

Effectiveness of Interventions to Increase Screening for Breast, Cervical, and Colorectal Cancers

Nine Updated Systematic Reviews for the Guide to Community Preventive Services

Susan A. Sabatino, MD, MPH, Briana Lawrence, MPH, Randy Elder, PhD, MEd, Shawna L. Mercer, MSc, PhD, Katherine M. Wilson, PhD, MPH, Barbara DeVinney, PhD, Stephanie Melillo, MPH, Michelle Carvalho, MPH, Stephen Taplin, MD, MPH, Roshan Bastani, PhD, Barbara K. Rimer, DrPH, Sally W. Vernon, PhD, Cathy Lee Melvin, PhD, MPH, Vicky Taylor, BMBS, MPH, Maria Fernandez, PhD, Karen Glanz, PhD, MPH, and the Community Preventive Services Task Force

Context: Screening reduces mortality from breast, cervical, and colorectal cancers. The *Guide to Community Preventive Services* previously conducted systematic reviews on the effectiveness of 11 interventions to increase screening for these cancers. This article presents results of updated systematic reviews for nine of these interventions.

Evidence acquisition: Five databases were searched for studies published during January 2004–October 2008. Studies had to (1) be a primary investigation of one or more intervention category; (2) be conducted in a country with a high-income economy; (3) provide information on at least one cancer screening outcome of interest; and (4) include screening use prior to intervention implementation or a concurrent group unexposed to the intervention category of interest. Forty-five studies were included in the reviews.

Evidence synthesis: Recommendations were added for one-on-one education to increase screening with fecal occult blood testing (FOBT) and group education to increase mammography screening. Strength of evidence for client reminder interventions to increase FOBT screening was upgraded from sufficient to strong. Previous findings and recommendations for reducing out-of-pocket costs (breast cancer screening); provider assessment and feedback (breast, cervical, and FOBT screening); one-on-one education and client reminders (breast and cervical cancer screening); and reducing structural barriers (breast cancer and FOBT screening) were reaffirmed or unchanged. Evidence remains insufficient to determine effectiveness for the remaining screening tests and intervention categories.

Conclusions: Findings indicate new and reaffirmed interventions effective in promoting recommended cancer screening, including colorectal cancer screening. Findings can be used in community and healthcare settings to promote recommended care. Important research gaps also are described.

(Am J Prev Med 2012;43(1):97–118) © 2012 Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine

From the Division of Cancer Prevention and Control (Sabatino, Melillo), National Center for Chronic Disease Prevention and Health Promotion, the Community Guide Branch, Epidemiology Analysis Program Office (Elder, Mercer, Wilson), Office of Surveillance, Epidemiology, and Laboratory Services, CDC, Rollins School of Public Health (Carvalho), Emory University, Atlanta, Georgia; the Division of Health Promotion and Behavioral Sciences (Lawrence, Vernon, Fernandez), the University of Texas School of Public Health, Houston, Texas; the Division of Cancer Control and Population Sciences, the National Cancer Institute (Taplin), National Institutes of Health, Bethesda, Maryland; the UCLA School of Public Health (Bastani), Los Angeles, California; Gillings School of Global Public Health (Rimer), University of North Carolina at Chapel Hill, Chapel Hill, North Carolina; Medical University of South Carolina (Melvin), Charleston, SC; the Division of Public Health Sciences (Taylor), Fred Hutchinson Cancer Research Center, Seattle, Washington; the Department of Biostatistics and Epidemiology (Glanz), Perelman

School of Medicine, the Department of Biobehavioral Health Sciences (Glanz), School of Nursing, the University of Pennsylvania, Philadelphia, Pennsylvania, Barbara DeVinney is an Independent Contractor in Christiansburg, Virginia.

Dr. Wilson was affiliated with the Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, CDC, and Dr. Melvin was affiliated with The University of North Carolina at Chapel Hill when this research was completed.

Names and affiliations of Task Force members are available at www.thecommunityguide.org/about/task-force-members.html.

Address correspondence to: Susan A. Sabatino, MD, MPH, Division of Cancer Prevention and Control, CDC, 4770 Buford Highway (K-55), Atlanta GA 30341. E-mail: SSabatino@cdc.gov.

0749-3797/\$36.00

<http://dx.doi.org/10.1016/j.amepre.2012.04.009>

Context

Cancer is the second-leading cause of death in the U.S.¹ According to U.S. Cancer Statistics,² more than 560,000 people died from cancer in 2007. Screening reduces cancer mortality, and in some cases, incidence from breast, cervical, and colorectal cancers.^{3–5} The U.S. Preventive Services Task Force recommends age-appropriate screening for breast cancer with mammography; cervical cancer with Pap tests; and colorectal cancers with fecal occult blood test (FOBT), flexible sigmoidoscopy, or colonoscopy.^{3–5}

Although screening use has improved over time for several screening tests,^{6–8} rates are still suboptimal. This is particularly true for colorectal cancer screening; approximately 35%–50% of the population has not been screened at recommended intervals.^{8–11} For breast cancer screening, 25%–30% of age-eligible women report not having had recent mammograms^{6,11}; for cervical cancer screening, approximately 20% of women aged 18–44 years have not had Pap tests within the prior 3 years.^{6,11} Rates of regular screening use are even lower,^{12,13} and screening rates have not risen in recent years.¹⁴ Further, for many cancers, there are disparities in screening use for underserved groups, such as those with low income, no insurance, or no usual source of care.^{8,11,14–16} Interventions to increase appropriate screening use can help achieve national screening objectives (www.healthypeople.gov/2020) and save lives, and may reduce disparities in screening.

The *Guide to Community Preventive Services* (*Community Guide*), under the guidance of the independent, non-federal Community Preventive Services Task Force (the Task Force), previously conducted systematic reviews^{17–20} on effectiveness of interventions to increase screening for breast, cervical, and colorectal cancers. Evidence for reviews was based on studies published between 1966 and 2004, and provided the basis for Task Force recommendations for intervention use. Interventions selected for these reviews were included in one of three strategies conceptualized to increase screening: increasing community demand for screening, reducing barriers to access, and increasing screening service delivery by healthcare providers. The first two strategies included client-directed approaches; the third strategy included provider-directed approaches to promote use of appropriate screening.

Eleven intervention categories were defined and grouped within these three strategies, which are as follows:

- client reminders, client incentives, one-on-one education, group education, mass media, and small media (increasing community demand);

- reducing client out-of-pocket costs and reducing structural barriers (enhancing access);
- provider reminders, provider assessment and feedback, and provider incentives (increasing provider delivery).

Findings from these reviews led to Task Force recommendations for seven interventions to increase use of one or more of these recommended cancer screening tests. There was insufficient evidence to determine the effectiveness for remaining intervention categories.^{17–20}

Given the number of intervention categories for which effectiveness was not established for one or more cancer screening sites, the relative lack of evidence across reviews for colorectal cancer screening, and the particular need to increase uptake of colorectal cancer screening in appropriate populations, the *Community Guide* team, Task Force, and the Cancer Prevention and Control Research Network (CPCRN) sought to update these systematic reviews. This article presents results from the updated reviews of effectiveness for group education, one-on-one education, client incentive, client reminder, mass media, reducing out-of-pocket costs, reducing structural barriers, provider assessment and feedback, and provider incentive interventions to increase screening for breast, cervical, and colorectal cancers. Summary Task Force findings from the original reviews and from these updates are presented in Table 1.

These updated reviews sought to address three questions:

- whether interventions for which there was insufficient evidence to determine effectiveness in the previous reviews^{17–20} now had sufficient evidence to determine effectiveness;
- whether additional evidence would lead to a change in findings for interventions found to have sufficient or strong evidence of effectiveness on previous review;
- what important research gaps remain.

An updated review for small media interventions is underway. A review¹⁷ of provider reminders was published recently.

Evidence Acquisition

Methods for conducting the original *Community Guide* systematic reviews of interventions to increase breast, cervical, and colorectal cancer screening are described elsewhere.²¹ These methods were followed for the current updates with the exception of adaptations described in this section.

Analytic frameworks for the three primary strategies assessed through updated reviews are shown in Figures 1–3. These frameworks are unchanged from those used in the original reviews with the exception that they were revised to incorporate healthcare system factors. Updated reviews used the same primary strategies,

Table 1. Original and updated Community Preventive Services Task Force findings^a for cancer screening interventions

Intervention	Original review findings ^b	Updated review findings
INCREASING COMMUNITY DEMAND FOR SCREENING		
Group education		
Breast cancer screening	Insufficient evidence	Recommended: sufficient evidence
Cervical cancer screening	Insufficient evidence	Insufficient evidence
Colorectal cancer screening	Insufficient evidence	Insufficient evidence
One-on-one education		
Breast cancer screening	Recommended: strong evidence	Recommended: strong evidence
Cervical cancer screening	Recommended: strong evidence	Recommended: strong evidence
Colorectal cancer screening	Insufficient evidence	Recommended: sufficient evidence^c
Client reminders^d		
Breast cancer screening	Recommended: strong evidence	Recommended: strong evidence
Cervical cancer screening	Recommended: strong evidence	Recommended: strong evidence
Colorectal cancer screening	Recommended: sufficient evidence ^c	Recommended: strong evidence^c
Client incentives		
Breast cancer screening	Insufficient evidence	Insufficient evidence
Cervical cancer screening	Insufficient evidence	Insufficient evidence
Colorectal cancer screening	Insufficient evidence	Insufficient evidence
Mass media		
Breast cancer screening	Insufficient evidence	Insufficient evidence
Cervical cancer screening	Insufficient evidence	Insufficient evidence
Colorectal cancer screening	Insufficient evidence	Insufficient evidence
INCREASING COMMUNITY ACCESS TO SCREENING		
Reducing structural barriers		
Breast cancer screening	Recommended: strong evidence	Recommended: strong evidence
Cervical cancer screening	Insufficient evidence	Insufficient evidence
Colorectal cancer screening	Recommended: strong evidence ^c	Recommended: strong evidence ^c
Reducing out-of-pocket costs		
Breast cancer screening	Recommended: sufficient evidence	Recommended: sufficient evidence
Cervical cancer screening	Insufficient evidence	Insufficient evidence
Colorectal cancer screening	Insufficient evidence	Insufficient evidence
INCREASING PROVIDER DELIVERY OR PROMOTION OF SCREENING		
Provider assessment and feedback	Recommended: sufficient evidence ^c	Recommended: sufficient evidence ^c
Provider incentives	Insufficient evidence	Insufficient evidence

^aStrength of evidence based on the number of available studies, the suitability of study design for evaluating effectiveness, the quality of execution of studies, the consistency of results across studies, and the magnitude of effect.^{21,23}

^bFindings published in Baron et al.^{18,19} and Sabatino et al.²⁰

^cInsufficient evidence to determine effectiveness for colorectal cancer screening with tests other than FOBT

^dFor client reminders, the original review was limited to studies with greatest design suitability (e.g., RCTs) because of the large number of such studies identified. All update studies for client reminder interventions had greatest design suitability except for one. That study was not included in the assessment of absolute change in screening use for cervical or colorectal cancer, and exclusion of that study did not change overall conclusions for any of the three cancer screening sites.

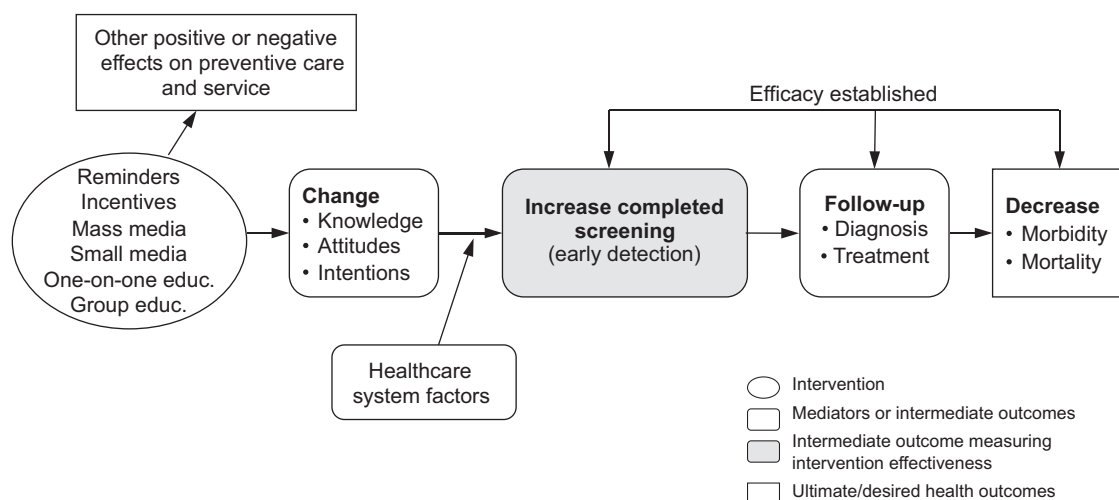


Figure 1. Analytic framework: client-directed interventions to increase community demand for cancer screening services educ, education

intervention categories, and definitions as the original reviews. This report includes updates for nine of these reviews.

