Comparative Effectiveness Review
Number 222

Achieving Health Equity in Preventive Services

Agency for Healthcare Research and Quality

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Key Messages

Purpose of Review

To summarize research on achieving health equity in 10 preventive services for cancer, cardiovascular disease, and diabetes in adults by identifying effects of impediments and barriers that create disparities and effectiveness of interventions to reduce them.

Key Messages

- No eligible studies evaluated effects of provider barriers.
- Evidence is low or insufficient for effects of population barriers, including insurance, access, age, rural location, income, language, health literacy, country of origin, and attitudes.
- Screening rates are higher with patient navigation for colorectal, breast, and cervical cancer; telephone calls and prompts for colorectal cancer; and reminders with lay health workers for breast cancer.
- Evidence is low or insufficient for other interventions due to lack of studies or their limitations.

This report is based on research conducted by the Pacific Northwest Evidence-based Practice Center (EPC) under contract to the Agency for Healthcare Research and Quality (AHRQ), Rockville, MD (Contract No. 290-2015-00009-I). The National Institutes of Health (NIH) Office of Disease Prevention funded the report. The findings and conclusions in this document are those of the authors, who are responsible for its contents; the findings and conclusions do not necessarily represent the views of AHRQ or NIH. Therefore, no statement in this report should be construed as an official position of AHRQ, NIH, or the U.S. Department of Health and Human Services.

None of the investigators have any affiliations or financial involvement that conflicts with the material presented in this report.

The information in this report is intended to help healthcare decisionmakers—patients and clinicians, health system leaders, and policymakers, among others—make well-informed decisions and thereby improve the quality of healthcare services. This report is not intended to be a substitute for the application of clinical judgment. Anyone who makes decisions concerning the provision of clinical care should consider this report in the same way as any medical reference and in conjunction with all other pertinent information, i.e., in the context of available resources and circumstances presented by individual patients.

AHRQ or U.S. Department of Health and Human Services endorsement of any derivative products that may be developed from this report, such as clinical practice guidelines, other quality enhancement tools, or reimbursement or coverage policies, may not be stated or implied.

This report may periodically be assessed for the currency of conclusions. If an assessment is done, the resulting surveillance report describing the methodology and findings will be found on the Effective Health Care Program website at www.effectivehealthcare.ahrq.gov. Search on the title of the report.

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public- and private-sector organizations in their efforts to improve the quality of healthcare in the United States.

The National Institutes of Health requested this report from the EPC Program at AHRQ. AHRQ assigned this report to the following EPC: Pacific Northwest Evidence-based Practice Center (Contract Number: 290-2015-00009-I).

The report was presented at the National Institutes of Health Office of Disease Prevention's Pathways to Prevention Workshop public meeting Achieving Health Equity in Preventive Services on June 19–20, 2019.

The reports and assessments provide organizations with comprehensive, evidence-based information on common medical conditions and new healthcare technologies and strategies. They also identify research gaps in the selected scientific area, identify methodological and scientific weaknesses, suggest research needs, and move the field forward through an unbiased, evidence-based assessment of the available literature. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

To bring the broadest range of experts into the development of evidence reports and health technology assessments, AHRQ encourages the EPCs to form partnerships and enter into collaborations with other medical and research organizations. The EPCs work with these partner organizations to ensure that the evidence reports and technology assessments they produce will become building blocks for healthcare quality improvement projects throughout the Nation. The reports undergo peer review and public comment prior to their release as a final report.

AHRQ expects that the EPC evidence reports and technology assessments, when appropriate, will inform individual health plans, providers, and purchasers as well as the healthcare system as a whole by providing important information to help improve healthcare quality.

If you have comments on this evidence report, they may be sent by mail to the Task Order Officer named below at: Agency for Healthcare Research and Quality, 5600 Fishers Lane, Rockville, MD 20857, or by email to epc@ahrq.hhs.gov.

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Technical Expert Panel

In designing the study questions and methodology at the outset of this report, the EPC consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicted opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

Technical Experts must disclose any financial conflicts of interest greater than $5,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The TOO and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

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Peer Reviewers

Prior to publication of the final evidence report, EPCs sought input from independent Peer Reviewers without financial conflicts of interest. However, the conclusions and synthesis of the scientific literature presented in this report do not necessarily represent the views of individual reviewers.

Peer Reviewers must disclose any financial conflicts of interest greater than $5,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals with potential nonfinancial conflicts may be retained. The TOO and the EPC work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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Achieving Health Equity in Preventive Services

Structured Abstract

Objectives. To summarize research on achieving health equity in 10 preventive services for cancer, cardiovascular disease, and diabetes in adults for a National Institutes of Health Pathways to Prevention Workshop by identifying the effects of impediments and barriers that create disparities, and the effectiveness of interventions to reduce them.

Data sources. Ovid® MEDLINE®, PsycINFO®, SocINDEX (January 1, 1996, to July 5, 2019); Veterans Affairs Health Services database; manual review of reference lists.

Review methods. Eligible abstracts and full-text articles were independently dual-reviewed for inclusion using pre-established criteria. Data were abstracted into evidence tables and verified for accuracy. Risk of bias and applicability of studies were independently dual-rated using established criteria; disagreements were resolved by consensus. Strength of evidence and applicability for each Key Question and outcome were assessed using established methods. Meta-analysis used a profile likelihood random effects model.

Results. No eligible studies evaluated effects of provider-specific barriers; 18 studies of population barriers provided low or insufficient evidence regarding insurance coverage, access, age, rural location, low income, language, low health literacy, country of origin, and attitudes. In 12 studies of clinician interventions, screening was higher for colorectal cancer with patient navigation, risk assessment and counseling, educational materials, and decision aids; breast and cervical cancer with reminders involving lay health workers; and cervical cancer with outreach and health education. Clinician-delivered interventions were effective for smoking cessation and weight loss. In 11 studies of health information technologies, automated reminders and electronic decision aids increased colorectal cancer screening, and web- or telephone-based self-monitoring improved weight loss, but other technologies were not effective. In 88 studies of health system interventions, evidence was strongest for patient navigation to increase screening for colorectal (risk ratio [RR] 1.64; 95% confidence interval [CI] 1.42 to 1.92; 22 trials), breast (RR 1.50; 95% CI 1.22 to 1.91; 10 trials), and cervical cancer (RR 1.11; 95% CI 1.05 to 1.19). Screening was also higher for colorectal cancer with telephone calls, prompts, other outreach methods, screening checklists, provider training, and community engagement; breast cancer with lay health workers, patient education, screening checklists, and community engagement; cervical cancer with telephone calls, prompts, and community engagement; and lung cancer with patient navigation. Trials of smoking cessation and obesity education and counseling had mixed results.

Conclusions. In populations adversely affected by disparities, evidence is strongest for patient navigation to increase colorectal, breast, and cervical cancer screening; telephone calls and prompts to increase colorectal cancer screening; and reminders including lay health workers encouraging breast cancer screening. Evidence is low or insufficient to determine effects of barriers or effectiveness of other interventions because of lack of studies and methodological limitations of existing studies.

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Evidence Summary

Introduction

Purpose

This systematic evidence review summarizes research on achieving health equity in 10 preventive services for cancer, cardiovascular disease, and diabetes in adults by identifying the effects of impediments and barriers that create disparities and the effectiveness of strategies and interventions to reduce them. It is guided by five Key Questions (KQs) developed to inform the June, 2019 National Institutes of Health (NIH) Office of Disease Prevention's Pathways to Prevention Workshop on Achieving Health Equity in Preventive Services (https://prevention.nih.gov/research-priorities/research-needs-and-gaps/pathways-prevention/achieving-health-equity-preventive-services), cosponsored by the National Institute on Minority Health and Health Disparities (NIMHD), the National Heart, Lung, and Blood Institute (NHLBI), the National Cancer Institute (NCI), and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). This review also serves as a resource for health researchers, policymakers, planners, and other stakeholders to inform future efforts to achieve health equity in preventive services.

Background

Health equity is defined by Healthy People 2020 as the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and healthcare disparities."[1] NIMHD defines a *health disparity* as "a health difference that adversely affects disadvantaged populations based on one or more health outcomes"[2] determined by a higher incidence or prevalence of disease, a population health measure of greater burden of disease, or worse outcomes.[2] Populations adversely affected by disparities as defined by NIMHD include racial and ethnic minority populations (African Americans/Blacks, Hispanics/Latinos, American Indians/Alaska Natives, Asians, and Native Hawaiians and Other Pacific Islanders), socioeconomically disadvantaged populations, underserved rural populations, sexual and gender minority populations, and/or others subject to discrimination.[2] These populations have poorer health outcomes attributed to being socially disadvantaged, which results in being underserved in the full spectrum of healthcare.[2] Social determinants of health underlie health disparities and extend beyond recognized disadvantaged populations. While social determinants can affect health outcomes directly, they may also be associated with differential access to and use of healthcare.

The existence of health disparities in the United States is well known including disparities in preventive health services,[3] such as routine screenings, examinations, and patient counseling to prevent illnesses and other health-related conditions.[4]

Key Questions

This review addresses five KQs on achieving health equity in preventive services related to three high-burden diseases in the United States: cancer, cardiovascular disease, and diabetes. Specific preventive services are based on 10 A- or B-level recommendations from the U.S.

Preventive Services Task Force (USPSTF) (Table A). KQs were developed by members of an NIH planning committee and a nonfederal Technical Expert Panel and include the following:

Key Question 1: What is the effect of impediments and barriers on the part of providers to the adoption, promotion, and implementation of evidence-based preventive services that contribute to disparities in preventive services? Which of them are most common?

Key Question 2: What is the effect of impediments and barriers on the part of populations adversely affected by disparities to the adoption, promotion, and implementation of evidence-based preventive services that contribute to disparities in preventive services? Which of them are most common?

Key Question 3: What is the effectiveness of different approaches and strategies between providers and patients that connect and integrate evidence-based preventive practices for reducing disparities in preventive services?

Key Question 4: What is the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation, and dissemination of evidence-based preventive services in settings that serve populations adversely affected by disparities?

Key Question 5: What is the effectiveness of interventions that healthcare organizations and systems implement to reduce disparities in preventive services use?

Table A. Preventive services included in review

Condition	Preventive Service	Population
Cancer	Colorectal cancer screening	Adults age 50 to 75 years
	Breast cancer screening	Women age 40 years and older[a]
	Cervical cancer screening	Women age 21 to 65 years
	Lung cancer screening	Adults age 55 to 80 years with a smoking history
	Tobacco smoking cessation: behavioral and pharmacotherapy interventions[b]	Adults
Cardiovascular disease	Aspirin use to prevent cardiovascular disease and colorectal cancer: preventive medication	Adults age 50 to 59 years with >10% 10-year CVD risk
	Healthful diet and physical activity for CVD prevention in adults with risk factors: behavioral counseling	Adults with obesity and cardiovascular disease risk factors
	High blood pressure screening	Adults age 18 years and older
Diabetes	Abnormal blood glucose and type 2 diabetes screening	Adults age 40 to 70 years who are overweight or obese

Condition	Preventive Service	Population
	Obesity in adults: screening and management[b]	All adults (screening); adults who are overweight or obese (management)

Abbreviations: CVD = cardiovascular disease

[a]Breast cancer screening for women age 40 to 49 is a C-level USPSTF recommendation, but is covered under the Affordable Care Act and included in this review.
[b]Also relevant to cardiovascular disease prevention.

Methods

This review follows standard methods for systematic reviews[5] that are further described in the full protocol available at the Effective Health Care website (https://effectivehealthcare.ahrq.gov/topics/health-equity-preventive/protocol). The protocol was registered with PROSPERO (CRD42018109263).

Searches included Ovid® MEDLINE®, PsycINFO®, and SocINDEX databases from January 1, 1996 to July 5, 2019; Veterans Affairs Health Services Research and Development citations database; manual review of reference lists; reports produced by government agencies and healthcare provider organizations; and suggestions from experts.

Pre-established eligibility criteria defined by populations, interventions, comparators, outcomes, timing, and setting (PICOTS) were developed by investigators in accordance with established methods.[5] To meet inclusion criteria for KQ1 and KQ2, studies reported the effects of barriers and impediments, not just their association or existence. That is, studies were only included if they examined whether a barrier or impediment resulted in or explained differential preventive service use, but not if they merely demonstrated the existence of a hypothesized barrier. Although several types of study designs were eligible for inclusion, trials or observational studies with comparison groups, or before-after studies that assessed differences between groups, were most likely to report measures of effect.

Studies of the effectiveness of clinician-patient interventions (KQ3) were differentiated from studies of health system interventions (KQ5) by having a major component of care based in the clinical provider's setting or in the context of the clinical interaction. Interventions occurring outside of clinical or health system settings, such as in communities, were included if the interventions were directly or indirectly connected to clinics or health systems.

Two investigators independently reviewed eligible abstracts and full-text articles for inclusion; disagreements were resolved by discussion and consensus. Data were abstracted into evidence tables with particular emphasis on specific populations adversely affected by disparities in terms provided by the original study. All study data were verified for accuracy and completeness by a second investigator.

Risk of bias and applicability of studies were independently dual-rated as good, fair, or poor by investigators using established criteria;[5-8] disagreements were resolved by consensus. Evidence tables were developed to describe study characteristics, results, and ratings for included studies, and summary tables highlight main findings. Data synthesis involved a hierarchy-of-evidence approach, where the best evidence was considered most highly for each KQ. The strength of evidence and overall applicability for each KQ and outcome were assessed by investigators as high, moderate, or low through consensus using established methods.[5] Results of studies of patient navigation interventions to increase screening rates for colorectal, breast, or cervical cancer were combined using meta-analysis to obtain summary estimates of effect using a profile likelihood random effects model.[9]

Results

A total of 17,956 abstracts were identified through database searches and reviewed for inclusion; of these, 1,981 full-text articles meeting initial criteria were reviewed in detail. One hundred twenty-five articles representing 120 unique studies met inclusion criteria; eight studies addressed more than one KQ (Table B). Most studies evaluated the effectiveness of interventions to increase screening rates for colorectal, breast, and cervical cancer. These studies were designed as randomized controlled trials (RCTs), nonrandomized trials, and before-after studies comparing screening rates between intervention versus usual care or alternative care groups.

Table B. Number of studies included in review by Key Question and preventive service

Condition	Preventive Service	KQ1. Effect of Impediments and Barriers of Providers	KQ2. Effect of Impediments and Barriers of Populations	KQ3. Effectiveness of Patient-Provider Approaches	KQ4. Effectiveness of Health Information Technologies	KQ5. Effectiveness of Health System Interventions
Cancer	Colorectal cancer screening	0	5	6	4	50[a]
	Breast cancer screening	0	10	2	3	26[b]
	Cervical cancer screening	0	7	3	1	13[c]
	Lung cancer screening	0	0	0	0	1
	Tobacco smoking cessation	0	3	1	2	0
Cardio-vascular disease	Aspirin to prevent CVD and CRC	0	0	0	0	0
	Healthful diet and physical activity for CVD prevention	0	0	0	0	0
	High blood pressure screening	0	0	0	0	1
Diabetes	Abnormal blood glucose and type 2 diabetes screening	0	0	0	0	0
	Obesity screening and management	0	0	1[d]	2	7

Abbreviations: CRC = colorectal cancer; CVD = cardiovascular disease; KQ = Key Question

Note: Some studies are included for multiple Key Questions or preventive services.

[a]50 studies in 54 publications
[b]26 studies in 27 publications
[c]13 studies in 14 publications
[d]1 study in 2 publications

Key Question 1. Effect of Impediments and Barriers of Providers

No eligible studies evaluated provider-specific effects of impediments and barriers to the adoption, promotion, and implementation of the 10 preventive services that contribute to disparities. Although many studies describing impediments and barriers have been published, they generally do not focus on factors related to providers and frequently report cross-sectional associations between disadvantaged groups and hypothesized barriers without examining the effects of those barriers on preventive service use.

Key Question 2. Effect of Impediments and Barriers of Populations Adversely Affected by Disparities

Eighteen studies evaluated the effects of impediments and barriers of populations adversely affected by disparities to the adoption, promotion, and implementation of the 10 preventive services (Table C). Most studies were primarily designed to evaluate interventions to increase use of a preventive service, and barriers were assessed by various methods of secondary analysis. Studies included racial and ethnic minorities, including African Americans, Hispanics, Korean Americans, and Chinese Americans; and rural and low-income patients. Studies involved screening for colorectal, breast, or cervical cancer, including five studies that examined screening for multiple types of cancer, and smoking cessation.

The most commonly examined barrier was type of insurance coverage, however, results of studies were mixed, as were results for lack of a regular healthcare provider. Impediments and barriers with effects on the use of preventive services included older age, rural or economically deprived location, and issues related to access. Low income, Spanish or limited-English language, and low health literacy were not barriers.

Table C. Summary of evidence for Key Question 2: effect of impediments and barriers of populations

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Low income	1 RCT (240)	No effect among safety net clinics	Low; low
	Insurance status and type	2 RCTs (1,436)	Less screening with Medicare compared with county health plans in 1 RCT; no effect in another RCT	Low; low
	Screening attitudes	1 RCT[a] (257)	Higher scores on attitudes scale associated with higher screening rates among African Americans	Insufficient; insufficient
	Language	1 RCT[b] (1,070)	No effect on screening with Spanish compared with English speakers	Low; low
	Health literacy	1 RCT (264)	No effect on screening among disadvantaged	Low; low
Breast cancer screening	Country of origin	1 RCT (1,333); 1 before-after study (437)	More screening among Puerto Rican vs. other non-U.S. born Latinas in 1 RCT, and African-American women born outside the U.S. in a before-after study	Insufficient; insufficient
	Older age at migration	1 RCT (300)	Less screening for older low-income Chinese immigrants	Low; low
	Low income	2 RCTs (491)	No effect in 2 RCTs	Low; low

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Insurance status and type	2 before-after studies (666); 5 RCTs (3,871); 1 retrospective chart review (8,347)	More screening with Medicare compared with no coverage in 1 RCT and with insurance in 2 studies; less with insurance in 1 before-after study; no effect in 3 studies; mixed results in chart review study (lower rates for Black, not Hispanic)	Low; low
	Rural access	1 cohort study (166)	Less screening with increasing distance from radiologist office and with living in economically-deprived areas	Low; low
	No provider	1 before-after study (437); 1 RCT (300)	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
	Language	2 RCTs (1,617); 1 before-after study (229)	No effect among low-income Chinese-American immigrants, Spanish speaking or limited-English speaking Hispanic women	Low; low
	Individual access-related barriers	1 RCT (851)	Some barriers decrease screening among rural, low-income women (not knowing where to get a mammogram, cost), while others had no effect (time, insurance status, difficulty getting to the facility)	Low; low
Cervical cancer screening	Country of origin	2 RCTs (1,678)	More screening among Puerto Rican vs. other non U.S.-born Latinas in 1 RCT; no effect in RCT of low-income rural women	Insufficient; insufficient
	Older age	1 RCT (345)	Less screening for older low-income rural women	Low; low
	Low income	1 RCT (345)	No effect among low-income rural women	Low; low
	Insurance status and type	3 RCTs (2,246); 1 before-after study (782)	Less screening with Medicare compared with county health plans in 1 RCT and with any insurance in 2 studies; no effect in 1 RCT	Low; low
	Language	1 RCT[b] (967)	No effect on screening among Spanish speaking women	Low; low
	No provider	1 RCT (705); 1 before-after study (732)	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
Smoking cessation	Attitudes	1 RCT[c] (314)	Motivations for smoking differed between African-American and White smokers, but did not explain lower quit rates for African Americans	Insufficient; insufficient
	No provider	1 before-after study (879)	A regular source of healthcare was associated with planning to quit, ever receiving physician advice to quit, and smoking ≤10 cigarettes/day	Low; low

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Language	1 before-after moderation analysis (615)	Latinos preferring Spanish are more likely to quit vs. those preferring English	Insufficient; insufficient

Abbreviations: RCT = randomized controlled trial.

[a]Secondary data analysis of participants who did not undergo screening.
[b]Secondary analysis of RCT data.
[c]Mediation analysis of baseline data.

Key Question 3. Effectiveness of Patient-Provider Approaches

Twelve studies (in 13 publications) evaluated the effectiveness of approaches and strategies between patients and clinician providers that connect and integrate practices for reducing disparities in preventive services (Table D). Studies evaluated colorectal, breast, and cervical cancer screening, tobacco smoking cessation, and obesity management and enrolled African-American, Hispanic, Asian, rural, and low-income patients.

Two studies of interventions with patient navigators showed improvement in colorectal cancer screening rates, while tailored and personalized risk assessment using printed materials and telephone counseling improved screening for first-degree relatives of patients with colorectal cancer. Educational videos with physician reminders and a screening decision aid also improved colorectal cancer screening rates in specific populations. Mailed or in-person reminders for mammography screening involving lay health workers increased rates in two studies. Cervical cancer screening rates increased for low-income Latina farm workers with outreach and health education, and for low-income Chinese-American women with education and navigation. A tobacco smoking cessation intervention for women smokers attending their child's pediatric visit improved smoking abstinence rates. A weight loss intervention provided by primary care physicians for low-income, overweight and obese African-American women was effective for initial weight loss, but not for sustained weight loss.

Table D. Summary of evidence for Key Question 3: effectiveness of patient-provider approaches

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	2 RCTs (486)	Increased screening rates in 2 RCTs of Hispanic, African-American, and low-income patients	Low; low
	Printed materials and telephone counseling	1 RCT (1,280)	Increased screening rates among first-degree relatives of colorectal cancer cases for Latinos, Asians, and Whites, but not African Americans	Low; low
	Mailed materials	1 RCT (1,430)	Higher screening rates in Whites than African Americans	Insufficient; insufficient
	Educational video and physician reminder	1 RCT (65)	Higher screening rates among Latinos	Insufficient; insufficient
	Decision aid with or without personalized risk assessment	1 RCT (825)	Increased screening completion rates with decision aid among low-income patients	Insufficient; insufficient

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Breast cancer screening	Reminders with lay health workers	1 RCT[a] (2,357); 1 nonrandomized trial (1,693)	Increased screening rates among low-income women in 2 trials	Moderate; moderate
Cervical cancer screening	Reminders with lay health workers	1 nonrandomized trial (1,693)	Increased screening rates among low-income women	Low; low
	Education video and *promotora*	1 RCT (443)	Increased screening rates among rural Latinas	Low; low
	Education with navigation	1 cohort (134)	Increased screening rates among low-income Chinese-American women	Insufficient; insufficient
Tobacco smoking cessation	Message from child's clinician, interview, telephone counseling	1 RCT (303)	Higher quit rates at 3 and 12 months among low-income women	Low; low
Obesity management	Tailored weight loss intervention from primary care physicians	1 RCT (137)	Improved weight loss in low-income African-American women at 9 months, but not at 12 or 18 months	Insufficient; insufficient

Abbreviations: RCT = randomized controlled trial

[a]Includes reminder letters followed by lay health worker counseling.

Key Question 4. Effectiveness of Health Information Technologies

Eleven studies evaluated the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation and dissemination of preventive services in settings that serve populations adversely affected by disparities (Table E). Interventions included methods to increase screening for colorectal, breast, or cervical cancer, smoking cessation, and obesity management. Studies used different technology-based approaches including automated reminders delivered via text message or telephone, web-based self-monitoring, interactive kiosks, telemedicine-based video counseling, and electronic decision aids. Studies enrolled low-income, Alaska Native and American Indian, and Latina patients.

Most technology interventions did not increase screening rates or smoking quit rates compared with alternative approaches. Screening rates were higher in a study using an electronic health record (EHR) to identify patients eligible for colorectal cancer screening for mailings and phone calls, and in a RCT using an electronic decision aid with patient-ordered screening tests. A trial of smoking cessation counseling using telemedicine compared with telephone calls showed an increase in pharmacotherapy use, but no improvement in quit rates. Rates were higher with an intervention combining technological approaches to identifying and recruiting eligible patients for smoking cessation counseling and pharmacotherapy. An intervention for obesity management using a web- or telephone-based self-monitoring component resulted in lower body mass index (BMI).

Table E. Summary of evidence for Key Question 4: effectiveness of health information technologies

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Electronic decision aid with patient-ordered tests and followup messages	1 RCT (450)	Increased screening rates in low-income patients	Low; low
	Web-based electronic decision aid before healthcare visit	1 RCT (264)	No effect on screening rates in socioeconomically disadvantaged patients; increased patient readiness for screening	Insufficient; insufficient
	EHR-identified mailings and telephone calls	1 RCT (240)	Increased screening rates in low-income patients	Insufficient; insufficient
	Text messages added to usual telephone calls and mailings	1 RCT (808)	No differences among Alaska Native and American Indian patients	Low; low
Breast cancer screening	EHR-identified mailings and telephone calls	1 RCT (191)	No effect among low-income patients	Insufficient; insufficient
	EHR-triggered reminder letters	1 RCT (1,717)	No effect among low-income patients	Insufficient; insufficient
	Interactive computer program and patient navigation	1 RCT (179)	Increased mammography adherence and readiness among low-income African-American women	Insufficient; insufficient
Cervical cancer screening	Electronic education modules	1 RCT (943)	No effect among low-income Latinas	Low; low
Smoking cessation	Counseling by telemedicine	1 RCT (566)	No difference in quit rates among low-income rural patients	Low; low
	EHR-identified smokers followed by counseling and NRT	1 RCT (707)	Increased quit rates among low socioeconomic status patients	Low; low
Obesity Management	Behavioral change counseling with web- or telephone-based patient self-monitoring	1 RCT (365)	Decreased BMI among patients of ethnic and racial minorities	Low; low

Abbreviations: BMI = body mass index; EHR = electronic health record; NRT = nicotine replacement therapy; RCT = randomized controlled trial.

Key Question 5. Effectiveness of Health System Interventions

Eighty-eight studies (in 92 publications) evaluated the effectiveness of interventions implemented by healthcare organizations and systems to reduce disparities in use of preventive services (Table F). These include 50 studies of colorectal cancer screening, 26 of breast cancer screening, 13 of cervical cancer screening, six of smoking cessation, seven of obesity screening and management, and single studies of screening for lung cancer and high blood pressure. Most studies demonstrated improved outcomes with health system interventions, although some reported mixed results. Studies were highly heterogeneous and many interventions included multiple components.

Studies generally compared enhanced interventions with usual care or alternative methods, and measured effectiveness with improved screening rates, smoking quit rates, or changes in

BMI or blood pressure. Interventions included those provided within health system settings, such as patient navigators, telephone and mail contacts, checklists, and provider training; and those using community resources through partnerships or outreach, such as patient navigators in the community, lay health workers, telephone or mail contacts, patient education, and engagement with community resources. Study populations included racial and ethnic minority groups including Hispanic, African-American, and Asian; and rural and low-income patients.

Fifty studies (in 53 publications) evaluated the effectiveness of interventions to improve colorectal cancer screening compared with standard screening procedures, general health education, or usual care. Of 25 studies evaluating patient navigation, screening rates were higher in all but four. Additional studies evaluating the effectiveness of telephone calls, prompts, and other outreach methods; educational videos; screening checklists; provider training; and practice changes involving community engagement also reported higher screening rates. However, results occasionally varied by subgroup and some interventions were evaluated in few studies.

Twenty-six studies (in 27 publications) evaluated the effectiveness of health system interventions for breast cancer screening. Seven studies of patient navigation showed higher breast cancer screening rates compared with standard screening procedures, general health education, or usual care, while one trial indicated no increase. Screening was not higher with telephone calls, prompts, and other outreach methods. Small numbers of additional studies of lay health workers, patient education, screening checklists, and practice changes involving community engagement reported higher breast cancer screening rates with interventions.

Thirteen studies (in 14 publications) evaluated the effectiveness of health system interventions for cervical cancer screening. Four studies of patient navigation showed increased screening and diagnostic resolution compared with general health education or usual care. Screening and colposcopy followup rates also increased with specific types of telephone calls and prompts. Interventions with lay health workers increased screening rates among Hispanic women in one trial, but were not effective in others. While a study of practice changes involving community engagement improved screening rates, a screening checklist that increased screening rates for breast cancer was not effective in increasing rates for cervical cancer.

Lung cancer screening rates were higher with patient navigation in a trial involving five community health centers. Interventions for tobacco smoking cessation were evaluated in six trials, although results were mixed: three trials indicated improved quit rates with patient navigation, counseling, and nicotine replacement therapy, while three showed no effects. Rates of high blood pressure were not reduced with an intervention involving lay health workers, education, community activities, and a behavior change prescription. Obesity education and counseling interventions showed mixed results with lower BMI in three studies and no differences in three. Case management with a lay health worker was also ineffective in a weight reduction trial of low-income Hispanic adults.

Table F. Summary of evidence for Key Question 5: effectiveness of health system interventions

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	20 RCTs (30,736); 3 nonrandomized trials (1,392); 2 before-after studies (4,882)	Increased screening rates in all but 4 studies	High; high
	Telephone calls, prompts, and other outreach	10 RCTs (61,155); 2 nonrandomized trials (1,080); 2 before-after studies (918,667); 1 post intervention time series (4,423,734)	Increased screening rates for multiple types of outreach among several patient populations; no effect in 2 studies	High; high
	Educational videos	4 RCTs (1,823)	Increased screening for low-income patients in 2 RCTS; no effect in 2 others	Low; low
	Screening checklist	1 RCT (1,196)	Increased screening rates in low-income patients	Low; low
	Provider training	2 before-after studies (4,092)	Increased colonoscopy rates and documentation; no increase in FOBT	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low
Breast cancer screening	Patient navigation	7 RCTs (8,622); 1 before-after study (91); 1 post-intervention time series (1,664)	Increased screening rates in all studies except 1 RCT	Moderate; moderate
	Telephone calls, prompts, and other outreach	5 RCTs (2,238)	Increased screening rate in 1 RCT; no increase others	Low; low
	Patient education	2 RCTs (341)	Increased screening rates in Chinese and Korean-American women	Low; low
	Lay health workers	4 RCTs (2,573)	Increased screening rates in 3 RCTs of Hispanic and African-American women; no increase in another RCT of Hispanic women	Moderate; moderate
	Screening checklist	1 RCT (1,196)	Increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low
Cervical cancer screening	Patient navigation	3 RCTs (2,378); 1 nonrandomized trial (1,763)	Increased screening and diagnostic resolution	Moderate; moderate
	Telephone calls, prompts, and other outreach	2 RCTs (1,784)	Increased screening and colposcopy followup	Low; low
	Lay health workers	5 RCTs (3,641)	Increased screening rates among Hispanic women in 1 RCT; no increases in others	Low; low
	Screening checklist	1 RCT (1,196)	No increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Lung cancer screening	Patient navigation	1 RCT (1,200)	Increased screening rates among low-income smokers	Insufficient; insufficient
Smoking cessation	Patient navigation	2 RCTs (960)	Higher quit rates in 1 RCT, but not another	Insufficient; insufficient
	Nicotine replacement	2 RCTs (5,705)	Higher quit rates with counseling and nicotine replacement	Insufficient; insufficient
	Education and counseling	2 RCTs (6,219)	Higher short-term quit rates, but not long-term rates in 1 RCT; no differences in another	Insufficient; insufficient
High blood pressure screening	Education and counseling	1 RCT (1,443)	No difference in rates of high blood pressure among underserved women	Insufficient; insufficient
Obesity screening; management	Education and counseling	4 RCTs (1,293); 1 cohort study (69); 1 before-after study (59)	Lower BMI in 3 studies; no differences in 3 others	Insufficient; insufficient
	Case management and outreach	1 RCT (207)	No differences in BMI among low-income Hispanic adults	Insufficient; insufficient

Abbreviations: BMI = body mass index; FOBT = fecal occult blood test; RCT = randomized controlled trial

Meta-Analysis of Studies of the Effectiveness of Patient Navigation To Increase Cancer Screening

The meta-analysis included 36 studies of the effectiveness of patient navigation interventions involving clinicians and health systems to increase screening for colorectal, breast, and cervical cancer in populations adversely affected by disparities. Patient navigation broadly refers to services intended to improve a patient’s engagement in their healthcare by providing **personal guidance as they move through the healthcare system**. Services may include outreach activities with letters or calls, educational materials and sessions, assessment and addressing of barriers to screening, language translation, and appointment scheduling and reminders, among others that varied across studies. Comparison groups included patients receiving usual care or alternative services without patient navigation.

For colorectal cancer screening, 22 RCTs and 6 observational studies evaluated the effectiveness of navigation. Results of all but 4 studies indicated higher screening rates with navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups. Combining results of all studies in meta-analysis indicated increased colorectal cancer screening with navigation in both RCTs (risk ratio [RR] 1.64; 95% confidence interval [CI] 1.42 to 1.92; I^2 = 93.7%; 22 trials) and observational studies (RR 2.63; 95% CI 1.46 to 4.85; I^2 = 90.9%; 6 studies). In RCTs, navigation increased screening for fecal occult blood test/fecal immunochemical test (RR 1.69; 95% CI 1.33 to 2.15; I^2 = 80.5%; 6 trials), colonoscopy/endoscopy (RR 2.08; 95% CI 1.08 to 4.56; I^2 = 94.6%; 6 trials), and any type of test (RR 1.72; 95% CI 1.43 to 2.08; I^2 = 93.9%; 14 trials).

For breast cancer screening, 10 RCTs and one before-after observational study evaluated the effectiveness of patient navigation, and all but one study indicated higher screening rates with navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups. Combining results of all RCTs indicated increased breast cancer screening with navigation (RR 1.50; 95% CI 1.22 to 1.91; I^2 = 98.6%; 10 trials). The single observational study was consistent with these results (RR 1.52; 95% CI 1.16 to 2.00).

For cervical cancer screening, three RCTs and one observational study indicated higher screening rates with patient navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups. Results were not combined in statistical meta-analysis because of high heterogeneity.

Discussion

Strength of Evidence and Applicability

For most KQs, the strength of evidence regarding the effect of a barrier (KQ 2) or effectiveness of an intervention (KQs 3, 4, 5) is low or insufficient because of the lack of studies or studies met criteria for poor quality, were highly heterogeneous, reported different types of outcomes, or had inconsistent results. For these questions, additional evidence is required before making a conclusion or concluding either that the findings are stable or that the estimate of effect is close to the true effect.

Evidence is strongest for studies of patient navigation services to increase colorectal (high), breast (moderate), and cervical cancer screening (moderate). Although the evidence base includes several small, poor quality studies, results are supported by additional large, well-conducted studies reporting increased screening rates regardless of patient populations and settings. While results were generally consistent, the magnitude of the observed effects varied across studies. Some patient navigation interventions included additional services, such as lay health workers, reminder calls and mailings, and motivational interviewing. These services likely enhance the effect of navigation, although additional effects of these services could not be determined from the studies themselves. Evidence is high for the effectiveness of telephone calls and prompts to improve colorectal cancer screening, and moderate for reminders including lay health workers encouraging breast cancer screening.

For most KQs, overall applicability regarding the effect of a barrier (KQ2) or effectiveness of a screening intervention (KQs 3, 4, 5) is low or insufficient because the study participants were highly selected and may not represent more general populations; and studies were small in size, usually involved only one or few clinical sites, and evaluated interventions tailored for specific population groups. However, applicability ratings may not be as important in studies of populations adversely affected by disparities as they are in studies of general populations. Different populations have different mediating and contributing factors, and interventions designed to reduce disparities may be targeted to the social, historical, and structural contexts of specific populations. Thus, interventions may be more or less effective across different populations. While variability across studies may limit the ability to apply results to other populations and settings, it also provides opportunities to evaluate unique approaches to reducing disparities in specific populations.

Limitations

Limitations of this review include using only English language articles and studies applicable to the United States, although this focus improves its relevance to the Pathways to Prevention Workshop on Achieving Health Equity in Preventive Services. This review addressed five KQs that limited its scope. Eligibility criteria for studies confined inclusion to specific populations, interventions, comparators, and outcomes. Many additional issues relevant to achieving health equity in preventive services fall outside this scope. The number, quality, and applicability of studies evaluated in the evidence review varied widely. Few studies addressed the effects of impediments and barriers to preventive care, including no studies of provider barriers. The limited number of health technology-based studies precludes any conclusions about using them to improve preventive services in disadvantaged populations.

