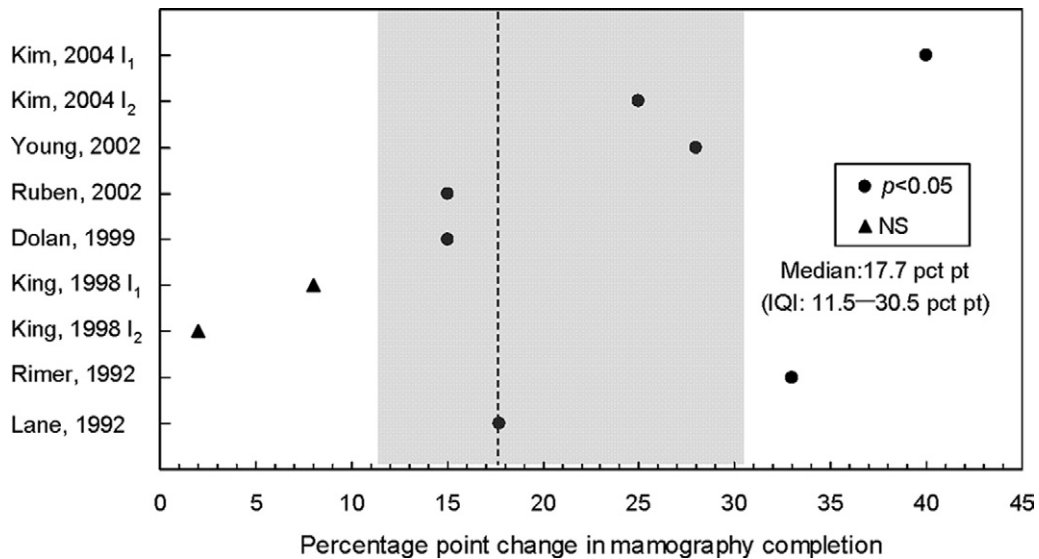
Structural barriers are non-economic burdens or obstacles that impede access to screening. Interventions designed to reduce these barriers may facilitate access by reducing time or distance between service delivery settings and target populations; modifying hours of service to meet client needs; offering services in alternative or nonclinical settings (e.g., mobile mammography vans at worksites or in residential communities); and eliminating or simplifying administrative procedures and other obstacles (e.g., scheduling assistance, transportation, dependent care, translation services,

limiting the number of clinic visits). When judged by the team to be the principal intent of the intervention program, this class of interventions was often combined with one or more secondary supporting measures: printed or telephone reminders, education about cancer screening, information about screening availability (e.g., group education, pamphlets, or brochures), or measures to reduce out-of-pocket costs to the client. Interventions otherwise principally designed to reduce client costs are reviewed as a separate class of approaches (see Reducing Out-of-Pocket Costs to Clients).

### Breast Cancer

**Effectiveness.** Eight studies<sup>19–26</sup> were identified on the effectiveness of reducing structural barriers to promote breast cancer screening using mammography. One study<sup>19</sup> was excluded due to limited quality of execution. Of the seven remaining studies that qualified for review, six were of greatest design suitability, three<sup>20,24,25</sup> with good quality of execution and three<sup>21,22,26</sup> with fair quality of execution. One study<sup>23</sup> was of moderate design suitability and had fair quality of execution.

All studies except one<sup>23</sup> specified that enrolled women did not have screening mammograms in the previous 1 or 2 years. None of the studies reported whether study participants were never screened or were not being screened at recommended intervals. Screening completion was assessed using self-reports<sup>21–25</sup> or record reviews.<sup>20,26</sup> The seven qualifying studies evaluated nine intervention arms. Two studies<sup>21,22</sup> each evaluated two interventions. Six interventions<sup>21,23–26</sup> used mobile mammography units at alternative screening sites, two interventions<sup>22</sup> provided free transporta-



**Figure 2.** Percentage point changes in mammography utilization attributable to reduced structural barriers. IQI, interquartile interval; NS, nonsignificant

tion to a screening clinic, and one intervention<sup>20</sup> offered mammography on the day it was ordered or recommended. Mobile mammography programs also included small media,<sup>23,24</sup> group education,<sup>21,24,26</sup> and free or reduced-cost screening.<sup>21,23,25,26</sup>

All studies reported effects in the favorable direction (Figure 2). The median post-intervention increase in completed mammography was 17.7 percentage points (interquartile interval [IQI], 11.5 to 30.5 percentage points). The magnitude of this effect and consistent positive results across studies demonstrate the effectiveness of reducing structural barriers in increasing breast cancer screening by mammography.