Reaffirmation Updates, Interval Updates, and Full Updates

Three types of update approaches were possible. The approach selected by the team depended on strength of evidence in the original review. Where evidence of effectiveness was strong or sufficient (Table 1), the team pursued reaffirmation and interval updates, respectively. Where evidence was insufficient to determine effectiveness, full updates were undertaken. For reaffirmation updates, evidence from studies identified during update was compared with evidence from the original review for consistency. In the interest of efficiency, scoring studies for quality of execution, whereby the internal validity of included studies was assessed using a standardized *Community Guide* process,²¹ was not required,

because these interventions previously were determined to have strong evidence of effectiveness.

For interval updates, evidence from update studies also was compared with that from the original review. For these updates, studies were scored for quality of execution.²¹ For full updates, evidence from the update was combined with evidence from the original review and synthesized using standard *Community Guide* methods.²¹ In some instances where reaffirmation or interval updates were undertaken, evidence from both reviews was combined to address specific research questions of interest identified by the team.

Updated reviews were based on evidence from literature published between January 2004 and October 2008. Although some studies in the original review were published in 2004, the original reviews did not include the entire calendar year of 2004. Thus, 2004 was included in the search strategy for updated reviews. Studies

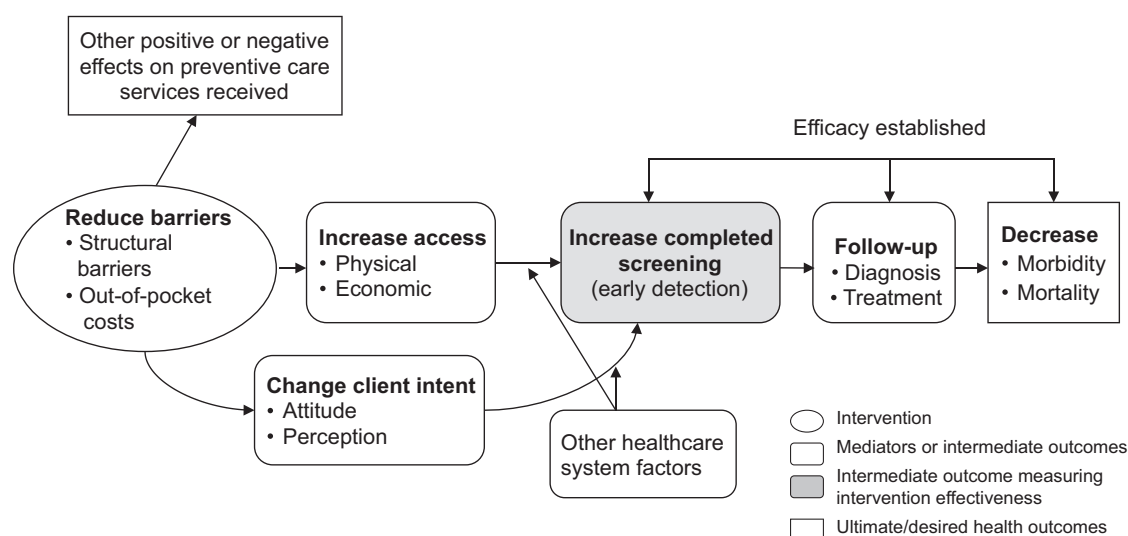


Figure 2. Analytic framework: client-directed interventions to increase community access to cancer screening services

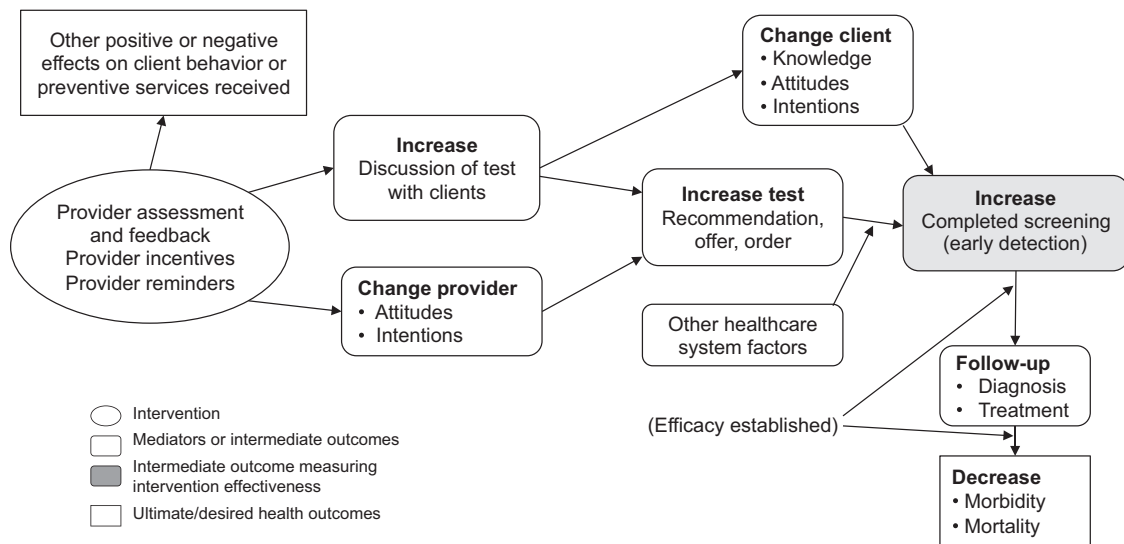


Figure 3. Analytic framework: provider-directed interventions to increase screening for breast, cervical, and colorectal cancers

from 2004 included in the original reviews were excluded from the body of evidence for updates.

The team searched five computerized databases for potentially eligible studies (MEDLINE; the Cumulative Index to Nursing and Allied Health database [CINAHL]; the Chronic Disease Prevention database [CDP, Cancer Prevention and Control subfield]; PsycINFO; and the Cochrane Library databases). (Search terms are available at www.thecommunityguide.org/cancer/screening/provider-oriented/supportingmaterials/SSclient_provider.html.) The team also reviewed citations received from team members and reference lists from articles, as appropriate. Conference abstracts were not included.

The search identified 18,906 citations for which titles and abstracts were screened for potential relevance to the interventions and outcomes of interest. Full-text review was undertaken for 319 of these articles. As in the original reviews, studies had to (1) be a primary investigation of at least one of the defined intervention categories; (2) be conducted in a country with a high-income economy²¹ to increase applicability to the U.S.²²; (3) provide information on one or more cancer screening outcomes of interest (breast, cervical, and/or colorectal cancer screening); and (4) include a comparison group that either reflected screening use prior to intervention implementation or a concurrent group unexposed to the intervention category of interest. A total of 45 studies qualified for these reviews.

Qualifying studies were abstracted independently by two abstractors using a standardized abstraction form. Following *Community Guide* methods, information about study design suitability, quality of execution, sample, intervention and comparison groups, outcomes, and effect was abstracted. When necessary, conflicts were resolved by review by a third team member. Design suitability categories included greatest, moderate, and least suitable according to *Community Guide* rules.²³ Quality of execution is used to assess biases and limitations in study execution. Quality was categorized as good, fair, or limited.²³ Studies of limited quality were excluded from analyses, consistent with *Community Guide* rules.

Consistent with previous reviews, intervention effectiveness was evaluated by examining the difference between change in screening

use in the intervention group attributable to the intervention and concurrent change in the comparison group. When this was not possible, effectiveness was evaluated either by examining the difference in post-intervention screening use between groups or change from pre-intervention to post-intervention in the same group, depending on the data available. Interpretation of findings and conclusions followed *Community Guide* rules, with evidence about intervention effectiveness categorized as strong evidence of effectiveness, sufficient evidence of effectiveness, or insufficient evidence to determine effectiveness, based on number of available studies, suitability of study design for evaluating effectiveness, quality of execution of studies, consistency of results across studies, and magnitude of effect.^{21,23}

Conclusions of insufficient evidence to determine effectiveness do not indicate that interventions are ineffective, but rather that more information is needed to determine whether or not interventions are effective. The number of studies required to determine effectiveness varied depending on the quality of execution and design suitability of studies included.²³ Information about populations and settings for which recommendations are relevant is provided in the Applicability sections. According to *Community Guide* rules,²¹ where evidence of intervention effectiveness was sufficient or strong, information about effectiveness, applicability, additional benefits and potential harms, barriers to implementation, and research gaps was summarized. Where evidence was insufficient to determine effectiveness, remaining questions about effectiveness were summarized.

For client reminders, the original review was limited to studies with greatest design suitability (e.g., RCTs), because of the large number of such studies identified. However, the updated reviews were expanded to include all designs to maximize the potential to address additional research questions, including examining incremental effects of client reminder interventions when added to other interventions. All update studies had greatest design suitability except for one study. This study was not included in the assessment of absolute change in screening use for cervical or colorectal cancer. Exclusion of this study did not change overall conclusions for any of the three cancer screening sites.

As in the original reviews of provider-directed interventions, studies that reported only screening tests recommended or offered but not completed were not included in the determination of intervention effectiveness. These studies could be used to provide information about applicability, implementation, and other effects. Also consistent with the original reviews,^{17,20} effectiveness of provider-directed interventions was determined by considering evidence across all three cancer screening sites combined, as long as there were not differences in effectiveness by screening test. Additional information about *Community Guide* methods is available at www.thecommunityguide.org/about/methods.html.

Evidence Synthesis

Increasing Community Demand for Screening: Group Education

Definition. Group education conveys information about indications for, benefits of, and ways to overcome barriers to screening with goals of informing, encouraging, and motivating participants to seek recommended screening. Group education usually is conducted by health professionals or by trained lay people who use presentations or other teaching aids in lectures or interactive formats; they often incorporate role modeling or other methods. Group education can be given to a variety of groups, in different settings, and by different types of educators with different backgrounds and styles.

Breast cancer screening promotion (full update). Of 13 qualifying studies of group education interventions to increase breast cancer screening, ten²⁴⁻³³ had greatest design suitability with good to fair quality of execution, and three³⁴⁻³⁶ had least suitable designs with fair quality of execution. Twelve studies^{24-34,36} examined post-intervention completion of mammography screening, as determined by self-report. One study³⁵ examined county-level mammography rates. Most studies^{24,26-35} used interactive education programs with one or more sessions intended to improve participants' screening awareness, knowledge, and attitudes. Eight studies focused specifically on breast cancer, and four others addressed multiple cancers. Where specified, interventions were conducted in the U.S. and specifically targeted minority^{26-28,32-36} and elderly^{25,26,29,31,35} populations. An additional study³⁰ targeted self-identified gay, lesbian, and transgendered participants. Most programs were delivered in churches or homes within communities.

Of these studies, 12, with 13 intervention arms (one report²⁴ included two study arms), yielded a post-intervention median absolute percentage point change of 11.5 (interquartile interval [IQI] = 5.5, 24.0). Results from the remaining study³² could not be expressed as an absolute percentage point change. It reported AORs of receiving a mammogram at group (0.82, 95% CI = 0.44, 1.56) and individual

(1.31, 95% CI = 0.99, 1.74) levels. Group-level analysis was adjusted for baseline measures and screening behaviors. Individual-level analysis was adjusted additionally for intervention group, level of acculturation, age, education, and insurance status.

Cervical cancer screening promotion (full update). Five studies qualified for the combined body of evidence; one study³⁷ identified during update was excluded because of limited quality of execution. Three qualifying studies^{26,28,32} had greatest design suitability and fair quality of execution and two^{36,38} had least-suitable designs and fair quality of execution. Four studies^{26,28,36,38} examined self-reported Pap test use. For one study,³⁶ the type of education (interactive or didactic) could not be determined; the four remaining studies included an interactive format. Education sessions were delivered by lay health workers or peer facilitators in three studies^{28,32,36} and by health professionals in the others. Where specified, interventions were conducted in the U.S., among African Americans, Latin Americans, Filipino Americans, and whites, and in populations of low- to mixed- or middle-class SES. Most programs were delivered in churches or homes in the community.

Data from four studies could be converted to a common metric and yielded a post-intervention absolute median percentage point change in screening completed of 10.6 (range of values: 0 to 59.1). The remaining study³² reported an AOR of receiving a Pap test at group (0.69 [95% CI = 0.41, 1.19]) and individual (1.12 [95% CI = 0.91, 1.37]) levels. ORs were adjusted for factors described in Breast Cancer Screening Promotion, above.