Current evidence on achieving health equity in preventive services is limited primarily by the lack of studies for specific preventive services, population groups, and interventions. Most studies involved screening for colorectal, breast, or cervical cancer, studies were not available for most of the preventive services that are the focus of this review. Although the database search identified an expansive literature on the topic of health disparities, many studies were not relevant to the KQs for this systematic review. While the effectiveness of the preventive services covered in this review has been previously established and supported by USPSTF recommendations, research evaluating the effectiveness of interventions to reduce disparities in receipt of these services is generally lacking. The lack of studies and methodological deficiencies of existing studies reflect a limited and fragmented evidence base.

Future Research Needs and Opportunities

Future research is needed to address gaps and deficiencies of existing studies. Additional research on unstudied populations experiencing adverse effects of healthcare disparities would include racial, ethnic, and socioeconomically disadvantaged populations, underserved rural populations, sexual and gender minority populations, and others subject to discrimination. Studies should expand to include more than one site or geographic region to improve statistical power for subgroup comparisons and improve understanding of similarities and differences across defined groups. Members of the target population should be involved in planning studies to inform the study design, interventions, and outcome measures. Studies evaluating interventions found to be successful in existing studies, such as patient navigation or clinician-linked outreach and education, should be extended to additional populations and settings. Additional research is needed to evaluate the effectiveness of interventions to reduce disparities for preventive services that have not been addressed by existing studies, including cardiovascular disease and diabetes.

Conclusions

This review included 120 studies (in 125 publications) of populations adversely affected by disparities in preventive health services from multiple racial, ethnic, and socioeconomically disadvantaged groups. Studies primarily evaluated barriers and interventions related to screening for colorectal, breast, and cervical cancer, with additional studies on smoking cessation and obesity management, and single studies of screening for lung cancer and high blood pressure. No studies evaluated the effect of impediments and barriers on the part of providers to the adoption, promotion, and implementation of preventive services that contribute to disparities (KQ1).

Eighteen studies evaluated the effect of impediments and barriers on the part of populations (KQ2). Results of studies were mixed for type of insurance coverage and lack of a regular healthcare provider. Impediments and barriers with effects on the use of preventive services included older age, living in a rural or economically deprived location, and issues related to access. Low income, Spanish or limited-English language, and low health literacy were not barriers.

Eleven studies evaluated the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation and dissemination of preventive services in settings that serve populations adversely affected by disparities (KQ4). Most technology interventions did not increase screening rates or smoking quit rates compared with alternative approaches.

Twelve studies evaluated the effectiveness of clinician-based interventions (KQ3) and 88 studies evaluated health system interventions to reduce disparities in use of preventive services (KQ5), predominantly screening for colorectal, breast, and cervical cancer. Colorectal cancer screening rates were higher with patient navigation; telephone calls, prompts, and other outreach methods; screening checklists; provider training; and practice changes involving community engagement. Results were mixed for educational videos. Breast cancer screening rates were higher with patient navigation; lay health workers; patient education; screening checklists; and practice changes involving community engagement, but not with telephone calls, prompts, and other outreach methods. Cervical cancer screening and diagnostic resolution rates were higher with patient navigation; telephone calls and prompts; and practice changes involving community engagement. Interventions with lay health workers and a screening checklist were not effective.

Overall, evidence is strongest for patient navigation services to increase colorectal, breast, and cervical cancer screening, telephone calls and prompts to increase colorectal cancer screening, and for reminders including lay health workers encouraging breast cancer screening. Evidence is low or insufficient for most other interventions and outcomes because of the lack of studies and methodological limitations of existing studies.

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Introduction

Purpose

This systematic evidence review summarizes research on achieving health equity in 10 preventive services for cancer, cardiovascular disease, and diabetes in adults by identifying the effects of impediments and barriers that create disparities and the effectiveness of strategies and interventions to reduce them. It is guided by five Key Questions (KQs) developed to inform the June, 2019 National Institutes of Health (NIH) Office of Disease Prevention's Pathways to Prevention Workshop on Achieving Health Equity in Preventive Services (https://prevention.nih.gov/research-priorities/research-needs-and-gaps/pathways-prevention/achieving-health-equity-preventive-services), cosponsored by the National Institute on Minority Health and Health Disparities (NIMHD), the National Heart, Lung, and Blood Institute (NHLBI), the National Cancer Institute (NCI), and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). This review also serves as a resource for health researchers, policymakers, planners, and other stakeholders to inform future efforts to achieve health equity in preventive services.

Background

Health Equity and Health Disparity: Definitions and Populations

Health equity is defined by Healthy People 2020 as the "attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and healthcare disparities."[1] NIMHD defines a *health disparity* as "a health difference that adversely affects disadvantaged populations based on one or more health outcomes."[2] The main health outcomes are: (1) higher incidence or prevalence of disease including earlier onset or more aggressive progression, and premature or excessive mortality from specific conditions; (2) a population health measure of greater global burden of disease such as Disability Adjusted Life Years (DALY); and (3) worse outcomes on self-reported measures of daily functioning or symptoms from specific conditions.[2]

Populations adversely affected by disparities as defined by the NIMHD include racial and ethnic minority populations (African Americans/Blacks, Hispanics/Latinos, American Indians/Alaska Natives, Asians, and Native Hawaiians and Other Pacific Islanders), socioeconomically disadvantaged populations, underserved rural populations, sexual and gender minority populations (lesbian, gay, bisexual, or transgender), and/or others subject to discrimination.[2] These populations have poorer health outcomes attributed to being socially disadvantaged, which results in being underserved in the full spectrum of healthcare.[2]

Social determinants of health underlie health disparities and extend beyond recognized disadvantaged populations. Social determinants of health are "conditions in which people are born, grow, live, work, and age."[3] They affect health outcomes and contribute to health inequity through pathways that typically do not involve the use, or non-use, of healthcare services.[4] Social determinants include socioeconomic factors, such as income, food insecurity, access to education, and literacy; social and community contexts, such as institutional discrimination, incarceration, and social cohesion; and environmental factors, such as crime and violence, pollution, quality of housing and other environmental conditions.[4] While social determinants can affect health outcomes directly, they may also be associated with differential access to and use of healthcare.

The existence of health disparities in the United States is well known including disparities in preventive health services, [5] such as routine screenings, examinations, and patient counseling to prevent illnesses and other health-related conditions.[6] Health disparities in preventive services are the focus of this report.

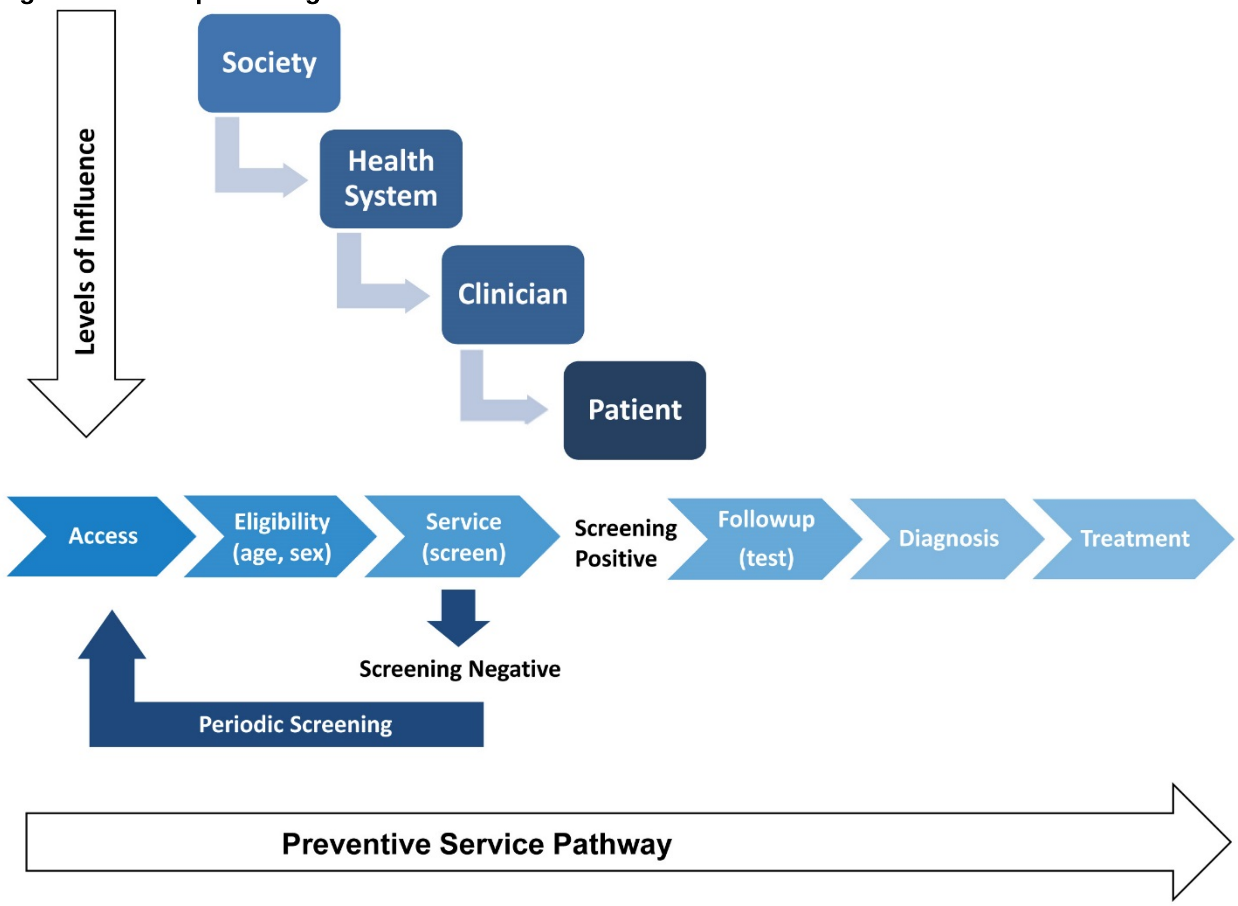
Challenges in Achieving Health Equity in Preventive Services

Overall, Americans use preventive services at approximately half the recommended rates.[7] Access and utilization of preventive healthcare differs across racial and ethnic groups,[8,9] among adolescents,[10] and for individuals with mental illness[11] or disabilities,[12] among others. Screening for cancer (colorectal, breast, cervical) and cardiovascular risk varies by poverty level and insurance status.[13-15] However, evidence about ways to reduce health disparities is often not available to inform clinical practice recommendations. In a report to Congress, the U.S. Preventive Services Task Force (USPSTF) identified evidence gaps that prevent it from making recommendations for specific racial and ethnic populations and age groups.[16] These gaps include screening for breast cancer in African-American women, prostate cancer in African-American men, and illicit drug use in children and adolescents.

Achieving health equity in prevention is particularly challenging because nearly everyone in the population is eligible for preventive services, and, consequently, disparities can occur across multiple sociodemographic dimensions as defined by Healthy People 2020.[17] In addition, the effectiveness of prevention relies on specific clinical pathways of services, which create multiple opportunities for disadvantaged groups to "fall through the cracks." As a result, the scope and complexity of this topic is immense and can be imagined as the large number of sociodemographic dimensions across which disparities might exist, multiplied by the number of preventive services considered.

The complexity of this issue is illustrated in an example of a clinical pathway for a preventive service in the conceptual diagram below (Figure 1). The first step involves gaining access to healthcare, encompassed by affordability (e.g., copays, deductibles, coinsurance payments), availability (e.g., enough providers in area, appointment availability), accessibility (e.g., geographic considerations, ease of travel to and from appointments), accommodation (e.g., flexible work schedules, clinic hours), and acceptability (e.g., racial/ethnic, gender considerations to foster productive patient-provider relationships).[18,19] After accessing healthcare, eligibility for the preventive service must be determined by identifying risk factors or other criteria (e.g., age, sex); followed by delivery of the preventive service (e.g., screening test, counseling intervention); followup of abnormal results (e.g., biopsy after mammography); and either diagnosis of the targeted health condition or resumption of routine screening at specified intervals. Each step in the pathway represents a potential gap or barrier that might give rise to a disparity resulting in inadequate preventive care for disadvantaged groups. Different preventive services present variations of this pathway.

Figure 1. Conceptual diagram



The multiple levels of influence that impact the successful navigation of the preventive service pathway are illustrated in the conceptual diagram for this review.

Successful navigation of the preventive service pathway is subject to multiple levels of influence, including those at societal, health system, clinician, and patient levels. Societal influences are particularly relevant to preventive services because accessibility is currently enhanced by provisions of the Affordable Care Act (ACA)[20] that mandate insurance coverage for U.S. Preventive Services Task Force (USPSTF) A- and B-level recommendations, immunizations recommended by the Centers for Disease Control and Prevention's Advisory Committee on Immunization Practices, and recommendations from the Health Resources and Services Administration's Bright Futures program and Women's Preventive Services Initiative. While major goals of the ACA, including expanded coverage, reduced costs, and improved healthcare quality and population health, are directed at reducing health disparities,[5] these goals may not be achieved for everyone and do not address all societal influences. Effective implementation of preventive services at the health system level is dependent upon additional influences that vary across healthcare organizations.[21] Finally, clinician and patient level influences introduce issues related to professional, group, and individual factors.

Approach to Review and Key Questions

This review addresses five KQs on achieving health equity in preventive services related to three high-burden diseases in the United States: cancer, cardiovascular disease, and diabetes.

Specific preventive services are based on 10 A- or B-level recommendations from the USPSTF (Table 1). KQs were developed by members of an NIH planning committee and a nonfederal Technical Expert Panel and include the following:

Key Question 1: What is the effect of impediments and barriers on the part of providers to the adoption, promotion, and implementation of evidence-based preventive services that contribute to disparities in preventive services? Which of them are most common?

Key Question 2: What is the effect of impediments and barriers on the part of populations adversely affected by disparities to the adoption, promotion, and implementation of evidence-based preventive services that contribute to disparities in preventive services? Which of them are most common?

Key Question 3: What is the effectiveness of different approaches and strategies between providers and patients that connect and integrate evidence-based preventive practices for reducing disparities in preventive services?

Key Question 4: What is the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation, and dissemination of evidence-based preventive services in settings that serve populations adversely affected by disparities?

Key Question 5: What is the effectiveness of interventions that healthcare organizations and systems implement to reduce disparities in preventive services use?

Table 1. Preventive services included in review

Condition	Preventive Service	Population	Outcomes Related to Access and Services	Health Outcomes
Cancer	Colorectal cancer screening	Adults age 50 to 75 years	Rates of screening based on screening modality, followup procedures, and biopsies	Colorectal cancer incidence; advanced colorectal cancer; cancer-specific mortality, morbidity, quality of life, harms of screening
	Breast cancer screening	Women age 40 years and older[a]	Rates of screening mammography, followup imaging, and biopsies	Breast cancer incidence, advanced breast cancer, breast cancer mortality, and all-cause mortality, quality of life, harms of screening
	Cervical cancer screening	Women age 21 to 65 years	Rates of screening, followup procedures, biopsies, and colposcopy	Early detection of disease; invasive cancer incidence; disease specific mortality, morbidity, quality of life, harms of screening

Condition	Preventive Service	Population	Outcomes Related to Access and Services	Health Outcomes
	Lung cancer screening	Adults age 55 to 80 years with a smoking history	Rates of screening, followup procedures, and biopsies; smoking cessation	Cancer specific mortality, morbidity, and quality of life, harms of screening
	Tobacco smoking cessation: behavioral and pharmacotherapy interventions[b]	Adults	Rates of utilization of management services; smoking cessation; changes in tobacco smoking	Disease specific morbidity; mortality; perinatal morbidity/mortality; and quality of life, harms of interventions
Cardiovascular disease	Aspirin use to prevent CVD and colorectal cancer: preventive medication	Adults age 50 to 59 years with 10% or more 10-year CVD risk	Use of low-dose aspirin for prevention purposes	CVD events (MI, CHD); colorectal cancer incidence; disease specific mortality, morbidity, quality of life, harms of low dose aspirin
	Healthful diet and physical activity for CVD prevention in adults with cardiovascular risk factors: behavioral counseling	Adults with obesity and CVD risk factors	Utilization of counseling services; changes in diet and physical activity	Cardiovascular specific mortality, morbidity, quality of life, harms of counseling
	High blood pressure screening	Adults age 18 years and older	Rates of screening; measurable changes in blood pressure	Hypertension related mortality; CVD; CHD; stroke; heart failure; end stage kidney disease, harms of screening
Diabetes	Abnormal blood glucose and type 2 diabetes screening	Adults age 40 to 70 years who are overweight or obese	Rates of screening; development of type 2 diabetes; late stage diagnosis; healthcare utilization related to diabetes	Disease specific mortality, morbidity, quality of life, harms of screening
	Obesity in adults: screening and management[b]	All adults (screening); adults who are overweight or obese (management)	Rates of screening and utilization of management services	Disease specific morbidity, mortality, function, and quality of life, harms of screening and management

Abbreviations: CHD = coronary heart disease; CVD = cardiovascular disease; MI = myocardial infarction

[a] Breast cancer screening for women age 40 to 49 is a C-level USPSTF recommendation, but is covered under the ACA.

[b] Also relevant to cardiovascular disease prevention.

Scope of Review and PICOTS

The scope of this review is confined to five KQs regarding achieving health equity for the10 clinical preventive services in the United States healthcare environment. The USPSTF recommendations are intended for implementation in primary care clinical settings, although additional resources may be necessary to successfully deliver services, such as mammography for breast cancer screening. Scope is further defined by the specific populations, interventions, comparators, outcomes, timing, and settings (PICOTS) of studies included in the review.

Research on disparities can be structured using a conceptual framework outlining phases that describe the focus of specific studies.[22] In this framework, the five KQs for this review can be considered within the second (KQ1, KQ2) and third (KQs 3-5) phases of research (Table 2).

Table 2. Relationship of the three phases of disparities research and Key Questions of review

Phase	Focus	KQ in Review
First: detecting	Define health disparities and vulnerable populations, measure disparities in vulnerable populations, consider selection effects and confounding factors	Not included
Second: understanding	Identify determinants of health disparities at patient, provider, clinical encounter, and healthcare system levels	KQ1, KQ2
Third: reducing	Intervene, evaluate, translate and disseminate, change policy	KQs 3-5

Abbreviations: KQ = Key Question

For some aspects of this review, criteria for studies are intentionally broad in order to identify research that may be unanticipated at the beginning of the search process. Criteria are more restrictive for other parts of the review in order to manage its scope. For example, studies specifically concerning individuals with disabilities are excluded because the many types of disabilities to consider would greatly expand the systematic review. However, studies with broad inclusion criteria that also enrolled individuals with disabilities are included if studies otherwise meet eligibility criteria. Table 3 lists pre-specified inclusion and exclusion criteria that guided review of potentially eligible abstracts and articles.

Population

Populations adversely affected by disparities are those defined by NIMHD and include racial and ethnic minority populations (African Americans/Blacks, Hispanics/Latinos, American Indians/Alaska Natives, Asians, and Native Hawaiians and Other Pacific Islanders); socioeconomically disadvantaged populations; underserved rural populations; sexual and gender minority populations; and/or others subject to discrimination who have poorer health outcomes often attributed to being socially disadvantaged, which results in being underserved in the full spectrum of healthcare.[2]

Adults comprising the intended target populations for the USPSTF preventive service recommendations are included for all KQs. Target populations are asymptomatic for the condition of interest and vary according to the preventive service as listed in Table 1. KQ1 includes all types of healthcare providers, such as institutions (e.g., healthcare organizations or systems) and clinicians (e.g. primary care physicians, physician assistants, nurse practitioners); all KQs include populations adversely affected by disparities; KQ3 includes clinicians in healthcare organizations and systems serving populations and patients adversely affected by disparities, while KQ5 includes the health systems themselves. Excluded populations are individuals symptomatic for the condition of interest or not eligible for the preventive service; adolescents, children, and pregnant women; populations not adversely affected by disparities (except when used as a comparator); institutionalized individuals; and studies enrolling only individuals with disabilities.

Intervention

KQs 3, 4, and 5 examine the effectiveness of interventions to improve use of preventive services and health outcomes related to the 10 included preventive services as defined in Table 1. Interventions for KQ3 include approaches and strategies connecting providers and patients for reducing disparities in preventive services; KQ4 includes health technologies and digital enterprises to improve adoption, implementation, and dissemination of preventive services; and

KQ5 includes healthcare organization level interventions to reduce disparities in use of preventive services.

Comparators

The review includes studies evaluating the impact of barriers and interventions between disadvantaged and non-disadvantaged populations (e.g., minority vs. majority) and also within populations affected by disparities (e.g., among Latinos). Specific types of comparisons include screened versus unscreened populations; served versus not served populations; intervention versus no intervention, usual care, or alternative intervention; populations with barriers versus those without; populations adversely affected by disparities versus those unaffected. Studies without comparisons are excluded.

Outcomes

Clinical outcomes for all KQs include differences in the incidence, morbidity, mortality, burden of disease, function and quality of life; and other adverse health conditions that exist among specific population groups. Intermediate outcomes include differences in measures of access to preventive services including rates of screening and followup procedures, utilization of services, behavior change, and improvements in intermediate health outcomes. Adverse effects or harms of interventions are also included for KQs 3, 4, and 5 (Table 1 and Table 3).

Timing

Any duration of study execution and followup are included.

Setting

Included settings are consistent with the scope of the USPSTF clinical recommendations and include settings applicable to primary care clinical practice, such as outpatient clinics, community health clinics, and other settings where primary care is delivered in addition to settings referable from primary care settings. Settings are located in the United States or in countries with a "very high" United Nations Human Development Index[23] that are relevant to care in the United States.

Table 3. Inclusion and exclusion criteria for studies

PICOTS	Inclusion and Exclusion Criteria
Populations	**Include:** Adults, asymptomatic for the condition and eligible for the screening or preventive service (target populations vary according to the preventive service; see Table 1) KQ1: Healthcare providers including institutions (e.g., healthcare organizations or systems) and clinicians (e.g. primary care physicians, physician assistants, nurse practitioners) KQs 1, 2, 4, & 5: Populations adversely affected by disparities KQ3: Populations adversely affected by disparities, providers serving populations adversely affected by disparities
	Exclude: Individuals symptomatic for the condition of interest or not eligible for the preventive service; adolescents, children, pregnant women; populations not adversely affected by disparities unless comparator; institutionalized individuals; individuals with severe and persistent mental illness or cognitive impairment; studies enrolling only individuals with disabilities

PICOTS	Inclusion and Exclusion Criteria
Interventions	**Include:** KQs 3-5: 10 preventive services as defined in Table 1 KQ3: Approaches and strategies connecting providers and patients for reducing disparities in preventive services KQ4: Health technologies and digital enterprises to improve adoption, implementation, and dissemination of preventive services KQ5: Healthcare organization level interventions to reduce disparities in preventive service use
	Exclude: Interventions not relevant to the KQs
Comparisons	**Include:** Screened versus unscreened populations; served versus not served populations; intervention versus no intervention or usual care; populations with barriers versus those without; populations adversely affected by disparities versus those unaffected
	Exclude: No comparison
Outcomes	**Include:** For all KQs, clinical outcomes: Differences in the incidence, morbidity, mortality, burden of disease, function and quality of life; other adverse health conditions that exist among specific population groups (see Table 1) For all KQs, intermediate outcomes: Differences in measures of access to preventive services including rates of screening and followup procedures, utilization of services, behavior change, and improvement in intermediate health outcomes For all KQs, adverse effects or harms of services or interventions
	Exclude: Outcomes not relevant to KQs
Timing	**Include:** Any duration of followup; no exclusions
Clinical Setting	**Include:** Settings applicable to U.S. primary care settings, including primary care outpatient clinics, community health clinics, and others; settings referable from primary care settings
	Exclude: All other settings, including community health case-finding
Country Setting	**Include:** All KQs: Research conducted in the United States or in populations similar to U.S. populations with services and interventions applicable to U.S. practice (i.e., countries with a United Nations Human Development Index of “very high”)
	Exclude: All KQs: Research not relevant to primary care settings in the United States
Study designs	**Include:** All KQs: Original research, including RCTs, nonrandomized controlled trials, prospective cohort studies with a concurrent control group; systematic reviews. KQs 1, 2, and 5: Before-after cohort studies without a control group in addition to above
	Exclude: All other designs including cross-sectional studies, case reports, case series, studies with historical (rather than concurrent) control groups, retrospective cohort studies.
Language	**Include:** English language article
	Exclude: Article written in languages other than English

Abbreviations: KQ = Key Question; PICOTS = populations, interventions, comparators, outcomes, timing, and setting; RCT = randomized controlled trial

Defining Barriers, Impediments, and Their Effects

For the purposes of this review, a barrier is defined as a factor that blocks access to or completion of a preventive service. An impediment is a factor that complicates or delays access to or completion of a preventive service. While some barriers and impediments may be clearly attributed to either a provider or population (e.g. a clinician’s bias towards certain patients), others are difficult to categorize.

To meet inclusion criteria for KQ1 and KQ2, studies needed to report the effects of barriers and impediments, not just their association or existence. That is, studies were only included if they examined whether a barrier or impediment resulted in or explained differential preventive service use, but not if they merely demonstrated the existence of a hypothesized barrier. For example, a study demonstrating that patients reported travel distance as a barrier to preventive service use would not be included unless it also demonstrated that distance was associated with lower screening rates. Although several types of study designs are eligible for inclusion, trials or observational studies with comparison groups, or before-after studies that assess differences between groups, are most likely to report measures of effect.

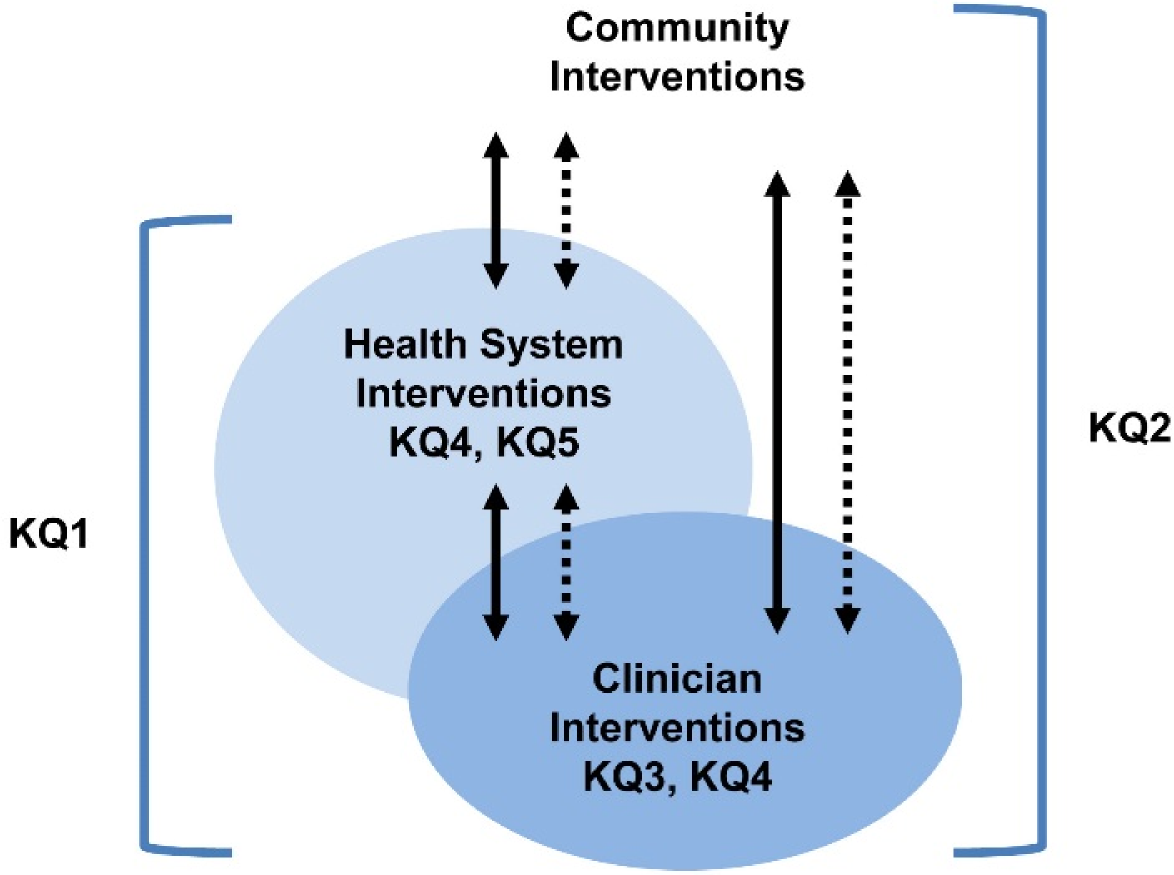
There is substantial heterogeneity in how barriers are defined and categorized in studies, particularly regarding patient-level barriers in preventive services addressed by KQ2. For included studies for KQ2, effects of barriers are based on how study investigators identified and framed barriers in individual studies. For example, an evaluation of the effect of primary language on the uptake of mammography screening in a trial of a culturally-tailored educational program would be included in the review if the primary language was identified *a priori* as a potential barrier evaluated in the study. Studies that less clearly framed their analysis around evaluating the effect of a barrier or barriers, and instead adjusted for a host of predictors, were not included. Instead of barriers, these studies focused on enabling predictors or factors more proximally involved in facilitating utilization of preventive services.

Defining Interventions and Their Effectiveness

Studies meeting inclusion criteria for KQs 3, 4, and 5 evaluated the effectiveness of an intervention on intermediate outcomes (i.e., measures of utilization or uptake such as screening rates, or measures of effects on health experienced by patients such as lipid levels); or health outcomes (i.e., measures of effects on health experienced by patients such as reduction in cancer death). These studies were designed as randomized or nonrandomized trials, observational studies with comparison groups, or before-after studies with comparisons.

Studies of the effectiveness of clinician-patient interventions (KQ3) were differentiated from studies of the effectiveness of health system interventions (KQ5) by having a major component of care based in the clinical provider's setting or in the context of the clinical interaction. Interventions occurring outside of clinical or health system settings, such as in communities, were included only if the interventions were directly or indirectly connected to clinics or health systems. These connections are illustrated by the solid and dotted lines in Figure 2. The solid lines depict interventions with direct connections between the patient and the clinical provider or healthcare system. The dashed lines depict interventions that may not have a direct connection to a clinician or health system, but bring patients to these settings, such as through a patient navigator assisting with making appointments. These types of studies are included in the review. Studies that exist outside these connections are excluded from the review, such as community-based studies that do not have a direct or indirect connection to a clinical setting (e.g., national smoking cessation quit line). Settings for KQ1 and KQ2 are depicted in Figure 2.

Figure 2. Relationship of Key Questions, interventions, and settings

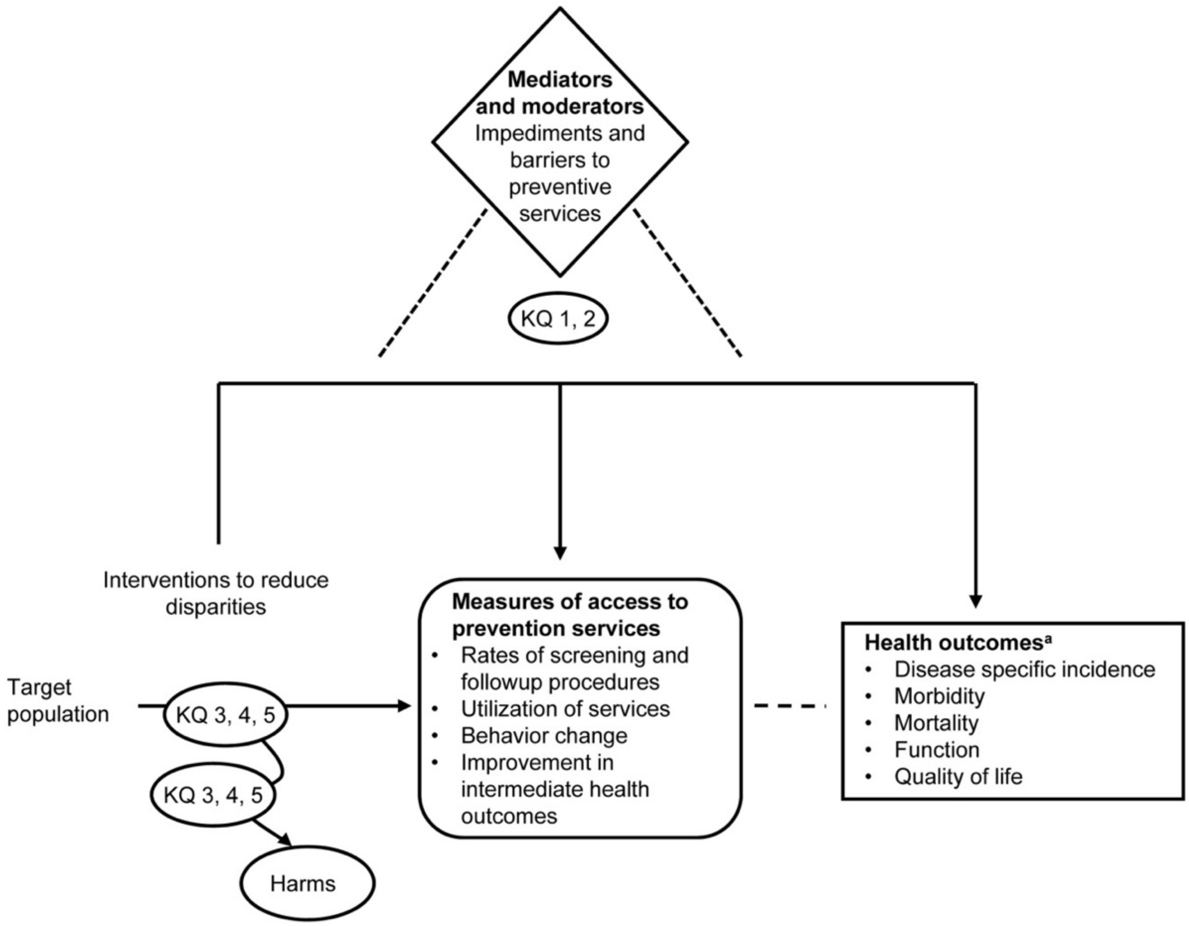


Interventions may take place primarily within clinical settings (KQ3) or health systems (KQ5), and may involve direct (solid line) or indirect (dotted line) connections to communities outside these settings.
Abbreviations: KQ = Key Question

Analytic Framework

The analytic framework represents the relationships of the KQs and the target population, interventions, and outcomes included in this review (Figure 3). The questions are depicted by linkages between interventions and outcomes as numbered below.

Figure 3. Analytic framework



Outcomes vary by preventive service and are specified in Table 1

Abbreviations: KQ = Key Question

Methods

This review follows standard methods for systematic reviews[24] that are further described in the full protocol available at the Effective Health Care website (https://effectivehealthcare.ahrq.gov/topics/health-equity-preventive/protocol). The protocol was registered with PROSPERO (CRD42018109263). Development of the purpose, scope, and Key Questions (KQs) for this review involved representatives from the National Institutes of Health (NIH) Office of Disease Prevention, the Agency for Healthcare Research and Quality (AHRQ), and the co-sponsoring NIH Institutes and Centers in addition to experts in the field who constituted a Technical Expert Panel; a presentation of the draft protocol to a panel of content area experts assembled by NIH; and posting of the protocol for public comments on a website for four weeks before beginning the review. Earlier drafts of the report were reviewed by AHRQ, NIH, and experts in the field and posted on a website for four weeks for public comments.

Search Methods

In collaboration with investigators, a research librarian initially searched Ovid® MEDLINE®, PsycINFO®, and SocINDEX databases from January 1, 1996 to July 26, 2018 and updated searches on July 5, 2019 (Appendix A). The search strategy was reviewed by a second librarian with systematic review expertise using the validated Peer Review of Electronic Search Strategies (PRESS) tool.[25] Searches also included the Veterans Affairs Health Services Research and Development citations database and manual review of reference lists of key articles. Sources for unpublished literature included reports produced by government agencies, healthcare provider organizations, and others. Members of a Technical Expert Panel, reviewers, and speakers at the Pathways to Prevention Workshop provided additional references. Authors of studies were contacted when important information regarding methods or results was omitted from a publication or for unpublished data.