**Applicability.** The same body of evidence was used to evaluate the applicability of reducing structural barriers to mammography in different populations and settings. All studies were conducted in the U.S. and interventions were delivered in residential facilities<sup>22,24</sup> or community<sup>21,23,25,26</sup> or clinical<sup>20</sup> settings. The overall body of evidence represents lower income, white, Hispanic, African-American, Native American, and Asian-American women in urban settings. The evidence is heavily weighted toward strategies that reduce time and distance or create alternative testing sites, and may not generalize to efforts geared to increasing flexibility of clinic hours or overcoming administrative or cultural barriers. Although none of the study populations were specified as rural, reducing structural barriers should be applicable across a range of settings where target populations may have limited physical access to mammography. These studies do not specifically address effectiveness among women who were never screened or who may be hard to reach for screening and for whom more intensive and individualized approaches may be needed.

**Economic efficiency.** No studies were found meeting the inclusion criteria for review of the economic efficiency of reducing structural barriers in increasing breast cancer screening.

### Cervical Cancer

**Effectiveness.** Two studies<sup>27,28</sup> were identified on the effectiveness of reducing structural barriers to promote cervical cancer screening by Pap test. Both studies were of greatest design suitability and had fair quality of execution.

Both studies used self-reports to assess Pap test completion. One study,<sup>27</sup> which did not specify prior screening histories of participants, reported a 17.8 percentage point increase in Pap test completion after the intervention was offered in a low-income, high-rise apartment setting. The other study<sup>28</sup> reported a 13.6 percentage point increase after prescheduled appointments were offered to women who were due or overdue for screening in a university-based general practice. Despite the substantial improvement in screening rates demonstrated by the two studies, the limited quality of execution of both studies provides insufficient evidence to determine the effectiveness of reducing structural barriers in increasing cervical cancer screening.

Because effectiveness was not established, the general applicability of this intervention was not addressed nor was there a search for evidence of economic efficiency.

### Colorectal Cancer

**Effectiveness.** Seven studies<sup>29–35</sup> were identified on the effectiveness of reducing structural barriers to promote colorectal cancer screening, all by guaiac-

**Table 1.** Reducing structural barriers to colorectal cancer (CRC) screening: components of comparison and intervention (I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub>) study arms, using guaiac-based FOBT kits

Study	Comparison group	Intervention arm		
		I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>
Mant (1992) <sup>29</sup>	Invited to attend clinic health check	FOBT kit mailed from clinic with return postage	FOBT kit mailed from clinic with return postage and invited to attend clinic health check	
Church (2004) <sup>35</sup>	Required to appear at clinic for FOBT kit	FOBT kit mailed from clinic with return postage	FOBT kit mailed from clinic with return postage plus telephone follow-up	
King (1992) <sup>30</sup>	Physician letter of encouragement to get FOBT and asking client to order free FOBT kit by telephone	FOBT kit mailed from clinic with return postage and physician letter of encouragement	FOBT kit mailed from clinic with return postage, dietary restrictions, and physician letter of encouragement	FOBT kit mailed from clinic with return postage, educational CRC brochure, and physician letter of encouragement
Ore (2001) <sup>34</sup>	Received mail-in card to request FOBT kit	Received FOBT kit by mail from clinic		
Plaskon (1995) <sup>33</sup>	CRC screening educational material distributed at office visit	Received FOBT kit at office visit with CRC screening educational material		
Freedman (1994) <sup>32</sup>	FOBT kit provided at clinic without return mailer	FOBT kit provided at clinic with return mailer but no prepaid postage	FOBT kit provided at clinic with return mailer and prepaid postage	
Miller (1993) <sup>31</sup>	FOBT kit provided at clinic without return postage	FOBT kit provided at clinic with return postage		

FOBT, fecal occult blood test

based FOBT only. All seven studies qualified for review: all were of greatest design suitability, four with good quality of execution,<sup>31–34</sup> and three with fair quality of execution.<sup>29,30,35</sup>