Colorectal cancer screening promotion (full update). Two studies^{36,39} were included in the combined body of evidence. One study³⁹ with three intervention arms had greatest study design suitability and good quality of execution. The other³⁶ had least-suitable design and fair quality of execution. Both studies examined post-intervention changes in colorectal cancer screening by FOBT as determined by the proportion of returned FOBT kits. One study³⁹ offered interactive group sessions delivered by peer facilitators, and the other³⁶ offered sessions delivered by *promotoras* with an in-class format. For this study, the team was unable to determine if discussions were delivered in an interactive or didactic format. Interventions were interactive education programs delivered in churches or homes in the community. Populations included Latinas, African Americans, and white Americans. The two studies included four intervention arms and yielded a median absolute percentage point change of 4.4 (range of values: -13 to 37).

Conclusion. According to *Community Guide* rules of evidence, there is now sufficient evidence that group education

is effective in increasing screening for breast cancer (Table 1). There still is insufficient evidence to determine the effectiveness of group education in increasing screening for cervical cancer and colorectal cancer because of small numbers of studies, methodologic limitations of identified studies, and inconsistent findings.

Applicability. Based on populations and settings included in these studies, group education interventions to increase breast cancer screening should be applicable across a range of settings and populations, provided they are adapted to target populations and delivery context. Results from studies targeting specialized populations may not be generalizable to interventions directed at the general population.

Increasing Community Demand for Screening: One-on-One Education

Definition. One-on-one education conveys information to individuals by telephone or in person about indications for, benefits of, and ways to overcome barriers to screening with the goal of informing, encouraging, and motivating people to seek recommended screening. These messages are delivered by healthcare workers or other health professionals, lay health advisors, or volunteers, and are conducted in medical, community, work-site, or household settings. Interventions can be untailored to address the overall target population or tailored according to individual assessments to address the recipient's individual characteristics, beliefs, or perceived barriers to screening. As defined for this review, one-on-one education may be accompanied by a small media or a client reminder component.

Breast cancer screening promotion (reaffirmation update). The original review¹⁸ found strong evidence of effectiveness based on a median increase in mammography use across 23 studies of 9.2 percentage points (IQI=4.9, 14.4), and ORs from four additional study arms in the favorable direction. Nine studies^{40–48} were included in the update. All had greatest design suitability.

As in the original review,¹⁸ outcomes were assessed by self-report^{40,41,46,47} or medical record review.^{42–45,48} Interventions were delivered in the home^{40–48} or clinic,⁴⁴ by medical^{40,44} and nonmedical professionals,^{41–43,45–48} by telephone,^{40,42,44–48} or in person.^{41,43,44} Most studies included tailored components.^{40,42–47} Studies were conducted in the U.S. and included urban^{40,41,44,45,48} and rural populations.^{42,43} Studies included participants who were African-American, Hispanic,^{40,41,43,45–48} Asian-American,^{46,47} and Native American⁴³; had low SES had increased risk for breast cancer^{46,47}; and were non-adherent with recent screening.

Results from two studies^{46,47} of participants with increased breast cancer risk ranged from 1 to 18 percentage

point increases in mammography use. Of five studies^{40,42,43,45,48} of absolute change not specific to participants at increased risk, the median increase for seven intervention arms was 11.9 percentage points (range of values: 6.5 to 15.2).

To compare effects of tailored interventions with those not explicitly tailored (referred to as “untailored”), the team examined evidence from both reviews. Among the 30 studies measuring absolute change, 23 studies^{40,42,43,45–47,49–65} evaluated 30 tailored intervention arms, and demonstrated a median effect of 9.7 percentage points (IQI=6.5, 15.2). For the nine studies^{48,56,64,66–71} evaluating nine untailored intervention arms, the median effect was 6.3 percentage points (IQI=2.0, 11.4). Findings from the three studies^{56,64,72} in the original review providing intra-study comparisons of tailored versus untailored intervention arms were consistent with the larger effect seen for tailored interventions. No update studies provided information about both tailored and untailored interventions.

To examine the effect of one-on-one education interventions among underserved populations, the team identified nine studies^{40,43,45,48–50,52,65,70} from both reviews that described their samples as including predominantly low-income women, or that reported that >30% of their sample had income less than \$15,000–\$20,000. The median effect across 13 effect estimates from these nine studies was 10.4 percentage points (IQI=9.4, 15.1), compared with a median of 8.8 percentage points (IQI=2.0, 14.4) for the remaining 21 studies ($n=26$ effect estimates).

The team also sought to evaluate the incremental effect of one-on-one education interventions beyond the effect of other intervention components common to two or more study arms. Five studies^{40,41,44–46} were identified from the update, seven studies^{49–51,55,60,63,69} from the original review, and one study⁷³ from the review of multicomponent interventions that allowed this type of comparison. Two of these studies^{44,63} provided information about three comparisons that included a different form of one-on-one education in comparison groups (e.g., the incremental effect of phone education beyond the effect of in-person education combined with other intervention components⁴⁴). Across all 13 studies ($n=15$ effect estimates), the overall median incremental effect was 6.1 percentage points (IQI=2.0, 11.0). Effects for the three comparisons that included forms of one-on-one education in comparison groups were –17.4, –3.0, and 11.0 percentage points.

Cervical cancer screening promotion (reaffirmation update). The original review¹⁸ found strong evidence of effectiveness based on a median increase of 8.1 percent-

age points (IQI=5.7, 17.3), with three studies evaluating five tailored intervention arms, and two studies evaluating three untailored arms. No additional studies were identified during update.

Colorectal cancer screening promotion (full update). All seven qualifying studies in the combined body of evidence had greatest design suitability, four⁷⁴⁻⁷⁷ with good and three⁷⁸⁻⁸⁰ with fair quality of execution. Most studies^{75,76,78,80} ascertained screening use via medical record review, although others reviewed appointment attendance,⁷⁷ screening program records,⁷⁹ or ascertained use by self-report confirmed by physician survey.⁷⁴ Interventions were delivered in both home^{74,77-79} and clinic settings,^{75,76,80} by phone,⁷⁷⁻⁷⁹ in person,^{74-76,80} or by medical professionals^{74,75,80} or others.^{74,76-79} Three studies^{74,78,79} evaluated tailored interventions. Most studies included participants aged ≥ 50 years, although two included participants in their 40s.^{74,80} In addition to white participants, studies included African-American,^{75,77} Hispanic,⁷⁵ and Asian-American^{74,76} participants; participants with low SES^{76,80}; and urban populations.⁷⁵⁻⁷⁷ No studies specified inclusion of rural populations. One study⁷⁴ included participants at increased risk due to a first-degree family history of colorectal cancer. All studies were conducted in the U.S.

These seven studies evaluated 15 intervention arms (one study⁸⁰ included six intervention arms) and reported outcomes for FOBT ($n=10$ effect estimates)^{75,76,78-80}; flexible sigmoidoscopy ($n=1$ effect estimate)⁷⁸; colonoscopy ($n=2$ effect estimates)^{78,80}; and with any test ($n=2$ effect estimates).^{74,78} The median effect for FOBT was 19.1 percentage points (IQI=12.9, 25.1). Effects for any cancer screening test ranged from 1 to 11 percentage points, and for colonoscopy ranged from 0 to 11 percentage points. The one study reporting flexible sigmoidoscopy outcomes reported no effect.

Among the five studies of FOBT screening, two evaluated tailored interventions^{78,79} and three studies,^{75,76,80} with evaluable data from eight intervention arms, did not. Effects for tailored interventions ranged from 1 to 20.7 percentage points. The median for untailored interventions was 20.7 percentage points (IQI=13.8, 25.8). No studies included within-study comparisons of tailored and untailored interventions. The few studies of tailored and of untailored arms along with overlapping findings by tailored status, makes drawing conclusions for FOBT based on tailoring difficult. The team also stratified analyses by whether interventions were delivered by phone or in person, by medical professionals or others, and whether small media and/or client reminders were in-

cluded. No clear differences emerged, although the number of effect estimates in some strata was small.

Conclusion. According to *Community Guide* rules of evidence, there is strong evidence that one-on-one education is effective in increasing screening for breast and cervical cancers, and sufficient evidence of its effectiveness in increasing colorectal cancer screening with FOBT (Table 1). However, evidence remains insufficient to determine the effectiveness of one-on-one education in increasing colorectal cancer screening with other modalities, because too few studies were identified, and results for those studies were inconsistent (colonoscopy).

Applicability. In the original review, the Task Force concluded that findings for breast and cervical cancer screening should apply both to tailored and untailored interventions across a range of populations, provided intervention programs were adapted to target population and delivery context. Studies included in the update support these conclusions. Recommendations for colorectal cancer screening with FOBT also should apply across a range of populations. Although no studies explicitly noted the inclusion of rural populations, findings are not expected to differ substantially from those of urban and unspecified populations.

Increasing Community Demand for Screening: Client Reminders

Definition. Client reminders or recalls are textual (letter, postcard, e-mail) or telephone messages advising people that their screening is due (reminder) or overdue (recall). Client reminders may be enhanced by one or more of the following: follow-up printed or telephone reminders; additional text or discussion with information about indications for, benefits of, and ways to overcome barriers to screening; and assistance in scheduling appointments. Interventions can be untailored to address the overall target population or tailored with the intent to reach one specific person, based on characteristics unique to that person, related to the outcome of interest, and derived from an individual assessment.

Breast cancer screening promotion (reaffirmation update). The original review¹⁸ of client reminders found strong evidence of effectiveness based on a median increase of 14.0 percentage points in recent mammography (19 studies; IQI=2.0, 24.0) and three additional studies demonstrating an increase in repeat mammography. In the update, six additional studies⁸¹⁻⁸⁶ were included. All had greatest design suitability except for one⁸³ with least-suitable design. Exclusion of this study⁸³ did not change overall conclusions.

Outcomes for update studies of breast cancer screening promotion were ascertained via self-report,⁸⁶ medical record review,⁸⁵ administrative records,^{81,82,84} or screening program attendance.⁸³ Interventions included both textual⁸³⁻⁸⁶ and telephone reminders,^{81,82} which included automated interactive voice response reminders (AIVR) by phone⁸¹ as well as tailored interventions⁸⁶ and enhanced interventions^{82,84-86} (as in the original review,¹⁸ defined as including follow-up reminders, additional text, discussion, or appointment scheduling assistance). Studies included reminders delivered by clinical practices or organizations,^{81,85} screening programs or registries,⁸²⁻⁸⁴ or other sources.⁸⁶ Where specified, interventions were conducted in the U.S.^{82,84-86} and Norway.⁸³ Studies included white,^{82,84-86} African-American,^{82,86} and Hispanic participants.⁸⁶ No studies specified inclusion of other racial or ethnic groups, although several included groups of unspecified race. Others did not report race or ethnicity. Individuals with low SES^{82,84} and urban or mixed urban/rural populations^{82,84,85} also were included. Several studies did not report this information.

Of four update studies^{81,83,84,86} providing information about absolute change in mammography use, two^{81,83} provided information about recent screening only, defined as completion of the most recent mammogram within a specified interval; one⁸⁴ provided information about repeat mammography only, defined as examining two or more consecutive, on-time mammograms; and one⁸⁶ provided information about both. The only phone intervention among these four studies was the AIVR study.⁸¹ When studies from both reviews were combined to examine differences by recent versus repeat screening use, the median increase for recent use was 12.3 percentage points (IQI=3.0, 18.9; $n=30$ effect estimates) and for repeat mammography was 6.0 percentage points (IQI=3.0, 19.1; $n=8$ effect estimates).

Findings from the original review also suggested that unenhanced, printed reminders have smaller effects than enhanced or telephone reminders (median 3.6 percentage points across 12 studies vs 18.5 percentage points across 13 studies, respectively). This conclusion was supported by all nine intra-study comparisons. When the team incorporated update studies,^{81,83,84,86} including one study⁸⁴ with separate arms for unenhanced and enhanced client reminders, findings reaffirmed that enhanced or telephone reminders may have a greater effect (15.5 percentage points [IQI=7.0, 29.0] vs 4.5 percentage points [IQI=1.9, 14.0]).

The team also examined the incremental effect of client reminders beyond the effect of other intervention components common to two or more study arms. One study⁸⁵ in the update, six studies⁸⁷⁻⁹² in the original review, and two studies^{93,94} from the review of multicomponent in-

terventions enabled this type of comparison. Across all nine studies ($n=12$ effect estimates), the overall median incremental effect was 5.0 percentage points (IQI=1.6, 6.7).

One study⁸² in the update provided information about the effect of a telephone client reminder in increasing screening use by either clinical breast exam or mammography. Because of the different outcome, it was not included in analyses of absolute change in mammography use. This study⁸² showed an absolute increase in screening of 8 percentage points.