Inclusion and Exclusion Criteria

Pre-established eligibility criteria were developed by investigators to determine inclusion and exclusion of abstracts and articles in accordance with the Methods Guide for Effectiveness and Comparative Effectiveness Reviews.[24] Eligibility criteria were defined by populations, interventions, comparators, outcomes, timing, and setting (PICOTS) (described above and in Table 3). Populations and health outcomes differ by preventive service (see Table 1). Two team members independently reviewed abstracts identified through searches to select eligible articles; two team members subsequently independently reviewed full-text articles meeting inclusion criteria; disagreements were resolved by discussion and consensus among investigators.

Data Abstraction and Management

After studies were selected for inclusion (Included studies are listed in Appendix B), data were abstracted into evidence tables including: study design, year, setting, number of participants, population and clinical characteristics, with particular emphasis on specific populations adversely affected by disparities in terms provided by the original study, details and characteristics about the intervention, and results relevant to each KQ. All study data were verified for accuracy and completeness by a second team member. Studies excluded at the full-text level with reasons for exclusion are listed in Appendix C.

Assessing Risk of Bias of Individual Studies

The risk of bias (quality or internal validity) of individual controlled trials, systematic reviews, and observational studies was independently dual-rated by investigators using criteria from the U.S. Preventive Services Task Force (USPSTF).[26] Systematic reviews were assessed using the AMSTAR (A MeaSurement Tool to Assess systematic Reviews) quality rating instrument.[27] These criteria and methods were used in conjunction with the approach recommended in the AHRQ Methods Guide.[24,28] Studies were rated good, fair, or poor as specified by the quality assessment criteria. Disagreements were resolved by consensus. Appendix D depicts an algorithm for classifying study designs. Detailed instructions and criteria for assessing the quality of studies are provided in Appendix E.

Studies rated *good* have the least risk of bias, and their results are considered valid. Good quality studies include clear descriptions of the population, setting, interventions, and comparison groups; a valid method for allocation of patients to treatment; low dropout rates and clear reporting; appropriate means for preventing bias; and appropriate outcome measurement.

Studies rated *fair* may be susceptible to some bias, though not enough to invalidate the results. These studies may not meet all the criteria for a rating of good quality, but no flaw is likely to cause major bias. The study may be missing information, making it difficult to assess limitations and potential problems. The fair quality category is broad, and studies with this rating vary in their strengths and weaknesses. The results of some fair quality studies are likely to be valid, while others may be only possibly valid.

Studies rated *poor* have significant flaws that imply biases of various types that may invalidate the results. They may have a serious flaw in design, analysis, or reporting; large amounts of missing information; discrepancies in reporting; or serious problems in the delivery of the intervention. The results of these studies will be at least as likely to reflect flaws in the study design as the true difference between the compared interventions. Studies rated poor were not excluded from the review, but were downgraded in synthesizing the evidence.

Assessing Applicability of Individual Studies

Applicability (external validity) was independently dual-rated by investigators using criteria from the USPSTF.[26] Disagreements were resolved by consensus. Studies were rated good, fair, or poor as specified by the applicability criteria.

Studies rated *good* differ minimally from the U.S. primary care population, setting, or providers and only in ways that are unlikely to affect the outcome. This rating indicates that it is highly probable (>90%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

Studies rated *fair* differ from the U.S. primary care population, setting, or providers in a few ways that have the potential to affect the outcome in a clinically important way. This rating indicates that it is moderately probable (50% to 89%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

Studies rated *poor* differ from the U.S. primary care population, setting, or providers in many ways that have a high likelihood of affecting the clinical outcome. This rating indicates that probability is low (<50%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

Data Synthesis

Investigators developed evidence tables describing study characteristics, results, and ratings for included studies and summary tables highlighting main findings. Data synthesis involved a hierarchy-of-evidence approach, where the best evidence was considered most highly for each KQ. Qualitative data were summarized descriptively. Appendix F provides evidence tables for each KQ, while Appendix G provides the quality ratings for individual studies. Selected relevant studies of community-based interventions captured in searches for this review that did not meet full inclusion criteria (based on Figure 2 above) are not included in the results or data synthesis, but study details are included in Appendix H as a resource.

Statistical Meta-Analysis

Results of studies of patient navigation interventions to increase screening rates were combined using meta-analysis to obtain summary estimates of effect. Meta-analysis was considered separately for studies of screening for colorectal, breast, and cervical cancer. If a study reported outcomes for more than one type of cancer screening, the results were included in multiple relevant meta-analyses. To determine the appropriateness of meta-analysis, investigators considered clinical and methodological differences and assessed statistical heterogeneity. If heterogeneity among the included studies was deemed too much to produce a meaningful estimate, the results of the studies were not combined in a meta-analysis. Small study effects (potential publication bias) were assessed using funnel plot and the Egger's test when the number of studies in the meta-analysis was larger than 10 (Appendix I).[29]

Studies were eligible for meta-analysis when the following conditions were met: 1) the intervention was described in the publication as patient navigation; 2) when not described explicitly as patient navigation, the intervention included identifiable components of patient navigation, such as assistance with patient scheduling or followup, assistance with travel to and from an appointment, and/or accompanying patients to appointments; 3) screening rates were explicit outcomes that were compared between the intervention and control groups. Studies meeting criteria for poor quality were included in the meta-analysis because the rating criteria are more suited to efficacy trials of medications than effectiveness trials of personalized patient interventions. Trials receiving poor-quality ratings may provide useful findings nonetheless.

The screening outcome was binary (screened/not screened) and risk ratio (RR) was used as the effect measure. If an adjusted RR or odds ratio (OR) was reported, it was used in the meta-analysis (an adjusted OR was first converted to an adjusted RR).[30] Otherwise, the RR was calculated from the reported raw numbers. When a study reported outcomes at more than one time point, results from the longer time point were used in the overall analysis. In studies with two intervention arms with navigation components,[31] results of the two arms were first combined before they were included in the meta-analysis. Meta-analysis was conducted separately for randomized controlled trials and observational studies. Studies of cervical cancer screening were not combined because of their high heterogeneity, but are described in the results for completeness.

The presence of statistical heterogeneity among the studies was assessed using Cochran's χ^2 tests, and the magnitude of heterogeneity using the I^2 statistic.[32] The RRs were combined by using a profile likelihood random effects model to account for variation among studies.[33,34]

Subgroup analysis was performed to explore whether the combined estimates differed by study level characteristics when this information was provided by studies. Estimates based on specific populations adversely affected by disparities were not made because they varied widely across studies, although basic descriptions of the 16 different groups are included for each study in tables accompanying the forest plots.

For colorectal cancer screening studies, subgroup analysis was based on type of screening test (fecal occult blood test/fecal immunohistochemistry test; colonoscopy/endoscopy; any type), screening adherence at baseline (no adherence; some adherence), followup time points (6 months; 1 year; 18 months; 5 years), and study quality rating (good; fair; poor) when at least two studies reported results. For breast cancer screening studies, subgroup analysis was based on screening adherence at baseline (no adherence; some adherence), followup time points (1 year; 18 months; 2 years; 5 years; other), and study quality rating (fair; poor).

Annualized percentage estimates of screening rates with navigation compared with controls were created by standardizing the screening data to 12 months, assuming consistent screening rates over time. These were calculated as simple unweighted proportions across studies, and percent navigation divided by percent control does not equal the pooled RR. While these estimates do not provide formal inferences, they are intended to provide clinical context and facilitate the interpretation of the RRs.

All analyses were performed by using STATA® 14.2 (StataCorp, College Station, TX), and all results were provided with 95 percent confidence intervals.

Grading the Strength of Evidence for Major Comparisons and Outcomes

The strength of evidence for each KQ and outcome was initially assessed by one investigator using the approach described in the AHRQ Methods Guide.[24] To ensure consistency and validity of the assessment, the grades were then reviewed by the entire team of investigators for: study limitations (low, medium, or high level); consistency (consistent, inconsistent, or unknown/not applicable); directness (direct or indirect); precision (precise or imprecise); and reporting bias (suspected or undetected).

The strength of evidence was assigned an overall grade of high, moderate, low, or insufficient by evaluating and weighing the combined results of the above domains. *High* strength of evidence indicates high confidence that the estimate of effect lies close to the true effect for the outcome; the body of evidence has few or no deficiencies; and the findings are stable, (i.e., another study would not change the conclusions). A *moderate* grade indicates moderate confidence that the estimate of effect lies close to the true effect for the outcome; the body of evidence has some deficiencies; and the findings are likely to be stable, but some doubt remains. A *low* grade indicates limited confidence that the estimate of effect lies close to the true effect for the outcome; the body of evidence has major or numerous deficiencies (or both); and additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect. A grade of *insufficient* indicates that there is no evidence, unable to estimate an effect, or there is no confidence in the estimate of effect for the outcome; and no evidence is available or the body of evidence has unacceptable deficiencies, precluding conclusions. Appendix J presents strength of evidence for each KQ.

Assessing Overall Applicability

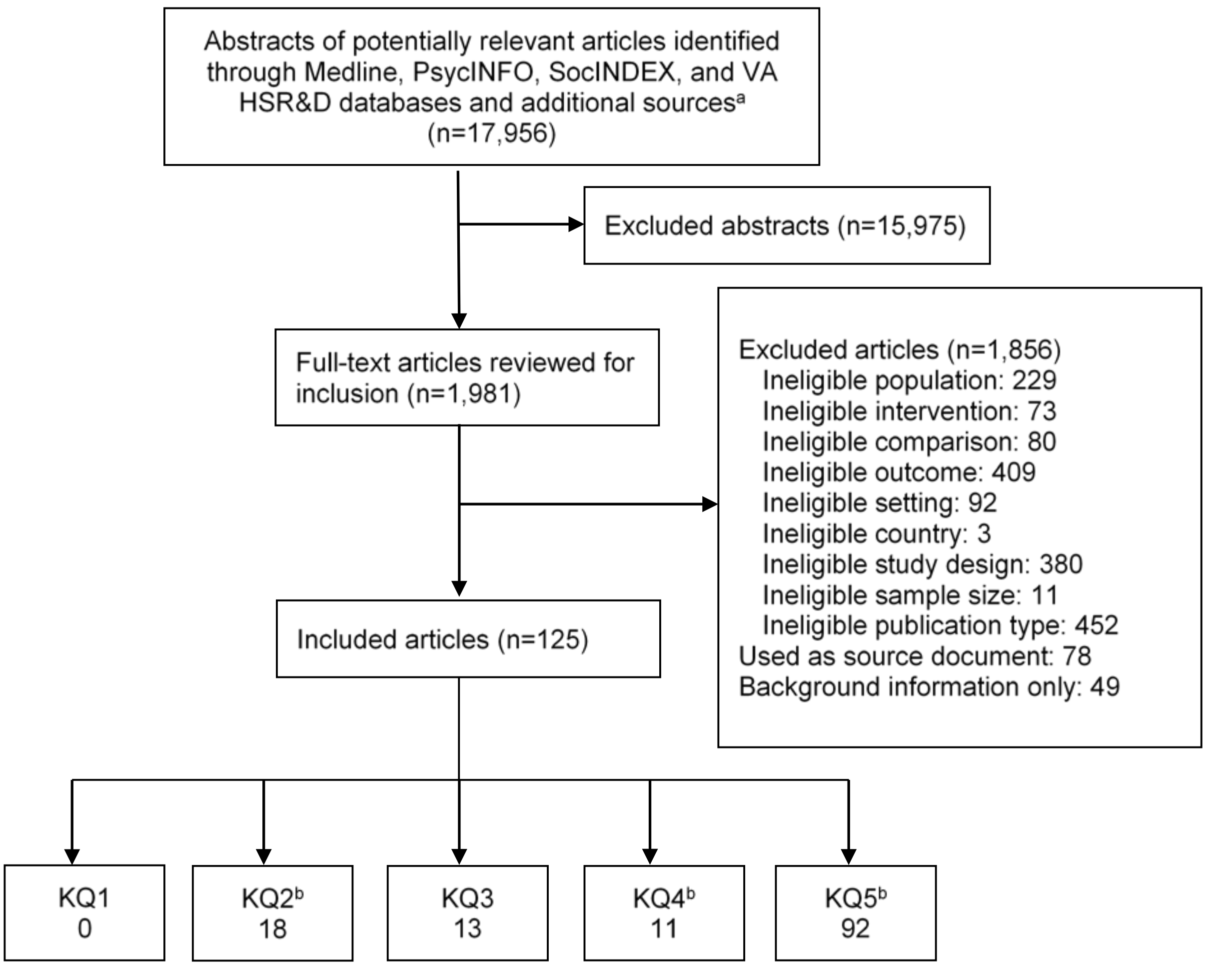
Overall applicability (external validity) for each KQ was rated *high*, *moderate*, *low*, or *insufficient* through team consensus. These ratings were estimated by examining the characteristics of the patient populations (e.g., demographic characteristics and characteristics of specific populations adversely affected by disparities, criteria used for diagnosis, presence of co-morbidities); sample sizes of the studies; clinical settings where the interventions occurred (e.g., primary care, community setting, type of provider); and levels of influence that may impact specific populations adversely affected by disparities (see Figure 1).

Results

Results of Literature Search

A total of 17,956 abstracts were identified through database searches and additional sources (reference lists, reviewers) and reviewed for inclusion; of these, 1,981 full-text articles meeting initial criteria were reviewed in detail. One hundred twenty-five articles representing 120 unique studies met inclusion criteria; eight studies addressed more than one Key Question (KQ) (Figure 4).

Figure 4. Literature flow diagram



Abbreviations: KQ = Key Question; VA HSR&D = Veterans Affairs Health Services Research and Development Service
[a] Additional sources include suggested references, reference lists, etc.
[b] Some are included in multiple Key Questions.

Types of Studies Included

Table 4 lists the numbers of studies (out of a total of 120) meeting inclusion criteria by KQ and preventive service. Most studies evaluated the effectiveness of interventions to increase screening rates for colorectal, breast, and cervical cancer. These studies were designed as randomized controlled trials (RCTs), nonrandomized trials, and before-after studies comparing screening rates between intervention versus usual care or alternative care groups. Ten studies evaluated interventions to increase screening for more than one type of cancer and five studies met criteria for more than one KQ.

Table 4. Number of studies included in review by Key Question and preventive service

Condition	Preventive Service	KQ1. Effect of Impediments and Barriers of Providers	KQ2. Effect of Impediments and Barriers of Populations	KQ3. Effectiveness of Patient-Provider Approaches	KQ4. Effectiveness of Health Information Technologies	KQ5. Effectiveness of Health System Interventions
Cancer	Colorectal cancer screening	0	5	6	4	50[a]
	Breast cancer screening	0	10	2	3	26[b]
	Cervical cancer screening		7	3	1	13[c]
	Lung cancer screening	0	0	0	0	1
	Tobacco smoking cessation	0	3	1	2	6
Cardio-vascular disease	Aspirin use to prevent CVD and CRC	0	0	0	0	0
	Healthful diet and physical activity for CVD prevention	0	0	0	0	0
	High blood pressure screening	0	0	0	0	1
Diabetes	Abnormal blood glucose and type 2 diabetes screening	0	0	0	0	0
	Obesity screening and management	0	0	1[d]	2	7

Abbreviations: CRC = colorectal cancer; CVD = cardiovascular disease; KQ = Key Question
Note: Some studies are included for multiple Key Questions or preventive services.
[a] 50 studies in 54 publications
[b] 26 studies in 27 publications
[c] 13 studies in 14 publications
[d] 1 study in 2 publications

Key Question 1. Effect of Impediments and Barriers of Providers

No studies met inclusion criteria for KQ1. While the search identified studies that investigated potential barriers and impediments related to healthcare providers and systems, no studies directly addressed the impact of hypothesized barriers and impediments on disparities in preventive service use, or on utilization rates in disadvantaged populations.

Key Question 2. Effect of Impediments and Barriers of Populations Adversely Affected by Disparities

Key Question 2. Overview

Eighteen studies evaluated the effect of impediments and barriers on the part of populations adversely affected by disparities to the adoption, promotion, and implementation of preventive services. Studies included racial and ethnic minorities, including African Americans, Hispanics, Korean Americans, and Chinese Americans; and rural and low-income patients. Studies involved screening for colorectal, breast, or cervical cancer, and smoking cessation.

Key Question 2. Key Findings

- Results of studies were mixed for type of insurance coverage and lack of a regular healthcare provider.
- Impediments and barriers with effects on the use of preventive services included older age, rural or economically deprived location, and issues related to access.
- Low income, Spanish or limited-English language, and low health literacy were not barriers.

Key Question 2. Results of Studies

Eighteen studies meeting inclusion criteria evaluated the effects of impediments and barriers on the part of populations adversely affected by disparities to the adoption, promotion and implementation of evidence-based preventive services (Appendix F, Tables F-1 and F-2).[35-47]

Studies involved screening for colorectal, breast, or cervical cancer, including six studies (in 7 publications) of screening for multiple services (e.g., breast and cervical cancer screening), and smoking cessation. No studies of other preventive services were identified or met inclusion criteria. Most studies were primarily designed to evaluate interventions to increase use of a preventive service, and barriers were assessed by various methods of secondary analysis. Eleven[35-38,41,42,44,46-48] studies specifically enrolled racial and ethnic minority populations including Hispanic/Latino,[41,46,48,49] African-American,[35-37,44,47] Korean-American,[38] and Chinese-American.[42] Five[39,45,50-52] studies enrolled rural and low-income populations, including one in France;[39] the remaining studies were set in the United States. Most studies were conducted in community settings, although five[36,37,40,43,46] studies were in community health centers, primary care clinics,[36,37,48,49,51,52] and hospitals. Studies enrolled 166 to 8,347 participants with mean ages, when reported, between 36 to 63 years. Twelve[36-39,41,42,44-46,49,51,52] studies exclusively enrolled women.

Major limitations of RCTs include high loss to followup, inadequate description of randomization, and unbalanced groups at baseline. Major limitations of cohort studies include unclear or high differential loss to followup and attrition, and unclear blinding of outcome assessors and data analysts. While blinding of patients and health workers in several studies may not be feasible, studies frequently did not adequately describe these efforts or considerations (Appendix G, Tables G-1, G-2, G-3, and G-4).

All studies included evaluations of a heterogeneous set of specific barriers with no consensus across studies on how barriers were defined or assessed. Instead, evaluations of the effect of barriers on the use of preventive services were largely ad-hoc and determined by each study.

Key Question 2. Effects of Barriers to Colorectal Cancer Screening

Five studies examined the effects of barriers to colorectal cancer screening including type of insurance coverage among low-income patients,[40,43] patients' attitudes towards screening in an African-American population,[44] acculturation/primary language among Spanish-speaking women,[49] and health literacy among socioeconomically disadvantaged adults[50] (Table 5).

Two fair quality RCTs showed mixed effects of insurance coverage on screening. A trial of 240 low-income patients in safety-net clinics overdue for colorectal screening evaluated access-related barriers.[40] Patients were randomized to a 6-month multimodal intervention (outreach, prompts to clinicians, and mailing of home testing kits) versus usual care. In logistic regression models, neither insurance coverage nor household income was related to screening.

A cluster RCT tested a cancer screening checklist and chart stickers designating whether screening was ordered or completed to increase screening for colorectal, breast, and cervical cancer among 1,196 low-income patients at a community health center.[43] The study compared patients under the county health plan, which provided healthcare for uninsured persons who did not qualify for public programs, with those who had Medicaid, Medicare, or other coverage and adjusted for baseline characteristics including age, sex, race, and comorbidities, among others. Patients with Medicare coverage were less likely to obtain colorectal screening compared with patients covered under the county health plan (adjusted odds ratio [aOR] 0.73, 95% confidence interval [CI] 0.54 to 0.998). Screening for patients with Medicaid or other sources of insurance coverage did not differ from patients covered under the county health plan.

A secondary data analysis of participants of a RCT examined the effects of patients' attitudes, benefits, and barriers on colorectal cancer screening in a community-based sample of 257 African-American adults.[44,53] Participants were randomized to receive one of three interventions or to the control group: 1) reduced out of pocket, reimbursement for personal expenses incurred during screening; 2) one-on-one education, meeting with a health educator for 3 weekly sessions; 3) group education, meeting as a group with a health educator for 4 weekly sessions. In adjusted logistic regression analyses, scores on the investigator developed Attitudes, Benefits, and Barriers scale were associated with a higher likelihood of screening (aOR 1.12, 95% CI 1.01 to 1.24). However, the study did not provide details on how the scale was constructed, how barriers were defined and operationalized in the multi-domain scale, or directionality and interpretation of scale values. Screening had no relationship to scores on other scales used in this study (Fatalism Scale, Rosenberg Self-esteem Scale, Social Support Scale, Social Network Diversity Scale).

A secondary data analysis of patients in Federally Qualified Community and Migrant Health Centers participating in a RCT assessed the effect of acculturative status (defined as Spanish or English language preference) on the effectiveness of a prevention care management intervention in improving colorectal cancer screening for 1,070 women overdue for screening.[49] Participants were randomized to usual care or care management, where a care manager provided support to overcome screening barriers and assistance scheduling appointments. In adjusted logistic regression analyses, screening was not higher in English or Spanish-speaking women receiving the care management intervention (Spanish-speaking aOR 1.31, 95% CI 0.78 to 2.19).

A fair quality RCT in a community-based setting evaluated the effect of limited health literacy on the effectiveness of a web-based decision aid, Communicating Health Options through Interactive Computer Education (CHOICE), on colorectal cancer screening completion among 264 socioeconomically disadvantaged adults.[50] The control group received a web-based program delivering information on prescription drug refills and safety. In adjusted logistic regression analyses, the intervention did not increase screening for adults with limited (aOR 1.7, 95% CI 0.69 to 4.4) or adequate literacy (aOR 1.9, 95% CI 1.1 to 5.0).

Table 5. Studies of the effects of barriers to colorectal cancer screening

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Beach et al., 2007[a,b,49]	Spanish-speaking women	Preferred language (Spanish, English)	Federally Qualified Community/Migrant Health Centers New York City, New York	Secondary analysis of RCT data (1,070)	Care management with reminder calls, assistance in overcoming barriers, providing emotional support, and help scheduling appointments versus usual care	Screening up-to-date at followup (any test): Spanish-speaking: aOR 2.12 (95% CI 1.54 to 2.90); English-speaking: aOR 1.62 (95% CI 1.08 to 2.45); Interaction, Spanish language/study group: aOR 1.31 (95% CI 0.78 to 2.19)	Fair; fair
Hendren et al., 2014[a,40]	Low-income adults	Insurance status and type; household income	Large safety-net primary care practice; Rochester, New York	RCT (240)	Multimodal intervention including: 1) letters; 2) automated telephone calls; 3) point-of-care prompts reminding clinicians and patients of past due status; 4) mailing home test kit versus control	Screening (colonoscopy, FIT, FOBT) by insurance status (none is reference): private, OR 1.58 (95% CI 0.38 to 6.53); Medicare, OR 3.61 (95% CI 0.83 to 15.55); Medicaid, OR 2.53 (95% CI 0.57 to 11.21); by household income (<$30,000 is reference): >$40,000, OR 1.88 (95% CI 0.69 to 5.09); $30,000 to $39,000, OR 1.98 (95% CI 0.83 to 4.76)	Fair; good
Miller, Jr et al., 2011[50]	Socio-economically dis-advantaged adults	Health literacy	Community-based, Winston-Salem, North Carolina	RCT (264)	Subanalysis of patients with limited and adequate health literacy in trial of CHOICE, an interactive, web-based decision aid versus attention control	Completed any screening test: Limited health literacy aOR 1.7 (95% CI 0.69 to 4.4); adequate health literacy aOR 1.9 (95% CI 0.70 to 5.0)	Fair; fair
Roetzheim et al., 2004[a,b,43]	Low-income adults	Insurance type	8 clinics; Hillsborough County, Florida	Cluster RCT of 8 practices (1,196)	Cancer screening checklist completed by patients and stickers to designate whether screening was ordered and completed versus usual care	Screening (FOBT) by insurance type (county is reference): Medicare, OR 0.73 (95% CI 0.54 to 0.998); Medicaid, OR 0.83 (95% CI 0.60 to 1.16); other, OR 0.82 (95% CI 0.54 to 1.23)	Fair; fair
Smith et al., 2017[44]	African American adults	Screening attitudes	Community (not further described)	Secondary analysis of participants who did not receive screening in a RCT (257)	Randomized to a group: 1) reduced out of pocket: reimbursed for personal screening expenses; 2) one-on-one education: met with health educator in 3 weekly sessions; 3) group education: met with health educator in four weekly sessions; 4) control	Screening (any type) and Attitudes, Barriers, and Beliefs Scale: OR 1.121 (95% CI 1.013 to 1.242); screening had no relationship to other scales (Fatalism Scale, Rosenberg Self-esteem Scale, Social Support Scale, Social Network Diversity Scale)	NA; fair

Abbreviations: aOR = adjusted odds ratio; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; NA = not applicable; OR = odds ratio; RCT = randomized controlled trial

[a] Also includes breast cancer screening (Table 6).

[b] Also includes cervical cancer screening (Table 7).

Key Question 2. Effects of Barriers to Breast Cancer Screening

Ten studies examined the effects of barriers to breast cancer screening among racial and ethnic minorities, including African-American,[37] Hispanic,[41,46,49] and Chinese-American women;[42] and among rural[39] and low-income women[40,43,51,52] (Table 6).

A before-after study in community health centers and primary care clinics administered a tailored case management intervention over five years to address barriers to mammography screening among 437 African-American women age 40 years and older.[37] The study examined predictors of mammography uptake (at least one occurrence of mammography use during the study period) and predictors of receiving recommended repeated, longitudinal mammography screening after the case management intervention. The study occurred when routine mammography screening was recommended for all women age 40 and older.

Predictors of mammography uptake for women age 40 and older included no regular healthcare provider at baseline (aOR 0.20, 95% CI 0.07 to 0.62) and housing concerns (aOR 0.40, 95% CI 0.21 to 0.77), while insurance coverage was not a predictor. For women age 50 and older, no predictors were related to uptake. Predictors of repeated, longitudinal mammography screening for women age 40 and older included no insurance (aOR 0.54, 95% CI 0.35 to 0.85), family history of breast cancer (aOR 0.64, 95% CI 0.44 to 0.94), mammogram at baseline (aOR 2.16, 95% CI 1.51 to 3.09), and born outside the United States (aOR 1.68, 95% CI 1.15 to 2.47). Among women age 50 and older, no insurance (aOR 0.42, 95% CI 0.20 to 0.87), mammogram at baseline (aOR 1.94, 95% CI 1.07 to 3.52) and born outside the United States (aOR 2.41, 95% CI 1.29 to 4.49) were predictors.

A secondary data analysis of Federally Qualified Community and Migrant Health Centers patients participating in a RCT assessed the effect of acculturative status (defined as Spanish or English language preference) on the effectiveness of a prevention care management intervention in improving mammography screening for 1,317 women overdue for screening.[49] Participants were randomized to usual care or care management, where a care manager provided support to overcome screening barriers and assistance scheduling appointments. In adjusted logistic regression analyses, screening was not higher in English or Spanish-speaking women receiving the care management intervention (Spanish-speaking aOR 1.51, 95% CI 0.94 to 2.42).

A fair quality RCT of 851 rural, low-income women seen in federally funded community health centers evaluated a lay health advisor intervention on uptake of breast cancer screening.[51] The intervention consisted of 3 in-person visits with the lay health advisor and included educational materials and followup phone calls and mailings. Women in the control group received a National Cancer Institute brochure about cervical cancer screening. Not knowing where to get a mammogram (risk ratio [RR] 0.44, 95% CI 0.24 to 0.82) and cost (RR 0.83, 95% CI 0.70 to 0.97) were associated with lower screening mammography. Other factors were not associated including difficulty finding time for screening (RR 0.77, 95% CI 0.59 to 1.02), no insurance (RR 0.96, 95% CI 0.83 to 1.10), difficulty getting to the doctor's office (RR 1.01, 95% CI 0.71 to 1.45), and not feeling respected by doctors and nurses (RR 0.43, 95% CI 0.11 to 1.65).

A retrospective chart review study of 8 rural Accountable Care Organization primary care clinics evaluated associations between health insurance and primary language barriers and mammography screening among 8,347 rural women.[52] This study conducted multilevel analyses to assess whether obtaining biennial mammography screening was affected by patient, provider, and county-level characteristics. Relative to non-Hispanic white women, non-Hispanic Black women (OR 0.32, 95% CI 0.14 to 0.75), and women described as "other race/ethnicity" (OR 0.76, 95% CI 0.61 to 0.94) had lower use of mammography, although the specific definition of “other race/ethnicity” category was not specified. Hispanic women (OR 0.85, 95% CI 0.56 to 1.28) and women whose primary language is English (OR 1.02, 95% CI 0.74 to 1.43) were not less likely to be screened. Women who were uninsured (OR 0.22, 95% CI 0.10 to 0.46) or publicly insured (OR 0.83, 95% CI 0.69 to 1.00) were less likely to be screened compared with privately insured women.

Two studies examined barriers to screening in Hispanic women and indicated conflicting results regarding health insurance coverage. A faith-based breast and cervical cancer educational and *promotora* (lay health worker) intervention was compared with a control group receiving diabetes prevention education in a fair quality cluster RCT of 1,333 Latina women.[41] The study was conducted in community-based settings across three sites in Arkansas, Buffalo, and New York City and spanned two years (2007 to 2009) with followup at 2 and 8 months. Results indicated increased screening for women with health insurance (OR 2.48, 95% CI 1.67 to 3.70), and among women with Puerto Rican ethnicity compared with Latinas not born in the United States or Puerto Rico. Although several other barriers to screening were examined, including financial (lack of money) and access-related barriers (lack of time), results were not provided.

A before-after study of an outreach program with *promotoras* assessed access-related barriers to mammography screening for 229 Latina immigrants in Alabama.[46] Barriers to screening examined in the study included lack of health insurance, not knowing where to get screening, limited English proficiency, recent arrival to the United States (lived in Alabama less than 5 years), procrastination, embarrassment, fear of finding cancer, and lack of a doctor’s recommendation for screening. In multivariable analysis, Latina immigrants with health insurance were less likely to schedule a mammogram compared with Latina immigrants without health insurance (adjusted prevalence ratio [aPR] 0.45, 95% CI 0.26 to 0.78). Other barriers were not predictors of mammography screening in this study.

A fair quality RCT of a community-based population of 300 Chinese-American immigrants in Portland, Oregon compared a two-part culturally-tailored breast cancer educational intervention coupled with individualized counseling sessions with a control group receiving a mammography brochure published by the National Cancer Institute.[42] The study was conducted over one year (2010 to 2011) with followup at 3, 6, and 12 months. Barriers to screening included in final adjusted models were not married/partnered, older age, and older age at migration to the United States, while lower educational attainment, employment (part-time or unemployed compared with full employment), lower income, limited English proficiency, not having a regular healthcare provider, not having a healthcare provider recommendation, and lack of health insurance coverage were not barriers in this study.

A fair quality cohort study assessed the effectiveness of mobile mammography screening in reducing economic and geographic barriers to breast cancer screening among rural and low-income women in a geographic region in Orne, France.[39] Screening participation rates were determined from mammography screening records from 2003 through 2012 and related to measures of geographic, area-level deprivation using the French version of the European Deprivation index and remoteness to screening sites. One group was invited to mammography screening at their radiologists’ offices, while another group was invited to screening at their radiologists’ offices or at a mobile mammography van. Among the radiologist office group, women residing in the most deprived areas were screened less compared with women in the least deprived areas (most deprived areas: fourth quintile, aOR 0.83, 95% CI 0.71 to 0.96; fifth quintile, aOR 0.81, 95% CI 0.69 to 0.95). Also, women living in areas farther from their radiologists’ offices were screened less than women residing closer (5 to 10 km, aOR 0.91, 95%

CI 0.81 to 1.01; 10 to 15 km, aOR 0.75, 95% CI 0.66 to 0.85; see Table 6 for additional data). Screening was not associated with area-level deprivation quintile or distance to radiologists' offices in the group offered screening at radiologists' offices or at a mobile mammography van.

Two studies of barriers to breast cancer screening in low-income women also evaluated barriers to colorectal cancer screening and are discussed in the above section.[40,43] A fair quality RCT examined access-related barriers to mammography screening among 191 low-income patients in safety-net care clinics who were overdue for screening.[40] Patients were randomized to a 6-month multimodal intervention (outreach, prompts to clinicians) or usual care. In logistic regression models, patients with Medicare coverage had higher screening rates compared with uninsured patients (aOR 6.24, 95% CI 1.23 to 31.61). Other insurance coverage categories and household income were not predictors of mammography screening in this study. Another fair quality cluster RCT evaluated the effectiveness of a cancer screening checklist and chart stickers designating whether screening was ordered or completed to increase breast cancer screening among 1,196 low-income patients at a community health center.[43] Type of insurance (Medicare, Medicaid, or other sources) did not influence mammography screening compared with patients covered under the county health plan.

Table 6. Studies of the effects of barriers to breast cancer screening

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Beach et al., 2007[a,b,49]	Spanish-speaking women	Preferred language (Spanish, English)	Federally Qualified Community/Migrant Health Centers New York City, New York	Secondary analysis of RCT data (1,317)	Care management with reminder calls, assistance in overcoming barriers, providing emotional support, and help scheduling appointments versus usual care	Screening up-to-date at followup: Spanish-speaking: aOR 1.86 (95% CI 1.39 to 2.50); English-speaking: aOR 1.23 (95% CI 0.85 to 1.78); interaction, Spanish language/study group: aOR 1.51 (95% CI 0.94 to 2.42)	Fair; fair
Clark, et al., 2009[c,37]	African-American women	Insurance status; access; socio-economic factors	Community health centers and primary care clinics; Boston, Massachusetts	Before-after study (437)	Case management intervention provided services to address barriers to screening; compared changes in screening uptake before and after the intervention	Barriers age ≥40: no regular provider, aOR 0.20 (95% CI 0.07 to 0.62); housing concerns, aOR 0.40 (95% CI 0.21 to 0.77); not insurance status; barriers age ≥50: no statistically significant predictors	NA; fair
Guillaume, et al., 2017a[39]	Rural and/or low-income women	Income; distance from screening	Orne, France	Longitudinal cohort study (166)	Women invited to screening through radiologist office compared with women invited to screening though radiologist office or mobile mammography van	Invited by radiologist office: reduced screening for lowest income, 4th quintile aOR 0.83 (95% CI 0.71 to 0.96); 5th quintile, aOR 0.81 (95% CI 0.69 to 0.95); and greater distance from office, 5 to 10 km, aOR 0.91 (95% CI 0.81 to 1.01); 10 to 15 km, aOR 0.75 (95% CI 0.66 to 0.85); 15 to 20 km, aOR 0.61 (95% CI 0.53 to 0.70); 20 to 25 km, aOR 0.47 (95% CI 0.40 to 0.56); 25 to 30 km, aOR 0.47 (95% CI 0.39 to 0.57); >30 km, aOR 0.54 (95% CI 0.42 to 0.69); no associations with income or distance from radiologist office for van invitations; increased screening with van invitation, aOR 2.9 (95% CI 2.7 to 3.03)	Fair; fair
Hendren et al., 2014[a,40]	Low-income	Insurance status and type	Large safety-net primary care practice; Rochester, New York	RCT (191)	Multimodal intervention including: 1) letters; 2) automated telephone calls; 3) point-of-care prompts reminding clinicians and patients the patient was past due for the service versus control	Screening by insurance status (none is reference): private, OR 1.50 (95% CI 0.36 to 6.19); Medicare, OR 6.24 (95% CI 1.23 to 31.61); Medicaid, OR 2.57 (95% CI 0.57 to 11.59); by household income (<$30,000 is reference): >$40,000, OR 2.65 (95% CI 0.84 to 8.43); $30,000 to $39,000, OR 1.44 (95% CI 0.49 to 4.29)	Fair; good

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Jandorf, et al., 2014[b,41]	Latinas	Insurance; ethnicity	Community-based settings in Arkansas, Buffalo and New York City, New York	Cluster RCT (1,333)	Faith-based, peer-led breast and cervical cancer education sessions plus navigation at 2 months for those not yet screened versus diabetes education sessions	Increased screening: health insurance, OR 2.48 (95% CI 1.67 to 3.70); U.S. born Puerto Rican ethnicity compared with Latinas born outside the U.S. or Puerto Rico (OR not reported)	Fair; fair
Lee-Lin et al., 2015[42]	Low-income Chinese-American immigrant women	Access; insurance; language; socio-economic factors	Chinese communities in Portland, Oregon	RCT (300)	Culturally responsive targeted breast health educational program versus standard brochure	Barriers to screening: marital status, age, and age at migration to the U.S.; not barriers: lower educational attainment, employment, income, English proficiency, having a regular healthcare provider, healthcare provider recommendation, mammography insurance coverage	Fair; fair
Paskett et al., 2006[51]	Rural, low-income women	Access; insurance	4 Federally funded community health centers Robeson County, North Carolina	RCT (851)	Lay health advisor intervention consisting of 3 in-person visits with educational materials and followup phone calls/mailings after each visit versus control group receiving brochure about cervical cancer screening	Too hard to find time: RR 0.77 (95% CI 0.59 to 1.02); do not know where to get a mammogram: RR 0.44 (95% CI 0.24 to 0.82); no insurance: RR 0.96 (95% CI 0.83 to 1.10); too hard to get to the doctor's office: RR 1.01 (95% CI 0.71 to 1.45); doctors and nurses do not treat me with respect: RR 0.43 (95% CI 0.11 to 1.65); cost is a barrier: RR 0.83 (95% CI 0.70 to 0.97)	Fair; poor
Roetzheim et al., 2004[a,b,43]	Low-income women	Insurance type	8 clinics; Hillsborough County, Florida	Cluster RCT of 8 practices (1,196)	Cancer screening checklist completed by patients and stickers to designate whether screening was ordered and completed versus usual care	Screening by insurance type (county is reference): Medicare, OR 0.77 (95% CI 0.57 to 1.06); Medicaid, OR 0.89 (95% CI 0.64 to 1.26); other, OR 0.86 (95% CI 0.57 to 1.31)	Fair; fair
Wang et. al, 2018[52]	Rural women	Race/ ethnicity; preferred language; health status and type	8 rural ACO primary care clinics Nebraska	Retrospective chart review (8,347)	Generalized estimating equations model and multi-level logistic regression models assessing receipt of mammogram versus patients not receiving biennial mammogram	Race/ethnicity (reference = Non-Hispanic White): Hispanic: aOR 0.85 (95% CI 0.56 to 1.28); non-Hispanic Black: aOR 0.32 (95% CI 0.14 to 0.75); other: aOR 0.76 (95% CI 0.61 to 0.94); preferred language is English: aOR 1.02 (95% CI 0.74 to 1.43); health insurance status (reference = private): uninsured: aOR 0.22 (95% CI 0.10 to 0.46); public: aOR 0.83 (95% CI 0.69 to 1.00)	NA; fair

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
White, 2012[b,46]	Latina immigrants	Access; health insurance	Public and private clinical settings; Birmingham, Alabama	Before-after study (229)	No-cost mammograms offered to attendees at educational luncheons	Multivariable-adjusted prevalence ratio: knows where to get screening, aPR 1.07 (95% CI 0.92 to 1.24); lived in Alabama ≥5 years, aPR 1.09 (95% CI 0.96 to 1.24); has health insurance, aPR 0.45 (95% CI 0.26 to 0.78)	NA; poor

Abbreviations: ACO = Accountable Care Organization; aOR = adjusted odds ratio; aPR = adjusted prevalence ratio; CI = confidence interval; NA = not applicable; OR = odds ratio; RCT = randomized controlled trial; RR = risk ratio; U.S. = United States

[a] Also includes colorectal cancer screening (Table 5).