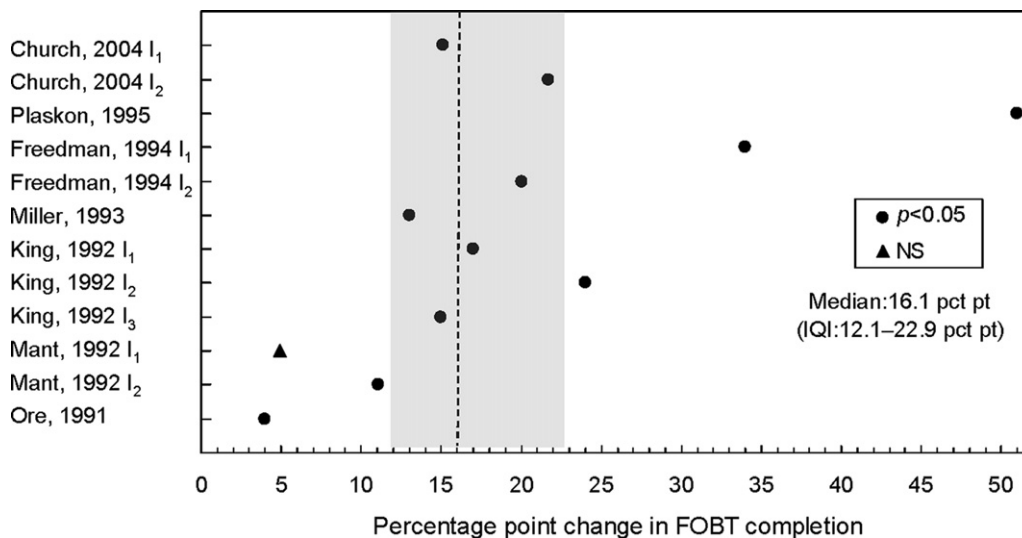
Each study enrolled men and women due or overdue for annual FOBT and ascertained screening completion by self-reports,<sup>33,35</sup> record reviews,<sup>29,34</sup> or returned FOBT kits.<sup>30–32</sup> The seven qualifying studies evaluated 12 intervention arms. One study<sup>30</sup> evaluated three interventions and three studies<sup>29,32,35</sup> each evaluated two interventions. All intervention groups were distinguished from corresponding comparison groups by making the receipt or return of FOBT kits less burdensome. Components of the various intervention and comparison conditions are shown in Table 1.

All studies reported effects in the favorable direction (Figure 3). The median post-intervention increase in FOBT completion was 16.1 percentage points (IQR=12.1, 22.9). The magnitude of this effect and consistent positive results across interventions demonstrate the effectiveness of reducing structural barriers in increasing colorectal cancer screening by FOBT. Based on within-study comparisons, it appears that interventions that included an invitation to attend a clinic,<sup>29</sup> prepaid postage on the return mailer,<sup>31,32</sup> or a follow-up telephone reminder<sup>35</sup> were more effective

than intervention or comparison arms that did not include these components.

**Applicability.** The same body of evidence was used to evaluate the applicability of reducing structural barriers to FOBT in different populations and settings. Studies were conducted in the U.S., the United Kingdom, Australia, and Israel, in clinical settings and in both urban and rural communities. The overall body of evidence generally represents white and African-American populations but not groups of other racial or ethnic backgrounds. It is likely that reducing structural barriers to FOBT should be applicable across a range of settings where target populations may have limited physical access to FOBT. The findings, however, apply only to FOBT, and no conclusions can be drawn about reducing structural barriers to screening by colorectal endoscopy or by double contrast barium enema. Moreover, questions may remain about the effectiveness of this type of intervention among people who were never screened or who may be hard to reach for screening and for whom more intensive and individualized approaches may be needed.

**Economic efficiency.** Three studies<sup>30,32,35</sup> met inclusion criteria<sup>8</sup> for cost-effectiveness analysis of reducing structural barriers in increasing colorectal cancer



**Figure 3.** Percentage point changes in FOBT utilization attributable to reduced structural barriers. IQI, interquartile interval; NS, nonsignificant

screening by guaiac-based FOBT. These studies were classified as good. One study<sup>32</sup> assessed cost effectiveness of supplying return FOBT kit envelopes, with and without prepaid postage, compared with the usual in-person return. The cost per additional screening of providing the return envelope was \$0.64 with no return postage and \$1.46 with return postage, compared with usual care. A second study<sup>30</sup> evaluated cost effectiveness of mailing an FOBT kit with a physician-signed letter of encouragement to the client alone or with an educational brochure or a set of dietary restrictions, compared with sending the letter of encouragement alone (with the request that the client call in separately for the kit). The cost of sending the kit, per additional screening, was \$4.73 when the letter was sent alone, \$8.89 when the brochure was included, and \$6.66 when dietary restrictions were included. Another study<sup>35</sup> assessed cost effectiveness of sending a return postage prepaid FOBT kit with and without a follow-up telephone reminder during a mass media campaign versus exposure to the mass media campaign alone, which offered FOBT kits at no cost. Costs per additional screening, calculated by *Community Guide* economists from reported data, were \$32.10 with the follow-up telephone reminder and \$20.10 without the follow-up reminder.