Cervical cancer screening promotion (reaffirmation update). The original review¹⁸ found strong evidence of effectiveness based on a median increase in Pap test use across 14 intervention arms of 10.2 percentage points (IQI=6.3, 17.9). In the update, six additional qualifying studies^{81,85,95-98} were identified. All had greatest design suitability except for one⁹⁵ with least-suitable design. This study⁹⁵ was not included in the assessment of absolute change in screening use; exclusion of this study did not change overall conclusions.

Outcomes for update studies of cervical cancer screening promotion were ascertained via medical record review,⁸⁵ administrative records,⁸¹ or screening registry records.⁹⁶⁻⁹⁸ Method of ascertainment was not reported in one study.⁹⁵ Interventions included printed reminders only,^{85,96,98} telephone reminders only,⁸¹ and printed reminders with telephone follow-up reminders.^{95,97} Reminders were delivered by clinical practices or organizations^{81,85,95} and screening programs or registries.⁹⁶⁻⁹⁸ No studies included tailored interventions, and four^{85,95,97,98} included enhanced interventions. Where specified, interventions were conducted in the U.S., Sweden,⁹⁷ Belgium,⁹⁶ and Australia.^{95,98} One study⁸⁵ reported including nonwhite participants but did not provide more-specific information. The remaining studies did not report race/ethnicity. The one study⁹⁷ that reported SES included low-SES participants. Three studies^{85,95,98} included urban or mixed urban/rural populations. The other three studies^{81,96,97} did not report urban/rural status.

Four studies^{81,96-98} evaluating five intervention arms provided information about absolute changes in screening use. One⁹⁷ provided information about both follow-up printed reminders and follow-up telephone reminders. The median increase was 2.8 percentage points (range of values: 1.6 to 31.4). Although the increase in the update was smaller than in the original review,¹⁸ effect estimates from the update fell within the range of effects in the original review.

As for breast cancer screening, findings from the original review¹⁸ suggested that unenhanced printed

reminders may have a smaller effect than enhanced or telephone reminders (median increase 9.8 percentage points vs 15.5 percentage points, respectively). This conclusion was supported by one intra-study comparison.¹⁸ Among three update studies^{81,97,98} evaluating four intervention arms that included telephone and/or enhanced reminders, the range of effects was 1.6 to 31.4 percentage points. The one update study of printed unenhanced reminders reported a 1.8 percentage point increase.⁹⁶ No differences were noted according to other study characteristics, although there were few update studies, which limited the authors' ability to detect differences.

The team also examined the incremental effect of client reminders beyond the effect of other intervention components common to two or more study arms. One study⁸⁵ in the update interval, one study⁹⁹ in the original review, and two studies^{93,94} from the original review of multicomponent interventions enabled this type of comparison. These studies evaluated five intervention arms and provided information about the incremental effect of client reminders in addition to provider-directed interventions. The overall median incremental effect was 3.7 percentage points (range of values: –3.5 to 25.2). One update study⁹⁵ reported the relative increase in number of Pap tests performed over 2 years to be 6.3%. Because of the different outcome (i.e., number of tests), it was not included in analyses of absolute change.

Colorectal cancer screening promotion (interval update for fecal occult blood testing). The original review found sufficient evidence of effectiveness for client reminders to increase colorectal cancer screening with FOBT based on a median increase across four studies ($n=8$ effect estimates) of 11.5 percentage points (IQI=8.9, 20.3). The update included three additional studies.^{85,100,101} All had greatest design suitability except for one¹⁰¹ with least-suitable design. That study was not included in the assessment of absolute change in screening and its exclusion did not change overall conclusions. All three studies had fair quality of execution.

Outcomes for update studies were ascertained via survey¹⁰⁰ and medical record review.^{85,101} All interventions were printed, none were tailored, and two^{85,100} were enhanced. Reminders were delivered by clinical practices or organizations^{85,101} or screening programs.¹⁰⁰ Where specified, interventions were conducted in the U.S. and Italy.¹⁰¹ One⁸⁵ study reported including nonwhite participants, although it did not provide more-specific information. The remaining studies did not report race/ethnicity. Two studies^{85,100} included mixed urban/rural or non-urban populations; the third did not report urban/rural status.

No update studies provided information about absolute changes in screening. The two studies^{85,100} with greatest suitability provided information about incremental effects of client reminders on FOBT screening. One study⁸⁰ from the original review and two studies^{93,94} from the review of multicomponent interventions also allowed this type of comparison for FOBT screening. Across all five studies^{80,85,93,94,100} evaluating nine intervention arms, the median incremental effect for FOBT use was 10.9 percentage points (IQI=6.0, 13.5).

No studies in the original review provided information about colorectal cancer screening with tests other than FOBT. Two update studies^{85,100} evaluating five intervention arms provided information about incremental effects of client reminders on use of flexible sigmoidoscopy, colonoscopy, or barium enema. The median increase across these five effect estimates was 0.5 percentage points (range of values: 0.0–6.0). One study¹⁰⁰ reported the incremental effect on completion of any colorectal cancer screening test (FOBT, flexible sigmoidoscopy, colonoscopy, or barium enema) to be 1.0 percentage point.

One update study¹⁰¹ provided information about a printed follow-up reminder to participants randomized to one of five screening-test regimens who did not respond. The outcome was FOBT or flexible sigmoidoscopy completion. Because of the different nature and outcome of this study,¹⁰¹ it was not included in analyses of absolute or incremental change. Absolute increases associated with reminders were reported to be 9.2% and 11.1% for participants invited to complete mailed FOBT kits and FOBT delivered by general practitioners, respectively, and 3.3% for participants invited to complete one-time sigmoidoscopy and 3.2% for flexible sigmoidoscopy followed by FOBT.

Conclusion. According to *Community Guide* rules of evidence, there is strong evidence that client reminders are effective in increasing screening for breast and cervical cancers and for colorectal cancer with fecal occult blood testing (Table 1). However, evidence remains insufficient to determine its effectiveness in increasing colorectal cancer screening with other tests (colonoscopy, flexible sigmoidoscopy) because evidence from the two additional studies identified produced inconclusive results.

Applicability. The original review¹⁸ concluded that recommendations for client reminder interventions to increase screening for breast, cervical, and colorectal cancer (FOBT only) should be applicable across a range of settings and populations, provided they are adapted to the target populations and delivery context. Studies included during the update support these conclusions.

Increasing Community Demand for Screening: Client Incentives

Definition. Client incentives are small, noncoercive rewards (e.g., cash or coupons) to motivate people to seek cancer screening for themselves or to encourage others (e.g., family members, close friends) to seek screening. Incentives are distinct from interventions designed to improve access to services (e.g., transportation, child care, reducing client out-of-pocket costs).

Breast cancer screening promotion (full update). One study¹⁰² qualified for review and had greatest design suitability and fair quality of execution. This study evaluated the effect of a \$10 incentive for women who completed mammography screening through a pre-existing program that provided free mammograms to low-income, under-, or uninsured women. The intervention was sent to all women in a commercial database who were aged 40–63 years and from census blocks having household size and income characteristics consistent with program guidelines. However, only program-eligible women were included in assessing mammography completion.

The study provided information about the incremental effect of adding client incentives to screening availability information and appointment scheduling assistance. The incremental effect was 0.52 percentage points (95% CI=0.32, 0.72). Results restricted to women eligible for the free screening program, rather than all women in the identified census blocks, yielded an incremental effect of <2.0 percentage points.

Cervical cancer screening promotion (full update). No qualifying studies evaluating the effect of client incentives on cervical cancer screening were identified.

Colorectal cancer screening promotion (full update). No qualifying studies evaluating the effect of client incentives on colorectal cancer screening were identified.

Conclusion. According to *Community Guide* rules of evidence, there is insufficient evidence to determine the effectiveness of using client incentives to increase screening for breast, cervical, or colorectal cancers, because only one study¹⁰² for breast cancer and no studies for cervical and colorectal cancers qualified for review (Table 1).

Increasing Community Demand for Screening: Mass Media

Definition. Mass media—including TV, radio, newspapers, magazines, and billboards—are used to communicate educational and motivational information in community or larger-scale intervention campaigns. Mass media interventions, however, almost always include other components or

attempt to capitalize on existing interventions and infrastructure. This review evaluated the effectiveness of mass media used alone or its individual contribution to the effectiveness of multicomponent interventions.

Breast cancer screening promotion (full update). Two studies^{103,104} qualified for review. Both had fair quality of execution, one¹⁰³ with greatest and one¹⁰⁴ with moderate design suitability. One study¹⁰⁴ evaluated the effect of a radio and newspaper advertisement campaign compared with usual care among urban, Italian-speaking women in Australia. The outcome was the number of mammograms performed per month, ascertained through review of screening program records. For women in their 50s, the relative percentage change in number of mammograms completed was –16.1% for initial screens and –4.2% for subsequent screens. Among women in their 60s, the relative percentage changes were –10.8% and 9.0% for initial and subsequent screens, respectively.

The second study¹⁰³ compared a multicomponent intervention including a higher-intensity mass media component (messages on city buses, newspaper ads and/or articles, radio and/or TV programs, and public service announcements) with a multicomponent intervention including a lower-intensity mass media component (campus newspapers and yard signs [reported seldom to be employed]). Other components in both arms included group education, small media, and health fairs. The sample included African-American women living in census tracts with a high proportion of African-American residents. The outcome was self-reported completion of a mammogram within 2 years; clinical breast exam within 2 years also was reported. The absolute change in screening was –2.4 percentage points (95% CI= –9.0, 4.2) for mammography and 4.2 percentage points (95% CI= –1.1, 9.5) for clinical breast exam, respectively. No studies included information provided through other modes, such as magazines or the Internet.

Cervical cancer screening promotion (full update). Three studies qualified for review, of which two^{103,105} had greatest and one¹⁰⁶ had least-suitable designs. All had fair quality of execution. The two studies from the original review included three intervention arms. Relative percentage increases in Pap test completion ascertained by record review were reported to be 20.4% and 47.6% in one study and 21.3% in the other. The update study assessed the effect of higher- versus lower-intensity mass media as part of a multicomponent intervention (described further above). The absolute change in women screened within 2 years was 4.7 percentage points.

Colorectal cancer screening promotion (full update). One study¹⁰³ qualified for review. This study examined the effect of higher- versus lower-intensity mass

media as part of a multicomponent intervention (described further above). Outcomes included ever having had FOBT and ever having had proctoscopy. (Like colonoscopy or sigmoidoscopy, proctoscopy involves insertion of a tube into the rectum to look for signs of cancer or other problems, although proctoscopy is an older test that used a rigid tube.¹⁰⁷) The absolute change in screening was -4.7 percentage points (95% CI = $-12.3, 2.9$) for FOBT, and -8.0 percentage points (95% CI = $-15.2, -0.8$) for proctoscopy.

Conclusion. According to *Community Guide* rules of evidence, there is insufficient evidence to determine the effectiveness of mass media interventions in increasing screening for breast, cervical, and colorectal cancers because too few studies qualified for review (Table 1).

Increasing Community Access to Screening: Reducing Structural Barriers

Definition. 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 or patient navigators, transportation, dependent care, translation services, limiting the number of clinic visits). Such interventions often include one or more secondary supporting measures, such as printed or telephone reminders; education about cancer screening; information about screening availability (e.g., group education, pamphlets, or brochures); or measures to reduce client out-of-pocket costs. Interventions principally designed to reduce client costs are considered a separate class of approaches (discussed below).

Breast cancer screening promotion (reaffirmation update). The original review¹⁹ found strong evidence of effectiveness for reducing structural barriers to breast cancer screening, based on a median overall increase in mammography use across seven studies of 17.7 percentage points (IQI = 11.5, 30.5). The update included one additional study¹⁰⁸ with a least-suitable study design.

That study examined self-reported, post-intervention completion of mammography, and clinical breast exam screening. The intervention was a 1-day community celebration in Hawaii with personalized recruitment, one-on-one talk story education sessions, and culturally relevant education brochures. Subjects met with physicians of the same gender, who were flown in for the event.

Other health issues also were discussed (e.g., prostate and colorectal cancer screening). Women residing on Molokai Island who were aged ≥ 40 years were eligible for mammography screening. The post-intervention increase in mammography screening was 18 percentage points (95% CI = $-1.0, 37.0$). The secondary outcome, clinical breast examinations, increased by 34 percentage points (95% CI = 19.0, 49.0).