[b] Also includes cervical cancer screening (Table 7).

[c] Also includes cervical cancer screening (Clark, 2011 in Table 7).

Key Question 2. Effects of Barriers to Cervical Cancer Screening

Seven studies examined the effects of barriers to cervical cancer screening among racial and ethnic minorities, including African-American[36] Hispanic,[41,46] and Korean-American women;[38] and among rural and low-income women[43,45,46,49] (Table 7).

A before-after study in community health centers and primary care clinics administered a tailored case management intervention over 5 years to improve cervical cancer screening among 732 African-American women age 18 years and older.[36] The study examined social and healthcare system barriers on the impact of care management to improve receipt of Pap test screening. Barriers included insurance coverage, lacking a regular provider, concerns communicating with providers, poor self-rated health, educational attainment, housing concerns, and social support for childcare. In multivariable models, barriers to screening included no regular clinical provider (aOR 0.20, 95% CI 0.11 to 0.37), concerns communicating with clinical providers (aOR 0.45, 95% CI 0.27 to 0.74), poor self-rated health (aOR 0.71, 95% CI 0.52 to 0.96), and low educational attainment (less than high school, aOR 0.54, 95% CI 0.30 to 0.99; high school or equivalent, aOR 0.50, 95% CI 0.28 to 0.88). In analyses examining repeated or longitudinal screening at recommended intervals, social support for childcare improved adherence (aOR 1.94, 95% CI 1.28 to 2.93) regardless of prior screening, while public insurance coverage (Medicaid/Medicare) was associated with lower adherence for women who had screening at baseline (aOR 0.51, 95% CI 0.27 to 0.97), but not for women without screening at baseline. Other barriers were not associated with repeated screening in this study.

A secondary data analysis of Federally Qualified Community and Migrant Health Centers patients participating in a RCT assessed the effect of acculturative status (defined as Spanish or English language preference) on the effectiveness of a prevention care management intervention in improving cervical cancer screening for 967 women overdue for screening.[49] Participants were randomized to usual care or care management, where a care manager provided support to overcome screening barriers and assistance scheduling appointments. In adjusted logistic regression analyses, Spanish-speaking women who received the care management intervention were not more likely to complete screening (aOR 1.75, 95% CI 1.0 to 3.06).

Two studies of Latina women are also included in the above section on screening for breast cancer. A before-after study of an outreach program with *promotoras* evaluated access-related barriers to cervical cancer screening among 782 Latina immigrants.[46] Latina immigrants who knew where to get a Pap test and those with health insurance were less likely to schedule screening (knew where to get screening, aPR 0.90, 95% CI 0.83 to 0.96; had health insurance, aPR 0.64, 95% CI 0.50 to 0.84). Recent arrival to the United States was not a predictor of scheduling a Pap test in this study. In in a fair quality cluster RCT of 1,333 Latina women, a faith-based breast and cervical cancer educational and *promotora* intervention was compared with a control group receiving diabetes prevention education.[41] However, none of the barriers examined were associated with cervical cancer screening including financial (lack of money) and access-related barriers (lack of time).

A fair quality RCT of 705 Korean-American immigrant women compared a multicomponent intervention to increase screening with an information only comparison group.[38] The intervention included navigation services and bilingual community health educators to address perceived risks, benefits, barriers, and cultural norms of cervical cancer screening. The comparison group involved bilingual community health educators delivering general information on health, cancer education, and screening guidelines. Barriers evaluated in this study included lack of insurance, and having a regular physician. In adjusted models, being insured was associated with lower odds of screening (aOR 0.44, 95% CI 0.22 to 0.90), and having a regular physician was not associated with screening. Primary reasons for not screening included the perception by women that they were healthy or had no health problems, and having no time or being too busy.

A good quality RCT of 345 rural low-income women in community-based settings recruited from churches compared an intervention to increase screening with a wait-listed control group.[45] The intervention included the deployment of trained lay health advisors with similar characteristics to study participants who delivered tailored home visits and newsletters addressing barriers participants identified in a baseline assessment. The comparison group included wait-listed women. All participants attended an educational lunch program that delivered information on cervical cancer screening and prevention. Participant-perceived barriers were assessed at baseline, but not described. Statistically significant associations between participant characteristics and Pap test receipt included age, race, marital status, education, employment, annual household income, perceived financial status, health insurance coverage, perceived health status, and time since last Pap. In adjusted models, screening was less likely for women age 55 to 59 years than age 40 to 44 years (aOR 0.41, 95% CI 0.20 to 0.86), but more likely for women with Pap tests 1 to 5 years ago than more than 5 years ago (aOR 2.50, 95% CI 1.47 to 4.25). No other reported factors were associated with screening.

A fair quality cluster RCT tested a cancer screening checklist and chart stickers designating whether screening was ordered or completed to increase cancer screening among 1,196 low-income patients at a community health center.[43] This study was also included in the above sections on screening for colorectal and breast cancer. In this study, patients with Medicare coverage were less likely to obtain Pap screening compared with patients covered under the county health plan (aOR 0.63, 95% CI 0.43 to 0.92). Screening for patients with Medicaid or other sources of insurance coverage did not differ from patients covered under the county health plan.

Table 7. Studies of the effects of barriers to cervical cancer screening

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Beach et al., 2007[a,b,49]	Spanish-speaking	Preferred language (Spanish, English)	Federally Qualified Community/Migrant Health Centers New York City, New York	Secondary analysis of RCT data (967)	Care management with reminder calls, assistance in overcoming barriers, providing emotional support, and help scheduling appointments versus usual care	Screening up-to-date at followup: Spanish-speaking: aOR 2.18 (95% CI 1.52 to 3.13); English-speaking: aOR 1.25 (95% CI 0.81 to 1.91); Interaction, Spanish language/study group: aOR 1.75 (95% CI 1.00 to 3.06)	Fair; fair
Clark, et al., 2011[c,36]	African American	Access; socio-economic factors	Community health centers and primary care clinics; Boston, Massachusetts	Before-after study (732)	Case management intervention provided services to address barriers to screening; compared changes in screening uptake before and after the intervention	Barriers: no regular provider, aOR 0.20 (95% CI 0.11 to 0.37); concerns communicating with providers, aOR 0.45 (95% CI 0.27 to 0.74); poor self-rated health, aOR 0.71 (95% CI 0.52 to 0.96); less than high school, aOR 0.54 (95% CI 0.30 to 0.99); high school/GED, aOR 0.50 (95% CI 0.28 to 0.88)	NA; fair
Fang et al., 2017[38]	Korean American	Insurance status; having a regular physician	Churches (community setting); Southeastern Pennsylvania and New Jersey	RCT (705)	Bilingual community health educators deliver general information on health, cancer education, screening guidelines versus information-only control group	Screening (intervention vs. control): OR 25.9 (95% CI 10.1 to 66.1); being insured: aOR 0.44 (95% CI 0.22 to 0.90); having a regular physician: aOR 0.93 (95% CI 0.46 to 1.86)	Fair; fair
Jandorf, et al., 2014[a,41]	Latinas	Ethnicity	Community-based settings in Arkansas, Buffalo and New York City, New York	Cluster RCT (1,333)	Faith-based, peer-led breast and cervical cancer education sessions plus navigation at 2 months for those not yet screened versus diabetes education sessions	Increased screening for Puerto Rican ethnicity, OR 1.35 (95% CI 1.09 to 1.67)	Fair; fair
Roetzheim et al., 2004[a,b,43]	Low-income	Insurance status and type	8 clinics; Hillsborough County, Florida	Cluster RCT of 8 practices (1,196)	Cancer screening checklist completed by patients and stickers to designate whether screening was ordered and completed versus usual care	Screening by insurance status (county is reference): Medicare, OR 0.63 (95% CI 0.43 to 0.92); Medicaid, OR 0.73 (95% CI 0.48 to 1.09); other, OR 1.04 (95% CI 0.63 to 1.72)	Fair; fair

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Studts et al., 2012[45]	Rural, low-income	Socio-economic and demographic factors	Harlan, Knott, Letcher, and Perry counties in Appalachian Kentucky recruited through churches	RCT (345)	Trained lay health advisors similar in characteristics to participants delivered tailored home visits and newsletters addressing participant-identified barriers from baseline assessment; all participants attended an educational lunch program with information on cervical cancer screening and prevention versus wait list	Pap at 8 months followup: 31 (18%) vs. 19 (11%), aOR 2.73 (95% CI 1.08 to 6.89); factors associated with getting pap: age 55 to 59 years vs. 40 to 44, OR 0.41 (95% CI 0.20 to 0.86); previous Pap >1 and <5 years ago vs. >5 years ago, OR 2.50 (95% CI 1.47 to 4.25); not race, marital status, education, employment status, household income, perceived financial status, health insurance, perceived health status	Good; fair
White et al., 2012[a,46]	Latina immigrants	Access; insurance status	Public and private clinical settings; Birmingham, Alabama	Before-after study (782)	Low-cost pap smears offered to attendees at educational luncheons	Screening: knows where to get screening, aPR 0.90 (95% CI 0.83 to 0.96); lived in Alabama ≥5 years: aPR 0.96 (95% CI 0.89 to 1.03); has health insurance, aPR 0.64 (95% CI 0.50 to 0.84)	NA; poor

Abbreviations: aOR = adjusted odds ratio; aPR = adjusted prevalence ratio; CI = confidence interval; NA = not applicable; GED = general equivalency diploma; OR = odds ratio; Pap = Papanicolaou; RCT = randomized controlled trial

[a] Also includes breast cancer screening (Table 6).

[b] Also includes colorectal cancer screening (Table 5).

[c] Also includes breast cancer screening (Clark, 2009 in Table 6).

Key Question 2. Effects of Barriers to Smoking Cessation

Three studies examined the effects of barriers to smoking cessation among African American[35,47] and Latino[48] smokers (Table 8).

A secondary analysis of 879 African-American smokers in the intervention and control arms of a smoking cessation study at the posttest time point evaluated whether having a regular source of healthcare affected smoking behaviors.[47] In adjusted models, regular source of healthcare was associated with intent to quit in the next 30 days (aOR 1.46, 95% CI 1.04 to 2.05), ever receiving physician advice to quit (aOR 1.46, 95% CI 1.02 to 2.10), and smoking ≤10 cigarettes/day (aOR 1.42, 95% CI 1.00 to 2.03), but not with quit attempts in the past year (aOR 0.98, 95% CI 0.69 to 1.41) or intent to quit in the next 6 months (aOR 0.90, 95% CI 0.61 to 1.32).

A mediation analysis of baseline data prior to randomization in a RCT tested whether smoking motives, as measured by subscales of the Wisconsin Index of Smoking Dependence Motives (WISDM), explained higher rates of failed quit attempts reported by Black compared with White smokers.[35] This study enrolled 314 non-treatment seeking daily smokers (≥10 cigarettes per day) who also frequently used alcohol (≥14 drinks/week for men; ≥7 for women). Responses on the WISDM survey were used to identify mediators of racial differences in successful smoking cessation efforts using least squares and logistic regression analyses. Results indicated that race had an indirect effect on failed quit attempts through negative reinforcement (b=0.05, standard error [SE] 0.02; 95% CI 0.02 to 0.11), positive reinforcement (b=0.05, SE 0.02; 95% CI 0.17 to 0.12), and taste/sensory processes (b=0.06, SE 0.3; 95% CI 0.02 to 0.12), but not behavioral choice and craving. These findings suggest that Black smokers were less motivated to smoke to experience the positive reinforcement, negative reinforcement, and taste/sensory processes related to smoking compared with White smokers. However, lower motivation to smoke did not explain why Black smokers were less successful in quitting.

A moderation analysis of a before-and-after study of 615 Latinos in three urban hospital-based primary care clinics assessed whether acculturation moderated the relationship between smoking cessation and psychosocial factors (nicotine dependence and confidence).[48] The study involved analysis of a study cohort that received a brief smoking cessation intervention using the '5 A's' model. Participants who decided to quit received two followup counseling calls, a free nicotine replacement patch, behavioral skills training, a self-help manual, a community resource guide, and additional followup calls. Results indicated less acculturated Latinos were more likely to abstain from smoking at 6 months compared with non-Latino White smokers (OR 2.15; 95% CI 0.37 to 1.79) whereas there was no difference between more acculturated Latino and non-Latino White smokers (OR 0.82; 95% CI 0.37 to 1.79). After conducting formal moderator analyses, a logistic regression model indicated that the acculturation interaction term with confidence (p<0.01) and nicotine dependence (p<0.01) were predictive of smoking cessation.

Table 8. Studies of the effects of barriers to smoking cessation

Author, Year	Disparity Group	Barrier	Setting	Study Design (N)	Comparison	Results	Quality; Applicability
Ahluwalia, et al., 2002[47]	African Americans	Regular source of healthcare	Large inner-city hospital; geographic location not reported	Secondary data analysis of an intervention study at the posttest assessment (879)	Regular source of healthcare compared with no regular source of care	Intent to quit in the next 30 days, aOR 1.46 (95% CI 1.04 to 2.05); ever receiving physician advice to quit, aOR 1.46 (95% CI 1.02 to 2.10); ≤10 cigarettes per day, aOR 1.42 (95% CI 1.00 to 2.03); quit attempts in the past year, aOR 0.98 (95% CI 0.69 to 1.41); intent to quit in the next 6 months, aOR 0.90 (95% CI 0.61 to 1.32)	NA; Fair
Bacio, et al., 2014[35]	African Americans	Attitudes	Community sample; geographic location not reported	Secondary data analysis of baseline data for an RCT before randomization (314)	Mediation analysis of smoking motives and quit attempts for African American compared with White smokers	Race had an indirect effect on failed quit attempts for African Americans through negative reinforcement (indirect effect b=0.05, SE 0.02; 95% CI 0.02 to 0.11), positive reinforcement (indirect effect b=0.05, SE 0.02; 95% CI 0.17 to 0.12), and taste/sensory processes (indirect effect b=0.06, SE 0.3; 95% CI 0.02 to 0.12)	NA; Fair
Bock, et al., 2005[48]	Latino	Accultura-tion (Spanish language preference)	3 urban hospital-based primary care clinics New England	Before-after (615)	Pre-post comparisons between racial/ethnic groups testing acculturation as a moderator between cognitive and psychosocial variables and smoking cessation outcomes	7 Day point prevalence abstinence at 6 months Latino, more acculturated (English-preferred): OR 0.82 (95% CI, 0.37 to 1.79) Latino, less acculturated (Spanish-preferred): OR 2.15 (95% CI, 1.74 to 5.02) Non-Latino White: reference Additional moderator analyses indicated the acculturation interaction term with confidence (p<0.01) and nicotine dependence (p<0.01) were predictive of smoking cessation in more acculturated Latino smokers	NA; fair

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; NA = not applicable; OR = odds ratio; RCT = randomized controlled trial; SE = standard error

Key Question 3. Effectiveness of Patient-Provider Approaches

Key Question 3. Overview

Twelve studies in 13 publications evaluated the effectiveness of approaches involving clinical providers and patients to improve screening for colorectal, breast, and cervical cancer; obesity management; and tobacco smoking cessation. Study populations included racial and ethnic minorities, including African Americans, Hispanics, Latino immigrants, Native Americans, and Asians; and low-income patients.

Key Question 3. Key Findings

- Colorectal cancer screening rates were higher with patient navigation, personalized risk assessment and telephone counseling for first-degree relatives of patients with colorectal cancer, educational videos with physician reminders, and a screening decision aid.
- Breast cancer screening rates were higher with mailed or in-person reminders for mammography screening involving lay health workers.
- Cervical cancer screening rates were higher for low-income Latina farm workers with outreach and health education, and for low-income Chinese-American women with education and navigation.
- A tobacco smoking cessation intervention for women smokers attending their child's pediatric visit improved smoking abstinence rates.
- A weight loss intervention provided by primary care physicians for low-income, overweight and obese African-American women was effective for initial weight loss, but not for sustained weight loss.

Key Question 3. Results of Studies

Studies of the effectiveness of clinician-patient interventions differ from studies of the effectiveness of health system interventions (KQ5) by having a major component of care based in the clinical provider's setting or in the context of the clinical interaction. Twelve studies in 13 publications met inclusion criteria (Table 9; Appendix F, Tables F-3 and F-4) including 10 RCTs (one good quality,[54] six fair,[55-61] three poor[62-64]); one fair quality nonrandomized trial;[65] and one poor quality observational study[66] (Appendix G, Tables G-1, G-2, G-3).

Six studies evaluated interventions for screening for colorectal cancer, two for breast cancer, two for cervical cancer, one for both breast and cervical cancer, and single studies for tobacco smoking cessation and obesity management. These include direct interventions aimed at the clinician or the patient, such as mailed reminders, telephone outreach, or aid-assisted decision making; and use of physician extenders, patient navigators, or health educators. Study populations included those with low income or no insurance, from racial and ethnic minority groups (Latino, Native American, Black, Asian), and from rural and urban settings. All studies were based in the United States; ranged in size from 21 to 2,357 participants; and were conducted in community health centers, community outreach linked with primary care, and academic health centers. Mean ages ranged from 21 to 74 years depending on the preventive service and population served. Major limitations of studies included low numbers of participants, lack of blinding, use of unclear outcome measures, or unclear accounting for confounders.

Key Question 3. Clinician Approaches for Colorectal Cancer Screening

Six studies evaluated interventions for colorectal cancer screening including patient navigation,[58,62] printed materials with telephone counseling about personal cancer risk,[56] mailed materials and reminders,[64] an educational video and patient reminders,[55] and a decision aid.[63]

A fair quality RCT evaluated the effect of patient navigators in a primary care setting to increase colorectal cancer screening rates among 465 low-income, mostly Haitian, patients eligible for screening.[58] A patient navigator coordinated scheduling and discussed risks and benefits after patients received an introductory letter with educational materials from their primary care physicians. Navigators offered screening by fecal occult blood test (FOBT) or colonoscopy. Screening rates using either modality were higher for navigation versus controls after one year followup (33.6% vs. 20.0%; RR 1.68, 95% CI 1.23 to 2.30).

A poor quality pilot study evaluated patient navigators among 21 low-income patients from racial minority groups (71% Hispanic, 21% African American, 8% other).[62] Of navigated patients, 54 percent completed screening colonoscopy compared with 13 percent of non-navigated patients (RR 4.31, 95% CI 0.64 to 28.84).

A fair quality RCT of 1,280 unscreened first-degree relatives of patients with colorectal cancer recruited through a cancer registry evaluated the effectiveness of a risk notification intervention on colorectal cancer screening.[56] The study enrolled 403 Latino, 284 African American, 242 Asian, and 351 White participants. The intervention group received ethnically targeted and individually tailored print materials followed by telephone counseling that included personalized colorectal cancer risk assessment, while the control group received usual care. Overall screening rates at 6 months were higher for the print intervention alone compared with usual care (15% vs. 10%; OR 1.6, p=0.006), with no race-specific differences. Overall screening rates at 12 months were higher for the cumulative print plus telephone intervention (26% vs. 18%, OR 1.6, p=0.001). Stratified analyses at 12 months followup indicated the intervention was effective among White, Latino, and Asian sub-groups, but not among African Americans. This study is most applicable to patients with first-degree relatives with colorectal cancer.

A poor quality RCT evaluated an intervention to increase colorectal cancer screening for African-American patients in primary care practices using mailed reminders, tailored messages, and reminder calls.[64] Results may not be valid because of important study limitations including unclear baseline comparisons between groups; unclear masking of outcome assessors or analysts; poor reporting of attrition; and no accounting for confounders.

A fair quality RCT of 65 Latino immigrants evaluated a multilevel intervention in a primary care setting to increase colorectal cancer screening.[55] Patients in the intervention group viewed a Spanish language educational video about colorectal cancer screening while they waited for their visit, followed by a brochure, a reminder to hand to the physician notifying them of their eligibility for screening, and receipt of pre-visit education. Patients receiving the intervention had higher screening rates compared to those receiving usual care (55% vs. 18%, p=0.002).

A poor quality RCT assessed the impact of a decision aid on colorectal cancer screening among low-income patients in an urban clinical setting.[63] All clinicians received pre-trial training seminars about recommendations for screening, highlighting the role of shared decision making. Patients receiving the intervention were randomized to either the decision aid alone or the decision aid plus a personalized risk assessment tool with feedback, and compared with patients receiving usual care. Within 12 months of the study visit, screening completion rates were higher in the group receiving the decision aid alone (43.1% vs 34.8%, p=0.046), while there was no difference in rates between groups receiving the decision aid plus risk assessment versus controls (p=0.15).

Key Question 3. Clinician Approaches for Breast Cancer Screening

Two studies evaluated interventions with lay health workers to increase mammography screening.[65,54]

A fair quality nonrandomized controlled trial determined the effectiveness of using lay health workers to recommend screening on the physician's behalf and offer convenient screening opportunities with a nurse practitioner.[65] The study was conducted in an urban, low-income population (66 to 73% public insurance, Medicaid, or Medicare) of 1,483 African-American, Native American, and Asian women age 40 and older attending non-primary care outpatient clinics. Controls received usual care. Mammography screening rates at followup were higher with the intervention (69% vs. 63%, p=0.009). Using a model that included race-specific intervention effects, age, and insurance status on rates of screening at followup, the intervention showed an effect for Native American (aOR 2.59, 95% CI 1.25 to 5.37) and African-American women (aOR 2.06, 95% CI 0.98 to 4.34), while insurance status had no specific effect.

A good quality RCT of 2,357 very low-income women insured by a managed care organization evaluated the effect of a mailed prompt letter and counseling from lay health workers.[54] Women were randomized to either: 1) simple intervention using a prompt letter from the medical director; 2) intense intervention using a letter from their primary care provider and counseling from lay health workers; or 3) usual care. Women receiving the intense intervention were more likely to receive mammography screening compared with usual care (27.1% vs. 13.1%; RR 2.03, 95% CI 1.64 to 2.51) and compared with the simple intervention (RR 1.69, 95% CI 1.39 to 2.06); and when compared with the simple and usual care groups combined (RR 3.11, 95% CI 2.16 to 4.44).

Key Question 3. Clinician Approaches for Cervical Cancer Screening

Three studies evaluated the effectiveness of lay health workers[65,59] and education and patient navigation[66] to increase cervical cancer screening.

A fair quality nonrandomized controlled trial determined the effectiveness of using lay health workers to recommend screening on the physician's behalf and offer convenient screening opportunities with a nurse practitioner.[65] This study also included breast cancer screening and is described above. Results indicated higher cervical cancer screening rates at followup for the intervention compared with usual care group overall (70.3% vs. 62.9%, p=0.02), however, rates varied by racial group (White, 62% vs. 51%; p=0.020; African American, 66% vs. 71%; p=0.230; Native American, 56% vs. 37%; p=0.060; other, 76% vs. 45%; p=0.040). A model that included race-specific intervention effects, age, and insurance status on rates of screening at followup demonstrated an effect of the intervention on White women only (aOR 1.72, 95% CI 1.09 to 2.71), with no effect on African American, Native American, or other races. Insurance status had no specific effect on screening.

A fair quality RCT evaluated interventions for 443 low-income, rural Latinas age 21 to 64 attending a Federally Qualified Health Center (FQHC) who were non-adherent with cervical cancer screening.[59] Participants were randomized to: 1) low-intensity intervention including a Spanish-language video sent to participants' homes informing them of the importance of cervical cancer screening; 2) high intensity intervention including a *promotora*-led (lay health worker) educational session at participants' homes in addition to the video; or 3) usual care. Patient navigators provided outreach for followup. Results indicated higher screening rates with the high-intensity intervention compared with usual care (53.4% vs. 34.2%, p<0.001) and compared with the low-intensity intervention (53.4% vs. 38.7%, p<0.01).

A poor quality observational study evaluated an intervention that included cervical cancer education and patient navigation to increase cervical cancer screening for 134 Chinese-American women from two community-based organizations in New York City.[66] The intervention included education, interaction with a Chinese physician, and navigation assistance to identify and access free or low-cost screening services. Results indicated higher screening rates in the intervention than control group (70.0% vs. 11.1%, p<0.001).

Key Question 3. Clinician Approaches for Obesity Management

A fair quality RCT[60,61] evaluated a tailored weight loss intervention provided by primary care physicians for 137 low-income African-American women. The intervention included five monthly physician-counseled office visits focused on weight loss, diet, physical activity, barriers to weight loss, and healthy alternatives when shopping and eating out. Women in the intervention group reduced their weight from baseline compared with women receiving usual care after 9 months (−1.52 kg vs. 0.61 kg, p=0.01), however, there were no differences at 12 and 18 month followup visits. Limitations of the study included lack of blinding for participants and providers, and high loss to followup (37%) by 18 months.

Key Question 3. Clinician Approaches for Tobacco Smoking Cessation

A fair quality RCT evaluated a smoking cessation intervention delivered in pediatric clinics for 303 low-income women.[57] The intervention group received a motivational message from the child's clinician during a clinic visit, a guide to quitting smoking, a 10-minute motivational interview with a nurse or study interventionist, and up to 3 outreach telephone counseling calls in the 3 months following the visit. Controls received usual care. At 3 and 12 months followup, quit rates were higher in the intervention group compared with controls (12 month rates, 17% vs. 8%; aOR 3.47, 95% CI 1.52 to 8.50).

Table 9. Studies of effectiveness of clinician approaches in reducing disparities in preventive care services

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Aragones et al., 2010[55]	Colorectal cancer screening	Latino	Urban teaching hospital	RCT (65)	Spanish language educational video about screening; brochure in Spanish; patient-delivered one page reminder for the physician vs. usual care	Screening at 3 months: 15 (55%) vs 6 (18%); aOR 5.4 (95% CI 1.6 to 18.5)	Fair; poor
Bastani et al., 2015[56]	Colorectal cancer screening	First degree relatives of colorectal cancer cases; Latino, African American, Asian, white	California Cancer Registry and community clinics	RCT (1,280)	Culturally-tailored printed educational materials and telephone counseling at 6 months if needed vs. none	Screening at 6 months (FOBT, sigmoidoscopy, or colonoscopy): overall 15% vs. 10%; OR 1.6, p=0.006; no race-specific differences; at 12 months: overall 26% vs. 18%, OR 1.6, p=0.001; Latino 24% vs. 14%, OR 1.9, p=0.027; African American 23% vs. 22%, OR 1.1, p=0.906; Asian 28% vs. 17%, OR 1.9, p=0.039; White 30% vs. 20%, OR 1.7, p=0.045	Fair; fair
Christie et al., 2008[62]	Colorectal cancer screening	Hispanic, African American	Community health center; New York, New York	RCT (21)	Patient navigator to schedule colonoscopy and discuss risks and benefits vs. usual care	Screening rate: 53.8% vs. 13.0%, p=0.058; rate ratio 4.31 (95% CI 0.64 to 28.84)	Poor; poor
Lasser et al., 2011[58]	Colorectal cancer screening	Low-income	Community health centers; Cambridge, Massachusetts	RCT (465)	Patient navigator to schedule colonoscopy and discuss risks and benefits vs. usual care	After 12 months, screening rates: 33.6% (79/235) vs. 20.0% (46/230); RR 1.68 (95% CI 1.23 to 2.30)	Fair; fair
Schroy, 2012[63]	Colorectal cancer screening	Low-income	Urban, ambulatory care settings	RCT (825)	Decision aid alone; decision aid + personalized risk assessment tool with feedback; vs. general health information (attention control)	Screening completed: decision aid alone at 6 mo, 34.2% vs. 26.4%; p=0.049; at 12 mo, 43.1% vs. 34.8%, p=0.046; decision aid + risk assessment at 6 mo, 34.2 vs. 30%, p=0.292; at 12 mo, 43.1 vs. 37.1%, p=0.153	Poor; fair

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Siddiqui et al., 2011[64]	Colorectal cancer screening	African American	Academic primary care practice; Philadelphia, Pennsylvania	RCT (1,430)	Mailed educational intervention (screening invitation, informational booklet, FOBT, reminder letter) vs. mailed educational intervention plus 2 tailored messages addressing personal barriers to screening vs. mailed educational intervention, tailored messages, and a reminder call vs. usual care	578 Whites compared with 852 African Americans, screening after 12 months: usual care aOR 1.01 (95% CI 0.64 to 1.61); all interventions aOR 1.44 (95% CI 1.12 to 1.86); mailed intervention: aOR 1.68 (95% CI 1.10 to 2.58); mailed plus messages aOR 1.42 (95% CI 0.92 to 2.21); mailed plus messages plus reminder aOR 1.25 (95% CI 0.81 to 1.92)	Poor; poor
Ahmed et al., 2010[54]	Breast cancer screening	Low-income women	Tennessee coordinated care network	RCT (2,357)	Reminder letter vs. reminder letter, second prompt letter from clinician, then counseling from lay health workers if needed vs. usual care (monthly newsletters, health pamphlets, and access to community health outreach workers)	Mammograms completed: no letters 13% (105/786); reminder letter 16% (126/785), RR 1.20 (95% CI 0.95 to 1.53); reminder letter and prompts if needed 27% (213/786) vs. 13%; RR 2.03 (95% CI 1.64 to 2.51)	Good; good
Margolis et al., 1998[65]	Breast and cervical cancer screening	Low-income women	Outpatient primary care clinics; Minneapolis, Minnesota	Non-randomized controlled trial (1,693)	Reminders from lay health aides with referral to a culturally sensitive women's cancer screening clinic vs. no additional contact	Breast cancer screening rate at followup: overall 69.3% vs. 62.9%, p=0.009; cervical cancer screening rate: overall 70.3% vs. 62.9%, p=0.02	Fair; fair
Thompson et al., 2017[59]	Cervical cancer screening	Latina, rural	Farm workers clinic; Yakima Valley, Washington	RCT (443)	Spanish-language home video about cervical cancer screening vs. home video plus *promotora*-led educational session at home vs. usual care access to information at clinic	Pap test at 7 months: usual care 34.2% (50/146); home video 38.7% (58/150); video plus *promotora* 53.4% (78/146) vs. usual care p<0.001, vs. video alone p<0.01	Fair; fair

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Wang et al., 2010[66]	Cervical cancer screening	Low-income Chinese-American women	Community-based organizations; New York, New York	Cohort (134)	Cervical cancer education combined with patient navigation vs. general health and cancer education	Screening at 12 mo: 70.0% (56/80) vs. 11.1% (6/54), p<0.001	Poor; good
Martin et al., 2006[60] Martin et al., 2008[61]	Obesity management	Low-income, African American women	Outpatient primary care clinics; Baton Rouge, Louisiana	RCT (137)	6 month tailored weight loss intervention delivered by primary care physician vs. usual care	Weight loss at 9 mo: -1.52 kg ± 3.72 kg vs. 0.61 ± 3.37 kg, p=0.01; at 12, 18 mo: no differences	Fair; fair
Curry, et al., 2003[57]	Tobacco smoking cessation	Low-income women	Urban, university based clinics, Seattle, Washington	RCT (303)	Brief motivational message from child's clinician during scheduled clinic visit, self help guide to quitting smoking, in-person motivational interview with clinic nurse or study interventionist; up to 3 telephone counseling calls from nurse or interventionist vs. usual care	Self-reported 7-day prevalent abstinence at 3 mo: 10% vs. 4%, aOR 2.43 (95% CI 0.80 to 8.30);12 mo: 17% vs. 8%, aOR 3.47 (95% CI, 1.52 to 8.50); sustained abstinence: 3% vs. 2%; aOR 2.39 (95% CI 0.38 to 19.10)	Fair; fair

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; FOBT = fecal occult blood test; kg = kilogram; mo = month; Pap = Papanicolaou; OR = odds ratio; RCT = randomized controlled trial; RR = risk ratio; vs. = versus

Key Question 4. Effectiveness of Health Information Technologies

Key Question 4. Overview

Eleven RCTs evaluated the effectiveness of health information technology (HIT) and digital enterprises to improve screening for colorectal, breast, and cervical cancer; smoking cessation; and obesity management in settings serving populations adversely affected by disparities. Interventions included patient reminders, electronic decision aids, interactive computer programs coupled with patient navigators, interactive educational modules, telemedicine, and multimodal approaches enhanced by technology. Study populations included Native Alaskan, American Indian, Hispanic, African American, rural, and low-income patients.

Key Question 4. Key Findings

- Most technology interventions did not increase screening rates or smoking quit rates compared with alternative approaches.
- Screening rates were higher in a study using an electronic health record (EHR) to identify patients eligible for colorectal cancer screening for mailings and phone calls, and in a RCT using an electronic decision aid with patient-ordered screening tests.
- A trial of smoking cessation counseling using telemedicine compared with telephone calls showed an increase in pharmacotherapy use, but no improvement in quit rates.
- Rates were higher with an intervention combining technological approaches to identifying and recruiting eligible patients for smoking cessation counseling and pharmacotherapy.
- An intervention for obesity management using a web- or telephone-based self-monitoring component resulted in lower body mass index (BMI).

Key Question 4. Results of Studies

Eleven RCTs meeting inclusion criteria evaluated the effectiveness of HIT to improve preventive health services in settings serving populations adversely affected by disparities (Table 10; Appendix F, Table F-5 and F-6).[40,50,67-75] Studies examined different uses of technology to identify eligible patients and deliver interventions. All studies included comparison groups that typically received educational materials or other information considered the usual or standard of care.