### Conclusions About Reducing Structural Barriers

According to *Community Guide* methods,<sup>16</sup> there is strong evidence that reducing structural barriers is effective in increasing both breast cancer screening by mammography and colorectal cancer screening by guaiac-based FOBT. Questions remain, however, about whether additional interventions are needed when focusing on specific populations, such as people who have never been screened or who may be hard to reach for

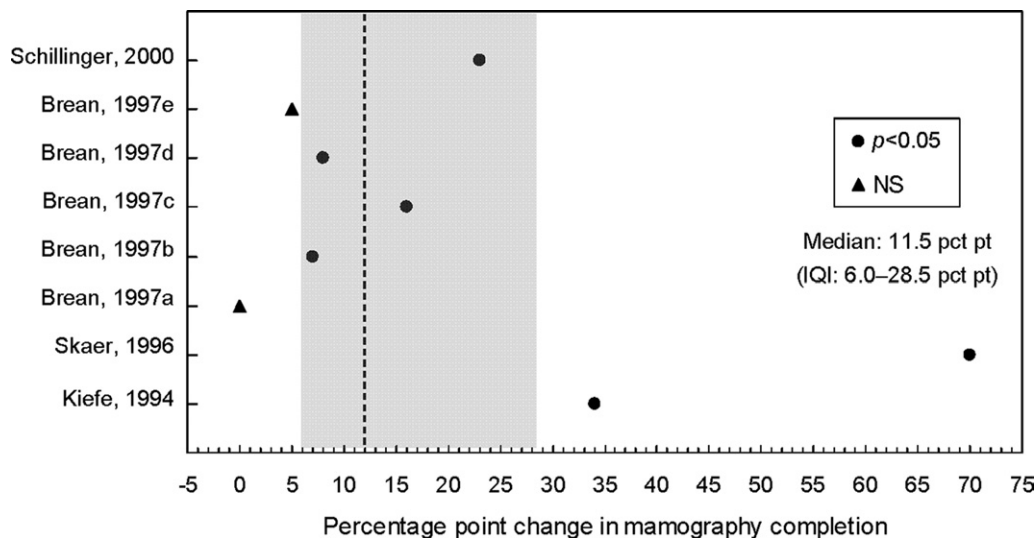
screening. These findings should apply across a range of settings and populations but cannot be generalized to colorectal cancer screening by flexible sigmoidoscopy, colonoscopy, or double contrast barium enema, because no studies addressed these procedures. There is insufficient evidence to determine the effectiveness of reducing structural barriers in increasing cervical cancer screening by Pap test, because there were too few qualifying studies with adequate quality of design and execution.

### Results: Reducing Out-of-Pocket Costs to Clients

Out-of-pocket costs can be reduced in an attempt to remove or minimize economic barriers that limit client access to cancer screening. Costs can be reduced by subsidizing screening through use of vouchers, reducing co-payments or other up-front client-borne expenses, reimbursing clients or clinics after services have been rendered, or adjusting the cost of federal or state insurance coverage. When judged by the team to be the principal intent of the intervention program, this class of interventions was occasionally combined with one or more secondary supporting measures: education about cancer screening, information about availability, or measures to reduce structural barriers (e.g., assisting with language and cultural barriers; streamlining appointment scheduling). Interventions otherwise principally designed to reduce structural barriers are reviewed as a separate class of approaches (see Reducing Structural Barriers).

### Breast Cancer

**Effectiveness.** Eight studies<sup>36–39</sup> were identified on the effectiveness of reducing out-of-pocket costs to promote breast cancer screening using mammography



**Figure 4.** Percentage point changes in mammography utilization attributable to reduced out-of-pocket cost to clients. IQI, interquartile interval; NS, nonsignificant

(including five studies in one report<sup>38</sup>). All eight studies qualified for review: two were of greatest design suitability, one<sup>37</sup> with good quality of execution and one<sup>36</sup> with fair quality of execution; six studies<sup>38,39</sup> were of least suitable design with fair quality of execution. Two studies<sup>36,37</sup> evaluated free client vouchers and six evaluated extension of Medicare<sup>38</sup> or state<sup>39</sup> benefits to cover periodic mammography.

Only two studies specified that enrolled women did not have mammograms in the previous 1<sup>37</sup> or 2<sup>36</sup> years. No studies indicated whether participants were never screened or not being screened at recommended intervals. Screening completion was assessed using self-reports,<sup>39</sup> clinic record reviews,<sup>36,37</sup> Medicare reimbursement records,<sup>38</sup> or a combination. Each qualifying study evaluated a single intervention.

All studies reported effects in the favorable direction (Figure 4). The median post-intervention increase in completed mammography was 11.5 percentage points (IQI=6.0, 28.5). The magnitude of this effect and the consistent positive results across studies demonstrate the effectiveness of reducing out-of-pocket costs in increasing breast cancer screening by mammography.