Cervical cancer screening promotion (full update). Three studies qualified for review. Two studies^{109,110} were of greatest design suitability with fair quality of execution, and the remaining study¹¹¹ had a least-suitable design with fair quality of execution. All three studies of reducing structural barriers examined self-reported, post-intervention Pap test use. Two of three studies^{109–111} investigated effectiveness of alternative screening sites. One study¹¹¹ examined a nurse-led clinic within a correctional facility, and another¹¹⁰ offered on-site screening to residents at a high-rise apartment building. The final study¹⁰⁹ invited participants to receive screening during extended hours. Studies were conducted in the U.S., Canada, and Australia. Participants included low-income female residents of a high-rise apartment building,¹¹⁰ incarcerated women,¹¹¹ and female patients of a university-based general practice who were due or overdue for screening.¹⁰⁹ For the overall body of evidence, the median increase in Pap screening was 13.6 percentage points (range of values: 5.9–17.8).

Colorectal cancer screening promotion (reaffirmation update). The original review¹⁹ found strong evidence of effectiveness of interventions to reduce structural barriers to colorectal cancer screening with FOBT. The median increase was 16.1 percentage points (IQI = 12.1, 22.9; $n=11$ effect estimates). Five additional studies were included in the update. Four studies^{108,112–114} had least-suitable study designs and fair quality of execution. One study¹¹⁵ had greatest suitability of study design, with good quality of execution.

Outcomes in update studies included completion of FOBT alone^{112,115}; colonoscopy or FOBT (including fecal immunochemical tests)¹¹³; any of the three testing modalities (FOBT, sigmoidoscopy, or colonoscopy)¹⁰⁸; and the mean number of colonoscopies per month.¹¹⁴ Outcomes were ascertained by proportion of returned kits,^{112,115} self-report,¹¹³ and medical record¹⁰⁸ or hospital record review.¹¹⁴ Most evidence focused on approaches to reduce time and distance to completing screening (e.g., mailing FOBT cards to clients). Studies were conducted in the U.S. and France and in medical care and community settings. All studies enrolled men and women aged ≥ 50 years. One study¹¹² enrolled participants who were due or overdue for screening. Another

study¹¹⁵ enrolled participants who had not received screening in the previous year. The remaining studies did not specify screening histories. Specified racial/ethnic groups included whites, Hispanics/Latinos, African Americans, and Native Hawaiians. Included populations also varied, from residents of urban communities¹¹³ to residents of a remote Hawaiian Island.¹⁰⁸

Based on four effect estimates in the update studies, there was a median 36.9 percentage point increase across colorectal cancer screening tests (range of values: 16.3 to 41.1). Additional evidence showed a 9.5% relative increase in the mean number of colonoscopies per month.¹¹⁴

Conclusion. According to *Community Guide* rules of evidence, there is strong evidence that reducing structural barriers is effective in increasing screening for breast and colorectal cancers (by mammography and FOBT, respectively; Table 1). Evidence is insufficient, however, to determine whether reducing structural barriers is effective in increasing colorectal cancer screening by flexible sigmoidoscopy or colonoscopy because only one study¹¹⁴ using these screening procedures was identified. Evidence was also insufficient to determine the effectiveness of reducing structural barriers in increasing screening for cervical cancer because only three relevant studies were identified, and these had methodologic limitations.

Applicability. The original review concluded that the evidence for reducing structural barriers interventions to increase breast cancer screening should be applicable across a range of settings for target populations with limited access to mammography. That review placed heavy emphasis on strategies to reduce time and distance or create alternative screening locations. In addition to including populations similar to the original review, the updated body of evidence included a study that focused on rural populations. Hence, findings from the original review are supported, such that recommendations should apply across a range of populations and settings, provided that programs are adapted to target populations and delivery contexts.

For colorectal cancer screening, original review findings were limited to FOBT screening and applicable across a range of settings where target populations may have limited physical access to FOBT. Included studies generally represented white and African-American populations but no other racial ethnic groups. For the updated review, applicability may be expanded, given the addition of studies from another high-income economy¹¹² and studies whose samples included other populations (e.g., Native Hawaiians, Hispanics).

Increasing Community Access to Screening: Reducing Out-of-Pocket Costs

Definition. These interventions attempt to minimize or remove economic barriers that impede client access to cancer screening services. Costs can be reduced through a variety of approaches, including vouchers, reimbursements, reduction in copays, or adjustments in federal or state insurance coverage. Efforts to reduce client costs may be combined with measures to provide client education, information about program availability, or measures to reduce structural barriers.

Breast cancer screening promotion (interval update). The original review¹⁹ found sufficient evidence of effectiveness to recommend interventions that reduce out-of-pocket costs to promote breast cancer screening, based on a median increase in completed mammography across eight intervention arms of 11.5 percentage points (IQI=6.0, 28.5). No additional studies were identified during the update.

Cervical cancer screening promotion (full update). One study¹¹⁶ qualified for review and had least-suitable design and fair quality of execution. This study reported an increase in completed Paps tests of 17 percentage points.

Colorectal cancer screening promotion (full update). No qualifying studies of reducing client out-of-pocket costs interventions to increase colorectal cancer screening were identified.

Conclusion. According to *Community Guide* rules of evidence, there is sufficient evidence that reducing client out-of-pocket costs is effective in increasing screening for breast cancer (Table 1). There is insufficient evidence to determine its effectiveness in increasing screening for cervical or colorectal cancer because too few (cervical cancer) or no (colorectal cancer) studies were identified. Nonetheless, the consistently favorable results for interventions that reduce costs for breast cancer screening and several other preventive services suggest that such interventions are likely to be effective for increasing cervical and colorectal cancer screening as well.

Applicability. The original review¹⁹ concluded that recommendations for use of interventions that reduce out-of-pocket costs to increase screening for breast cancer should be applicable across a range of settings and populations where target populations may have limited financial resources for mammography. Because no additional studies were identified during the update, conclusions about applicability remain unchanged.

Increasing Provider Delivery or Promotion of Screening: Provider Assessment and Feedback

Definition. Provider assessment and feedback interventions both evaluate provider performance in offering and/or delivering screening to clients (assessment) and present providers with information about their performance in providing screening services (feedback). Feedback may describe the performance of a group of providers (e.g., mean performance for a practice) or individual providers and may be compared with a goal or standard.

Breast, cervical, and colorectal cancer screening promotion (full update). Nine qualifying studies¹¹⁷⁻¹²⁵ were included in the review. Four studies^{117,122-124} had greatest, two^{119,125} had moderate, and three^{118,120,121} had least suitable designs. Quality of execution was fair for all except two,^{121,122} for which it was good.

Seven studies^{118,120-125} reported completed screening, and four studies^{117,119,121,123} reported screening ordered by providers. No studies of ordered screening were included in the update. Completed screening outcomes were ascertained through medical record review.^{118,120-123,125} Assessment of provider screening performance was conducted by providers auditing charts of their own patients¹¹⁸ or another provider's patients,¹²⁰ via computer search^{123,124} or chart review by researchers^{121,122} or others.¹²⁵ Feedback was provided concerning individual provider performance,^{120,124} group performance,^{121,125} or both.^{118,122,123} Feedback received by providers varied from a single occurrence^{118,121} to regular intervals.^{120,122-125} Studies of completed screening were conducted in the U.S.¹²⁰⁻¹²⁵ and the United Kingdom,¹¹⁸ and included both trainee^{120,122-124} and non-trainee physicians.^{118,121} Two studies specified patient race/ethnicity, including African-American, Hispanic, and Asian participants,^{122,123} and several specified the inclusion of urban^{120,122,124} and rural groups.¹²¹

For completed screening, four effect estimates¹²¹⁻¹²⁴ were included for mammography, four^{118,120,122,124} for Pap test, and three^{120,122,124} for colorectal cancer screening with FOBT, with one study¹²² also providing an estimate for flexible sigmoidoscopy. One study¹²⁵ evaluated change in use of FOBT, flexible sigmoidoscopy, or colonoscopy. Findings across all screening sites led to a median increase in screening use of 13.0 percentage points (IQI=5.5, 21.8). Findings for mammography varied from 3.4 to 20.6 percentage points, for Pap from 4.0 to 29.5 percentage points, and for FOBT screening from 12.3 to 23.0 percentage points. The one estimate for flexible sigmoidoscopy showed essentially no effect. The estimate from the update study examining FOBT, flexible

sigmoidoscopy, or colonoscopy was a 45 percentage point increase.

Conclusion. According to *Community Guide* rules of evidence, there is sufficient evidence that provider assessment and feedback interventions are effective in increasing screening for breast cancer (mammography); cervical cancer (Pap test); and colorectal cancer (FOBT; Table 1). Evidence was insufficient, however, to determine effectiveness of this intervention in increasing colorectal cancer screening using methods other than FOBT.

Applicability. The original review concluded that recommendations to increase screening for breast, cervical, and colorectal cancer (FOBT only) should be applicable across settings and populations described, with the caveat that provider training status potentially was related to magnitude of effect. Considering additional information from the update, conclusions about applicability remain unchanged.

Increasing Provider Delivery or Promotion of Screening: Provider Incentives

Definition. Provider incentives are direct or indirect rewards intended to motivate providers to perform cancer screening or make appropriate referral for their patients to receive these services. Rewards are often monetary but can include nonmonetary incentives also (e.g., continuing medical education credit). Because some form of assessment is needed to determine whether providers receive rewards, an assessment component may be included in the intervention.

Breast, cervical, and colorectal cancer screening promotion (full update). Five studies qualified for review. Of these, three¹²⁶⁻¹²⁸ had greatest and two^{129,130} had least-suitable designs. All had fair quality of execution except for one¹²⁸ with good quality of execution.

Of these five studies, three¹²⁸⁻¹³⁰ reported completed screening, one¹²⁷ reported recommended or offered screening, and one¹²⁶ reported both. The four studies of completed screening ascertained outcomes from medical records,^{126,129} self-report,¹²⁶ performance reports,¹²⁸ or claims data¹³⁰ from health plans. Interventions included provider incentives alone¹²⁸⁻¹³⁰ or with provider assessment and feedback and reminders.¹²⁶

The nature of and details provided about incentives varied across studies. Interventions included a quarterly practice bonus of approximately \$0.23 per member per month for each performance target met, with bonus potential representing approximately 5% of capitation¹²⁸; quarterly practice bonuses with the amount related to whether higher or lower screening thresholds were met¹²⁹; a physician bonus based on the percentage re-

ferred for screening during each audit period (i.e., \$50 for a 50% referral rate)¹²⁶; and a year-end physician bonus program with specifics of the bonus unavailable.¹³⁰

Studies of completed screening took place in the U.S.^{126,128,130} and Scotland.¹²⁹ Physician settings ranged from large, multispecialty organizations¹²⁸ to individual practice associations or physician practices.^{126,129,130} Patient populations included commercially insured health plan members¹³⁰ and patients of selected practices.^{126,129}

The four studies of completed screening evaluated seven intervention arms: two for mammography, two for Pap tests, one for FOBT, one for endoscopic screening, and one for double-contrast barium enema. The median change in screening use across studies was 1.7 percentage points (IQR = −0.1, 3.6). Findings for mammography varied from −2.0 to 1.7 percentage points, for Pap from 3.6 to 8.0 percentage points, and for colorectal screening from −0.1 to 2.8 percentage points.

Conclusion. According to *Community Guide* rules of evidence, there is insufficient evidence to determine the effectiveness of provider incentives in increasing screening for breast, cervical, or colorectal cancers (Table 1). Evidence is insufficient because results were inconsistent and generally small.

Additional Benefits and Potential Harms of Interventions

No reports of other positive or negative effects of interventions on use of other healthcare services, health behaviors, or informed decision making were found while updating reviews in all intervention categories. For client incentives, no other positive or negative effects of incentives with small monetary value were identified in the literature reviewed or by the review team. However, the team noted that, at some point, as the monetary value of incentives increases, they have the potential to become coercive.

Potential Barriers to Implementing Interventions

In general, limited resources and infrastructure appear to be the most important barriers to implementing interventions.¹⁸ For one-on-one education interventions, recruitment and training of educators, quality-control measures, duration of educational sessions, travel for in-person education, and professional backgrounds of educators may influence costs and feasibility of implementation. In addition to costs, these interventions may require special skills or tools to develop messages, including tailored messages, which also may pose implementation barriers.¹⁸

For client reminders, barriers may include limited infrastructure and staffing and/or computer support to identify patients due for screening and deliver reminders efficiently.¹⁸ Further, costs of generating and delivering reminders may be a substantial barrier, and barriers related to tailoring may apply.¹⁸ (When done on a large scale, such interventions may cost little per person.) As noted in the original review,¹⁹ potential barriers for reducing structural barriers interventions may include limited resources to provide mobile mammography services, difficulty identifying alternative screening sites, adequately staffing facilities at alternative sites or during alternative hours, and ensuring follow-up of abnormal tests for clients lacking access to care. Barriers to implementation were not addressed for client incentives, mass media, and provider incentives, because effectiveness was not established for any cancer screening site.