Trials evaluated the effectiveness of different approaches to screening for colorectal, breast, and cervical cancer; smoking cessation; and obesity management. One trial evaluated both colorectal and breast cancer screening.[40] Seven studies enrolled low-income populations[40,50,68,69,71-73] including a study in rural clinics[71] and four studies of low-income women.[68,71-73] Studies enrolled exclusively Hispanic/Latina women,[73] African-American women,[67,68] Alaska Native and American Indian patients of a tribally-owned healthcare organization,[70] and mixed populations of ethnic and racial minorities.[74] One trial described enrolled patients as vulnerable.[75] All studies were conducted in primary care and community clinics in the United States and included between 179 to 1,717 participants. Mean ages, when reported, ranged from 39 to 58 years and included patients up to 75 years. Women comprised between 54 to 100 percent of study populations.

One study met criteria for good quality,[70] nine for fair,[40,50,67-69,71,73-75] and one for poor[72] (Appendix G, Tables G-1 and G-2). Major limitations include inadequate description of randomization and allocation concealment procedures.[50,72] Studies frequently failed to adequately describe the masking of outcome assessors, care providers, and patients, although in some cases, it may have been impossible to blind providers and patients.[40,67-74] Applicability was rated fair in eight of the eleven studies. Limitations were primarily due to unique populations, settings, interventions that required novel electronic enterprises (e.g., electronic kiosks) that may not be available in primary care practices, or complex interventions with multiple components.

Key Question 4. Health Information Technologies in Colorectal Cancer Screening Interventions

Four RCTs examined technology-based interventions to improve colorectal cancer screening in different populations.[40,50,70,75] A good quality RCT was conducted in a tribally-owned healthcare organization offering primary care in Anchorage, Alaska.[70] The study population included 808 Native Alaskan and American Indian customer-owners of the organization who received preventive screening at no cost and were due for colorectal cancer screening. Participants in both the intervention and comparison groups received screening reminders by telephone, mail, and from physicians during in-person visits. In addition, the intervention group received text message reminders (up to 3 messages over the course of 2 months). Screening rates at 6-month followup were higher for the intervention group, although not statistically significantly different from comparison groups (15.6% vs. 11.1%; hazard ratio [HR] 1.42, 95% CI 0.97 to 2.09).

A fair quality RCT, the Mobile Patient Technology for Health-CRC (mPATH-CRC), was conducted in six community-based primary care practices within a large health system in North Carolina.[75] Participants included 450 “vulnerable patients” due for colorectal cancer screening. The intervention used an iPad to deliver an 8.6-minute decision aid about colorectal cancer screening. After viewing the decision aid, patients could order their own colorectal cancer screening tests, followed by electronic messages tailored to specific screening instructions. Patients in the control group viewed a 4.3-minute video produced by the Centers for Disease Control and Prevention about diet and exercise. At 24 weeks followup, screening was completed in 30 percent of intervention versus 15 percent of control patients (aOR 2.5, 95% CI 1.6 to 4.0). Subgroup analysis indicated higher screening rates among intervention group participants with higher versus lower income (37.5% above vs. 24.6% below $20,0000 income; p-value not reported), while screening rates did not differ by income in the control group (15.5% vs. 15.0%; p-value not reported).

Another fair quality RCT conducted in a community-based, university affiliated internal medicine practice in Winston-Salem, North Carolina tested a web-based decision aid to increase colorectal cancer screening in a socioeconomically disadvantaged population of 264 patients.[50] The decision aid, Communicating Health Options through Interactive Computer Education (CHOICE), included interactive, multimedia modules providing an overview of colorectal cancer screening followed by optional modules with details about specific tests. The aid was delivered to patients immediately before a healthcare provider visit and encouraged them to discuss screening with their providers. Patients in the comparison group viewed web-based material about prescription drug refills and safety before their visit. Completion of screening was assessed at 24 weeks by chart audit. Results indicated similar screening rates (19% decision aid vs. 14% controls; aOR 1.7, 95% CI 0.88 to 3.2), although patient readiness for screening was higher for the decision aid patients compared with controls among patients in precontemplative or contemplative stages of readiness (52% vs. 20%; aOR 4.7, 95% CI 1.9 to 11.9).

A fair quality RCT conducted in a large primary care, safety-net practice in Rochester, New York enrolled 240 low-income patients overdue for colorectal cancer screening.[40] This trial also included a breast cancer screening intervention described below. The multimodal intervention for colorectal cancer screening consisted of reminder letters, automated telephone calls (technology component), point-of-care prompts for clinicians and patients, and mailed fecal immunohistochemistry test (FIT) kits for up to 6 months. The comparison group received usual care that was not controlled by the study. At 1-year followup, 38 percent of intervention patients compared with 17 percent of control patients had completed screening (p=0.0002). When adjusted for baseline differences, the intervention group remained more likely to complete screening compared with the control group (OR 3.22, 95% CI 1.65 to 6.30). Unadjusted subgroup comparisons based on race indicated that non-Hispanic Black patients and non-Hispanic White patients in the intervention group completed screening at higher rates than patients in the usual care group (44.2% vs. 14.6%; 34.6% vs. 16.1%, respectively; p-values not reported), while patients of other races, including Hispanic, in the intervention group completed screening at lower rates than those in the control group (20.0% vs. 30.0%, p-value not reported).

Key Question 4. Health Information Technologies in Breast Cancer Screening Interventions

Three RCTs evaluated the effectiveness of health information technologies for improving uptake of mammography screening among low-income women.[40,68,72]A fair quality RCT conducted in a large primary care, safety-net practice in Rochester, New York enrolled 191 low-income women between ages 40 and 74 years who were overdue for breast cancer screening.[40] This trial also included a colorectal cancer screening intervention described above. The multimodal intervention for breast cancer screening consisted of reminder letters, automated telephone calls (technology component), and point-of-care prompts for clinicians and patients. The comparison group received usual care that was not controlled by the study. At 1-year followup, 30 percent of intervention patients compared with 17 percent of control patients completed screening (p=0.034). However, when adjusted for baseline differences, results were not statistically significant (OR 1.96, 95% CI 0.87 to 4.39). Unadjusted subgroup comparisons based on race indicated that non-Hispanic Black patients, non-Hispanic White patients, and patients of other races, including Hispanics, in the intervention group completed mammograms at higher rates than the usual care group, although the magnitude of differences varied (27.0% vs. 10.6%; 25.6% vs. 20.1%; 60.0% vs. 33.3%, respectively; p-values not reported).

A fair quality trial conducted in a single FQHC in Indianapolis, Indiana enrolled 179 low-income, African-American women.[68] The intervention consisted of an interactive computer program that used an algorithm to provide tailored messages to identify participants' views of breast cancer and to assess health beliefs, self-efficacy, barriers to screening and stage of readiness for breast cancer screening. This was combined with a lay health advisor who assisted patients in navigation services such as barriers counseling, referrals to low/no-cost mammograms, and assistance with scheduling appointments and transportation. The comparison group received a culturally appropriate pamphlet about breast cancer screening and a recommendation to schedule a mammogram by a lay health worker followed by mailed postcards with general nutrition information. At 6-months followup, 51 percent of intervention patients were adherent with screening versus 18 percent in the comparison group (aOR 4.3, 95%

CI 2.1 to 9.0). When assessing screening readiness, 76 percent of the intervention group and 38 percent of the comparison group showed improved readiness (aOR 4.9, 95% CI 2.3 to 10.4).

A poor quality RCT based in two Detroit Health Department primary care clinics randomized 1,717 women to one of two screening intervention groups or a control group.[72] The trial used an electronic database to trigger reminders for patients in the intervention groups to receive letters instructing them to either: 1) visit their primary care physician for a mammogram referral (physician referral letter); or 2) schedule an appointment for a mammogram directly (direct referral letter). Patients in the control group did not receive a letter. At 1-year followup, differences between intervention and control groups were not statistically significant (physician referral letter aOR 1.10, 95% CI 0.77 to 1.56; direct referral letter aOR 1.28, 95% CI 0.92 to 1.82). Limitations of this study included not reporting the method for randomizing patients or techniques for allocation concealment. It was also unclear whether groups were similar at baseline and whether any masking for outcome assessors, care providers, or patients was performed.

Key Question 4. Health Information Technologies in Cervical Cancer Screening Interventions

A fair quality RCT of 943 low-income Latina women in community clinics in Los Angeles, San Jose, and Fresno, California evaluated an intervention to increase cervical cancer screening.[73] Interactive, electronic touch-screen kiosks were used to randomize eligible women to receive either eight interactive modules describing cervical cancer knowledge, risk factors, and screening procedures delivered in English or Spanish (intervention group), or language concordant educational materials consisting of an eight-panel brochure about gynecological cancers (control group). Women in both groups used the kiosk prior to randomization to complete a pre-test questionnaire that recorded their preferred language, demographic characteristics, and baseline assessments about their attitudes, knowledge, self-efficacy and behaviors related to cervical cancer. The mean duration of the intervention ranged from 24 to 28 minutes. At 6 months followup, screening rates were similar between groups (79.8% intervention vs. 74.3% control; aOR 1.14, 95% CI 0.84 to 1.55).

Key Question 4. Health Information Technologies in Smoking Cessation Interventions

Two fair quality RCTs evaluated technology-based smoking cessation interventions.[69,71] A trial of 566 low-income patients in 20 rural primary care practices in Kansas compared four smoking cessation counseling sessions delivered in the clinic by telemedicine with usual care consisting of four telephone counseling sessions.[71] In both groups, the sessions were delivered over a 3-month period and outcomes were assessed after 6 months. The counseling approach, intent, and educational materials were the same for telemedicine and telephone groups. Telemedicine counseling was video-based, and sessions were conducted via internet using a webcam and a desktop computer with specific software to facilitate the session. Telemedicine sessions occurred in a variety of clinic-based locations including exam rooms, administrative offices, and storage spaces. Clinic staff assisted in establishing a telemedicine connection between study counselors and the patient and with scheduling followup appointments. Rates of pharmacotherapy use were higher in the telemedicine group compared with the telephone group (55.9% telemedicine vs. 46.1% telephone, p=0.03), although other outcomes did not differ including rates of 7-day smoking cessation (9.8% telemedicine vs. 12.0% telephone, p=0.406) and smoking abstinence following the first month of treatment (8.1% telemedicine vs. 7.6% telephone, p=0.839).

A fair quality RCT enrolled 707 patients with low socioeconomic status from 13 primary care practices in Boston, Massachusetts.[69] Smokers were identified electronically through an EHR and recruited by an automated interactive voice response outreach call. Patients were then randomized to a multimodal intervention or usual care. The intervention consisted of telephone-based motivational counseling with a tobacco treatment specialist, access to free nicotine replacement therapy patches, personalized community-based referrals, and integration of all components through updated EHR documentation. Nine months after randomization, 18 percent of intervention participants and 8 percent of control participants reported 7-day tobacco abstinence (OR 2.5, 95% CI 1.5 to 4.0).

Key Question 4. Health Information Technologies in Obesity Management

Two RCTs used interactive technology interventions to manage obesity.[67,74] A fair quality RCT assessed a multimodal intervention with HIT components to decrease BMI in obese, predominantly African-American patients in three urban community health centers in Boston.[74] The 24-month intervention consisted of establishing behavioral change goals that were updated every 13 weeks, patient self-monitoring of progress using a project website or interactive voice response system, real-time feedback, behavioral skills training materials, counseling calls and optional monthly group counseling sessions in the community, information on community resources, and a walking kit that included a pedometer and maps. Patients also received at least one standardized message from their primary care provider about the importance of the intervention. The comparison group received usual care. The difference in mean BMI change between intervention and control groups at 24 months was small, but favored the intervention (mean change difference −0.38, 95% CI −0.75 to −0.004).

A fair-quality trial conducted in six community health centers within a FQHC system in central North Carolina enrolled 185 overweight and obese Black women.[67] The intervention group received a multimodal intervention consisting of tailored behavior change goals (beginning with three goals identified through a computer algorithm with personalized progress reports and updated goals every two months), weekly self-monitoring via interactive voice response telephone calls, 12 monthly counseling calls with a dietitian, tailored skills training, and a 12-month YMCA membership. The control group received usual care. The difference in mean BMI change favored the intervention group at the end of the intervention (12 months) (mean change difference −0.6, 95% CI −1.1 to −0.1) and six months after the intervention (mean change difference −0.6, 95% CI −1.2 to −0.1).

Table 10. Studies of effectiveness of health information technologies in reducing disparities in preventive care services

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Miller, Jr. et al., 2018[75]	Colorectal cancer screening	Vulnerable patients	6 community-based primary care practices within a large health system; North Carolina	RCT (450)	Decision aid (mPATH-CRC) using an iPad to deliver information on colorectal cancer screening followed by patients ordering screening tests and electronic messages vs. usual care and CDC video about diet and exercise	Screening within 24 wks (FIT, FOBT, colonoscopy, or sigmoidoscopy): 30.0% vs.15.0%; aOR, 2.5 (95% CI 1.6 to 4.0); by income: <$20,000/yr, 24.6% vs. 15.0%; ≥$20,000/yr, 37.5% vs. 15.5%; by race/ethnicity non-Hispanic White: 27.2% vs. 12.0% other race/ethnicity: 33.7% vs. 19.1%	Fair; good
Miller, Jr. et al., 2011[50]	Colorectal cancer screening	Socio-economically disadvan-taged population	Community-based, university-affiliated internal medicine practice; Winston-Salem, North Carolina	RCT (264)	Web-based decision aid (CHOICE) delivered immediately before a healthcare provider visit vs. usual care and viewing material about prescription drug refills and safety	Screening within 24 wks (any screening test): 19% vs. 14%; aOR 1.7 (95% CI 0.88 to 3.2); increased readiness for screening[a]: 52% vs. 20%; aOR: 4.7 (95% CI 1.9 to 11.9)	Fair; fair
Muller et al., 2017[70]	Colorectal cancer screening	Alaska Native and American Indian	Tribal owned and operated healthcare organization offering primary care; Alaska	RCT (808)	Screening reminders by telephone, mail, and physicians during in-person visits plus up to 3 text message reminders over 2 months vs. reminders without text messages	Screening after 6 months (FIT, FOBT, sigmoidoscopy, or colonoscopy): HR 1.42 (95% CI 0.97 to 2.09)	Good; fair
Hendren et al., 2014[40]	Colorectal and breast cancer screening	Low-income	Large safety-net primary care practice; New York	RCT (366[b]); colorectal cancer (240); breast cancer (191)	EHR identified patients past due for screening; 6 month intervention included letters, automated calls, point-of-care prompts, mailing home test kit for colorectal cancer screening vs. usual care	Screening at 1 year: colorectal cancer (colonoscopy, FIT, or FOBT) aOR 3.22 (95% CI 1.65 to 6.30); breast cancer aOR 1.96 (95% CI 0.87 to 4.39)	Fair; good

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Russell, et al., 2010[68]	Breast cancer screening	Low-income, African-American women	Single FQHC; Indianapolis, Indiana	RCT (179)	Interactive computer program providing tailored messages to identify views on breast cancer; assess health beliefs, self-efficacy, barriers to screening, and stage of readiness for screening; and a lay patient navigator vs. culturally appropriate pamphlet about breast cancer screening, lay health advisor recommendation to schedule a mammogram, and mailed postcards about nutrition	Mammography at 6 months: 50.6% vs. 17.8%; aOR 4.3 (95% CI 2.1 to 9.0); aRR 2.7 (95% CI 1.8 to 3.7); improved readiness: 76.3% vs. 38.5%; aOR 4.9 (95% CI 2.3 to 10.4); aRR 2.0 (95% CI 1.5 to 2.3)	Fair; fair
Simon et al., 2001[72]	Breast cancer screening	Low-income	2 Detroit Health Department primary care clinics; Michigan	RCT (1,717)	Letter to visit primary care physician for mammography referral vs. letter to arrange mammography directly vs. no letter	Screening after 1 year: referral letter vs. none aOR 1.10 (95% CI 0.77 to 1.56); direct letter vs. none aOR 1.28 (95% CI 0.92 to 1.82)	Poor; fair
Valdez et al., 2018[73]	Cervical cancer screening	Low-income, Latina women	Community clinics; Los Angeles, San Jose, and Fresno, California	RCT (943)	Interactive modules in English or Spanish via an electronic, touch-screen kiosk about cervical cancer knowledge, risk factors, and screening procedures vs. mailed Spanish or English language educational materials	Pap test within 6 months: aOR 1.14 (95% CI 0.84 to 1.55)	Fair; fair
Richter et al., 2015[71]	Smoking cessation	Rural, low-income	20 primary care clinics; Kansas	RCT (566)	4 counseling sessions delivered in the clinic through telemedicine vs. counseling by telephone	Smoking cessation at 6-months for telemedicine vs. telephone: 7-day point prevalence 9.8% vs. 12.0%, p=0.406; prolonged abstinence 8.1% vs. 7.6%, p=0.839; pharmacotherapy use 55.9% vs. 46.1%, p=0.03	Fair; fair

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Haas, et al., 2015[69]	Smoking cessation	Low socio-economic status	13 primary care practices; Boston, Massachusetts	RCT (707)	Smokers identified through practice EHR and recruited through an automated interactive voice response call for intervention: telephone-based motivational counseling; free nicotine replacement therapy; personalized community-based referrals to reduce social mediators of tobacco; integration of all components with documentation in EHR vs. usual care	7-day tobacco abstinence: 17.8% vs. 8.1%; OR 2.5 (95% CI 1.5 to 4.0)	Fair; good
Bennett et al., 2013[67]	Obesity manage-ment	Black women	6 community health centers in a FQHC system; central North Carolina	RCT (185)	Obesity treatment: tailored behavior change goals, reports and updates; weekly self-monitoring; 12 monthly counseling calls with dietitian; tailored skills training materials; 12 month YMCA membership vs. usual care	BMI mean change differences intervention vs. control, 12 months: –0.6 (95% CI –1.1 to –0.1); 18 months: –0.6 (–1.2 to –0.1)	Fair; fair
Bennett et al., 2012[74]	Obesity manage-ment	Racial and ethnic minorities	3 urban community health centers; Boston, Massachusetts	RCT (365)	24 month intervention: behavioral change goals, patient self-monitoring, counseling calls from educators, optional monthly group sessions, messages from primary care provider, behavioral skills materials, information on community resources, walking kit with pedometer vs. usual care	BMI mean change difference between intervention and control: –0.38 (95% CI –0.75 to –0.004)	Fair; fair

Abbreviations: aOR = adjusted odds ratio; aRR = adjusted risk ratio; BMI = body mass index; CDC = Centers for Disease Control and Prevention; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; EHR = electronic health record; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; FQHC = Federally Qualified Health Center; HR = hazard ratio; mPATH-CRC = Mobile Patient Technology for Health-CRC; OR = odds ratio; Pap = Papanicolaou; RCT = randomized controlled trial; vs. = versus; wks = weeks; YMCA = Young Men's Christian Association; yr = year

[a] Only among participants who were in the precontemplation and contemplation stages at baseline (n=73 intervention vs. 61 control).

[b] There is overlap between the two groups because some patients were eligible for both colorectal and breast cancer screening.

Key Question 5. Effectiveness of Health System Interventions

Key Question 5. Overview

Eighty-eight studies (in 92 publications) evaluated the effectiveness of interventions that healthcare organizations and systems implement to reduce disparities in use of preventive services. These include studies of 7 types of preventive services: 50 studies of colorectal cancer screening, 26 breast cancer screening, 13 cervical cancer screening, 1 lung cancer screening, 7 obesity screening and management, 6 smoking cessation, and 1 high blood pressure screening.

Studies generally compared enhanced interventions with usual care or alternative methods, and measured effectiveness through improved outcomes, such as higher screening rates. Interventions included those provided in clinical settings within health systems, such as patient navigators, telephone and mail contacts, checklists, and provider training; and those using community resources through partnerships or outreach, such as patient navigation in the community, lay health workers, telephone or mail contacts, patient education, and engagement with community resources (Figure 3). Study populations included racial and ethnic minority groups including Hispanic, African-American, and Asian patients; as well as rural, underserved, and low-income patients. Although studies were highly heterogeneous, most demonstrated improved outcomes with interventions.

Key Question 5. Key Findings

- Colorectal cancer screening rates were higher with patient navigation; telephone calls, prompts, and other outreach methods; screening checklists; provider training; and practice changes involving community engagement. Results were mixed for educational videos.
- Breast cancer screening rates were higher with patient navigation; lay health workers; patient education; screening checklists; and practice changes involving community engagement, but not with telephone calls, prompts, and other outreach methods.
- Cervical cancer screening and diagnostic resolution rates were higher with patient navigation; telephone calls and prompts; and practice changes involving community engagement. Interventions with lay health workers and a screening checklist were not effective.
- Lung cancer screening rates were higher with patient navigation in a single trial of low-income smokers at five community health centers.
- Tobacco smoking quit rates were higher with counseling and nicotine replacement, but mixed with patient navigation and education and counseling.
- Rates of high blood pressure were not reduced in a single trial involving lay health workers, education, community activities, and a behavior change prescription.
- Obesity education and counseling interventions had mixed results in lowering BMI, while case management with a lay health worker was ineffective.

Key Question 5. Results of Studies

The 88 studies included for KQ5 are described in Appendixes F (Tables F-7 and F-8) and G (Tables G-1, G2, G-3, and G-4). Studies are organized by type of preventive service and type of intervention. Several studies evaluated the effectiveness of interventions for more than one preventive service and are included in more than one place in this section of the review.

Key Question 5. Health System Interventions for Colorectal Cancer Screening

Fifty studies meeting inclusion criteria evaluated the effectiveness of interventions implemented by health systems to reduce disparities in colorectal cancer screening (Tables 11 and 12). These include 36 RCTs (in 37 publications) of which four met criteria for good quality,[76-79] 18 (in 19 publications) fair quality,[40,43,80-95] and 15 (in 16 publications) poor quality.[31,53,96-109] The remaining studies include eight before-after studies,[110-116] two prospective cohort studies,[117,118] three nonrandomized trials,[119-121] and one post-intervention time series study.[122]

Studies enrolled participants from racial and ethnic minority groups;[31,53,76,77,81,89,94,98,100,102,106,109,111,112,114,116,120] with low-income;[40,43,76,78,82-85,87,91,92,101,103,104,107,108,110,113,119,121,122] from underserved populations,[79-81,86,97,99,105,115,117,118] and from rural areas.[93,123] Studies ranged in size from 78 to 4,423,743 patients (median 731). The reported mean ages of participants ranged from 56 to 70 years, and the majority were female (median 63%). Studies enrolled participants from single or multiple racial and ethnic groups, most commonly Hispanic, African American, non-Hispanic White, and Asian American. Forty-eight studies were conducted in the United States in primary care clinics, community-based sites, community health or safety-net clinics, FQHCs, and hospitals. One study was conducted in community clinics in France,[87] and one in England.[122] Interventions included patient navigation, telephone calls, prompts and other outreach, educational videos, screening checklist, provider training, and practice changes involving community engagement.

Major limitations of studies rated fair or poor quality included inadequate or unclear masking of care providers or outcome assessors, allocation concealment, and randomization methods. Additional limitations included dissimilar or missing comparison groups at baseline, differential or high attrition, no intention-to-treat analysis for RCTs, and post-randomization exclusions. Limitations of applicability included narrow participant demographics; unique settings; specialty training, expertise, or ancillary providers needed for interventions; resource-intensive interventions; and low adherence.

Patient Navigation Within Health Systems

Twenty studies (in 21 publications) evaluated the effectiveness of patient navigation compared with usual care or other approaches to increase colorectal cancer screening within health systems.[77,78,80,82-87,90,94,96-98,102,105,107,113,114,118,119,124] All but three studies[87,124,102,119] indicated higher screening rates with patient navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups.

A good quality RCT in community health centers compared patient navigation with controls in 265 racial and ethnic minority, low-income adults (mean age 58 years).[78] The majority of participants were Latino (62%) and female (65%). The intervention included patient navigation services with in-clinic decision aid videos on FOBT or colonoscopy, barrier assessment, and FOBT kits. The attention control group viewed in-clinic food safety videos. Completion of colonoscopy or FOBT at 6 months was assessed using medical records. Screening was higher for navigation regardless of the screening modality (68% vs. 27%, p-value not reported; adjusted difference 40%, 95% CI, 29% to 51%).

In a good quality RCT in five primary care practices, effects of decision support and patient navigation were compared with minimal intervention in 400 Hispanic adults (mean age 57 years, 59% female).[77] The intervention included bilingual information and instructions for FOBT and colonoscopy, an FOBT kit, and telephone navigation to plan, schedule, and complete screening. The minimal intervention included bilingual information and screening instructions and an FOBT kit. Completion of FOBT or colonoscopy at 12 months was assessed using medical records. Screening adherence at 12 months was higher for the navigation group overall (77.7% vs. 43.3%, aOR 4.8, 95% CI, 3.1 to 7.6), and for both screening modalities individually (colonoscopy, 20.3% vs. 5.9%, aOR 8.79, 95% CI 4.1 to 18.7; FOBT, 57.4% vs. 37.4%, aOR 4.2, 95% CI, 2.6 to 6.7).

A fair quality RCT in university- and network-affiliated primary care clinics compared navigation to other services in 764 African Americans eligible for colorectal cancer screening.[94] The intervention included mailed materials, personalized messages based on identified barriers, colonoscopy contact number or FOBT kit, and patient navigation services. The comparison included all services except patient navigation. Completion of FOBT or colonoscopy was assessed using medical records. Screening was higher for the navigation group at 6 (aOR 2.1, 95% CI 1.5 to 2.9) and 12 months (aOR 1.7, 95% CI 1.2 to 2.3).

In a fair quality RCT at a safety-net hospital, effects of patient navigation were compared with usual care in 856 low-income adults age 50 to 74 years.[82] The majority of the population was non-Hispanic Black or Hispanic (40.4% each) and female (57.1%). The intervention group received patient navigation services including assessment of personal screening barriers and assistance with prescriptions, appointments, and transportation. The usual care group received a phone call, screening instructions, and a mailed prescription for bowel preparation. Completion of colonoscopy at 6 months was determined by medical record review. Screening was higher for navigated compared with control participants (61.1% vs. 53.2%, p=0.02; aOR 1.51, 95% CI 1.12 to 2.03), and among Hispanic compared with non-Hispanic White participants regardless of the intervention (aOR 2.60, 95% CI 1.64 to 4.13). When assessed by income level, the intervention improved screening only among participants with a yearly income of $20,000 to $34,999 compared with those making less than $10,000 (OR 2.09, 95% CI 1.33 to 3.31).

A fair quality RCT at a community and migrant health center examined effects of patient navigation compared with usual care on colorectal cancer screening in 1,413 low-income women (mean age 58.1 years).[83] The intervention group received patient navigation including assessment of personal screening barriers and assistance with communication, appointments, and transportation, while the usual care group received a phone call recommending preventive care. Completion of any colorectal cancer screening at 18 months was determined by medical record review. Screening rates improved from baseline to followup in both the intervention (39% vs. 63%, p<0.001) and control groups (39% vs. 50%, p-value not reported).

A fair quality RCT of 420 low-income patients compared patient navigation with usual care at a FQHC network (66% female, mean age 57.3 years).[86] The intervention group received automated phone calls and text messages, mailed home FIT kits, and patient navigation services for non-completers at 3 months. Usual care included computerized reminders and standing orders for FIT kits, and feedback for physicians on screening rates. Completion of FIT at 6 and 12 months was determined by medical record review. Screening was higher with navigation at 6 (36.7% vs. 14.8%, p<0.001) and 12 months (40% vs. 22.4%, p<0.001).

In a fair quality RCT conducted within Medicaid managed care organization plans, navigation was compared with usual care in 2,240 low-income women (mean age, 55.8 years).[84]

The intervention group received a personalized letter, educational materials, a list of overdue screenings to share with physicians, and navigation services including telephone assessment and management of barriers. Completion of any screening test (FOBT, colonoscopy, flexible sigmoidoscopy, or barium enema) at 18 months was assessed by Medicaid claims data. Screening was higher with navigation (36.7% vs. 30.6%; aOR 1.32, 95% CI 1.08 to 1.62).

A fair quality RCT of 469 low-income women compared patient navigation with usual care at a large safety-net primary care practice.[85] The majority of the 323 participants were younger than 59 years (mean age 62.5 years) and White (64%). Intervention participants received telephone and mailed outreach, mailed FOBT kits, and point-of-care prompt sheets for patients and clinicians. Completion of any screening (colonoscopy, FOBT, flexible sigmoidoscopy, or barium enema) at 1 year was determined by medical record review. Screening was higher with navigation (28.8% vs. 10%; aOR 3.69, 95% CI 1.93 to 7.08).A fair quality RCT, as part of a multi-site trial sponsored by Centers for Medicare and Medicaid Services (CMS), compared navigation with usual care in 1,691 African Americans in Baltimore.[90] Approximately half of participants were aged 65 to 69 years, and 72.5 percent were female. The intervention included printed screening education materials from CMS and navigation services including assessment and management of screening barriers. Completion of FOBT screening at 1 year or colonoscopy or flexible sigmoidoscopy within the past 10 years was self-reported. The screening rate for all tests combined was higher with navigation compared with controls (94% vs. 91%, p=0.04; aOR 1.56, 95% CI 1.08 to 2.25). When assessed by specific modality, rates were higher with colonoscopy or flexible sigmoidoscopy (aOR 1.54, 95% CI 1.08 to 2.20), but not for FOBT (aOR 1.09, 95% CI 0.72 to 1.64).

In a poor quality RCT in a hospital-affiliated primary care clinic, navigation was compared with usual care in 1,223 low-income adults (mean age 63 years).[107] The majority were female (60%) and White (47%) or Latino (40%). Navigation included an introductory letter, educational materials, assessment and management of screening barriers, and appointment and transportation assistance. Completion of any screening test (colonoscopy, flexible sigmoidoscopy, FOBT, or barium enema) at 9 months was determined by medical record review. Screening was higher with navigation (27.4% vs. 11.9%, p<0.001).

A poor quality RCT at a rural hospital in Hawaii compared patient navigation with usual care on screening rates in 488 Native Hawaiian and Filipino patients eligible for Medicare (72.7% older than 65 years, 53.3% female).[98] The intervention included patient navigation from a lay health worker with information on screening, mail and telephone reminders, appointment scheduling, transportation, and other services. Usual care included nutrition and cancer education from other healthcare providers. Completion of FOBT at 6 months and endoscopy at 5 years was determined by patient self-report. Screening was higher with navigation for both FOBT (20.7% vs. 12.6%, p=0.02) and endoscopy (43.0% vs. 27.2%, p<0.001).

Four trials at FQHCs compared effects of patient navigation with other approaches. A fair quality RCT in Chicago compared navigation with usual care in 450 low-income patients.[80] The intervention included a mailed reminder letter, a mailed FIT kit, and automated phone and text message reminders. Non completers at 3 months received patient navigation services including a second mailed kit or standard script and contact information over voicemail. Usual care included computerized reminders, standing orders for FIT kits at clinics, and clinician feedback on screening rates. Screening at 6 months was determined by medical record review. Screening was higher with navigation (82.2% vs. 37.3%, p<0.001), and the trial was stopped early to expand the intervention to the control group.

In three FQHCs in Louisiana, a trial of 961 patients compared three interventions: 1) patient navigation including mailed FOBT kit, education, printed materials, tailored problem solving for barriers, and assistance with scheduling; 2) education without navigation including FOBT kit at clinic visit, education, and printed materials; and 3) recommendation including FOBT kit at clinic visit, recommendation for screening, and education materials.[96,97] Completion of three FOBT kits over 3 years was highest for the navigation and education groups (13.6% navigation vs. 11.4% education without navigation vs. 4.7% recommendation, p=0.005).

In 13 FQHCs in Georgia, a nonrandomized trial of 809 patients compared navigation in clinics implementing a community screening program with control clinics.[118] The intervention included navigation services with education, assessment and management of screening barriers, and appointment assistance. Navigators also conducted chart audits, managed provider reminder systems, and coordinated provider feedback on referral patterns. Screening rates (colonoscopy within 10 years, flexible sigmoidoscopy within 5 years, or FOBT within 1 year) at 18 months were determined by medical record review. Completion of any screening test was higher with navigation compared with controls (42.6% vs. 10.8%, p<0.001).

A poor quality RCT at a FQHC in New York City compared navigation with usual care in 78 patients (mean age 61.2 years, 74.4% female, 82.1% Hispanic).[105] Navigation included telephone assessment of screening barriers, patient education, and followup. Endoscopy or FOBT was determined by medical record review. Screening was higher with navigation at 6 months for endoscopy (23.7% vs. 5%, p=0.02), but similar at 3 months for FOBT (42.1% vs. 25%, p=0.09).

Two before-after studies demonstrated improved screening rates after implementing patient navigation. In one study, culturally tailored patient navigation with assessment and management of barriers for 3,115 patients at a community health center increased up-to-date colorectal cancer screening rates in Latinos versus non-Latinos at the end of 5 years (73.5% vs. 66%, p<0.001).[114] In a before-after study in a public hospital, an intervention including patient navigation, direct referral systems, and enhancements to a gastrointestinal suite resulted in higher screening rates with colonoscopy compared with rates prior to the intervention (RR 3.0, 95% CI 1.9 to 4.7).[113] Rates were higher in a subgroup of patients enrolled in Medicaid (48.4% vs. 17%, p<0.001).

Three studies indicated no differences in colorectal cancer screening rates with navigation compared with other approaches. In a fair quality cluster RCT in France, navigation was compared with usual care in 16,267 patients in urban or rural and deprived or affluent geographical strata (mean age 58.7 years, 51.4% female).[87,124] The intervention group received a tailored introductory letter, telephone assessment of screening barriers, mailed FOBT kit, and home visits as needed. The usual care group received a mailed FOBT kit that is standard practice in France. Screening was higher with navigation at 9 months compared with controls overall (24.3% vs. 21.1%, p=0.003; OR 1.19, 95% CI 1.10 to 1.29). When assessed by subgroups, screening rates were higher only for affluent (26% vs. 21.9%, p=0.001), but not deprived patients (22.8% vs. 20.2%, p=0.07).

In a poor quality RCT, effects of case management were compared with usual care at a screening center for 703 Black men (mean age 63 years).[102] Case managers referred participants to community service agencies and called monthly to address sociocultural, economic, and individual barriers to screening, while control participants received usual care. After 3 years, rates of flexible sigmoidoscopy were similar between groups for low-income (68.9% vs. 51.3%, p=0.10) or moderate to high-income participants (53.8% vs. 62.5%, p=0.22).

In a cluster non-randomized trial in managed care network-affiliated primary care practices, navigation was compared with usual care among 416 patients with Medicaid (mean age 56 years, 57% female).[119] More Black patients were enrolled at intervention (62%) than control clinics (31%). The intervention included an 11-minute video decision aid followed by telephone navigation to address barriers to screening including assistance with appointment scheduling. Screening with colonoscopy, FOBT, or sigmoidoscopy at 6 and 12 months were determined using Medicaid claims data. For all enrolled patients, screening rates were similar between groups at both 6 (9.2% vs. 7.5%, aOR 1.44, 95% CI 0.68 to 3.06) and 12 months (16.3% vs. 10.3%, OR 1.68, 95% CI 0.80 to 3.56). However, among the 27.6% of participants actually contacted by navigators, screening was higher than controls (OR 3.5, 95% CI 1.7 to 7.1).

Patient Navigation Involving Community Settings

Five poor quality trials evaluated the effectiveness of patient navigation involving community settings that connected patients with healthcare systems. Four trials indicated higher screening rates with patient navigation,[31,101,120,53,106] while a trial comparing navigation with education sessions did not.[53]

A RCT of 731 African-American patients recruited from barbershops in New York City compared: 1) telephone patient navigation including assessment and management of barriers; 2) patient navigation plus motivational interviewing; and 3) motivational interviewing alone.[31] Screening was higher for navigation compared with interviewing alone (17.5% vs. 8.4%; aOR 2.28, 95% CI 1.28 to 4.06), and for navigation with interviewing compared with interviewing alone (17.8% vs. 8.4%; aOR 2.44, 95% CI 1.38 to 4.34).