**Applicability.** The same body of evidence was used to evaluate the applicability of reducing out-of-pocket costs for mammography in different populations and settings. Study sites included urban, rural, and mixed urban-rural clinical settings in the continental U.S. Women in these studies were aged 40–89 years. Three studies evaluated predominantly white,<sup>39</sup> predominantly African-American,<sup>36</sup> or entirely Hispanic<sup>37</sup> populations of lower SES; the other studies<sup>38</sup> did not specify racial, ethnic, or socioeconomic composition. Reducing out-of-pocket costs should apply across a range of populations and settings where target populations may have limited financial resources for mam-

mography. These studies did not specifically address effectiveness among women who were never screened or who may be hard to reach for screening and for whom more intensive and individualized approaches may be needed.

**Economic efficiency.** No studies were found meeting the inclusion criteria<sup>8</sup> for review of the economic efficiency of reducing out-of-pocket costs in increasing breast cancer screening by mammography.

### Cervical Cancer

**Effectiveness.** One study<sup>39</sup> was identified, of least-suitable design with fair quality of execution, on the effectiveness of reducing out-of-pocket costs to promote cervical cancer screening by Pap test. The study evaluated a state health benefit extension to cover Pap tests.

Within 1 year after the benefit was initiated, there was a 17 percentage point increase in self-reported Pap test completion within the previous 3 years. Despite this increase, the limited design suitability and quality of execution of the study provide insufficient evidence to determine the effectiveness of reducing out-of-pocket costs in increasing cervical cancer screening.

Because effectiveness was not established, the general applicability of this intervention was not addressed nor was there a search for evidence of economic efficiency.

### Colorectal Cancer

**Effectiveness.** No relevant studies were found, and thus there was insufficient evidence to determine the effectiveness of reducing out-of-pocket costs in promoting colorectal cancer screening.

## Conclusions About Reducing Out-of-Pocket Costs to Clients

According to *Community Guide* methods,<sup>16</sup> there is sufficient evidence that reducing out-of-pocket costs increases breast cancer screening by mammography. Evidence is insufficient, however, to determine the effectiveness of reducing out-of-pocket costs in increasing screening for cervical or colorectal cancer: only a single qualifying study with methodologic limitations was identified in the cervical screening review, and no studies were identified in the colorectal screening review.

## Other Positive or Negative Effects of Interventions to Increase Access

The search revealed no reports of other positive or negative effects on use of other healthcare services (e.g., blood pressure monitoring or adult immunization) associated with reducing structural barriers or client out-of-pocket costs to increase access to breast, cervical, or colorectal cancer screening services.

## Potential Barriers to Implementing Interventions to Increase Access

Potential challenges in reducing structural barriers include:

- limited resources to deliver services by mobile mammography units;
- identifying facilities to serve as alternative screening sites;
- adequate staffing at alternative facilities or during expanded clinic hours, and assurance of linguistic and cultural competence;
- assuring clinical follow-up for abnormal screening tests for clients with no access to primary care; and
- employer flexibility to enable workers to take advantage of expanded clinic hours.

Potential barriers to reducing out-of-pocket costs to clients include:

- limited public or private resources to defray clients' share of costs, and
- the perception that new, more expensive, screening technologies (e.g., MRI and digital mammography) are superior to subsidized technologies (e.g., film mammography).

## Research Issues for Increasing Community Access to Screening

### Evidence of Effectiveness

These reviews demonstrate the effectiveness of reducing structural barriers in increasing screening for breast

and colorectal cancers (by mammography and FOBT, respectively) and the effectiveness of reducing out-of-pocket client costs in increasing screening for breast cancer. However, important questions not addressed in the reviews may have additional implications for the effectiveness of these interventions.

- How can public social and economic policies, along with private initiatives, direct resources to increase cost relief and structural accessibility to cancer screening services?
- What are effective ways to ensure that clients are informed that structural and economic barriers to cancer screening access have been or can be reduced?
- How can access problems caused by shortages of radiologists who read mammograms and closing of breast cancer screening facilities be addressed?<sup>40</sup>
- Can the capacity to perform screening endoscopy be increased to meet current and future needs?

Because evidence was insufficient to determine whether reducing structural barriers is effective in increasing cervical cancer screening, or whether reducing out-of-pocket costs is effective in increasing both cervical and colorectal cancer screening, basic effectiveness research questions remain. These include questions about the role of reducing structural barriers and out-of-pocket costs in promoting screening by colorectal endoscopy and double contrast barium enema.