Research Gaps

The team found sufficient to strong evidence that interventions using one-on-one education, client reminders, provider assessment and feedback, and reducing structural barriers are effective in promoting colorectal cancer screening with FOBT. However, more information is needed to determine whether interventions are effective for other forms of colorectal cancer screening. Effectiveness for these other tests has not been established for any intervention.

Further, as new screening tests emerge (e.g., fecal immunochemical tests), information will be needed about whether effects differ for these tests. It is also unknown whether interventions to promote colorectal cancer screening are equally effective when specific to one type of test, or when addressing colorectal cancer screening more generally. Because there is more than one recommended screening test for colorectal cancer, focusing interventions on only one test may limit client choices, disregard client preferences, or fail to consider provider preferences. More information also is needed about effectiveness of interventions using incentives, both client- and provider-directed, and mass media. Where information about these interventions may be available, or where plans to employ such interventions may already be in place, the publication of such data or evaluation to examine effectiveness of these interventions would help bridge these gaps.

Effectiveness of group education and reducing out-of-pocket cost interventions was established for breast cancer screening although not for cervical or colorectal cancer screening. However, given consistently favorable results for interventions that reduce costs for breast cancer screening and other preventive services, there is no reason to conclude a priori that results for breast can-

cer screening would not apply to colorectal cancer and cervical cancer screening. It is not clear whether such interventions would differentially affect uptake of particular colorectal cancer screening tests. Client out-of-pocket costs vary among recommended colorectal cancer screening tests, with greater costs for colonoscopy than FOBT.^{131,132} Differences in client costs may influence patient preferences for screening tests.¹³²

For many interventions, whether there is an incremental effect of adding the intervention to other interventions is unknown. As multicomponent interventions are common, information about the magnitude of incremental effects of adding specific interventions to others is important to maximize intervention impacts. In spite of this fact, there is little information about the incremental effect of specific interventions. This review provides information about the incremental effects of one-on-one education and client reminder interventions for several types of cancer screening tests.

Additional questions for ongoing or future studies include determining what, if any, influence newer methods of communication, such as the Internet, e-mail, AIVR, social media, or texting may have on intervention effectiveness. As these modes of communication become more prevalent, interventions may be adapted to incorporate them. However, it is unknown how this will influence intervention effectiveness. Additional research questions are provided in Table 2.

Discussion

These reviews update the evidence base underlying Task Force recommendations for nine interventions to increase community demand, enhance community access, and increase provider delivery of recommended cancer screening services. Recommendations were expanded to include interventions using one-on-one education to increase colorectal cancer screening with FOBT and group education to increase mammography screening. Further, the Task Force upgraded the strength of evidence for client reminder interventions to increase colorectal cancer screening with FOBT from sufficient to strong.

Previous findings and recommendations were reaffirmed or unchanged for reducing out-of-pocket costs for breast cancer screening; provider assessment and feedback for breast, cervical, and FOBT screening; one-on-one education for breast and cervical cancer screening; reducing structural barriers for breast cancer and FOBT screening; and client reminders for breast and cervical cancer screening. Evidence still is insufficient to determine effectiveness for the remaining screening tests and intervention categories, largely because of an inadequate number of qualifying studies. As in the original reviews,

among recommended interventions, the largest effects were seen for interventions that reduce structural barriers. A similarly large effect was noted for FOBT screening after one-on-one education interventions. To some extent, effect sizes for different types of interventions to influence uptake of particular types of cancer screening (e.g., mammography versus colonoscopy) may reflect the state of diffusion of different kinds of cancer screening and what is needed to effect change.

The team did not find evidence from other recent reviews about the role of group education in breast cancer screening. However, the finding of insufficient evidence to determine effectiveness for colorectal cancer screening is consistent with other findings.^{9,133} The new finding for one-on-one education and the recommendation for client reminders to increase colorectal cancer screening with FOBT are consistent with findings from a recent systematic review¹³³ and Agency for Healthcare Research and Quality Report.⁹

Reaffirmed or standing recommendations are supported by earlier reviews also. Increased cervical cancer screening was associated with educational interventions,¹³⁴ including “interactive delivery of cognitive educational interventions by telephone.”¹³⁵ Reducing structural barriers was effective in promoting mammography¹³⁶ and increased FOBT screening.^{9,133} Addressing financial and logistic concerns increased mammography use in diverse populations,¹³⁷ and mailed educational materials and telephone reminders were effective in increasing attendance at community breast cancer screening activities.¹³⁸ Telephone reminders also have been found to increase cervical cancer screening.¹³⁵ For provider-directed interventions, audit and feedback have been associated with increased mammography screening.¹³⁷

In contrast to Task Force findings, a meta-analysis of single and multicomponent interventions in minority women reported that access-enhancing interventions and group education yielded the greatest benefits in increasing cervical cancer screening.¹³⁹ This may be due to the particular needs of minority women who also were economically disadvantaged. Further, home visits were ineffective in increasing invited attendance at community breast cancer activities.¹³⁸ Differences among reviews are likely due in part to differing study inclusion criteria and classification of interventions, as well as inclusion of studies with varied designs and execution, which makes comparisons of findings difficult.

Updating recommendations for interventions to promote colorectal cancer screening was a priority for these reviews. Findings have expanded the list of effective intervention categories to include one-on-one education (FOBT), and upgraded the strength of evidence for client reminders to increase FOBT screening from sufficient

Table 2. Research questions for future studies

Overall
Are interventions effective for promoting colorectal cancer screening with methods other than FOBT?
Are interventions to promote colorectal cancer screening equally effective when addressing colorectal cancer screening more generally, as when specific to one type of test?
What are the incremental effects of adding intervention components to other interventions?
What influence do newer methods of communication (e.g., the Internet, e-mail, social media, AIVR, texting) have on intervention effectiveness?
What is the influence of health system factors on intervention effectiveness?
Group education
Are group education interventions that target specific groups more effective in increasing breast, cervical, or colorectal cancer screening within those groups than untargeted interventions?
Does effectiveness vary with intensity of education sessions or specific components included in them?
One-on-one education
What duration, dose, and intensity of one-on-one educational interventions are needed to be effective? ¹⁸
What characteristics of “tailoring” contribute to its effect? Are there effects of tailoring channels (personal interaction, anonymous interaction)?
Does effectiveness of one-on-one education interventions vary according to whether or not education is delivered by a medical professional?
Client reminders
How do newer methods of communication (e.g., the Internet, e-mail, text messages, or automated telephone calls) influence the effectiveness of client reminder interventions?
To what extent does effectiveness vary for groups overdue for screening or never screened?
Does effectiveness vary according to the source of client reminders (e.g., clinic or practice versus screening registry or program)?
Do reminders for screenings for multiple cancer sites work as well as those for a single cancer site?
Client incentives
As in the original review, ¹⁸ does effectiveness vary with type of incentive?
Is screening use sustained after discontinuation of incentives? Is length of effect related to size or perceived value of incentives? Is there a value floor or ceiling?
Is there a threshold beyond which client incentives are effective? If so, is the magnitude of the incentive ethical or coercive?
Are there specific populations for whom client incentives are valuable? A clearer understanding of the nature of attractive incentives for different populations would be helpful. Are one-size-fits-all incentives no longer appropriate?
Mass media
What is the efficacy of Internet-delivered mass media campaigns and other mass approaches? Can the Internet be marshaled to create the impact of mass media at lower cost and with even greater reach?
Provider incentives
Does effectiveness vary with type of incentive, timing of incentive, and/or physician/practice characteristics?
Do provider incentives result in an incremental increase in the effectiveness of provider assessment and feedback interventions? ²⁰

Note: For interventions with established effectiveness, research issues concerning effectiveness, applicability, additional benefits and potential harms, and potential barriers to implementation were summarized. For interventions with established effectiveness for one or more screening sites, unaddressed questions were considered more broadly.
FOBT, fecal occult blood test

to strong. The recommendation for reducing structural barriers, to increase FOBT screening, was reaffirmed.

This is important, given evidence that the factor most negatively associated with colorectal cancer screening is lack of healthcare access.¹³³ However, for many interven-

tion categories there frequently was insufficient evidence to determine effectiveness for colorectal cancer screening, most often because of too few qualifying studies. Given that access to care alone does not ensure adequate screening use,¹³³ more information is needed to determine which of these interventions are effective. Moreover, most evidence is for FOBT use rather than colonoscopy, which increasingly has been utilized for screening while FOBT use has declined.⁹ Although information about colorectal cancer screening is increasing, additional information about endoscopic screening is needed for many interventions.

In selecting effective interventions to implement, local needs, barriers, populations, and resources should be considered, along with evidence data regarding effectiveness of different interventions. Targeted, tailored, and more intensive efforts may be more appropriate when population subgroups underutilize screening.^{135,137} Disparities in colorectal cancer screening and other screening tests have been described.^{8,11,14} In the current reviews, for many interventions including ones recommended for colorectal screening, there were often too few studies to identify particular intervention categories or approaches within categories that were effective for particular subgroups. An exception was that for breast cancer screening, one-on-one education appeared similarly effective in studies with relatively large underserved populations compared with other studies. More information about various approaches would help identify which strategies may be most appropriate for given populations and settings.

As with many reviews,^{133–135,139} publication bias and selective reporting of significant results may have influenced findings. It is also possible that not all relevant studies were identified¹³³; however, the search strategy employed was comprehensive, with studies included and findings reviewed by a Coordination team of Task Force members, systematic review methodologists, and subject matter experts.¹⁴⁰ Additionally, biases within studies may influence findings.^{134,139} Where applicable, following *Community Guide* rules,²³ study quality was assessed independently by two reviewers using a scoring protocol developed by the team, including systematic review methodologists. The strength of the overall body of evidence also was accounted for according to *Community Guide* rules.^{21,23} Conclusions of insufficient evidence to determine effectiveness do not indicate that interventions are ineffective. Instead such findings imply that additional research and information are needed before conclusions can be drawn. Finally, these reviews are based on studies published through 2008; more-recent findings therefore are not included.

Determining effectiveness of interventions is an important step to improve screening use among eligible populations. However, once effective interventions have been identified, dissemination and uptake of these interventions in community and healthcare settings are critical to maximizing their utility. Proactive, deliberate efforts are needed to disseminate findings into practice. Web-based resources such as Cancer Control PLANET (cancercontrolplanet.cancer.gov/) can facilitate access to research-tested cancer control interventions. More research is needed into contextual effects on screening intervention implementation and the process of screening promotion dissemination.

The authors acknowledge the invaluable contributions of members and leaders from the Cancer Prevention and Control Research Network (CPCRN) and logistic support from the Emory Prevention Research Center, cooperative agreement numbers 3-U48-DP-000050-1 (University of Washington); 3-U48-DP000064 (University of California Los Angeles); 3-U48-DP000059-01 (University of North Carolina); 3-U48-DP000057 (University of Texas Houston); 1-U48-DP000043-S1 (Emory University); and 3-U48-DP000049 (Morehouse University) from the CDC, Prevention Research Centers Program. In addition to the CPCRN grant to the Emory Prevention Research Center, KG was supported by a Georgia Cancer Coalition Distinguished Scholar Award. BD was hired by CDC as a contractor to abstract articles for this systematic review.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

The paper represents the opinions of the authors and cannot be construed to represent the opinions or policy of the National Cancer Institute or the Federal Government.

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

References

1. Xu JQ, Kochanek KD, Murphy SL, Tejada-Vera B. Deaths: final data for 2007. *Natl Vital Stat Rep* 2010;58(19).
2. U.S. Cancer Statistics Working Group. U.S. Cancer Statistics: 1999–2007 incidence and mortality web-based report. www.cdc.gov/uscs.
3. U.S. Preventive Services Task Force. Screening for cervical cancer, topic page. www.uspreventiveservicestaskforce.org/uspstf/uspsscerv.htm.
4. U.S. Preventive Services Task Force. Screening for colorectal cancer, topic page. www.uspreventiveservicestaskforce.org/uspstf/uspsscolo.htm.
5. U.S. Preventive Services Task Force. Screening for breast cancer, topic page. www.uspreventiveservicestaskforce.org/uspstf/uspssbrca.htm.
6. National Center for Health Statistics. Health, U.S. 2009: with special feature on medical technology. Hyattsville MD, 2010.