A RCT of 303 low-income Hispanic patients recruited from a Medicare list and contacts at community-based organizations in Texas compared telephone patient navigation with mailed educational materials.[101] Navigation included assessment of barriers and education on screening guidelines and Medicare coverage. Screening was higher with navigation (43.7% vs. 32.1%, p=0.04; aOR 1.82, p=0.02).

A nonrandomized trial of 167 Korean Americans recruited from churches in Los Angeles County, California compared group education on screening and patient navigation with group education alone.[120] Screening was higher with navigation at 12 months (77.4% vs. 10.8%; RR 7.14, 95% CI 3.81 to 13.37).

In a RCT in a community-based organization, effects of navigation (lay health worker delivered education session, telephone calls, home visits, navigation with referrals, appointment scheduling and transportation) were compared with lay health worker delivered education on healthy lifestyles in 640 Vietnamese Americans age 50 to 74 years with limited English proficiency (50% female).[106] Screening with FOBT or endoscopy at 6 months was determined by patient self-report and was higher for navigation than usual care (56% vs. 19%, p<0.001; aOR 5.45, 95% CI 3.02 to 9.82).

A RCT compared the effectiveness of patient navigation that included financial support with patient education alone on colorectal cancer screening.[53] The trial recruited 369 African Americans from community-based organizations in Atlanta, Georgia and compared three interventions: 1) navigation including transportation, scheduling, and payment assistance for out-of-pocket expenses; 2) one-on-one education with a health educator; 3) group education with a health educator; and 4) a pamphlet and list of screening resources. Results at 6 months indicated the highest screening rate for the group education intervention (22.2% group education; 17.4% one-on-one education; 16.7% navigation and financial support; 12.5% pamphlet).

Telephone Calls, Prompts, and Other Outreach

Fourteen studies in 15 publications evaluated the effectiveness of screening for colorectal cancer using telephone calls, prompts, and other outreach methods.[40,76,79,81,88,91,93,99,100,109,110,112,117,122,125] All but two studies[100,122] indicated increased screening, although results varied by subgroup in some studies.

A good quality RCT in a safety-net hospital system in Dallas, Texas evaluated two interventions compared with usual care in 5,999 underserved patients overdue for colorectal cancer screening.[79,125] The intervention groups received a letter, invitation, telephone reminder, and either 1) contact numbers for scheduling a colonoscopy and mailed bowel prep kit, or 2) FIT kit and instructions. Completion of screening was determined by medical record review. At 12 months, the intervention groups were more likely to have completed colonoscopy (aOR 1.83, 95% CI 1.57 to 2.14) or FIT (aOR 3.84, 95% CI 3.28 to 4.5). Screening rates at 3 years continued to be higher for interventions (colonoscopy 38.4%, FIT 28%) compared with controls (10.7%, p<0.001).

In a good quality RCT in an academic safety-net practice, effects of three interventions were compared with a minimal intervention in 1,008 low-income, Black, Hispanic, and White patients eligible for colorectal and/or breast cancer screening.[76] A bilingual letter with information on scheduling and the availability of free screening through a state program was sent to all participants and served as usual care for the control group. In addition, interventions included either 1) contact for an outreach worker and a personal telephone call with motivational interviewing to address screening barriers; 2) an automated telephone message to contact the outreach worker, and paper prompts for physicians at the patient's point-of-care; or 3) an automated telephone message to contact the outreach worker only. Completion of screening was determined by electronic medical records. Screening rates were higher for patients receiving personal calls (21.5%; aOR 2.0, 95% CI 1.1 to 3.9) or physician prompts (19.6%; aOR 1.9, 95% CI 1.0 to 3.7) compared with usual care (12.2%). Rates were not higher with the automated message only (15.3%; aOR 1.2, 95% CI 0.6 to 2.4).

A fair quality RCT in a large primary care safety-net practice in Rochester, New York enrolled 240 low-income patients overdue for colorectal cancer screening.[40] The intervention included a letter, automated telephone calls, point-of-care prompts, and mailed home test kit for colorectal cancer screening, and was compared with usual care. Completion of any colorectal cancer screening was assessed using medical records. At 12 months, screening was higher with the intervention (37.7% vs. 16.7%, p<0.001; aOR 3.22, 95% CI 1.65 to 6.30).

In a fair quality RCT in a community clinic in King County, Washington, effects of two interventions were compared with usual care in 501 underserved, Hispanic adults (53% female).[81] The majority were aged 50 years to 59 years (57%). The interventions included either 1) a mailed packet with a letter signed by the medical director, FOBT kit and instructions, and *promotora*-led telephone outreach including education, reminders, and home visits to reinforce the education material; or 2) a mailed packet only. Completion of FOBT screening was assessed by medical record review. Screening at 9 months was higher in outreach (31%) and mailed packet only (26%) intervention groups compared with controls (2%, p<0.001); while rates between intervention groups were similar (p=0.28).

A fair quality RCT in a safety-net system in Texas evaluated effects of a telephone and mail intervention compared with usual care in 5,994 underserved adults (mean age 59 years, 64% female).[88] The participants were primarily White (41%), Hispanic (29%), or Black (24%). The intervention included mailed invitations, automated and live reminder telephone calls, and either assistance with bowel prep for colonoscopy or a mailed FIT kit. Completion of screening was determined by claims data. Screening at 12 months was higher with the intervention for colonoscopy (24.6%) and FIT (40.7%) compared with control (12.1%, p<0.001 for both).

In a fair quality RCT in rural family medicine clinics in Iowa, three interventions were compared with usual care in 743 adults (mean age 61.1 years, 52% female, 98.7% White).[93] Interventions included either 1) a reminder in the patient's chart; mailed education materials, a refrigerator magnet, and FIT kit; and structured telephone calls providing education and assessment and management of screening barriers; 2) chart reminder and mailed materials; or 3) chart reminder only. Completion of any screening test (colonoscopy, flexible sigmoidoscopy, FOBT, or barium enema) was assessed by medical record review. Screening rates for any test were higher in the telephone and mail group (57.2%; aOR 6.38, 95% CI 0.9 to 10.5) and mail group (56.5%; aOR 6.29, 95% CI 3.8 to 10.4) compared with the control group (17.8%); while rates were similar in the chart reminder only group (20.5%; aOR 1.23, 95% CI 0.7 to 2.1).

A fair quality RCT conducted in a FQHC compared a mailing intervention with usual care among 202 low-income patients (mean age 60 years).[91] The population was primarily female (62%), and included White (27%), Black (28%, Hispanic (20%), and Asian (14%) participants. Intervention participants received a personalized letter encouraging screening along with a fact sheet, FOBT kit, and instructions; those not responding to the letter received reminder calls from bilingual lay health workers. Control participants received usual care. Rates of screening colonoscopy, FOBT, or sigmoidoscopy were higher in the intervention versus control group (30% vs. 5%, p<0.001), with the majority (94%) selecting FOBT for screening.

A large poor quality cluster RCT of 41,193 participants evaluated a mailed letter, FIT kit, and reminder letter compared with usual care in underserved adults at FQHCs in Oregon and California.[99] Rates of any screening test (colonoscopy, flexible sigmoidoscopy, or FIT) at 18 months were higher with the intervention compared with control (18.3% vs. 14.5%; adjusted mean difference 3.8, 95% CI 0.6 to 7.0). FIT screening rates at 12 months also were higher in the intervention group (13.9% vs. 10.4%; adjusted mean difference 3.4, 95% CI 0.1 to 6.8, p=0.05).

A poor quality RCT in a Seattle community clinic assessed differences in screening rates in 210 Chinese-American adults (63% female).[109] Intervention participants reviewed a video in person with a health educator and received a mailed pamphlet and FOBT kit. At 6 months, FOBT completion rates were higher with the intervention (69.5% vs. 27.6%; aOR 6.38, 95% CI 3.44 to 11.85).

A fair quality nonrandomized trial reported effects of a mailing intervention versus usual care with 119 low-income patients at a general medicine clinic in Chicago, Illinois (mean age 64 years).[121] The population was primarily Black (82%) and female (73%). The intervention group received three FOBT cards and personalized letter encouraging screening, as well as instructions and reminders 2 weeks prior to the appointment. Rates of FOBT screening after 12 months were statistically significantly higher in the intervention versus control group (40.7% vs. 5.0%, OR 13.0, 95% CI 3.6 to 45.5, p<0.001).

A poor quality nonrandomized trial in 8 FQHCs in Louisiana evaluated effects of 2 telephone and mail interventions compared with usual care in 961 underserved adults (mean age 58.4 years, 77% female, 67% Black).[117] Intervention included either 1) in person, nurse-led education and motivational interviewing and followup by telephone; or 2) in person, educational video and mailed FOBT kit and instructions. At 12 months, FOBT completion rates were higher with the nurse intervention compared with usual care (60.6% vs. 38.6%; adjusted screening ratio [aSR] 1.60, 95% CI 1.06 to 2.42). Rates were similar between the video intervention group compared with controls (57.1%; aSR 1.36, 95% CI 0.85 to 2.18) and between intervention groups (aSR 1.18, 95% CI 0.97 to 1.42).

In a 10-year before-after study, a California health system mailed FIT kits and implemented point-of-care prompts to increase screening for 868,934 patients including racial and ethnic minorities.[112] In the years following the program implementation, patients were more likely to be up-to-date with colorectal cancer screening compared with the pre-implementation period (1 to 3 years post-intervention, RR 1.60, 99% CI 1.59 to 1.60; 4 to 7 years, RR 2.05, 99% CI 2.04 to 2.05). However, only patients of Asian Pacific Islander or multiple race backgrounds had slightly higher screening rates than non-Hispanic Whites before and after program implementation. This may have been due to higher uptake of the mailed FIT kits by non-Hispanic Whites compared with other racial and ethnic backgrounds.

In another before-after study, 18 primary care practices in a large health system implemented an intervention to identify and contact patients overdue for screening.[110] When patients did not respond to an initial letter, patient delegates provided telephone counseling, education, and assistance managing screening barriers. At baseline, rates of colorectal cancer screening (colonoscopy, sigmoidoscopy, barium enema, or computed tomography colonography) differed by education level (65.7% less than high school vs. 74.5% high school or higher, $p<0.001$). After 1 year, rates continued to differ (69.4% vs. 76.7%, $p<0.001$), but slightly less (0.68%, $p<0.001$).

A post-intervention multiple time series study in England evaluated effects of population-based screening by socioeconomic deprivation and racial and ethnic diversity in 4,423,734 patients aged 60 to 64 years.[122] Eligible participants received biennial mailed invitations, FOBT kits and instructions, and prepaid envelops to return the kit, followed by a reminder letter if there was no response. Over a 5 year period, screening was more likely for female patients (OR 1.48, 95% CI 1.46 to 1.51), but less likely for patients living in more deprived areas (OR 0.99, 95% CI 0.98 to 0.99) or more ethnically diverse areas (OR 0.99, 95% CI 0.99 to 0.99).

Screening rates were not higher after an outreach intervention in a poor quality RCT in a Seattle community clinic that compared effects of a culturally tailored calendar with cancer-focused health messages with a calendar without messages in 5,065 American Indian/Alaska Native patients.[100] The trial included colorectal and breast cancer screening as well as tobacco smoking cessation. The majority of participants were female (56%); ages ranged from 18 years to 93 years, but colorectal cancer screening was assessed only in participants aged 50 years or older. Screening rates were similar to controls for both FOBT (2.9% vs. 3.1%, $p=0.81$) and colonoscopy (0.3% vs. 0.7%, $p=0.20$).

Educational Videos

Four trials evaluated the effects of educational videos on rates of colorectal cancer screening. Two trials found no differences in screening rates among Black patients in Texas,[89,103] while two trials indicated increased screening among low-income patients after interventions that included educational videos.[92,108]

In a fair quality RCT, 89 patients (69% female, mean age 57.5 years) at tertiary care center-affiliated primary care clinics were randomized to watch a 30-minute screening video (intervention) or an 11-minute hypertension video (control).[89] Screening rates were similar at 3 months (21% intervention vs. 28%, control; $p=0.45$). In a poor quality RCT, effects of an educational video were compared with a minimal intervention in 160 low-income patients attending an outpatient community clinic (mean age 61, 84.4% female).[103] Intervention participants watched a video and completed a questionnaire, received an order for an FOBT kit and instructions from a nurse, and made appointments for the kit return and followup visit. Controls received all but the video. After 3 months, screening rates were similar between groups (intercorrelation 0.07, p>0.05).

A fair quality RCT compared two types of videos in 202 low-income patients at a FQHC.[92] Participants were primarily female (64%) and Black (72%); mean age was 56 years. The intervention group watched a 12-minute educational video with communication training on asking for colorectal cancer screening, a brochure with communication tips, and telephone counseling about barriers if there was no response within 1 month. The control group watched a generic 10-minute educational video on colorectal cancer screening and received a screening brochure with no communication tips. Rates of FOBT or colonoscopy screening at 2 months were higher in the intervention group (19.6% vs. 9.9%, aOR 2.35, 95% CI 1.14 to 5.56).

In poor quality trial of 1,372 low-income patients (mean age 60 years) in community-based primary care clinics, a video intervention was compared with usual care.[108] Less than half of the population was female (45%); the population included Black (37%), White (30%), Hispanic (20%), and Asian (11%) participants. The intervention included a nurse reminder sheet, visual aids explaining the FOBT test and prep, video and written instructions, and a prepaid return envelope. Rates of colonoscopy, sigmoidoscopy, and FOBT after 18 weeks were higher for the intervention than control group (24.2% vs. 13.4%, p<0.001; OR 2.22, 95% CI 1.24 to 3.95).

Screening Checklist

A fair quality RCT of 1,196 patients compared an intervention with usual care in a primary care network serving disadvantaged populations.[43,95] Intervention clinics received reminder checklists including screening status stickers for patients to complete at visits, while control clinics received no materials. Completion of FOBT at 12 months was determined by medical record review. Screening rates were higher among patients attending intervention clinics compared with control clinics at 12 (40.1% vs. 11.9%, p<0.001; aOR 2.56, 95% CI 1.65 to 4.01),[43] but not 24 months (28.2% vs. 12.6%, p=0.19; aOR 1.17, 95% CI 0.92 to 1.48).[95]

Provider Training

Specific aspects of screening improved after provider training in two before-after studies. A study of 248 African-American patients in an academic affiliated clinic in Washington, D.C. evaluated screening rates before and after implementing an education program for internal medicine residents.[111] Training included didactic seminars, observation of screening modalities, exams, and charting. Colonoscopy rates at 6 months were higher after the education program (59.1% vs. 26.7%, p<0.001), although rates of FOBT did not change. A study among rural, primary care practices (66 practices with 3,844 patient records) compared screening rates before and after an academic detailing intervention for clinicians, including clinical performance measures, patient counseling, and practice changes. After 6 months, more colonoscopy results were documented (15.7%) than at baseline (2.4%, p=0.01).

Practice Changes Involving Community Engagement

A before-after study in four FQHCs evaluated practice changes and engagement with community resources on colorectal cancer screening for 97,433 patients.[115] The intervention, including self-management goal setting with patients, documentation of screening rates, screening result notifications, evaluation of abnormal results, and inclusion of community resources to support cancer screening, led to higher rates of colorectal cancer screening compared with rates prior to the intervention (21.2% vs. 8.6%, $p<0.001$).

Table 11. Studies of effectiveness of health system interventions for colorectal, breast, and cervical cancer screening combined

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Braun et al., 2015[98]	Colorectal, breast, cervical	Native Hawaiian and Filipino	Hospital; Moloka'I, Hawai'i	RCT (488)	Patient navigation based on *Kukui Ahi* model involving lay health worker vs. general health education from another healthcare entity	Screening: FOBT in past year, 20.7% vs. 12.6% (p=0.02); endoscopy in past 5 years, 43.0% vs. 27.2% (p<0.001); mammogram in past year, 61.7% vs. 42.4% (p=0.003); pap smear in past 2 years, 57.0% vs. 36.4% (p=0.001)	Poor; poor
Dietrich et al., 2006[83]	Colorectal, breast, cervical	Low-income	Community and Migrant Health Centers; New York City, New York	RCT (1,413)	Navigation with telephone calls, motivational support, barrier management, appointment scheduling, reminders, transportation assistance vs. telephone recommendation to screen	Screening rates: mammography increase by 0.1 (17%) vs. control, p<0.001; cervical cancer increase by 0.07 (10%) vs. control, p<0.001; colorectal screening increase by 0.24 (>60%) vs. control, p<0.001	Fair; fair
Doorenbos et al., 2011[100]	Colorectal, breast, cervical, tobacco smoking cessation	American Indian, Alaska Native	Community health clinic; Seattle, Washington	RCT (5,065)	Culturally tailored calendar with cancer focused, health related messages, vs. calendar without messages	Screening rates: FOBT: 2.9% vs. 3.1%, p=0.81; colonoscopy: 0.3% vs. 0.7%, p=0.20; mammogram: 13.6% vs. 14.8%, p=0.50; tobacco smoking cessation: nicotine patch use: 0.6% vs. 0.8%, p=0.48; cessation counseling: 4.5% vs. 4.5%, p=0.99; cessation counseling referral: 0% vs. 0.9%, p=0.51	Poor; poor
Fiscella et al., 2011[85]	Colorectal, breast	Low-income	Large safety net primary care practice; New York	RCT (469; colorectal (323); breast cancer (271)	Navigation with two letters and a phone call; mailed kits for patients not responding to outreach; point-of-care prompt sheets for patients and clinicians vs. usual care	Screening rates within past year: colorectal (colonoscopy, FOBT, flexible sigmoidoscopy, barium enema), aOR 3.69 (95% CI 1.93 to 7.08); mammography, aOR 3.44 (95% CI 1.91 to 6.19)	Fair; good

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Fortuna et al., 2014[76]	Colorectal, breast	Low-income, racial and ethnic minority	Academic internal medicine safety-net practice, Rochester, New York	RCT (1,008)	All groups received a bilingual letter with scheduling information, contact for outreach worker, and information on free screening (usual care); intervention also received: 1) personal call from outreach worker with motivational interviewing and navigation; 2) automated message to call outreach worker, paper prompts for physician during patient's point of care; or 3) automated message to call outreach worker	Mammography screening rates: personal call, 27.5%; aOR 2.2 (95% CI 1.2 to 4.0); physician prompt, 28.2%; aOR 2.1 (95% CI 1.1 to 3.7); automated call, 22.8%; aOR 1.3 (95% CI 0.7 to 2.4); colorectal cancer screening rates: personal call, 21.5%; aOR 2.0 (95% CI 1.1 to 3.9); physician prompt, 19.6%; aOR 1.9 (95% CI 1.0 to 3.7); automated call, 15.3%; aOR 1.2 (95% CI 0.6 to 2.4)	Good; fair
Hendren et al., 2014[40]	Colorectal, breast	Low-income	Large safety-net primary care practice; Rochester, New York	RCT; colorectal cancer (240); breast cancer (191)	Intervention over 6 months with letter, automated telephone calls, point-of-care prompts, mailing test kit for colorectal cancer screening vs. usual care	Screening at 1 year: colorectal (colonoscopy, FIT, FOBT), aOR 3.22 (95% CI 1.65 to 6.30); breast, aOR 1.96 (95% CI 0.87 to 4.39)	Fair; good
Jandorf et al., 2014[41]	Breast, cervical	Latinas	Community-based settings in Arkansas, Buffalo, and New York City, New York	Cluster randomized trial (1,333)	Faith-based, peer-led breast and cervical cancer education sessions, plus navigation at 2 months for those not yet screened vs. diabetes education sessions	Mammography at baseline, 2 months, and 8 months combined: 56.7% intervention vs. 62.2%, p=0.043, OR 8.56 (95% CI 5.85 to 12.53); pap at baseline, 2 months, and 8 months combined: 62.7% intervention vs. 64.6% control, p=NS	Fair; fair
Jibaja-Weiss et al., 2003[126]	Breast, cervical	Low-income	Community health centers; Houston, Texas	RCT (1,574)	1) Personalized tailored letter using specific breast and cervical risk factor info from EMR, or 2) personalized form letter with risk factors, importance of screening, encouragement to schedule screening, vs. 3) usual care	Screening rates at 12 months, cervical: 23.7% letter vs. 43.9% letter + information vs. 39.9% control, p<0.001; breast: 13% letter vs. 30.5% letter + information vs. 20.7% control, p<0.001	Fair; fair

Author, Year	Preventive Service	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Navarro et al., 1998[127]	Breast, cervical	Low-income, Hispanic	Community settings in San Diego County, California	RCT (512)	Weekly, culturally appropriate education sessions on breast and cervical cancer screening led by *consejeras* vs. weekly *consejera*-led education sessions on community living skills	Mammography in past year (n=113): 21.4% intervention vs. 7.0% control, p=0.029; cervical screening in past year: 23.1% intervention vs. 16.2% control, no difference	Poor; fair
Roetzheim et al., 2004;[43] Roetzheim et al., 2005[95]	Colorectal, breast, cervical	Low-income	8 clinics; Hillsborough County, Florida	Cluster RCT (1,196)	Cancer screening checklist completed by patients and stickers to designate whether screening was ordered and completed vs. usual care	Screening rates at 12 months: cervical, OR 1.57 (95% CI 0.92 to 2.64); breast, OR 1.62 (95% CI 1.07 to 9.78); FOBT, OR 2.56 (95% CI 1.65 to 4.01) Screening rates at 24 months: breast, OR 1.26 (95% CI 1.02 to 1.55); cervical, OR 0.88 (95% CI 0.68 to 1.15); FOBT, OR 1.17, (95% CI 0.92 to 1.48)	Fair; fair
Taplin et al., 2008[115]	Colorectal, breast, cervical	Underserved	4 FQHCs; United States nationwide	Before-after study (97,433)	Pre vs. post-intervention including practice changes with self-management goal setting, documentation of screening rates, results notification, evaluation of abnormal results, and community resources to support cancer screening	Screening rates: colorectal (colonoscopy, sigmoidoscopy, FOBT), 21.2% vs. 8.6%, p<0.001; breast, 39% vs. 23.2%, p<0.001; cervical, 37.2% vs. 25.2%, p<0.001	NA; poor

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; EMR = electronic medical record; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; FQHC = Federally Qualified Health Center; NA = not applicable; NS = not significant; OR = odds ratio; Pap = Papanicolaou; RCT = randomized controlled trial; vs. = versus

Table 12. Studies of effectiveness of health system interventions for colorectal cancer screening

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Arnold et al., 2016a[97], Arnold 2016b[96]	Underserved	Three FQHCs; Louisiana	Group-randomized trial (961)	Navigation (mailed FOBT kit, education, printed materials, tailored problem solving for barriers and assistance with scheduling) vs. education without navigation (FOBT kit at clinic, education, printed materials) vs. recommendation (FOBT kit at clinic visit, recommendation for screening, education materials)	Completion of three FOBT kits over 3 years: 13.6% navigation vs. 11.4% education without navigation vs. 4.7% recommendation, p=0.005; screening ratio navigation vs. recommendation, 2.65 (95% CI 1.47 to 4.77); education vs. recommendation, 2.39 (95% CI 1.21 to 4.72)	Poor; poor
Baker et al., 2014[80]	Underserved	FQHC; Chicago, Illinois	RCT (450)	Navigation (mailed FIT kit, letter from PCP, automated call and text message, patient navigation at 3 months for nonresponders) vs. no navigation (computerized reminders, standing orders for FIT, clinician feedback on screening rates)	Completion of FIT within 6 months: 82.2% navigation vs. 37.3% no navigation, p<0.001	Fair; Fair
Berkowitz et al., 2015[110]	Socio-economically disadvant-aged	18 primary care practices; Boston, Massachusetts	Before-after (49,733)	Electronically identify patients overdue for screening, contact, and track them with initial reminder letter, assignment to a patient delegate, and, for non-responders and high-risk patients, referral to patient navigation	Baseline screening (colonoscopy, sigmoidoscopy, barium enema, CT colonography), disadvantaged vs. not: 65.7% vs. 74.5%, p<0.001; post-intervention: 69.4% vs. 76.7%, p<0.001; increase over time: 3.7% vs. 2.2%, p<0.001 (2.7% overall, p<0.001); decline in difference over time: 0.68%, p<0.001	NA; good
Blumenthal et al., 2010[53]	African American	Community-based organizations; Atlanta, Georgia	RCT (369)	Financial support (payment for out of pocket expenses) and navigation including transportation, scheduling, and payment assistance vs. one on one education with health educator vs. group education with health educator vs. pamphlet and list of screening resources	Any type of screening at 6 months: 16.7% financial support vs. 17.4% one on one education vs. 22.2% group education vs. 12.5% pamphlet, no differences	Poor; poor
Cole et al., 2017[31]	African American	Patients recruited from barbershops; New York City, New York	RCT (731)	Telephone patient navigation including assessment and management of barriers vs. patient navigation plus motivational interviewing vs. motivational interviewing	Any type of screening at 6 months: navigation vs. interviewing, 17.5% vs. 8.4%, aOR 2.28 (95% CI 1.28 to 4.06); navigation plus interviewing vs. interviewing, 17.8% vs. 8.4%, aOR 2.44 (95% CI 1.38 to 4.34)	Poor; fair

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Coronado et al., 2011[81]	Hispanic, underserved	Community-based clinic; King County, Washington	RCT (501)	1) *Promotora*-led telephone patient navigation including assessment and management of barriers, plus home visits, mailed FOBT card and letter from medical director; or 2) mailed FOBT card and letter only; vs. 3) usual care	FOBT screening at 9 months: 31% navigation plus mailing vs. 26% mailing only vs. 2% control; either intervention vs. control, p<0.001; navigation plus mailing vs. mailing only, p=0.28	Fair; fair
Coronado et al., 2018[99]	Underserved	26 FQHCs; Oregon and California	Cluster RCT (41,193)	Mailed FIT kit, letter from clinic, reminder letter, process improvement for clinics vs. usual care	FIT completion in 12 months: 13.9% vs. 10.4%, adjusted MD 3.4 (95% CI 0.1 to 6.8); any screening (FIT, COL/FS) in 18 months: 18.3% vs. 14.5%, adjusted MD 3.8 (95% CI 0.6 to 7.0)	Poor; fair
Davis et al., 2013[117]	Underserved	8 FQHC-associated clinics; Louisiana	Prospective cohort (961)	1) Nurse-led patient education, FOBT kit, motivational interview, followup calls; or 2) staff-led patient education, video, FOBT kit vs. 3) usual care (FOBT kit)	FOBT completion in 12 months: 60.6% nurse education vs. 57.1% staff education vs. 38.6% control, p<0.0001; adjusted screening ratio nurse education vs. control, 1.60 (95% CI 1.06 to 2.42); adjusted screening ratio, staff education vs. control, 1.36 (95% CI 0.85 to 2.18); adjusted screening ratio, nurse vs. staff education, 1.18 (95% CI 0.97 to 1.42)	Poor; good
DeGroff et al., 2017[82]	Low-income	Hospital and community health center; Boston, Massachusetts	RCT (856)	Telephone patient navigation including management of screening barriers vs. computerized reminders, standing orders for FIT, clinician feedback on screening rates	Colonoscopy within 6 months: 61.1% navigation vs. 53.2% not navigation, p=0.02, OR 1.51 (95% CI 1.12 to 2.03); Hispanics more likely than Whites to screen, OR 2.60 (95% CI 1.64 to 4.13)	Fair; fair
Dietrich et al., 2013[84]	Low-income	3 Medicaid managed care organization plans; New York City, New York	RCT (2,240)	Telephone outreach including assessment and management of barriers, personalized letter and overdue screening card, educational materials, appointment reminders and scheduling assistance if requested vs. usual care	Any screening (FOBT, COL/FS, barium enema) at 18 months: 36.7% vs. 30.6%, aOR 1.32 (95% CI 1.08 to 1.62)	Fair; good
Dignan et al., 2014[123]	Rural	Primary care practices; Appalachian Kentucky	Before-after study (66 practices with 3,844 patient records)	Academic detailing for clinicians: screening efficacy, clinical performance measures, patient counseling, and creating a screening-friendly practice environment	Change in rates at 6 months: no differences in FOBT, colonoscopy, or any screening recommended or results documented; for documented recommendations: more colonoscopy results 15.7% vs. 2.4%, p=0.01	NA; fair

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Enard et al., 2015[101]	Low-income, Hispanic	Recruited from Medicare list and contacts at community organizations; Texas	RCT (303)	Telephone patient navigation including assessment of barriers, education on screening guidelines and Medicare coverage vs. mailed education materials	Screening rates (COL/FS or FOBT): 43.7% navigation vs. 32.1% mailed materials, p=0.04; aOR 1.82, p=0.02	Poor; good
Ford et al., 2006[102]	African American	Screening center for another trial; Detroit, Michigan	RCT (703)	Case management to reduce barriers with referrals to community services and agencies; at least monthly calls vs. usual care	Adherence to flexible sigmoidoscopy over 3 years: low income (≤1.5x federal poverty level), 68.9% vs. 51.3%, p=0.10; moderate to high income, 53.8% vs. 62.5%, p=0.22	Poor; poor
Friedman et al., 2001[103]	African American, low-income	Outpatient community clinic; Houston, Texas	RCT (160)	Educational video and questionnaire; ACS brochure and order for FOBT kit to give to physician; FOBT kit, instructions from nurse, appointments for FOBT return to lab and followup visit vs. all but video	Compliance with FOBT screening at 3 months, intercorrelation with treatment group: 0.07, p>0.05	Poor; poor
Friedman and Borum, 2007[111]	African American	Academic affiliated clinic; Washington, D.C.	Before-after study (248)	Pre vs. post-intervention including education for internal medicine residents with didactic seminars, observation of screening modalities, exam, and charting	Colonoscopy rates at 6 months: 59.1% post-intervention vs. 26.7%, p<0.001; no differences in rates of rectal exam or FOBT	NA; fair
Goldberg et al., 2004[121]	Low-income, African American	Comprehensive general medicine clinic; Chicago, Illinois	Non-randomized trial (119)	Personalized and signed letter with reminders and instructions 2 weeks prior to appointment, mailed 3 FOBT cards, vs. usual care	FOBT screening at index appointment: 35.6% vs. 3.3%, OR 16.0 (95% CI 3.5 to 71.4), p<0.001; FOBT screening after index appointment: 5.1% vs. 1.7%, OR 3.2 (95% CI 0.3 to 31.3), p=0.36; FOBT screening within 12 months: 40.7% vs. 5.0%, OR 13.0 (95% CI 3.6 to 45.5), p<0.001	Fair; good
Goldman et al., 2015[86]	Underserved	FQHC; Chicago, Illinois	RCT (420)	Navigation (mailed FIT kits, phone calls and text messages, patient navigation at 3 months for nonresponders) vs. usual care	Screening rates at 6 months: 36.7% navigation vs. 15.2% usual care, p<0.001; at 12 months: 40.0% vs. 23.3%, p<0.001	Fair; good
Guillame et al., 2017b[87] De Mil et al., 2018[124]	Low socio-economic status	Urban and rural strata of deprivation and affluence; France	Cluster RCT (16,267)	Introductory letter, telephone calls to address barriers, FOBT kit, potential for home visit as needed, vs. usual care (FOBT kit)	FOBT at 9 months: 24.3% vs. 21.1%, p=0.003; OR 1.19 (95% CI 1.10 to 1.29); FOBT at 9 months, deprived: 22.8% vs. 20.2%, p=0.07; FOBT at 9 months, affluent: 26% vs. 21.9%, p=0.001	Fair; fair

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Gupta et al., 2013[88]	Underserved	Safety-net system; Texas	RCT (5,994)	Mailed invitation, automated reminder telephone calls, live reminder telephone calls, assistance with scheduling and prep instructions for colonoscopy or FIT vs. usual care	Screening at 1 year: 24.6% colonoscopy vs. 40.7% FIT vs. 12.1% control, p<0.001, across all groups and between groups	Fair; good
Hirst et al., 2018[122]	Low socio-economic status, racial and ethnic minority	National Health Service bowel cancer screening program hub; England	Post-intervention multiple time series (4,423,734)	Biennial invitations, FOBT kit and instructions, prepaid envelope; reminder letter after 4 weeks non-response by quintiles of deprivation and area-based ethnic diversity	Uptake among adequately screened, female: OR 1.48 (95% CI, 1.46 to 1.51); highest deprivation: OR 0.99 (95% CI, 0.98 to 0.99); highest ethnic diversity: OR 1.0 (95% CI, 1.0 to 1.0); year (linear): OR 0.95 (95% CI, 0.95 to 0.95); for one unit increase in deprivation, probability of FOBT kit return: -0.36%; for one unit increase in area-based ethnic diversity, probability of FOBT kit return: -0.21%	NA; fair
Hoffman et al., 2017[89]	African American	Primary care clinics; Houston, Texas	RCT (89)	Tailored, entertainment-education decision aid video (30 minutes) vs. generic hypertension video (11 minutes)	Completed screening (colonoscopy, FOBT, sigmoidoscopy) at 3 months: 21% vs. 28%, p=0.45	Fair; poor
Honeycutt et al., 2013[118]	Underserved	13 FQHCs; Georgia	Prospective cohort (809)	Letters, automated telephone calls, point-of-care prompts reminding clinicians and patients the patient was past due for the service, and mailed FIT/FOBT kit vs. usual care	Rates of adherence (colonoscopy in 10 years, sigmoidoscopy in 5 years, FOBT in 1 year): 42.6% vs. 10.8%, p<0.001; effect measure White vs. Black, 1.23, p>0.05	Fair; poor
Horne et al., 2015[90]	African Americans	Unclear; CMS-funded multisite trial in Baltimore associated with Johns Hopkins	RCT (1,691)	Health navigators conduct chart audits, manage provider reminder systems, coordinate screening and followup, provide patient education and appointment reminders, assist in overcoming barriers to screening, coordinate provider feedback on referral patterns vs. usual care	Screening overall: 94% vs. 91%, p=0.04; aOR 1.56 (95% CI 1.08 to 2.25); FOBT: aOR 1.09 (95% CI 0.72 to 1.64); colonoscopy/sigmoidoscopy: aOR 1.54 (95% CI 1.08 to 2.20)	Fair; fair
Inadomi et al., 2012[104]	Low socio-economic status; racial and ethnic minority	Community health network; San Francisco, California	Cluster RCT (997)	Physician recommendation of either colonoscopy or FOBT in patient's preferred language; if selected, schedule for procedure and offer ride home vs. patient choice of FOBT or colonoscopy with no recommendation	Completed screening colonoscopy (referent): 38%; completed screening FOBT: 67%, aOR 3.50 (95% CI, 2.48 to 4.93); completed screening of either FOBT or colonoscopy: 69%, aOR 3.69 (95% CI, 2.63 to 5.16)	Poor; fair

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Jandorf et al., 2005[105]	Underserved	1 FQHC; New York City, New York	RCT (78)	Telephone patient navigation by research assistant: patient education, assessment of barriers, followup vs. usual care	FOBT at 3 months: 42.1% vs. 25%, p>0.05; endoscopy at 6 months: 23.7% vs. 5%, p=0.02	Poor; good
Jean-Jacques et al., 2012[91]	Low-income, racial and ethnic minority	1 FQHC; Chicago, Illinois	RCT (202)	Personalized letter encouraging screening, fact sheet, FOBT kit and instructions; if no response after 2 weeks, up to 3 reminder calls from bilingual lay health educators; if no response after 6 weeks, another mailed letter and kit vs. usual care	Screening at 4 months (FOBT, sigmoidoscopy, colonoscopy): 30% vs. 5%, p<0.001	Fair; fair
Katz et al., 2012[92]	Low socio-economic status, racial and ethnic minority	1 FQHC; Columbus, OH	RCT (270)	Educational video (12 minutes) with communication training, prevention brochure, communication tips brochure; if no response in 1 month, telephone barriers counseling to ask PCP for screening, vs. general educational video on screening and prevention brochure	Screening (FOBT or colonoscopy) at 2 months: 19.6% vs. 9.9%, aOR 2.35 (95% CI, 1.14 to 5.56)	Fair; fair
Leone et al., 2013[119]	Medicaid	12 managed care network-affiliated primary care practices; North Carolina	Cluster non-randomized trial (416)	Six intervention clinics: mailed packet with study invitation, survey, and CHOICE decision aid (11-min educational DVD); after one month, followup telephone call to address barriers, assist with appointment scheduling vs. six control clinics	Screening (colonoscopy, FOBT, sigmoidoscopy) at 6 months: 9.2% vs. 7.5%, aOR 1.44 (95% CI, 0.68 to 3.06); screening at 12 months: 16.3% vs. 10.3%, unadjusted OR 1.68 (95% CI, 0.80 to 3.56)	NA; fair
Levy et al., 2013[93]	Rural	16 rural family medicine clinics; Iowa	RCT (743)	1) Structured telephone call to provide education, assess and manage barriers, plus chart reminder, educational materials, fridge magnet, FIT kit; or 2) chart reminder, educational materials, fridge magnet, FIT kit; or 3) chart reminder only vs. usual care	Screening (colonoscopy, flexible sigmoidoscopy, FOBT, barium enema) at 15 months: 57.2% telephone vs. 56.5% chart plus materials vs. 20.5% chart reminder only vs. 17.8% control, p<0.0001; telephone aOR 6.38 (95% CI 3.9 to 10.5); chart plus materials aOR 6.29 (95% CI 3.8 to 10.4); chart reminder only OR 1.23 (95% CI 0.7 to 2.1)	Fair; good