### Evidence of Applicability

Interventions found to be effective were generally examined in broad population segments. However, questions may remain about their effectiveness in certain settings or for some populations and population subgroups. It is not practical, nor should it be assumed necessary, to conduct intervention trials in every setting or with every potential subgroup that might be reached, although science will benefit from the accumulation of such evaluation data.<sup>2</sup> At the same time, several key questions about applicability require attention.

- How applicable are these interventions in populations that already have relatively high screening rates?
- Are these interventions effective in populations of never-screened people or among people who are particularly hard to reach for screening? If not, can they be adapted for such populations? How should interventions to reduce structural barriers be combined with other interventions to address the specific needs of people who may be resistant to screening?
- How can employers contribute to reducing structural and out-of-pocket cost barriers?
- How can interventions to enhance access be coordinated with interventions that increase community



demand (e.g., through reminders and education) for screening services, or vice versa, where necessary? In particular, how can these interventions be adapted to groups of people who are more resistant to screening and for whom more intensive and individualized approaches also may be needed?

### **Evidence of Economic Efficiency**

Efforts by researchers to provide complete and detailed economic information using standard approaches will enhance the overall value of their contributions and will improve interpretability of cost effectiveness across studies and across intervention options. Because there were relatively few studies and methodologic differences, the reported cost-effectiveness ratios may not, at this stage, provide reliable guidance to decision makers in helping them choose specific options among a menu of interventions. To develop a sound basis for comparative economic analyses of cancer screening interventions, future research should consider:

- documenting all cost and effectiveness data elements to enable future sharing and evaluation of cost-effectiveness of these interventions;
- clarifying study perspective (i.e., program, client, insurance company, societal) and itemizing costs relevant to that perspective (i.e., direct, fixed, other indirect);
- eliminating from analysis any costs not related to the intervention to enhance screening uptake (e.g., costs of actual screening tests, diagnosis-related procedures, follow-up treatment); and
- including costs of all intervention components in multicomponent interventions and, where possible, separating effects of individual components from overall intervention effectiveness.

Finally, questions remain concerning the value to program planners of cost effectiveness in achieving intermediate outcomes (e.g., additional completed screening) rather than the health outcome ultimately desired (e.g., abnormal tests detected, life years saved). Further efforts, such as collection of data to estimate the number of cases of prevention or earlier detection of cancer resulting from the additional completed screening and to measure subsequent improvement in both quality and quantity of life, are also needed to translate cost effectiveness of screening into cost effectiveness of achieving ultimate health goals.

### **Evidence of Other Positive or Negative Effects**

Limited information on either potential or actual positive or negative effects of these interventions was provided in the studies reviewed. Some pertinent questions to consider include:

- Do these interventions result in other positive or negative changes in health behavior or use of health-care services by increasing access to other healthcare monitoring or services (e.g., blood pressure control or adult immunization)?
- Do interventions that increase access to cancer screening (e.g., by taking mobile mammography units to worksites) result in lower subsequent screening by reducing client motivation?
- Do interventions that increase access to cancer screening, such as alternative screening sites, limit receipt of other medical services from usual sources of care?

### **Evidence for Barriers to Implementation**

A key question that remains to be answered is how screening can be made more accessible in remote regions.

### **Discussion**

These reviews summarize the evidence base that supports Task Force recommendations<sup>41</sup> for two approaches designed to increase community access to breast, cervical, and colorectal cancer screening: reducing structural barriers and reducing client out-of-pocket costs. Interventions to increase community access are strategically distinct from those to increase community demand or to encourage providers to deliver these services.<sup>7</sup> Access-enhancing interventions concentrate on removing or minimizing non-economic barriers (obstacles that separate eligible groups from screening by time, distance, and effort) and economic barriers, both of which influence client decisions to comply with screening recommendations. These interventions are particularly appropriate for, but not limited to, groups with low incomes, with limited or no insurance, with no regular healthcare providers, or that live in rural or remote areas. At the same time, the benefit of providing access cannot be fully realized if intended populations are not aware of screening needs and options, or are resistant to screening. Healthcare providers, too, must be encouraged and enabled to avoid missing opportunities to discuss screening recommendations and to offer options during healthcare visits. Thus, strategy selection must be considered in the context of local resources and conditions before selecting specific interventions.

As noted in the accompanying article on interventions to enhance community demand,<sup>13</sup> these reviews offer little insight into the applicability of increasing access among people who have never been screened or who may be particularly hard to reach. Although such individuals are likely to have been included in target populations covered in these reviews, none of the studies reported outcome by prior screening history

nor did they attempt to demonstrate potential differences in effectiveness when access is enhanced in these groups. Moreover, studies in these reviews focus on post-intervention change over limited time frames and do not deal with maintenance of screening at recommended intervals or ways to optimize effective interventions to sustain screening behaviors, once initiated<sup>5,6</sup> (see Research Issues for Increasing Access to Screening).