7. Trivers KF, Shaw KM, Sabatino SA, Shapiro JA, Coates RJ. Trends in colorectal cancer screening disparities in people aged 50–64 years, 2000–2005. *Am J Prev Med* 2008;35(3):185–93.
8. Klabunde CN, Cronin KA, Breen N, Waldron WR, Ambbs AH, Nadel MR. Trends in colorectal cancer test use among vulnerable populations in the U.S. *Cancer Epidemiol Biomarkers Prev* 2011;20(8):1611–21.
9. Holden DJ, Harris R, Porterfield DS, et al. Enhancing the use and quality of colorectal cancer screening, evidence report/technology assessment no. 190. Rockville MD: Agency for Healthcare Research and Quality, 2010. Publication No. 10-E-002.
10. CDC. Vital signs: colorectal cancer screening, incidence, and mortality—U.S., 2002–2010. *MMWR Morb Mortal Wkly Rep* 2011;60(26):884–9.
11. CDC. Cancer screening—U.S., 2010. *MMWR Morb Mortal Wkly Rep* 2012;61(3):41–5.
12. Rakowski W, Meissner H, Vernon SW, Breen N, Rimer BK, Clark MA. Correlates of repeat and recent mammography for women ages 45 to 75 in the 2002 to 2003 Health Information National Trends Survey (HINTS 2003). *Cancer Epidemiol Biomarkers Prev* 2006;15(11):2093–101.
13. Rakowski W, Wyn R, Breen N, Meissner H, Clark MA. Prevalence and correlates of recent and repeat mammography among California women ages 55–79. *Cancer Epidemiol* 2010;34(2):168–77.
14. Swan J, Breen N, Graubard BI, et al. Data and trends in cancer screening in the United States: Results from the 2005 National Health Interview Survey. *Cancer* 2010;116(20):4872–81.
15. Sabatino SA, Coates RJ, Uhler RJ, Breen N, Tangka F, Shaw KM. Disparities in mammography use among U.S. women aged 40–64 years, by race, ethnicity, income, and health insurance status. *Med Care* 2008;46(7):692–700.
16. Ward E, Halpern M, Schrag N, et al. Association of insurance with cancer care utilization and outcomes. *CA Cancer J Clin* 2008;58(1):9–31.
17. Baron RC, Melillo S, Rimer BK, et al. Intervention to increase recommendation and delivery of screening for breast, cervical, and colorectal cancers by healthcare providers: a systematic review of provider reminders. *Am J Prev Med* 2010;38(1):110–7.
18. 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.
19. Baron RC, Rimer BK, Coates RJ, et al. Client-directed interventions to increase community access to breast, cervical, and colorectal cancer screening: a systematic review. *Am J Prev Med* 2008;35(1S):S56–S66.
20. 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.
21. 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.
22. Task Force on Community Preventive Services. Methods used for reviewing evidence and linking evidence to recommendations. In: *The Guide To Community Preventive Services*. New York: Oxford University Press, 2005:431–48.
23. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services—methods. The Task Force on Community Preventive Services. *Am J Prev Med* 2000;18(1S):35–43.
24. Aiken LS, West SG, Woodward CK, Reno RR, Reynolds KD. Increasing screening mammography in asymptomatic women: evaluation of a second-generation, theory-based program. *Health Psychol* 1994;13(6):526–38.
25. King E, Rimer BK, Benincasa T, et al. Strategies to encourage mammography use among women in senior citizens' housing facilities. *J Cancer Educ* 1998;13(2):108–15.
26. Maxwell AE, Bastani R, Vida P, Warda US. Results of a randomized trial to increase breast and cervical cancer screening among Filipino American women. *Prev Med* 2003;37(2):102–9.
27. Mishra SI, Chavez LR, Magana JR, Nava P, Burciaga Valdez R, Hubbell FA. Improving breast cancer control among Latinas: evaluation of a theory-based educational program. *Health Educ Behav* 1998;25(5):653–70.
28. Navarro AM, Senn KL, McNicholas LJ, Kaplan RM, Roppe B, Campo MC. Por la vida model intervention enhances use of cancer screening tests among Latinas. *Am J Prev Med* 1998;15(1):32–41.
29. Skinner CS, Arfken CL, Waterman B. Outcomes of the Learn, Share & Live breast cancer education program for older urban women. *Am J Public Health* 2000;90(8):1229–34.
30. Bowen DJ, Powers D, Greenlee H. Effects of breast cancer risk counseling for sexual minority women. *Health Care Women Int* 2006;27(1):59–74.
31. Hurdle DE. Breast cancer prevention with older women: a gender-focused intervention study. *Health Care Women Int* 2007;28(10):872–87.
32. Lopez VA, Castro FG. Participation and program outcomes in a church-based cancer prevention program for Hispanic women. *J Community Health* 2006;31(4):343–62.
33. Mishra SI, Bastani R, Crespi CM, Chang LC, Luce PH, Baquet CR. Results of a randomized trial to increase mammogram usage among Samoan women. *Cancer Epidemiol Biomarkers Prev* 2007;16(12):2594–604.
34. Erwin DO, Spatz TS, Stotts RC, Hollenberg JA, Deloney LA. Increasing mammography and breast self-examination in African American women using the Witness Project model. *J Cancer Educ* 1996;11(4):210–5.
35. Agho AO, Mosley BW, Rivers PA, Parker S. Utilization of mammography services among elderly rural and urban African American women. *Health Educ J* 2007;66(3):245–61.
36. Larkey L. Las mujeres saludables: reaching Latinas for breast, cervical and colorectal cancer prevention and screening. *J Community Health* 2006;31(1):69–77.
37. Vivilaki V, Romanidou A, Theodorakis P, Lionis C. Are health education meetings effective in recruiting women in cervical screening programmes? An innovative and inexpensive intervention from the island of Crete. *Rural Remote Health* 2005;5(2):376.
38. White SC, Agurto I, Araguas N. Promoting healthy behaviors to prevent chronic disease in Panama and Trinidad & Tobago: results of the women as agents of change project. *J Community Health* 2006;31(5):413–29.
39. Weinrich SP, Weinrich MC, Stromborg MF, Boyd MD, Weiss HL. Using elderly educators to increase colorectal cancer screening. *Gerontologist* 1993;33(4):491–6.
40. Saywell RM, Champion VL, Sugg Skinner C, Menon U, Daggy J. A cost-effectiveness comparison of three tailored interventions to increase mammography screening. *J Womens Health* 2004;13(8):909–18.
41. Husaini BA, Emerson JS, Hull PC, Sherkat DE, Levine RS, Cain VA. Rural-urban differences in breast cancer screening among African-American women. *J Health Care Poor Underserved* 2005;16(4):1–10.
42. Carney PA, Harwood BG, Greene MA, Goodrich ME. Impact of a telephone counseling intervention on transitions in stage of change and adherence to interval mammography screening (U.S.). *Cancer Causes Control* 2005;16(7):799–807.
43. Paskett E, Tatum C, Rushing J, et al. Randomized trial of an intervention to improve mammography utilization among a triracial rural population of women. *J Natl Cancer Inst* 2006;98(17):1226–37.

44. Otero-Sabogal R, Owens D, Canchola J, Tabnak F. Improving re-screening in community clinics: does a system approach work? *J Community Health* 2006;31(6):497-519.
45. Champion V, Skinner CS, Hui S, et al. The effect of telephone versus print tailoring for mammography adherence. *Patient Educ Couns* 2007;65(3):416-23.
46. Bloom JR, Stewart SL, Hancock SL. Breast cancer screening in women surviving Hodgkin disease. *Am J Clin Oncol* 2006;29(3):258-66.
47. Bloom JR, Stewart SL, Chang S, You M. Effects of a telephone counseling intervention on sisters of young women with breast cancer. *Prev Med* 2006;43(5):379-84.
48. Abood DA, Black DR, Coster DC. Loss-framed minimal intervention increases mammography use. *Womens Health Issues* 2005;15(6):258-64.
49. Champion V, Maraj M, Hui S, et al. Comparison of tailored interventions to increase mammography screening in nonadherent older women. *Prev Med* 2003;36(2):150-8.
50. Champion VL, Sugg Skinner C, Menon U, Seshadri R, Anzalone DC, Rawl SM. Comparisons of tailored mammography interventions at two months postintervention. *Ann Behav Med* 2002;24(3):211-8.
51. Costanza ME, Stoddard AM, Luckmann R, White MJ, Avrunin JS, Clemow L. Promoting mammography: results of a randomized trial of telephone counseling and a medical practice intervention. *Am J Prev Med* 2000;19(1):39-46.
52. Crane LA, Leakey TA, Woodsworth MA, et al. Cancer Information Service-initiated outcalls to promote screening mammography among low-income and minority women: design and feasibility testing. *Prev Med* 1998;27(5 Pt 2):S29-S38.
53. Duan N, Fox SA, Pitkin Derose K, Carson S. Maintaining mammography adherence through telephone counseling in a church-based trial. *Am J Public Health* 2000;90(9):1468-71.
54. Howze EH, Broyden R, Impara J. Using informal caregivers to communicate with women about mammography. *Health Commun* 1992;4(3):227-44.
55. King ES, Rimer BK, Seay J, Balshem A, Engstrom PF. Promoting mammography use through progressive interventions: is it effective? *Am J Public Health* 1994;84(1):104-6.
56. Lauver DR, Settersten L, Kane JH, Henriques JB. Tailored messages, external barriers, and women's utilization of professional breast cancer screening over time. *Cancer* 2003;97(11):2724-35.
57. Lipkus IM, Rimer BK, Halabi S, Strigo TS. Can tailored interventions increase mammography use among HMO women? *Am J Prev Med* 2000;18(1):1-10.
58. Marcus AC, Bastani R, Reardon K, et al. Proactive screening mammography counseling within the Cancer Information Service: results from a randomized trial. *Natl Cancer Inst Monogr* 1993;(14):119-29.
59. Messina CR, Lane DSG, Grimson R. Effectiveness of women's telephone counseling and physician education to improve mammography screening among women who underuse mammography. *Ann Behav Med* 2002;24(4):279-89.
60. Rimer BK, Halabi S, Sugg Skinner C, et al. Effects of a mammography decision-making intervention at 12 and 24 months. *Am J Prev Med* 2002;22(4):247-57.
61. Saywell RM, Champion VL, Zollinger TW, et al. The cost effectiveness of 5 interventions to increase mammography adherence in a managed care population. *Am J Manag Care* 2003;9(1):33-44.
62. Taplin SH, Barlow WE, Ludman E, et al. Testing reminder and motivational telephone calls to increase screening mammography: a randomized study. *J Natl Cancer Inst* 2000;92(3):233-42.
63. Valanis BG, Glasgow RE, Mullooly J, et al. Screening HMO women overdue for both mammograms and Pap tests. *Prev Med* 2002;34(1):40-50.
64. Champion VL. Strategies to increase mammography utilization. *Med Care* 1994;32(2):118-29.
65. Champion VL, Ray DW, Heilman DK, Springston JK. A tailored intervention for mammography among low-income African-American women. *J Psychosoc Oncol* 2000;18:1-13.
66. Hoare T, Thomas C, Biggs A, Booth M, Bradley S, Friedman E. Can the uptake of breast screening by Asian women be increased? A randomized controlled trial of a linkworker intervention. *J Public Health Med* 1994;16(2):179-85.
67. Schwartz MD, Rimer BK, Daly M, Sands C, Lerman C. A randomized trial of breast cancer risk counseling: the impact on self-reported mammography use. *Am J Public Health* 1999;89(6):924-6.
68. Segura JM, Castells X, Casamitjana M, Macia F, Porta M, Katz SJ. A randomized controlled trial comparing three invitation strategies in a breast cancer screening program. *Prev Med* 2001;33(4):325-32.
69. Seow A, Straughan PT, Ng EH, Lee HP. A randomized trial of the use of print material and personal contact to improve mammography uptake among screening non-attenders in Singapore. *Ann Acad Med Singapore* 1998;27(6):838-42.
70. Sung JFC, Blumenthal DS, Coates RJ, Williams JE, Alema-Mensah E, Liff JM. Effect of a cancer screening intervention conducted by lay health workers among inner-city women. *Am J Prev Med* 1997;13(1):51-7.
71. Calle EE, Miracle-McMahill HL, Moss RE, Heath CW Jr. Personal contact from friends to increase mammography usage. *Am J Prev Med* 1994;10(6):361-6.
72. Champion V, Huster G. Effect of interventions on stage of mammography adoption. *J Behav Med* 1995;18(2):169-87.
73. Rimer BK, Conaway M, Lyna P, et al. The impact of tailored interventions on a community health center population. *Patient Educ Couns* 1999;37(2):125-40.
74. Glanz K, Steffen AD, Taglialetta LA. Effects of colon cancer risk counseling for first-degree relatives. *Cancer Epidemiol Biomarkers Prev* 2007;16(7):1485-91.
75. Stokamer CL, Tenner CT, Chaudhuri J, Vazquez E, Bini EJ. Randomized controlled trial of the impact of intensive patient education on compliance with fecal occult blood testing. *J Gen Intern Med* 2005;20(3):278-82.
76. Tu SP, Taylor V, Yasui Y, et al. Promoting culturally appropriate colorectal cancer screening through a health educator: a randomized controlled trial. *Cancer* 2006;107(5):959-66.
77. Turner BJ, Weiner M, Berry SD, Lillie K, Fosnocht K, Hollenbeak CS. Overcoming poor attendance to first scheduled colonoscopy: a randomized trial of peer coach or brochure support. *J Gen Intern Med* 2008;23(1):58-63.
78. Costanza ME, Luckmann R, Stoddard AM, et al. Using tailored telephone counseling to accelerate the adoption of colorectal cancer screening. *Cancer Detect Prev* 2007;31(3):191-8.
79. Myers RE, Ross EA, Wolf TA, Balshem A, Jepson C, Millner L. Behavioral interventions to increase adherence in colorectal cancer screening. *Med Care* 1991;29(10):1039-50.
80. Thompson RS, Michnich ME, Gray J, Friedlander L, Gilson B. Maximizing compliance with hemoccult screening for colon cancer in clinical practice. *Med Care* 1986;24(10):904-14.
81. Crawford AG, Sikirica V, Goldfarb N, et al. Interactive voice response reminder effects on preventive service utilization. *Am J Med Qual* 2005;20(6):329-36.
82. Goel A, George J, Burack RC. Telephone reminders increase re-screening in a county breast screening program. *J Health Care Poor Underserved* 2008;19:512-21.
83. Hofvind S. Breast cancer screening—prevalence of disease in women who only respond after an invitation reminder. *J Med Screen* 2007;14(1):21-2.
84. Partin MR, Slater JS, Caplan L. Randomized controlled trial of a repeat mammography intervention: effect of adherence definitions on results. *Prev Med* 2005;41(3-4):734-40.