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Ma et al., 2009[120]	Korean American	Churches; Los Angeles County, California	Non-randomized trial (167)	Navigation (group education on screening and patient navigation) vs. no navigation (group education on general preventive health)	Screening rates (colonoscopy, flexible sigmoidoscopy, or FOBT) at 12 months: 77.4% navigation vs. 10.8% no navigation, RR 7.14 (95% CI 3.81 to 13.37); patients without screening in prior year, 76.7% vs. 12%, RR 6.39 (95% CI 3.42 to 11.95)	Poor; poor
Mehta et al., 2016[112]	Racial and ethnic minority	Kaiser Permanente Northern California	Before-after study (868,934)	Pre vs. post-intervention including mailed FIT kits and EMR prompts during clinic visits	Up-to-date screening: 2010-2013 vs. 2004-2006, rate ratio 2.05 (95% CI 2.04 to 2.05); 2007-2009 vs. 2004-2006, rate ratio 1.60 (95% CI 1.59 to 1.60)	NA; good
Myers et al., 2014[94]	African American	Primary care clinics; Philadelphia, Pennsylvania	RCT (764)	Navigation with mailed materials, personalized message based on identified barriers, colonoscopy contact number or SBT kit, patient navigation vs. all but navigation	Screening at 6 months: aOR 2.1 (95% CI 1.5 to 2.9); 12 months: aOR 1.7 (95% CI 1.2 to 2.3)	Fair; fair
Myers et al., 2019[77]	Hispanic	Five health system-affiliated primary care practices; Pennsylvania	RCT (400)	Mailed bilingual information for SBT and colonoscopy, SBT kit, and telephone navigation (identify preferred test, develop plan, schedule prescreen visit for colonoscopy or review for kit return, add plan to EHR) vs. usual care (all but navigation)	Screening at 12 months: 77.7% vs. 43.3%; aOR 4.8 (95% CI 3.1 to 7.6); SBT at 12 months: 57.4% vs. 37.4%; aOR 4.2 (95% CI, 2.6 to 6.7); colonoscopy at 12 months: 20.3% vs. 5.9%; aOR 8.79 (95% CI 4.1 to 18.7)	Good; fair
Nash et al., 2006[113]	Low-income racial or ethnic minority	Public hospital; New York City, New York	Before-after study (1,767)	Pre vs. post-intervention including patient navigator, direct endoscopic referral system, GI suite enhancements	Screening colonoscopy: RR 3.0 (95% CI 1.9 to 4.7); 40% post-intervention vs. 10%, p<0.001; Medicaid patients, 48.4% post-intervention vs. 17%, p<0.001	NA; fair
Nguyen et al., 2015[106]	Vietnamese American	Community-based organizations; Santa Clara County, California	RCT (640)	Navigation (lay health worker education session, telephone calls, home visits, navigation including referrals, appointment scheduling and transportation) vs. lay health worker education on healthy lifestyle	Screening rates (colonoscopy, sigmoidoscopy or FOBT) at 6 months: 56% navigation vs. 19% education, p<0.001; aOR 5.45 (95% CI 3.02 to 9.82)	Poor; poor

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Percac-Lima et al., 2009[107]	Low-income, racial or ethnic minority	Hospital-affiliated primary care clinic; Chelsea, Massachusetts	RCT (1,223)	Patient navigation including introductory letter, educational materials, addressing barriers, appointment scheduling and reminders, bowel prep assistance, transportation and appointment attendance as needed vs. usual care	Screening (colonoscopy, sigmoidoscopy, barium enema, FOBT) at 9 months: 27.4% vs. 11.9%, p<0.001; colonoscopy: 20.8% vs. 9.6%, p<0.001	Poor; fair
Percac-Lima et al., 2014[114]	Latino, non-English speakers, non-Latino	Hospital-affiliated community health center; Philadelphia, Pennsylvania	Before-after study (3,115)	Pre vs. post-intervention including culturally tailored patient navigation with assessment and management of barriers	Screening (colonoscopy, sigmoidoscopy, colonography, or barium enema) before intervention: Latino 47.5% vs. non-Latino 50.4%, no difference; after intervention, Latino 73.5% vs. non-Latino 66%, p<0.001;	NA; fair
Potter et al., 2011[108]	Low-income, racial or ethnic minority	Six community-based primary care clinics; San Francisco, California	Group RCT (1,372)	Nurse reminder sheet, visual aids explaining FOBT test and prep, simple multilingual written instructions, video instructions, and stamped envelopes to return kits vs. usual care	Screening (colonoscopy, sigmoidoscopy, FOBT) at 18 weeks: 24.2% vs. 13.4%, p<0.001; OR 2.22 (95% CI, 1.24 to 3.95); at 12 months: 45.5% vs. 35.6%, p<0.001; FOBT at 18 weeks: 21.6% vs. 11.8%, p<0.001, OR 2.25 (95% CI, 1.56 to 3.24); FOBT at 12 months: 33.8% vs. 21.7%, p<0.001	Poor; fair
Reuland et al., 2017[78]	Low-income, racial or ethnic minority	2 community health centers, Albuquerque, New Mexico and Charlotte, North Carolina	RCT (265)	Navigation using screening decision aid videos about FOBT/FIT or colonoscopy, distribution of FOBT/FIT kits vs. attention control (food safety videos)	Screening at 6 months: 68% vs. 27%, p=NR; adjusted difference 40% (95% CI 29% to 51%); FOBT/FIT at 6 months: 54% vs. 21%, p=NR; colonoscopy at 6 months: 14% vs. 6%, p=NR	Good; good
Singal et al., 2016[79] Singal et al., 2017[125]	Underserved	Safety-net hospital system; Dallas County, Texas	RCT (5,999)	1) Mailed letter with invitation, telephone call reminder for nonresponders, phone number to call for scheduling, mailed bowel prep, appointment reminder phone call; or 2) mailed letter with invitation, telephone call reminder for nonresponders, FIT kit, instructions vs. 3) usual care	Screening at 12 months: 42.4% colonoscopy vs. 58.8% FIT vs. 29.6% control; either intervention vs. control p<0.0001, colonoscopy vs. FIT, p<0.001; compared with usual care: colonoscopy aOR 1.83 (95% CI 1.57 to 2.14); FIT aOR 3.84 (95% CI 3.28 to 4.5); screening at 3 years: 38.4% colonoscopy vs. 28% FIT vs. 10.7% usual care, p<0.001.	Good; good

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Tu et al., 2006[109]	Chinese Americans	Community clinic serving primarily Asians; Seattle, Washington	RCT (210)	Health educator delivered education, video, pamphlet, mailed FOBT kit, instructions	FOBT screening at 6 months: 69.5% vs. 27.6%, aOR 6.38 (95% CI 3.44 to 11.85)	Poor; fair
Tu et al., 2014[116]	Vietnamese Americans	Two primary care community health centers; Seattle, Washington	Before-after (2,276)	Educational DVD and pamphlet promoting screening translated into Vietnamese, given to eligible patients by medical assistant vs. control clinic	Screening (baseline vs. 2 years): FOBT aOR 1.42 (95% CI 0.84 to 2.39); sigmoidoscopy aOR 0.60 (95% CI 0.10 to 3.72); colonoscopy aOR 1.38 (95% CI 0.89 to 2.13); any screening aOR 1.42 (95% CI 0.95 to 2.15)	NA; fair

Abbreviations: ACS = American Cancer Society; aOR = adjusted odds ratio; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; CMS = Centers for Medicare and Medicaid Services; COLS/FS = colonoscopy or flexible sigmoidoscopy; CT = computed tomography; DVD = digital versatile disk; EHR = electronic health record; EMR = electronic medical record; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; FQHC = Federally Qualified Health Center; GI = gastrointestinal; MD = mean difference; NA = not applicable; NR = not reported; OR = odds ratio; PCP = primary care provider; RCT = randomized controlled trial; RR = risk ratio; SBT = stool blood test; vs. = versus

Key Question 5. Health System Interventions for Breast Cancer Screening

Twenty-six studies (in 27 publications) evaluated the effectiveness of health system interventions to improve screening for breast cancer among women age 40 and older (**Tables 11** and **13**). Studies evaluated interventions for breast cancer screening only,[42,51,68,128-139] both breast and cervical cancer screening,[41,126,127] both breast and colorectal cancer screening,[40,76,85] and breast, cervical, and colorectal cancer screening combined.[43,83,95,98,100,115] One RCT met criteria for good quality,[76]15 RCTs in 16 publications met criteria for fair quality,[40-43,51,68,83,85,95,126,129-131,134,135,138] and 7 RCTs for poor.[98,100,127,128,132,137,139] The remainder included two before-after studies[115,133] and one post-intervention time series study.[136]

Studies enrolled participants from racial and ethnic minority groups, with low income, and from rural areas. All studies were conducted in the United States, ranged in size from 91 to 97,433 participants (median 512), and were conducted in hospitals, FQHCs, other community health centers, and community settings with connections to health systems. Reported mean ages ranged from 34 to 68 years, although all studies reported breast cancer screening data for women age 40 and older. Interventions included patient navigation, telephone calls, prompts and other outreach, patient education, lay health workers, screening checklist, and practice changes involving community engagement.

Major limitations of studies rated fair or poor quality included inadequate or unclear masking of care providers or outcome assessors, allocation concealment, and randomization methods. Additional limitations included differential or high attrition, no intention-to-treat analysis for RCTs, failure to control for confounding variables, and post-randomization exclusions. Limitations of applicability included narrow participant demographics; unique settings; specialty training, expertise, or ancillary providers needed for interventions; resource-intensive interventions; and low adherence.

Patient Navigation

Seven RCTs[51,85,98,132,134,137] and one before-after observational study[133] of patient navigation in health systems indicated increased mammography screening among low-income racial and ethnic minority women, while one RCT indicated no differences.[83]

A fair quality RCT of 3,895 patients in three internal medicine practices at a safety-net hospital in Boston compared patient navigation with usual care.[134] Patient navigators contacted participants by phone at least three times over a 2-week period to provide culturally tailored services, address barriers, and schedule appointments. Navigators were fluent in Spanish, Portuguese, or Cape Verdean Creole, and additional language support was provided as needed. Based on medical record data at 9 months followup, screening was higher with navigation (aOR 2.5, 95% CI 1.9 to 3.2).

A fair quality RCT of 851 low-income, racial and ethnic minority women seen in federally funded community health centers compared navigation services by a lay health advisor with usual care.[51] The intervention consisted of three in-person visits with the lay health advisor and included educational materials and management of screening barriers, assistance with mammography scheduling, two followup phone calls, and two postcard mailings. Women in the usual care group received a letter and National Cancer Institute brochure about cervical cancer screening. Based on medical record review at 12 months, screening rates were higher with navigation (42.5% vs. 27.3%; RR 1.56, 95% CI 01.29 to 1.87).

In a fair quality RCT of 469 low-income women, patient navigation to improve colorectal and breast cancer screening was compared with usual care at a large safety-net primary care practice.[85] Navigation services included telephone and mailed outreach and point-of-care prompt sheets for patients and clinicians. Completion of mammography at 1 year was determined by medical record review and indicated higher screening with navigation (41% vs. 16.8%; aOR 3.44, 95% CI 1.91 to 6.19).

A poor quality RCT of 1,358 African-American women on Medicare compared patient navigation with usual care at community settings in Baltimore (70.7% ≤75 years old).[132] The intervention group received patient education materials developed by CMS, along with navigation services that included addressing screening barriers, appointment scheduling and attendance, and coaching on patient-provider communication. The usual care group received patient education materials only. Screening rates over 2 years were higher with navigation (93.3% vs. 87.5%; aOR 2.26, 95% CI 1.59 to 3.42).

In a poor quality RCT, navigation using a community health worker was compared with usual care in 376 low-income, racial and ethnic minority women overdue for mammography at hospital-affiliated primary care practices in Rochester, New York.[137] The majority of participants were White (42%) or Black (36%) and the mean age was 63 years. The intervention included personalized reminder letters from primary care providers and a community health worker and navigation services with education, assessment and management of screening barriers, and assistance with appointments, finances, and dependent care. Screening rates at 16 weeks were higher with navigation (25% vs. 9.8%; RR 2.57, 95% CI 1.53 to 4.35).

A poor quality RCT at a rural hospital in Hawaii compared patient navigation using a lay health worker with usual care in Native Hawaiian and Filipino women eligible for Medicare.[98] The trial compared screening rates for 260 women receiving culturally-focused patient navigation to improve breast, cervical, and colorectal cancer screening with 132 women receiving education on nutrition and cancer. At 12 months followup, self-reported rates of breast cancer screening were higher with navigation (61.7% vs. 42.4%, p=0.003).

A small before-after study evaluated patient navigation with 91 Bosnian refugee and immigrant women at a community health center in Massachusetts (mean age 54 years).[133] Women received navigation services in person and by telephone including assistance with transportation, appointment scheduling and attendance, and insurance issues. At 12 months, screening was higher with navigation (67% vs. 44%, p=0.001). A post-intervention multiple time series from the same center compared screening rates for 1,664 refugees 5 years after completion of the patient navigation intervention.[136] After the intervention, screening rates were significantly higher in refugee compared with English-speaking populations (90.5% vs. 81.9%, p=0.006), while 5 years later rates were comparable (76.5% vs. 80.5%, p=0.46).

No differences were reported in a fair quality RCT of 1,413 patients in 11 federally qualified community and migrant health centers in New York City that compared telephone-based patient navigation targeting breast, cervical, and colorectal cancer screenings with a single call from study staff.[83] Patient navigation included multiple calls from prevention care managers over a period of 18 months or until participants were up-to-date on all three screenings. The single call included answering questions about preventive care, providing an update of usual care status, and advising participants to obtain needed preventive care from their primary care provider. Based on medical record review at 18 months followup, there was no difference between groups in mammography adherence (mean difference in percentage points 0.12, 95% CI 0.06 to 0.19).

Telephone Calls, Prompts, and Other Outreach

Of 5 RCTs,[40,128,138,129,139] screening rates were higher with telephone calls, prompts, and other outreach methods in only one.[128]

A poor quality RCT of 1,104 low-income women in Florida compared the use of scripted loss/risk-framed messages with usual care for incoming calls inquiring about mammograms for women 50 to 64 years old. Loss/risk-framed messages focused on increasing risks with age, the fact that symptoms are often not present, and the effectiveness of mammography. At 6 months followup, women receiving loss/risk-framed messages were more likely to have been screened (aOR 1.91, 95% CI 1.20 to 3.05).[128]

A fair quality RCT of 366 women in a large primary care practice in Rochester, New York[40] compared personalized reminder letters including information about free screening options, automated telephone calls, and point-of-care prompts with usual care. Based on medical record data at 1-year followup, screening was higher with the intervention (29.7% vs. 16.7%; p=0.034), although differences diminished after adjusting for age, race/ethnicity, insurance, and median income (aOR 1.96, 95% CI 0.87 to 4.39).

A fair quality RCT of 320 women in an FQHC in Birmingham, Alabama serving predominantly low-income African-American/Black patients evaluated the effectiveness of a two-stage stepped care intervention to improve screening mammography.[138] In Stage 1, eligible women were randomized to a personalized reminder letter or usual care. In Stage 2 occurring 6 months later, the 237 women who had not yet been screened were randomized to a tailored counseling call or tailored letter. Tailored counseling calls were conducted by African-American/Black female healthcare workers to identify and overcome barriers to screening and provide personalized risk information. At the end of the call, women were reminded of a free mammography program and provided contact information. Tailored letters described the woman's relative risk for breast cancer, recommended scheduling an appointment (along with contact information), and reminded them of the free mammography program. At followup, there were no differences in self-reported screening for intervention versus usual care groups at the end of Stage 1 (14% vs. 14%) or Stage 2 (15% vs. 13%).

A fair quality RCT of 430 low-income African-American/Black and Hispanic women in Los Angeles compared a culturally, ethnically, and individually tailored telephone counseling intervention with usual care.[129] Women randomized to the intervention were mailed bilingual educational brochures and contacted three times by telephone over a 6-month period by a mature African-American/Black or Hispanic counselor. Counselors discussed the importance of screening mammography, scheduled low or no cost screenings, and addressed barriers. Self-reported screening at 6 months followup was similar between groups (37% vs. 29%).

A poor quality RCT of 193 Chinese immigrant women compared a culturally and individually tailored bilingual telephone intervention addressing barriers to screening with a mailed brochure.[139] All women participated in a baseline phone interview to evaluate knowledge and identify barriers, and a followup call four months later. Self-reported screening at 4 months followup was similar between groups (40% vs. 33%).

Patient Education

Screening rates were higher in two RCTs of educational interventions.[42,131] A fair quality RCT of 200 Chinese immigrant women in Portland, Oregon evaluated a culturally targeted group education session followed by individual telephone counseling versus informational brochures.[42] The education session included culturally relevant materials with information about breast cancer incidence and risk factors, and common general and cultural barriers and how to overcome them. Within 10 days of the education session, women received individual counseling by telephone aimed at overcoming barriers. When needed, the intervention included appointment setting, translation services, financial assistance for screening, childcare, and transportation. Based on self-report, women in the education session were more likely to be screened at 3 months (OR 8.81, 95% CI 4.83 to 16.05), 6 months (OR 9.10, 95% CI 3.50 to 23.62), and 12 months (OR 4.61, 95% CI 1.59 to 13.37).

A fair quality trial of 141 Korean women in Los Angeles compared three interventions: 1) a culturally-tailored peer-group education program providing information about mammography, addressing cultural barriers, and providing access to low-cost mobile mammography; 2) access to low-cost mobile mammography; and 3) Korean language breast cancer screening brochure with information about local screening resources, cholesterol education and low-cost cholesterol testing, and osteoporosis screening.[131] At 2 months followup, self-reported mammography screening rates were higher with education and low-cost mobile mammography (87%) and low-cost mobile mammography alone (72%) than with brochures (47%). Women randomized to education and low-cost mammography had similar screening rates as women receiving mobile mammography only (OR 0.39, 95% CI 0.13 to 1.19), but higher rates compared with women only receiving brochures (OR 0.13, 95% CI 0.04 to 0.38).

Lay Health Workers

Two RCTs of low-income Hispanic women indicated higher mammography screening rates with lay health worker interventions,[127,130] while one did not;[41] and a cluster RCT reported higher screening rates among African American women receiving education sessions and home visits.

In a fair quality RCT in four FQHCs in Washington state, 536 women were randomized to an intervention that included bilingual *promotora* (lay health worker) led motivational interviews with a home visit and followup telephone call versus usual care.[130] All women had access to free screening mammograms. Based on medical record data at 12 months followup, rates of mammography screening were higher in the *promotora*-led intervention group than the usual care group (19.6% vs. 11%, p<0.01). A poor quality community-based RCT of 512 women in San Diego County compared the effectiveness of *consejera* (natural helpers) led cancer education sessions with sessions on community living skills (control group).[127] Cancer education sessions included early detection of breast and cervical cancer, the importance of screening, and how to obtain services. At 1-year followup, self-reported screening rates increased more from baseline with the cancer education intervention (21.4% vs. 7%, p=0.029). In contrast, a fair quality cluster randomized trial of 1,333 Hispanic women from community-based settings in Arkansas, Buffalo, and New York City compared an intervention including faith-based, peer-led breast and cervical cancer education sessions and navigation at 2 months for those not yet screened with diabetes education sessions.[41] Screening rates were lower for the intervention group (56.7% vs. 62.2%, p=0.043).

A fair quality cluster randomized trial of 192 rural African-American/Black women in 13 church communities in rural Alabama (unit of randomization was the church) compared two interventions with a nonintervention group.[135] Interventions included either 1) a 90-minute group education session provided by African-American/Black nurses to reduce fear and concerns about mammography and address the importance of screening and early detection; or 2) education session and a home visit and followup by a home health educator who reviewed and answered questions, provided a culturally appropriate motivational brochure, scheduled screening appointments, addressed concerns and barriers, and provided transportation and coordinated childcare, if needed. At 3 months followup, self-reported screening rates increased more from baseline for women with education sessions and home visits (38.4%) than education alone (8.6%, $p<0.001$) or no intervention (8.1%, $p<0.001$).

Screening Checklist

A fair quality cluster RCT of 1,196 low-income women in eight county-funded primary care clinics in Hillsborough County, Florida compared use of a short, self-administered cancer screening checklist and chart stickers (red, yellow, green) indicating screening status with usual care.[43,95] At both 12 and 24 month followup, screening was higher for women in the intervention clinics (12-month OR 1.62, 95% CI 1.07 to 9.78;[43] 24-month OR 1.26, 95% CI 1.02 to 1.55[95]).

Practice Changes Involving Community Engagement

A before-after study in four FQHCs evaluated practice changes and engagement with community resources on breast cancer screening for 97,433 patients.[115] The intervention, including self-management goal setting with patients, documentation of screening rates, screening result notifications, evaluation of abnormal results, and inclusion of community resources to support cancer screening, led to higher rates of breast cancer screening compared with rates prior to the intervention (39% vs. 23.2%, $p<0.001$).

Table 13. Studies of effectiveness of health system interventions for breast cancer screening

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Abood et al., 2005[128]	Low-income	County Health Clinics, Florida	Block RCT (1,104)	Scripted loss/risk-based messages for incoming calls about mammography vs. usual care	Screening at 6 months (adjusted for race and breast cancer symptoms): aOR 1.91 (95% CI 1.20 to 3.05)	Poor, poor
Allen and Bazargan-Hejazi, 2005[129]	African American, Hispanic	Community Health Center in Los Angeles, California	RCT (430)	Culturally-tailored telephone counseling to overcome barriers vs. one telephone call to check receipt of mammogram	Screening at 6 months: 36.8% intervention vs. 29.0% control, p=0.12; aOR 1.76 (95% CI 1.06 to 2.92); 29.9% African American vs. 37.1% Hispanic vs. 28.1% White/others, p=0.296	Fair; fair
Coronado et al., 2016[130]	Hispanic	FQHCs within 60 miles of Seattle, Washington	Block RCT (536)	A *promotora*-led, motivational interviewing intervention that included a home visit and telephone followup vs. usual care	Screening at 12 months: 19.6% intervention vs. 11% control, p<0.01	Fair; fair
Kim and Sarna, 2004[131]	Korean Americans	Churches in Los Angeles County, California	Cluster RCT (141)	1) Education about breast cancer screening and access to free or low-cost mobile mammography service or 2) mobile mammography access only vs. 3) cholesterol education and test, osteoporosis screening	Screening at 2 months: 87% education + access vs. 72% access vs. 47% control; control vs. education + access, OR 0.13 (95% CI 0.04 to 0.38); access vs. education + access, OR 0.39 (95% CI 0.13 to 1.19)	Fair; poor
Lee-Lin et al., 2015[42]	Low-income, Chinese American	Asian health clinic in Portland, Oregon	RCT (200)	Culturally responsive targeted breast health educational program vs. standard brochure	Screening at 3 months: aOR 8.81 (95% CI 4.83 to 16.05); 6 months: aOR 9.10 (95% CI 3.5 to 23.62); 12 months: aOR 4.61 (95% CI 1.59 to 13.37)	Fair; fair
Marshall et al., 2016[132]	African American	Community settings in Baltimore, Maryland	RCT (1,358)	CMS-developed patient education materials, navigation services including appointment assistance and communication coaching vs. patient education materials only	Screening past 2 years: 93.3% vs. 87.5%; aOR 2.26 (95% CI 1.59 to 3.42)	Poor; fair
Paskett et al., 2006[51]	Low-income, racial and ethnic minority women	Four federally funded community health centers Robeson County, North Carolina	RCT (897)	Lay health advisor intervention consisting of 3 in-person visits with educational materials, 2 phone calls, 2 postcard mailings to educate, manage barriers, and assist with appointment scheduling, vs. control group receiving physician letter and brochure about cervical cancer screening	Screening at 12 months: 42.5% vs. 27.3%, RR 1.56, 95% CI, 1.29 to 1.87, p<0.001	Fair; poor
Percac-Lima et al., 2012[133]	Serbo-Croatian (Bosnian) refugees and immigrants	Hospital-affiliated community health center in Chelsea, Massachusetts	Before-after study (91)	Patient navigation including education, assistance with transportation, insurance, appointment scheduling vs. baseline	Mammography up-to-date at 1 year: 67% vs. 44%, p=0.001	NA; poor

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Phillips et al., 2011[134]	Low-income, racial and ethnic minority	Safety-net hospital-affiliated internal medicine clinics in Boston, Massachusetts	RCT (3,895)[a]	Patient navigation as part of the primary care team, including assessment and management of individual barriers vs. usual care	Screening at 9 months: 87% vs. 76%, p<0.001; aOR 2.5 (95% CI 1.9 to 3.2); by race: African American, OR 1.9 (95% CI 1.4 to 2.6); Hispanic, OR 1.2 (95% CI 0.8 to 1.8); other, OR 2.1 (95% CI 1.3 to 3.3); by time since last mammogram at baseline: >24 months, aOR 5.6 (95% CI 3.9 to 8.2); 18 to 24 months, aOR 6.0 (95% CI 2.8 to 12.7); 12 to 18 months, aOR 3.5 (95% CI 1.8 to 6.5)	Fair; fair
Powell et al., 2005[135]	African American, rural	Churches in rural Alabama	Cluster RCT (192)	1) Full program of educational session with African-American nurses and visit by local home health educator offering materials, needs and barriers assessment, basic navigation services; 2) partial program of educational session only vs. control	Screening at 3 months: 63% full vs. 70% partial vs. 61% control; increase from baseline, 38.4% full vs. 8.6% partial vs. 8.1% control, p<0.001	Fair; poor
Rodriguez-Torre et al., 2019[136]	Refugees	Hospital-affiliated community health center in Chelsea, Massachusetts	Post-intervention multiple time series (1,664)	Patient navigation including education, assistance with transportation, insurance, appointment scheduling 5 years after intervention completion, vs. English-speaking patients	Adjusted screening rates over time, first year after intervention completion: 90.5% vs. 81.9%, p=0.006; second year: 88.7% vs. 82.1%, p=0.31; third year: 77.9% vs. 81.5%, p=0.66; fourth year: 81.9% vs. 84.6%, p=0.71; fifth year: 76.5% vs. 80.5%, p=0.46	NA; poor
Weber and Reilly, 1997[137]	Low-income, racial and ethnic minority	Hospital-affiliated primary care practices in Rochester, New York	RCT (376)	Personalized letter from physician and community health worker, navigation services with assistance with transport, appointments, finances, dependent care vs. mailed letter and usual care	Mammogram at 16 weeks: 25% vs. 9.8%; RR 2.57 (95% CI 1.53 to 4.35)	Poor; fair
West et al., 2004[138]	Low-income, African American	FQHC in rural Alabama locations	Multi-stage RCT (Stage 1, 320; Stage 2, 237)	Stepped-care intervention: personalized letter in Stage 1, personalized phone counseling in Stage 2 vs. usual care in each step; Stage 2 subjects were those not screened in Stage 1	Mammogram at 6 months: Stage 1, 14% intervention vs. 14% control; Stage 2, 15% vs. 13%; among women with no history of prior mammogram, 16% intervention vs. 7% control, p=0.05; cost as barrier 18% vs. 1% cost not barrier, p=0.04	Fair; fair

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Wu and Lin, 2015[139]	Chinese	Community settings in Michigan	RCT (193)	Telephone intervention tailored to the results of a baseline survey about barriers, misconceptions and risks vs. standard NCI mammography brochure	Screening at 4 months: 40% intervention vs. 33% control, p=NS; 56% with insurance coverage vs. 34% without, p=0.03	Poor; fair

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; CMS = Centers for Medicare and Medicaid Services; FQHC = Federally Qualified Health Center; NA = not applicable; NCI = National Cancer Institute; NS = not significant; OR = odds ratio; RCT = randomized controlled trial; RR = risk ratio; vs. = versus

[a] Unit of randomization was provider.

Key Question 5. Health System Interventions for Cervical Cancer Screening

Thirteen studies (in 14 publications) evaluated the effectiveness of interventions by health systems to improve cervical cancer screening (Tables 11 and 14). Six studies evaluated interventions for cervical cancer screening specifically;[38,140-144] two trials evaluated interventions to increase followup after an abnormal screening;[140,143] three studies included breast and cervical cancer screening;[41,126,127] and five studies included interventions for breast, cervical, and colorectal cancer screening.[43,83,95,98,100,115] One RCT met criteria for good quality,[144] five for fair quality,[38,41,43,83,95,126] and five for poor.[98,127,141-143] The remainder included one before-after study[115] and one non-randomized trial.[140]

Trials included women of racial and ethnic minorities, with low-income, and from rural areas. All studies were conducted in the United States, ranged in size from 210 to 97,433 (median 897), and were conducted in primary care, hospital, and community settings with connections to health systems. Mean ages ranged from 34 to 68 years. Interventions included patient navigation, telephone calls, prompts and other outreach, lay health workers, screening checklist, and practice changes involving community engagement.

Major limitations of studies rated fair or poor quality included inadequate or unclear masking of care providers or outcome assessors, allocation concealment, and randomization methods. Additional limitations included differential or high attrition and no intention-to-treat analysis for RCTs. Limitations of applicability included narrow participant demographics; unique settings; specialty training, expertise, or ancillary providers needed for interventions; resource-intensive interventions; and low adherence.

Patient Navigation

Three RCTs and a nonrandomized trial compared patient navigation with other interventions or usual care to improve cervical cancer screening[83,38,98] or diagnostic followup of screening abnormalities.[140]

A fair quality RCT of 1,413 low-income racial and ethnic minority women at 11 federally qualified community and migrant health centers in New York City compared telephone-based patient navigation for breast, cervical, and colorectal cancer screening with a single call from study staff.[83] Based on medical record review at 18 months followup, cervical cancer screening rates increased by 7 percent for the navigation group, but not for the single call group (between group differences were not reported).

A fair quality RCT of 705 Korean women compared bilingual education sessions about cervical cancer and navigation with educational sessions about general health and cancer.[38] The cervical cancer specific session addressed cultural norms, risk factors, screening guidelines and procedures, beliefs, expectancies, and barriers to screening. Women in the intervention group were also offered navigation services, and were mailed a screening reminder 6 months after the session. At 12 months followup, screening rates were higher for cervical cancer education and navigation (71.2% vs. 10.1%; OR 25.9, 95% CI 10.1 to 66.1).

A poor quality trial of 260 rural Native Hawaiian and Filipino women on Moloka'i, Hawaii compared a culturally-focused lay patient navigation intervention with usual care.[98] At 24 months followup, self-reported screening rates were higher with navigation (57% vs. 36.4%, p=0.001).

A fair quality nonrandomized trial in FQHCs in Boston compared patient navigation with usual care in 1,763 low-income, racial and ethnic minority women with cervical cancer screening abnormalities.[140] The majority of women were African American or Hispanic (32% and 31%, respectively) and had low-grade cervical abnormalities (93%). The intervention included phone, mail, and in person contact and navigation services with assessment of barriers to timely followup of a diagnostic evaluation. Diagnostic resolution was determined by medical review of final diagnostic testing or evaluation. The rate of diagnostic resolution of cervical abnormalities was higher with navigation (87.9% vs. 78.6%; adjusted hazard ratio 1.46, 95% CI 1.14 to 1.88).

Telephone Calls, Prompts, and Other Outreach

A poor quality RCT[143] of 210 low-income African-American/Black and Hispanic women at a university-affiliated clinic in Philadelphia, Pennsylvania compared two interventions to improve adherence to followup after cervical cancer screening abnormalities (colposcopy after screening and 6 and 12-month medical appointments) with standard care. Standard care included mail and telephone reminders and barrier assessment, while the interventions included either 1) mailings with culturally sensitive brochures targeting the two highest rated barriers from participants' initial assessments; or 2) culturally appropriate telephone counseling targeting the two highest rated barriers from participants' initial assessments. Based on medical record data and self-report, there were no differences between groups in adherence to initial colposcopy or followup appointments at 6 and 12 months when comparing all three groups individually. However, adherence was higher for all outcomes for the telephone intervention group compared with the standard care and mail intervention groups combined ($p=0.0475$).

A three-arm fair quality RCT of 1,574 low-income women compared screening rates after reminder letters (personalized form letters or tailored letters) with no letters.[126] Similar to findings reported in this study for breast cancer screening, the cervical cancer screening rate was higher with personalized form letters (43.9%), compared to personalized tailored letters (23.7%) or no letters (39.9%).

Lay Health Workers

A RCT demonstrated increased cervical cancer screening rates among women with interventions involving lay health workers,[98,141] while four trials did not.[41,127,142,144]

A poor quality RCT of 613 Hispanic women in El Paso and Houston, Texas, and Yakima Valley, Washington compared three group bilingual *promotora* led interventions with usual care.[141] Interventions included: 1) an education session with a video about cervical cancer screening and culturally significant barriers followed by a flip chart and games addressing themes in the video; 2) video only; or 3) flip chart and games only. At 6 months followup, self-reported screening rates were higher with the video with flip chart and games (52.3%), video only (41.3%), and flip chart and games only (45.5%) compared with usual care (24.8%, $p<0.001$).

A fair quality cluster randomized trial of 1,333 Hispanic women from community-based settings in Arkansas, Buffalo, and New York City compared an intervention including faith-based, peer-led breast and cervical cancer education sessions, plus navigation at 2 months for those not yet screened with diabetes education sessions.[41] Screening rates were not different between intervention and control groups (62.7% vs. 64.6%).

A trial of 512 low-income Hispanic women found no differences in cervical cancer screening rates between women randomized to *consejera* led education sessions on breast and cervical cancer and women randomized to education sessions on community living skills (23.1% vs. 16.2%, p=0.096).[127]

A poor quality RCT of 897 low-income rural women at community health centers in North Carolina examined the effect of a lay-health mammography intervention compared with a physician letter and National Cancer Institute (NCI) brochure on adherence to cervical cancer screening at 14-months post-intervention.[142] Results indicated no differences between groups (OR 1.03, 95% CI, 0.80 to 1.32). Similarly, subgroup analyses found no differences between baseline and followup rates by race or ethnicity.

A good quality RCT of 286 women at a community health clinic in rural Appalachian Ohio compared a lay health intervention that included two in-person visits, two telephone calls, and four postcards over a four-month period with a physician letter with an NCI brochure about cervical cancer screening.[144] Although self-reported 12-month screening was higher for the intervention (OR 2.10, 95% CI 1.22 to 3.61), there was no differences between groups based on medical record review (OR 1.44, 95% CI 0.89 to 2.33).

Screening Checklist

A fair quality cluster RCT of 1,196 low-income women at eight county-funded primary care clinics in Hillsborough County, Florida compared an in-clinic self-administered screening checklist and chart stickers with usual care.[43,95] No differences in cervical cancer screening rates were found at followup (12 months OR 1.57, 95% CI 0.92 to 2.64; 24 months OR 0.88, 95% CI 0.68 to 1.15).

Practice Changes Involving Community Engagement

In a before-after study in four FQHCs, the effects of practice changes and engagement with community resources on cervical cancer screening were evaluated for 97,433 patients.[115] The intervention, including self-management goal setting with patients, documentation of screening rates, screening result notifications, evaluation of abnormal results, and inclusion of community resources to support cancer screening, led to higher rates of cervical cancer screening compared with rates prior to the intervention (37.2% vs. 25.2%, p<0.001).