These reviews and the accompanying evidence-based Task Force recommendations<sup>41</sup> should be useful in identifying and selecting options for cancer screening interventions when increasing community access to these services is indicated. Moreover, research questions provided in this article can help identify important gaps in our knowledge base and should be used to guide future research, both in determining research priorities and in allocating research funds.

The authors gratefully acknowledge Rosalind A. Breslow, PhD, Peter Briss, MD, MPH, Steven Coughlin, PhD, Nancy C. Lee, MD, Patricia Dolan Mullen, DrPH, Bernice Tannor, MPH, and Cornelia White, PhD for contributions to the intervention reviews described in this paper, including conceptual and methodologic insights offered in preparation for presentation to the Task Force on Community Preventive Services.

The work of Stephanie Melillo, Nancy Habarta, Kimberly Leeks, and Geetika Kalra was supported with funds from the Oak Ridge Institute for Scientific Education (ORISE).

The findings and conclusions in this paper are those of the authors and do not necessarily reflect those of the Centers for Disease Control and Prevention.

No financial disclosures were reported by the authors of this paper.

## References

- Centers for Disease Control and Prevention. United States cancer statistics. [www.cdc.gov/cancer/npcr/uscs/index.htm](http://www.cdc.gov/cancer/npcr/uscs/index.htm).
- National Cancer Policy Board, Institute of Medicine. Fulfilling the potential of cancer prevention and early detection. Curry S, Byers T, Hewitt M, eds. Washington DC: The National Academies Press, 2003.
- Centers for Disease Control and Prevention, National Center for Health Statistics. Summary health statistics for U.S. adults: National health interview survey, 2005. [www.cdc.gov/nchs/data/series/sr\\_10/sr10\\_232.pdf](http://www.cdc.gov/nchs/data/series/sr_10/sr10_232.pdf).
- Swan J, Breen N, Coates RJ, Rimer BK, Lee NC. Progress in cancer screening practices in the United States: results from the 2000 National Health Interview Survey. *Cancer* 2003;97:1528–40.
- Clark MA, Rakowski W, Bonacore LB. Repeat mammography: prevalence estimates and consideration for assessment. *Ann Behav Med* 2003;26:201–11.
- Rakowski W, Breen N, Meissner H, et al. Prevalence and correlates of repeat mammography among women aged 55–79 in the Year 2000 National Health Interview Survey. *Prev Med* 2004;39:1–10.
- Breslow RA, Rimer BK, Baron RC, et al. Introducing the Community Guide's reviews of evidence on interventions to increase screening for breast, cervical, and colorectal cancers. *Am J Prev Med* 2008;35(1S):S14–S20.
- Baron RC, Rimer BK, Coates RJ, et al. Methods for conducting systematic reviews of evidence on effectiveness and economic efficiency of interventions to increase screening for breast, cervical, and colorectal cancers. *Am J Prev Med* 2008;35(1S):S26–S33.
- U.S. Preventive Services Task Force. Guide to clinical preventive services: cancer. [www.ahrq.gov/clinic/cps3dix.htm](http://www.ahrq.gov/clinic/cps3dix.htm).
- U.S. Preventive Services Task Force. Screening for colorectal cancer. [www.ahrq.gov/clinic/uspstf/uspstfcol.htm](http://www.ahrq.gov/clinic/uspstf/uspstfcol.htm).
- U.S. Preventive Services Task Force. Screening for cervical cancer. [www.ahrq.gov/clinic/uspstf/uspstfcerv.htm](http://www.ahrq.gov/clinic/uspstf/uspstfcerv.htm).
- U.S. Preventive Services Task Force. Screening for breast cancer. [www.ahrq.gov/clinic/uspstf/uspstfbrca.htm](http://www.ahrq.gov/clinic/uspstf/uspstfbrca.htm).
- Baron RC, Rimer BK, Breslow RA, et al. Client-directed interventions to increase community demand for breast, cervical, and colorectal cancer screening: a systematic review. *Am J Prev Med* 2008;35(1S):S34–S55.
- Sabatino SA, Habarta N, Baron RC, et al. Interventions to increase recommendation and delivery of screening for breast, cervical, and colorectal cancers by healthcare providers: systematic reviews of provider assessment and feedback and provider incentives. *Am J Prev Med* 2008;35(1S):S67–S74.
- Truman BI, Smith-Akin CK, Hinman AR, et al. Developing the Guide to Community Preventive Services—overview and rationale. *Am J Prev Med* 2000;18(1S):18–26.
- Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services—methods. *Am J Prev Med* 2000;18(1S):35–43.
- Zaza S, Wright-De Agüero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. *Am J Prev Med* 2000;18(1S):44–74.
- Jackson N, Waters E, Guidelines for Systematic Reviews in Health Promotion and Public Health Taskforce. Criteria for the systematic review of health promotion and public health interventions. *Health Promot Int* 2005;20:367–74.
- Turnbull D, Irwig L, Simpson J, Donnelly N, Mock P. A prospective cohort study investigating psychosocial predictors of attendance at a mobile breast screening service. *Aus J Public Health* 1995;19:172–6.
- Dolan N, McDermott M, Morrow M, Venta L, Martin G. Impact of same-day screening mammography availability: results of a controlled clinical trial. *Arch Intern Med* 1999;159:393–8.
- Kim YH, Sarna L. An intervention to increase mammography use by Korean American women. *Oncol Nurs Forum* 2004;31:105–10.
- King E, Rimer B, Benincasa T, Harrop C, Amfloh K, Bonney G. Strategies to encourage mammography use among women in senior citizens' housing facilities. *J Cancer Educ* 1998;13:108–15.
- Lane D, Burg M. Strategies to increase mammography utilization among community health center visitors. *Med Care* 1993;31:175–81.
- Rimer B, Resch N, King E, et al. Multistrategy health education program to increase mammography use among women ages 65 and older. *Public Health Reports* 1992;107:369–80.
- Reuben DB, Bassett LW, Hirsch SH, Jackson CA, Bastani R. A randomized clinical trial to assess the benefit of offering on-site mobile mammography in addition to health education for older women. *AJR Am J Roentgenol* 2002;179:1509–14.
- Young RF, Waller JB Jr., Smitherman H. A breast cancer education and on-site screening intervention for unscreened African American women. *J Cancer Educ* 2002;17:231–6.
- White J, Begg L, Fishman N. Increasing cervical cancer screening among minority elderly: education and on-site services increase screening. *J Gerontol Nurs* 1993;19:28–34.
- Pritchard D, Straton J, Hyndman J. Cervical screening in general practice. *Aust J Public Health* 1995;19:167–72.
- Mant D, Fuller A. Patient compliance with colorectal cancer screening in general practice. *Br J Gen Pract* 1992;42:18–20.
- King J, Fairbrother G, Thompson C, Morris D. Colorectal cancer screening: optimal compliance with postal faecal occult blood test. *Aust N Z J Surg* 1992;62:714–9.
- Miller M, Wong J. Reducing financial barriers enhances the return rate of stool Hemoccult packets. *Am J Med Sci* 1993;306:98–100.
- Freedman J, Mitchell C. A simple strategy to improve patient adherence to outpatient fecal occult blood testing. *J Gen Intern Med* 1994;9:462–4.
- Plaskon P, Fadden M. Cancer screening utilization: is there a role for social work in cancer prevention? *Soc Work Health Care* 1995;21:59–70.
- Ore L, Hagoel L, Lavi I, Rennert G. Screening with faecal occult blood test (FOBT) for colorectal cancer: assessment of two methods that attempt to improve compliance. *Eur J Cancer Prev* 2001;10:251–6.
- Church TR, Yeazel MW, Jones RM, et al. A randomized trial of direct mailing of fecal occult blood tests to increase colorectal cancer screening. *J Natl Cancer Inst* 2004;96:770–80.