85. Ruffin MT, Gorenflo DW. Interventions fail to increase cancer screening rates in community-based primary care practices. *Prev Med* 2004;39(3):435–40.
86. Vernon SW, del Junco DJ, Tiro JA, et al. Promoting regular mammography screening, II: Results from a randomized controlled trial in U.S. women veterans. *J Natl Cancer Inst* 2008;100(5):347–58.
87. Bankhead C, Richards SH, Peters TJ, et al. Improving attendance for breast screening among recent non-attenders: a randomised controlled trial of two interventions in primary care. *J Med Screen* 2001;8(2):99–105.
88. Burack RC, Gimotty PA, George J, Simon MS, Dews P, Moncrease A. The effect of patient and physician reminders on use of screening mammography in a health maintenance organization. Results of a randomized controlled trial. *Cancer* 1996;78(8):1708–21.
89. King ES, Rimer BK, Seay J, Balshem A, Engstrom PF. Promoting mammography use through progressive interventions: is it effective? *Am J Public Health* 1994;84(1):104–6.
90. Landis SE, Hulkower SD, Pierson S. Enhancing adherence with mammography through patient letters and physician prompts. A pilot study. *N C Med J* 1992;53(11):575–8.
91. Richards SH, Bankhead C, Peters TJ, et al. Cluster randomised controlled trial comparing the effectiveness and cost-effectiveness of two primary care interventions aimed at improving attendance for breast screening. *J Med Screen* 2001;8(2):91–8.
92. Saywell RM Jr, Champion VL, Zollinger TW, et al. The cost effectiveness of 5 interventions to increase mammography adherence in a managed care population. *Am J Manag Care* 2003;9(1):33–44.
93. Becker DM, Gomez EB, Kaiser DL, Yoshihara A, Hodge RH Jr. Improving preventive care at a medical clinic: how can the patient help? *Am J Prev Med* 1989;5(6):353–9.
94. Ornstein SM, Garr DR, Jenkins RG, Rust PF, Arnon A. Computer-generated physician and patient reminders. Tools to improve population adherence to selected preventive services. *J Fam Pract* 1991;32(1):82–90.
95. Byrnes P, McGoldrick C, Crawford M, Peers M. Cervical screening in general practice: strategies for improving participation. *Aust Fam Physician* 2007;36(3):183–92.
96. de Jonge E, Cloes E, de Beek LO, et al. A quasi-randomized trial on the effectiveness of an invitation letter to improve participation in a setting of opportunistic screening for cervical cancer. *Eur J Cancer Prev* 2008;17:238–42.
97. Eaker S, Adami H-O, Granath F, Wilander E, Sørensen P. A large population-based randomized controlled trial to increase attendance at screening for cervical cancer. *Cancer Epidemiol Biomarkers Prev* 2004;13(3):346–54.
98. Morrell S, Taylor R, Zeckendorf S, Niciak A, Wain G, Ross J. How much does a reminder letter increase cervical screening among under-screened women in NSW? *Aust N Z J Public Health* 2005;29(1):78–84.
99. Burack RC, Gimotty PA, George J, et al. How reminders given to patients and physicians affected Pap smear use in a health maintenance organization: results of a randomized controlled trial. *Cancer* 1998;82(12):2391–400.
100. 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(10):770–80.
101. Segnan N, Senore C, Andreoni B, et al. Randomized trial of different screening strategies for colorectal cancer: patient response and detection rates. *J Natl Cancer Inst* 2005;97(5):347–57.
102. Slater JS, Henly GA, Ha CN, et al. Effect of direct mail as a population-based strategy to increase mammography use among low-income underinsured women ages 40 to 64 years. *Cancer Epidemiol Biomarkers Prev* 2005;14(10):2346–52.
103. Blumenthal DS, Fort JG, Ahmed NU, et al. Impact of a two-city community cancer prevention intervention on African Americans. *J Natl Med Assoc* 2005;97(11):1479–88.
104. Page A, Morrell S, Tewson R, Taylor R, Brassil A. Mammography screening participation: effects of a media campaign targeting Italian-speaking women. *Aust N Z J Public Health* 2005;29(4):365–71.
105. Byles JE, Sanson-Fisher RW, Redman S, Dickinson JA, Halpin S. Effectiveness of three community based strategies to promote screening for cervical cancer. *J Med Screen* 1994;1(3):150–8.
106. Howe A, Owen-Smith V, Richardson J. The impact of a television soap opera on the NHS cervical screening programme in the north west of England. *J Public Health Med* 2002;24(4):299–304.
107. National Center for Health Statistics. 2008 National Health Interview Survey (NHIS) public use data release. NHIS survey description. http://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2008/srvydesc.pdf.
108. Gellert K, Braun KL, Morris R, Starkey V. The 'Ohana Day Project: a community approach to increasing cancer screening. *Prev Chronic Dis* 2006;3(3):A99.
109. Pritchard DA, Straton JA, Hyndman J. Cervical screening in general practice. *Aust J Public Health* 1995;19(2):167–72.
110. White JE, Begg L, Fishman NW, Guthrie B, Fagan JK. Increasing cervical cancer screening among minority elderly. Education and on-site services increase screening. *J Gerontol Nurs* 1993;19(5):28–34.
111. Elwood Martin R, Hislop TG, Grams GD, Calam B, Jones E, Moravan V. Evaluation of a cervical cancer screening intervention for prison inmates. *Can J Public Health* 2004;95(4):285–9.
112. Denis B, Reutsch M, Strentz P, et al. Short term outcomes of the first round of a pilot colorectal cancer screening programme with guaiac based faecal occult blood test. *Gut* 2007;56(11):1579–84.
113. Myers R, Hyslop T, Sifri R, et al. Tailored navigation in colorectal cancer screening. *Med Care* 2008;9(S1):S123–S131.
114. Nash DB, Azeez S, Vlahov D, Schori M. Evaluation of an intervention to increase screening colonoscopy in an urban public hospital setting. *J Urban Health* 2006;83(2):231–43.
115. Goldberg D, Schiff GD, McNutt R, Furumoto-Dawson A, Hammerman M, Hoffman A. Mailings timed to patients' appointments: a controlled trial of fecal occult blood test cards. *Am J Prev Med* 2004;26(5):431–5.
116. Schillinger JA, Mosbaek 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(1):11–7.
117. Brady WJ, Hissa DC, McConnell M, Wones RG. Should physicians perform their own quality assurance audits? *J Gen Intern Med* 1988;3(6):560–5.
118. Fleming DM, Lawrence MS. Impact of audit on preventive measures. *Br Med J* 1983;287(6408):1852–4.
119. Goebel LJ. A peer review feedback method of promoting compliance with preventive care guidelines in a resident ambulatory care clinic. *Jt Comm J Qual Improv* 1997;23(4):196–202.
120. Kern DE, Harris WL, Boekeloo BO, Barker LR, Hogeland P. Use of an outpatient medical record audit to achieve educational objectives: changes in residents' performances over six years. *J Gen Intern Med* 1990;5(3):218–24.
121. Kinsinger LS, Harris R, Qaish B, Strecher V, Kaluzny A. Using an office system intervention to increase breast cancer screening. *J Gen Intern Med* 1998;13(8):507–14.
122. McPhee SJ, Bird JA, Jenkins CN, Fordham D. Promoting cancer screening. A randomized, controlled trial of three interventions. *Arch Intern Med* 1989;149(8):1866–72.
123. Nattinger AB, Panzer RJ, Janus J. Improving the utilization of screening mammography in primary care practices. *Arch Intern Med* 1989;149(9):2087–92.
124. Tierney WM, Hui SL, McDonald CJ. Delayed feedback of physician performance versus immediate reminders to perform preventive care. Effects on physician compliance. *Med Care* 1986;24(8):659–66.

125. Battat AC, Rouse RV, Dempsey L, Safadi BY, Wren SM. Institutional commitment to rectal cancer screening results in earlier-stage cancers on diagnosis. *Ann Surg Oncol* 2004;11(11):970–6.
126. Grady KE, Lemkau JP, Lee NR, Caddell C. Enhancing mammography referral in primary care. *Prev Med* 1997;26(6):791–800.
127. Hillman AL, Ripley K, Goldfarb N, Nuamah I, Weiner J, Lusk E. Physician financial incentives and feedback: failure to increase cancer screening in Medicaid managed care. *Am J Public Health* 1998;88(11):1699–701.
128. Rosenthal MB, Frank RG, Li Z, Epstein AM. Early experience with pay-for-performance: from concept to practice. *JAMA* 2005;294(14):1788–93.
129. Reid GS, Robertson AJ, Bissett C, Smith J, Waugh N, Halkerston R. Cervical screening in Perth and Kinross since introduction of the new contract. *BMJ* 1991;303(6800):447–50.
130. Armour BS, Friedman C, Pitts MM, Wike J, Alley L, Etchason J. The influence of year-end bonuses on colorectal cancer screening. *Am J Manag Care* 2004;10(9):617–24.
131. Heitman SJ, Au F, Manns BJ, McGregor SE, Hilsden RJ. Nonmedical costs of colorectal cancer screening with the fecal occult blood test and colonoscopy. *Clin Gastroenterol Hepatol* 2008;6(8):912.e1–917.e1.
132. Pignone M. Patient preferences for colon cancer screening: the role of out-of-pocket costs. *Am J Manag Care* 2007;13(7):390–1.
133. Holden DJ, Jonas DE, Porterfield DS, Reuland D, Harris R. Systematic review: enhancing the use and quality of colorectal cancer screening. *Ann Intern Med* 2010;152(10):668–76.
134. Everett T, Bryant A, Griffin MF, Martin-Hirsch PP, Forbes CA, Jepson RG. Interventions targeted at women to encourage the uptake of cervical screening. *Cochrane Database Syst Rev* 2011;(5):CD002834.
135. Yabroff KR, Mangan P, Mandelblatt J. Effectiveness of interventions to increase Papanicolaou smear use. *J Am Board Fam Pract* 2003;16(3):188–203.
136. Ellis P, Robinson P, Ciliska D, et al. A systematic review of studies evaluating diffusion and dissemination of selected cancer control interventions. *Health Psychol* 2005;24(5):488–500.
137. Masi CM, Blackman DJ, Peek ME. Interventions to enhance breast cancer screening, diagnosis, and treatment among racial and ethnic minority women. *Med Care Res Rev* 2007;64(5S):195S–242S.
138. Bonfill X, Marzo M, Pladevall M, Marti J, Emparanza JI. Strategies for increasing women participation in community breast cancer screening. *Cochrane Database Syst Rev* 2001;(1):CD002943.
139. Han HR, Kim J, Lee JE, et al. Interventions that increase use of Pap tests among ethnic minority women: a meta-analysis. *Psychooncology* 2011;20(4):341–51.
140. 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.

Did you know?

The *AJPM* Most Read and Most Cited articles are listed on our home page.

Go to www.ajpmonline.org.