36. Kiefe C, McKay SV, Halevy A, Brody BA. Is cost a barrier to screening mammography for low-income women receiving Medicare benefits? *Arch Intern Med* 1994;154:1217-24.
37. Skaer T, Robison L, Sclar D, Harding G. Financial incentive and the use of mammography among Hispanic migrants to the United States. *Health Care Women Int* 1996;17:281-91.
38. Breen N, Feuer E, Depuy S, Zapka J. The effect of Medicare reimbursement for screening mammography on utilization and payment. *Public Health Reports* 1997;112:423-32.
39. Schillinger J, Mosback C, Austin D, et al. Health care reform in Oregon: the impact of the Oregon Health Plan on utilization of mammography. *Am J Prev Med* 2000;18:11-7.
40. Saving women's lives: strategies for improving breast cancer detection and diagnosis. Joy JE, Penhoet EE, Petitti DB, eds. Washington, DC: National Academies Press, 2005.
41. Task Force on Community Preventive Services. Recommendations for client- and provider-directed interventions to increase breast, cervical, and colorectal cancer screening. *Am J Prev Med* 2008;35(1S):S21-S25.

**What's new online?**

Visit [www.ajpm-online.net](http://www.ajpm-online.net) today to find out how you can link from cited references to abstracts and full-text articles of other participating journals.