Table 14. Studies of effectiveness of health system interventions for cervical cancer screening

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Battaglia et al., 2012[140]	Underserved	FQHCs in Boston, Massachusetts	Non-randomized trial (1,763)	Patient navigation including assessment of barriers to timely completion of diagnostic evaluation vs. usual care	Rates of diagnostic resolution of cervical abnormalities at 1 year: 87.9% vs. 78.6%; aHR 1.46 (95% CI 1.14 to 1.88)	Fair; fair
Byrd et al., 2013[141]	Hispanic	Community settings in El Paso and Houston, Texas and Yakima Valley, Washington	RCT (613)	Individual delivery of AMIGAS program by *promotora*, including: 1) screening contract, games and activities, video on barriers and facilitators, and flip chart to review video; 2) all but the video; or 3) all but the flip chart vs. usual care at clinic	Self-report Pap test at 6 months: 52.3% vs. 45.5% vs. 41.3% vs. 24.8% control, p<0.001 between intervention groups and control, no differences between intervention groups; medical record-validated Pap test at 6 months: 17.9% vs. 22.7% vs. 19.4% vs. 7.2% control, p=0.008 between intervention groups and control, no differences between intervention groups	Poor; poor
Fang et al., 2017[38]	Korean-American women	Churches in New Jersey and southeastern Pennsylvania	RCT (705)	Navigation services and bilingual community health educators addressing cervical cancer screening perceptions, beliefs, and expectations vs. control group with bilingual community health educators delivering general health and cancer screening information	Pap test at 12 months: 72.1% intervention vs. 10.1% control; aOR 35.8 (95% CI 11.13 to 114.90); post-hoc analyses to adjust for updated screening guidelines during study period, 65.5% intervention vs. 4.7%, OR 546.0 (95% CI 73.9 to 4,031.5)	Fair; fair
Katz et al., 2007 [142]	Rural, low-income	Community Health Centers Robeson County, North Carolina	RCT (897)	Lay health advisors provided 3 home visits, educational materials, followup phone calls, mailings vs. physician letter and brochure about Pap exams	Pap screening: OR 1.03, 95% CI, 0.80 to 1.32, p=0.81; rates (intervention, control): African American, 70% vs. 64%; Native American, 64% vs. 62%; White, 67% vs. 65%; high SES, 76% vs. 79%; low SES, 65% vs. 61%	Poor; poor
Miller et al., 2013[143]	Low-income, racial and ethnic minority	University-affiliated clinic serving low-income minority women in Philadelphia, Pennsylvania	RCT (211)	1) Telephone reminder and barrier assessment plus tailored telephone counseling to address barriers; or 2) telephone reminder and barrier assessment plus mailed materials to address barriers vs. 3) telephone reminder and barrier assessment only	No differences between groups for post screening colposcopy adherence: 75.4% vs. 61.8% vs. 65.8% control; medical followup at 6 months; 70.0% vs. 50.0% vs. 61.0% control; medical followup at 12 months: 63.0% vs. 58.6% vs. 53.9% control; differences in overall adherence to colposcopy and two followups only when group 1 vs. groups 2 and 3, p=0.05	Poor; fair
Paskett et al., 2011[144]	Rural	Community health clinic in Appalachia Ohio	RCT (286)	Lay health worker provided 2 in-person visits, 2 telephone calls, and 4 postcards over 10 months vs. physician letter and brochure about Pap test	Medical record 12 month Pap: by medical record, OR 1.44 (95% CI, 0.89 to 2.33); By self report, OR 2.10 (95% CI, 1.22 to 3.61)	Good; fair

Abbreviations: AMIGAS = Ayudando a Las Mujeres con Información, Guía y Amor para su Salud; aOR = adjusted odds ratio; aHR = adjusted hazard ratio; CI = confidence interval; FQHC = federally qualified health centers; OR = odds ratio; Pap = Papanicolaou; RCT, randomized controlled trial; SES = socioeconomic status; vs. = versus

Key Question 5. Health System Interventions for Lung Cancer Screening

One poor quality RCT comparing a patient navigation intervention with usual care in five community health centers reported improved lung cancer screening rates among 1,200 low-income smokers.[145] The majority of the population was female (52.5%) and White (81.4%) with mean age of 62 years. Patient navigation included identifying and overcoming barriers to lung cancer screening, shared decision making, improving patient-provider communication, facilitating reporting of results, and followup. Receipt of screening was assessed by medical record review. Screening was higher with navigation (23.5% vs. 8.6%, $p<0.001$). This study was limited by lack of reporting on randomization and allocation concealment, unclear masking of assessors or patients, and large loss to followup. Applicability was fair because it was based in a single setting and required specialized expertise and training.

Key Question 5. Health System Interventions for Tobacco Smoking Cessation

Six trials evaluated the effectiveness of interventions by health systems to improve tobacco smoking cessation (Tables 11 and 15). Three trials indicated improved quit rates with interventions,[146-148] while three showed no effect.[100,149,150]

One RCT met criteria for good quality,[147] one for fair quality,[149] and four for poor.[100,146,148,150]All studies were conducted in the United States, ranged in size from 352 to 5,065 (median 1,896), and were conducted in primary care, hospital, FQHCs, and community settings with connections to health systems. Participants' reported mean ages ranged from 24 to 50 years (median 38), and the majority were female (median 55%). Populations included low-income and racial and ethnic minority populations. Interventions included patient navigation, nicotine replacement therapy, and education and counseling. Quality was limited by lack of adequate randomization or allocation concealment, differences in groups as baseline, unclear masking of assessors or providers, and post-randomization exclusions. Applicability was generally fair; interventions were conducted in specialized settings such as Planned Parenthood clinics, a department of social services, or federally funded health centers, and required ancillary providers to connect with underserved or vulnerable populations.

Patient Navigation

A good quality RCT of 352 adults with low socioeconomic status at a safety net hospital compared patient navigation and financial incentives with enhanced usual care.[147] The population included Black (56%), White (22%), and Hispanic (11%) participants (mean age 50 years, 54% female). The intervention group received patient navigation, including assessment of barriers to cessation; connection to a quit line, support group, and a physician for prescription aids; and financial incentives for biochemical confirmation of cessation at 6 and 12 months. Enhanced usual care included a low-literacy cessation brochure and a list of local cessation resources. Cessation rates were higher in the intervention group at 6 months (9.6% vs. 0.6%, $p<0.001$) and 12 months (11.9% vs. 2.3%; aOR 4.89, 95% CI 1.59 to 15.03).

In a poor quality RCT, effects of patient navigation versus minimal intervention were evaluated in 608 Medicaid recipients in a county department of social services.[150] The population was primarily female (72.8%), mean age 36 years, and included White (42.9%), Black (42.4%), and Hispanics (7.6%). The intervention groups received either 1) patient navigation, including information on Medicaid's pharmacotherapy benefit, self-help materials, appointment scheduling and assistance, and vouchers for childcare or transportation; 2) information on Medicaid's pharmacotherapy benefit and self-help materials; or 3) information on the pharmacotherapy benefit only as a control group. Rates of biochemically confirmed cessation at 3 months were similar for all three groups (2.4% vs. 2.0% vs. 1.0%, $p>0.05$).

Nicotine Replacement

Two poor quality RCTs reported improved cessation rates with interventions incorporating nicotine replacement therapy (NRT). One trial of 3,068 smokers from Lung Health Study centers compared yearly validated quit rates after a 12-week group program, NRT, and quit messages focused on pulmonary function with usual care.[148] Participants were White (93.5%) or Black (6.5%), mean age 49 years, and predominantly male (46% female in the intervention group, 37% control). Quit rates were higher with the intervention after 1 year for White (aOR 5.99, 95% CI 4.65 to 7.71) and Black participants (aOR 1.18, 95% CI 0.66 to 3.32); Whites versus Blacks, $p=0.002$. Validated quit rates continued to be higher with the intervention during the 5 year study for both Whites (aOR 3.34, 95% CI 2.82 to 3.95) and Blacks (aOR 1.87 95% CI, 1.02 to 3.43); Whites versus Blacks, $p=0.06$.

In another trial, effects of office-based counseling and NRT were compared with usual care in 2,637 low-income adults at 14 community health center dental clinics (mean age 40.5 years, 57% female).[146] The trial enrolled Blacks (45.8%), Whites (32.2%), and Hispanics (15.8%). The intervention included counseling based on the '5 As' model, tailored print materials, a local quit line number, and NRT. After 6 months, cessation rates were higher in the intervention versus control group overall (5.3% vs. 1.9%, $p<0.001$), in Blacks (6.5% vs. 2.0%, $p<0.001$), and Whites (4.6% vs. 2.3%, $p<0.05$), but not Hispanics (3.2% vs. 1.1%, $p>0.05$).

Education and Counseling

In a fair quality RCT, effects of behavioral counseling were compared with enhanced usual care in 1,154 low socioeconomic status women attending four Planned Parenthood clinics (mean age 24 years).[149] The intervention included a 9-minute video, 12 to 15-minute behavioral counseling, a 20-second quit message from a physician, and telephone support for one month. The control group received a cessation brochure and 20-second quit message from a physician. After 6 weeks, 7-day abstinence rates were higher in the intervention group (10.2% vs. 6.9%; OR 1.52, 95% CI 1.01 to 2.32). However, 7-day abstinence rates were similar between groups at 6 months (18.3% vs. 14.9%, $p>0.05$) and for 30-day abstinence (10.2% vs. 7.8%, $p=0.15$).

Another poor quality RCT evaluated culturally tailored health messages and a calendar for smoking cessation and breast and colorectal cancer screening in 5,065 American Indian and Alaska Natives.[100] Cessation rates after 15 months were similar compared with controls for participants receiving a nicotine patch (0.6% vs. 0.8%, $p=0.48$), cessation counseling (4.5% vs. 4.5%, $p=0.99$), or cessation counseling referrals (0% vs. 0.9%, $p=0.51$).

Table 15. Studies of effectiveness of health system interventions for tobacco smoking cessation

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Glasgow et al., 2000[149]	Low socio-economic status	Four Planned Parenthood clinics, Portland, Oregon	RCT (1,154)	Nine-minute video, 12-15 minute behavioral counseling with staff, 20-second quit message from physician, supportive phone calls in following month, vs. smoking brochure and 20-second quit message from physician	7-day abstinence, 6 weeks: 10.2% vs. 6.9%; OR 1.52 (95% CI 1.01 to 2.32); 7-day abstinence, 6 months: 18.3% vs. 14.9%, p>0.05; 30-day abstinence, 6 months: 10.2% vs. 7.8%, p=0.15	Fair; fair
Gordon et al., 2010[146]	Low-income, racial and ethnic minority	14 federally funded community health center dental clinics, United States	RCT (2,637)	Brief office-based counseling using 5 As model, NRT, tailored print materials, local tobacco quit line number vs. usual care	No tobacco use (prolonged abstinence): 5.3% vs. 1.9%, p<0.01; African American: 6.5% vs. 2.0%, p<0.001; non-Hispanic White: 4.6% vs. 2.3%, p<0.05; Hispanic: 3.2% vs. 1.1%, p=NS	Poor; fair
Lasser et al., 2017[147]	Low socio-economic status, racial and ethnic minority	Safety-net hospital, Boston, Massachusetts	RCT (352)	Patient navigation (up to 4 hours over 6 months), connection to resources (quit line, support group), physician for prescriptions, counseling, financial incentives vs. enhanced usual care (brochure, list of cessation resources)	Biochemically confirmed cessation, 6 months: 9.6% vs. 0.6%, p<0.001; 12 months: 11.9% vs. 2.3%, p<0.001, aOR 4.89 (95% CI 1.59 to 15.03); 12 months, non-White: 15% vs. 3%, p<0.001	Good; fair
Murphy et al., 2005[150]	Low-income (Medicaid)	Department of Social Services, Erie County, New York	RCT (608)	1) Case management (information on Medicaid pharmacotherapy benefit, self-help materials, patient navigation); 2) Self-help (information on Medicaid pharmacotherapy benefit, self-help materials); vs. 3) minimal intervention (information on Medicaid pharmacotherapy benefit)	Biochemically confirmed cessation at 3 months (minimal intervention reference group): case management, 2.4%, OR 2.43 (95% CI 0.47 to 12.65); self-help, 2.0%, OR 1.94 (95% CI 0.35 to 10.71)	Poor; fair
Murray et al., 2001[148]	African American	6 participating Lung Health Study centers, United States	RCT (3,068)	Group program, including physician quit message focused on pulmonary function, 12 week group program, NRT vs. usual care	Quit at 1 year: Black, aOR 1.18 (95% CI 0.66 to 3.32); White, aOR 5.99 (95% CI 4.65 to 7.71); Black vs. White, p=0.002; Quit by 5 years: Black, aOR 1.87 (95% CI 1.02 to 3.43); White, aOR 3.34 (95% CI 2.82 to 3.95); Black vs. White, p=0.06	Poor; fair

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio; NRT = nicotine replacement therapy; NS = not significant; RCT = randomized controlled trial

Key Question 5. Health System Interventions for High Blood Pressure Screening

One poor quality RCT compared the effectiveness of an enhanced intervention to reduce high blood pressure in 1,443 underserved women attending Massachusetts Breast and Cervical Cancer Initiative clinics as part of the Well-Integrated Screening and Evaluation for WOMen Across the Nation (WISEWOMAN) program.[151] The enhanced intervention included lifestyle assessment and counseling on nutrition and physical activity to reduce risk of cardiovascular disease (CVD), individual and group education, and activities held in the community, in addition to the minimal intervention. Minimal intervention included standard screening for breast and cervical cancer and CVD risk factors, counseling and education, referrals, and followup as part of standard care, and low-literacy fact sheets on preventive services. Among women not on blood pressure medication at baseline, there was no difference in the proportion of participants with high blood pressure at 12 months in the enhanced versus minimal care groups (−6.8% vs. −8.6%, adjusted p=0.51). However, fewer women had high blood pressure at 12 months in both the enhanced (33.8% to 27.0%, adjusted p=0.02) and minimal groups (31.5% vs. 22.9%, adjusted p=0.009). This study was limited by lack of intent-to-treat analysis; unclear maintenance of comparable groups; unclear randomization procedures; and limited information on whether one site was excluded post-randomization. Study applicability was poor because of the setting, time, and effort to implement the intervention.

Key Question 5. Health System Interventions for Obesity Screening and Management

Seven studies evaluated the effectiveness of interventions by health systems to improve obesity screening and management (Tables 11 and 16). One RCT met criteria for good quality,[152] two for fair quality,[153,154] and two for poor.[155,156] The remaining two studies were a prospective cohort[157] and before-after study.[158] All studies were conducted in the United States, ranged in size from 59 to 585 (median 217), and were conducted in primary care, hospital, and community settings with connections to health systems. Reported mean ages ranged from 32 to 66 years (median 47), and the majority of participants were female (median 86%). Participants were African American, Hispanic, low-income, or underserved. Interventions included education and counseling and case management and outreach. Quality was limited by unclear or inadequate randomization and allocation concealment, high loss to followup, lack of intention-to-treat analysis, and unclear masking of assessors. Applicability was generally poor, as the interventions required significant time and resources, including specialized ancillary providers, for specific populations in unique settings.

Education and Counseling

Six studies compared education and counseling weight loss interventions with other interventions or usual care. Results indicated lower BMI in three studies,[153,155,157] but no differences in three others.[154,156,158]

A fair quality RCT based in four academic medical centers compared group and individual counseling with usual care for 585 participants (mean age 65.5 years; 72% White; 28% Black, 52% female).[153] Counseling groups focused on either 1) weight loss; 2) dietary sodium reduction; or 3) weight loss and sodium reduction. Usual care included a quarterly group education session on general health. After 1 to 3 years of followup, mean weight change was higher in weight loss intervention groups versus sodium reduction only or control groups for

White (-4.2 kg vs. -0.9 kg, p<0.001) and Black (-3.3 kg vs. -1.4 kg, p<0.01) participants. Weight loss was similar at the end of the study between White and Black patients (p=0.12), but Whites had higher net weight loss than Blacks across the study period (-3.9 kg vs. -2.3 kg, p=0.03).

A fair quality RCT in a university-affiliated family practice compared a culturally adapted lifestyle program with usual care in 237 African Americans with obesity (mean age 44 years, 90% female).[154] Intervention participants attended 10 weekly weight loss classes, followed by 1) an in-person group or 2) individual telephone counseling on healthy diet and exercise. Rates of mean weight loss after 18 months were similar for group counseling (-0.8 kg), individual telephone counseling (-1.3 kg), and control groups (-1.4 kg, p=0.90).

A poor quality RCT of 217 underserved Hispanic women compared counseling and education with or without community health worker outreach with usual care in two Breast and Cervical Cancer Early Detection Program clinics in Arizona.[156] The interventions, developed as part of the WISEWOMAN program, included either 1) community health worker outreach, including lifestyle advice and invitations to group walks in the community; two health education classes; monthly study newsletters; provider counseling; and a behavior change prescription tailored to the individual; 2) health education, provider counseling, and behavior change prescription only; or 3) provider counseling and behavior change prescription (active control). Change in BMI from baseline at 12 months was highest for the active control group (−0.1 BMI units, 95% CI −0.6 to 0.5) compared with the community health worker outreach (0.1, 95% CI −0.3 to 0.6) or health education group (0.7, 95% CI −0.1 to 1.4). While the reduction in percentage of participants with BMI ≥25 kg/m^2 was highest in the community health worker outreach group (−4.6%, compared with 4.2% and 0% in the health education and active control groups, respectively), the adjusted intervention effect was not statistically significant for any comparison.

A poor quality RCT of 254 Latino immigrant farmworkers at a work-sponsored clinic on farms in California evaluated an intervention consisting of a series of educational sessions on physical activity, healthy weight, healthy diet, and lifestyle compared with no intervention.[155] Mean BMI after the last session was lowest for the high attendance group (8 to 10 sessions) compared with low attendance (3 to 7 sessions) and control groups (27.9 kg/m^2, 95% CI 27.1 to 28.1 vs. 28.3 kg/m^2, 95% CI 27.9 to 28.8 vs. 28.6 kg/m^2, 95% CI 28.3 to 28.9, respectively). The high attendance group also reported more servings of fruits and vegetables per day and more non-work physical activity than the other groups.

A poor quality cohort study at a university medical center evaluated a lifestyle modification intervention in 69 Black participants with obesity (mean age 47 years, 86% female).[157] Participants received personalized and group counseling and education, one-week meal replacement, prescriptions for exercise, and access to a hospital exercise facility. Mean change in weight was higher after 12 months versus baseline (-4.6 kg, p<0.001), and compared with matched controls (0.3 kg, p<0.001).

In a before-after study, clinical and community partners reported outcomes of a 12-week lifestyle intervention in 59 underserved Hispanic adults (mean age 37 years, 92% female).[158] Patients at a FQHC and academic research center received weekly nutritional education and behavioral skills training and access to thrice-weekly exercise classes through a local YMCA and diabetes program. Rates were similar before and after the intervention for both mean weight change (82.1 kg vs. 80.6 kg, p=0.12) and BMI (32.1 kg/m^2 vs. 31.6 kg/m^2, p=0.12); however, weight-specific quality of life measures improved (64.6 vs. 71 out of 100, p=0.001).

Case Management and Outreach

A good quality RCT[152] of 207 low-income Hispanic adults at a community health center in California found no differences in BMI with case management with or without community health worker outreach compared with usual care. The interventions included either 1) community health worker outreach (family and environmental support, map neighborhood physical activity resources, track and manage physical activity and food goals) and case management (motivational interviewing, goal-setting, cooking and physical activity demonstrations, identification of community resources, and coordination with primary care); 2) case management only; or 3) usual care. Mean change in BMI did not differ between the three groups or between the two intervention arms at 6 months (−0.8 vs. −0.6 vs. −0.4 kg/m^2), 12 months (−0.7 vs. −0.6 vs. −0.3 kg/m^2), or 2 years (−0.4 vs. −0.4 vs. −0.2 kg/m^2).

Table 16. Studies of effectiveness of health system interventions for obesity management and screening

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Kumanyika et al., 2002[153]	African American	4 academic medical centers; United States	RCT (585)	Group (60 minutes) and individual counseling on 1) weight loss, 2) sodium reduction, or 3) weight loss and sodium reduction vs. usual care with quarterly group educational sessions on unrelated health topics	Mean weight change in weight loss group: Black, -3.2 kg (SE 0.7) vs. -1.2 kg (0.9), p<0.05; White, -5.2 kg (0.4) vs. -0.3 (0.5), p<0.001; Black vs. White, p=0.007	Fair; poor
Kumanyika et al., 2005[154]	African American	Health system-affiliated family practice; Philadelphia, Pennsylvania	RCT (237)	Culturally adapted Healthy Eating and Lifestyle Program with 10 weekly weight loss classes, followed by randomization to 1) group counseling with 1-hour classes and individualized help or 2) staff-facilitated self-help with monthly calls, local resources on diet and exercise, pedometer, telephone support vs. usual care	Mean weight change from baseline: group counseling, -0.8 kg (95% CI -2.5 to 0.9); self-help, -1.3 kg (95% CI -3.4 to 0.9); usual care, -1.4 kg (95% CI, -3.5 to 0.7; p=0.90	Fair; poor
Mitchell et al., 2015[155]	Latino, low-income, immigrant	Worksite-sponsored clinic on berry farms in California	RCT (254)	Ten 90-minute educational sessions on physical activity, healthy weight, healthy diet, and lifestyle vs. usual care	BMI at 12-14 weeks: high attendance, 27.9 kg/m^2; low attendance, 28.3 kg/m^2; control, 28.6 kg/m^2, p<0.001	Poor; poor
Racette et al., 2001[157]	African American	University medical center; St. Louis, Missouri	Prospective cohort (69)	Energy restricted diet for 1 week, lifestyle modification program to reduce fat intake (educational materials, utensils, personalized guidance, monthly telephone calls, newsletters, optional bimonthly group meetings and individual meetings, food diaries), and recommendation to increase physical activity (handouts, access to cardio equipment at hospital, exercise prescriptions, individual exercise orientation sessions, logbooks) vs. matched control	Mean weight change in kg (SD), 4 months: -4.8 (0.7) vs. -0.8 (0.6), p<0.001; 12 months: -4.6 (1.0) vs. 0.3 (0.8), p<0.001	Poor; poor

Author, Year	Disparity Group	Setting	Study Design (N)	Intervention; Comparison	Results; Intervention vs. Comparison	Quality; Applicability
Rosas et al., 2015[152]	Latino, low-income	Health system-affiliated community health center; Fair Oaks, California	RCT (207)	1) Lay health worker outreach with family support, mapping neighborhood resources, tracking and managing goals, and case management with motivational interviewing, cooking and physical activity demonstrations, coordination with primary care, or 2) case management only, vs. usual care	No differences among groups for mean change in BMI at 6 months, in kg/m^2: −0.8 (95% CI −1.1 to −0.5) vs. −0.6 (−1.0 to −0.3) vs. −0.4 (−0.7 to 0), p>0.05 for all comparisons; 12 months: −0.7 (−1.1 to −0.3) vs. −0.6 (−1.0 to −0.1) vs. −0.3 (−0.8 to 0.3), p>0.05 for all comparisons; or 2 years: −0.4 (−0.9 to 0.2) vs. 0.4 (−1.0 to 0.2) vs. −0.2 (−1.1 to 0.7), p>0.05 for all comparisons	Good; poor
Soltero et al., 2019[158]	Hispanic	Clinical and community settings; Phoenix, Arizona	Before-after (59)	12-week lifestyle intervention including nutritional education and behavioral skills training (60 minutes per week), and physical activity classes (60 minutes, 3 times per week)	Mean weight, kg (SD), baseline to study end: 82.1 (17.8) to 80.6 (17.8), p=0.12; mean BMI, kg/m^2 (SD), baseline to study end: 32.1 (5.9) to 31.6 (6.0), p=0.12	NA; poor
Staten et al., 2004[156]	Hispanic, underserved	2 national Breast and Cervical Cancer Early Detection Program clinics; Tucson, Arizona	RCT (217)	1) Community health worker outreach (advice on healthy diet and exercise, behavior change, and invitations to bimonthly walks in community), health education classes, monthly health newsletters for 12 months, reminder calls at 6 months; provider counseling on a healthy lifestyle, behavior change prescription tailored to individual; or 2) health education classes, newsletters, calls, counseling, and prescription; vs. 3) provider counseling and prescription only (active control)	No differences among groups in change in BMI from baseline to 12 months (95% CI): 0.1 (−0.3 to 0.6) vs. 0.7 (−0.1 to 1.4) vs. −0.1 (−0.6 to 0.5), p=NR; no differences in change in percent of study arm at BMI ≥25 from baseline to 12 months: −4.6% vs. 4.2% vs. 0%	Poor; fair

Abbreviations: BMI = body mass index; CI = confidence interval; NA = not applicable; RCT = randomized controlled trial; SD = standard deviation; SE = standard error

Meta-Analysis of Studies of the Effectiveness of Patient Navigation To Increase Cancer Screening

The meta-analysis included 37 studies of the effectiveness of patient navigation interventions involving clinicians and health systems to increase screening for colorectal,[31,53,58,62,76-78,80,82-87,90,94,98,101,102,105-107,113,114,117-120] breast,[51,68,76,83,85,98,132-135,137] and cervical cancer[38,66,83,98] in populations adversely affected by disparities (Table 17). Three studies met inclusion criteria for KQ3[58,62,66] and 34 for KQ5.[31,38,53,78,80,82-87,90,94,98,101,105-107,113,114,117,118,120,132-135,137] Studies included 29 RCTs[31,38,51,53,58,62,68,76-78,80,82-87,90,94,98,101,102,105-107,132,134,135,137] and 8 observational studies;[66,113,114,117-120,133] 3 RCTs provided data for more than one type of cancer screening.[83,85,98]

Table 17. Populations and other abbreviations in forest plots

Category	Abbreviation	Definition
Study populations	AA	African American
	AAM	African-American men
	RAA	Rural African-American
	AALI	African-American low-income
	Chin	Chinese American
	ChinLI	Chinese-American low-income
	Fil	Filipino American
	Haw	Native Hawaiian
	His	Hispanic/Latino
	LIHis	Low-income Hispanic/Latino
	HisW	Hispanic/Latina women
	Kor	Korean American
	LI	Low-income
	LIRE	Low-income racial/ethnic minority
	LIW	Low-income women
	Viet	Vietnamese American
Other abbreviations	Colo	Colonoscopy
	DL	DerSimonian and Laird method
	Endo	Endoscopy (colonoscopy and flexible sigmoidoscopy)
	FIT	Fecal immunohistochemistry test
	FOBT	Fecal occult blood test
	NA	Not applicable
	NR	Not reported
	PL	Profile likelihood
	RCT	Randomized controlled trial

Patient navigation broadly refers to services intended to improve a patient's engagement in their healthcare by providing personal guidance as they move through the healthcare system**.** Patient navigators may have medical, legal, financial, advocacy, or administrative roles. In studies of patient navigation to improve cancer screening, services often included outreach activities involving letters or calls, educational materials and sessions, assessment and addressing of barriers to screening, language translation, appointment scheduling and reminders, bowel prep assistance, mailed supplies and kits, transportation and appointment attendance as needed, and point-of-care prompts, among others. Components of navigation varied across studies and are summarized in Tables 18, 19, and 20 below. Comparison groups in the studies included patients receiving usual care or alternative services without patient navigation, such as a single mailing or educational encounter.

Table 18. Components of colorectal cancer screening navigation

Author, Year	Population	Description	Training and Qualifications	Ed	Pre	Sch	Tr	Info	Fin	Ph	Ref	Rm
Arnold et al., 2016[a,96]	Underserved	Nurse	Not reported	X		X				X		
Baker et al., 2014[80]	Low-income	Screening navigator	Not reported	X	X	X	X	X				
Braun et al., 2015[a,98]	Native Hawaiian and Filipino	Lay navigator	Lay navigators from the community; 48-hour training program; quarterly continuing education sessions	X		X	X		X	X		X
Berkowitz et al., 2015[a,110]	Disadvantaged	Patient navigator	Full-time trilingual (English, Spanish, Portuguese) patient navigator	X	X		X					X
Blumenthal et al., 2010[53]	African American	Health educator	Investigator trained staff	X			X		X	X		
Christie et al., 2008[62]	Hispanic and African American	Patient navigator	Health educator trained in navigation services (professional patient navigator)	X		X	X				X	X
Cole et al., 2017[31]	African-American men	Patient navigator	2-day training using standardized materials; additional skill-building sessions, role play, documentation, and 56 hours of community health worker training	X	X							
Coronado et al., 2011[a,81]	Underserved Hispanic	*Promotora*	Spanish-speaking male health coordinator; training in colorectal cancer, prevention and early detection, documentation	X	X							X
Davis et al., 2013[117]	Underserved	Nurse manager	2-hr in-service on screening; instruction in interviewing techniques, tracking system, and protocol for contacting and assisting patients	X		X				X		
DeGroff et al., 2017[82]	Low-income	Lay navigator	Two bilingual lay navigators with training in outreach and interviewing	X	X	X	X					X
Dietrich et al., 2006[83]	Low-income women	Prevention care manager	7 hours of training on USPSTF guidelines and screening barriers; role playing; ongoing review of logs	X		X	X			X		X
Dietrich et al., 2013[84]	Low-income women	Prevention care manager	5 training sessions on guidelines, barriers, protocol, forms, role playing; monthly quality assurance meetings	X		X				X		X
Enard et al., 2015[101]	Low-income Hispanic	Navigator	Bachelor's degree in public health or related field and 2 years' experience; 80 hours of training and 3-day continuing education conference	X		X		X			X	X

Author, Year	Population	Description	Training and Qualifications	Ed	Pre	Sch	Tr	Info	Fin	Ph	Ref	Rm
Fiscella et al., 2011[85]	Underserved	Community health worker	Recruited from community; training on intervention, database, how to assist patients; supervised by social worker					X				
Ford et al., 2006[102]	African-American men	Case manager	African-American women; trained in scheduling procedures and information from local health and social services organizations	X	X	X	X	X	X		X	
Fortuna et al., 2014[76]	Underserved	Outreach worker	Not reported	X	X	X		X			X	
Goldman et al., 2015[86]	Underserved	Navigator	Not reported	X	X	X				X		
Guillaume et al., 2017b[87]	Low socio-economic	Screening navigator	Social workers specifically trained in screening	X								
Honeycutt et al., 2013[118]	Underserved	Patient navigator	Trained professional health navigator	X			X		X			X
Horne et al., 2015[90]	African American	Patient navigator	Trained and certified patient navigator	X								
Jandorf et al., 2005[105]	Underserved	Patient navigator	Research associate with similar cultural background to participants	X	X	X						X
Lasser et al., 2011[58]	Low-income, racial or ethnic minority	Patient navigator	College educated and experienced in navigation; 10 hours of training in interviewing techniques	X	X					X	X	
Leone et al., 2013[119]	Low-income	Patient navigator	Medicaid patient outreach coordinator; 2-day training on screening, interviewing, and barriers	X	X	X	X					X
Ma et al., 2009[120]	Korean American	Health educator	Not reported	X		X			X	X		X
Myers et al., 2014[94]	African American	Navigator	Not reported	X	X							X
Myers et al., 2019[77]	Hispanic	Patient navigator	Not reported	X	X	X						X
Nash et al., 2006[113]	Low-income, racial or ethnic minority	Patient navigator	Not reported	X		X					X	X
Nguyen et al., 2015[106]	Vietnamese American	Lay health worker	Training on screening, delivering educational presentations, and using reference manuals	X		X		X	X		X	
Percac-Lima et al., 2009[107]	Low-income	Patient navigator	College-educated outreach workers and interpreters; 6-hour training on navigation and screening	X	X	X	X	X				X

Author, Year	Population	Description	Training and Qualifications	Ed	Pre	Sch	Tr	Info	Fin	Ph	Ref	Rm
Percac-Lima et al., 2014[114]	Latino	Patient navigator	College-educated outreach workers and interpreters; 6-hour training on navigation and screening	X	X	X	X	X				X
Reuland et al., 2017[78]	Low-income, racial or ethnic minority	Patient navigator	Clinic employees with previous training; 6-hour training, monthly check-ins	X	X							

Abbreviations: Ed = education, assessment and/or management of barriers; Fin = financial assistance; Info = screening information; Ph = connected patient to physician; Pre = assisted with prep kits or prescriptions; Ref = referrals; Rm = appointment reminders; Sch= appointment scheduling; Tr= assist with transportation; USPSTF = U.S. Preventive Services Task Force

[a] Not eligible for meta-analysis

Table 19. Components of breast cancer screening navigation

Author, Year	Population	Description	Training and Qualifications	Ed	Sch	Tr	Info	Fin	Ph	Ref	Rm
Allen and Bazargan-Hejazi, 2005[a,129]	African American and Hispanic	Trained interviewer	Trained on scripted telephone protocols	X	X		X	X			X
Braun et al., 2015[98]	Native Hawaiian and Filipino	Lay navigator	From community; 48-hour training program; supervised by health professionals	X	X	X		X	X		X
Coronado et al., 2016[a,130]	Hispanic	*Promotora*	3-day training on the intervention, screening, tracking and documentation; assessed by coding and scoring recorded sessions	X			X				
Dietrich et al., 2006[83]	Low-income	Prevention care manager	7 hours of training on USPSTF guidelines and screening barriers; role playing; ongoing review of logs	X	X	X			X		X
Fiscella et al., 2011[85]	Underserved	Community health worker	From community; training on screening, use of database, methods to assist patients; supervised by social worker				X				
Fortuna et al., 2014[76]	Underserved	Outreach worker	Not reported	X	X		X			X	
Marshall et al., 2016[132]	African American	Patient navigator	Classroom sessions, interactive role playing, shadowing of navigators, and instruction in electronic database	X	X				X		
Paskett et al., 2006[51]	Low-income, racial and ethnic minority	Lay health advisor	Nurse, social worker, and study interviewer; 1 week training with role playing, review of resource manual, handling problems; examination required; supervisor review	X	X						
Percac-Lima et al., 2012[133]	Bosnian immigrants and refugees	Patient navigator	Bilingual college educated; training in breast cancer prevention, treatment, navigation; supervised by professionals	X	X	X		X			X
Phillips et al., 2011[134]	Low-income racial and ethnic minorities	Patient navigator	Bilingual experienced navigators; training on barriers and culturally tailored services based on the care management model	X	X	X			X		
Powell et al., 2005[135]	Rural African American	Home health educator	16 hours of training on intervention, research protocol, and interviewing skills	X	X	X		X	X	X	X
Russell et al., 2010[68]	Low-income, African American	Lay health advisor	Two 8-hr training sessions on messages, barriers, appointments, transportation, referrals; periodic audiotape evaluation	X	X	X	X	X		X	
Weber et al., 1997[137]	Medically underserved	Community health educator	Not reported	X	X			X	X		X

Abbreviations: Ed = education, assessment and/or management of barriers; Fin = financial assistance; Info = screening information; Ph = connected patient to physician; Ref = referrals; Rm = appointment reminders; Sch= appointment scheduling; Tr = assist with transportation; USPSTF = U.S. Preventive Services Task Force.

[a] Not eligible for meta-analysis

Table 20. Components of cervical cancer screening navigation

Author, Year	Population	Description	Training and Qualifications	Ed	Sch	Tr	Info	Fin	Ph	Ref	Rm
Battaglia et al., 2012[a,140]	Low-income racial and ethnic minority	Patient navigator	Bilingual with some healthcare training; bimonthly local training	X							
Braun et al., 2015[98]	Native Hawaiian and Filipino	Lay navigator	From community; 48-hour training program; supervised by health professionals	X	X	X		X	X		X
Dietrich et al., 2006[83]	Low-income	Prevention care manager	7 hours of training on USPSTF guidelines and screening barriers; role playing; ongoing review of logs	X	X	X			X		X
Fang et al., 2017[38]	Korean American	Study navigator	Not reported	X	X	X	X	X			
Jandorf et al., 2014[a,41]	Hispanic	Lay health worker	Training at each site	X	X	X					X
Wang et al., 2010[66]	Low-income Chinese American	Community health educator	Trained Chinese community health educators	X	X	X	X	X		X	

Abbreviations: Ed = education, assessment and/or management of barriers; Fin = financial assistance; Info = screening information; Ph = connected patient to physician; Ref = referrals; Rm = appointment reminders; Sch= appointment scheduling; Tr = assist with transportation; USPSTF = U.S. Preventive Services Task Force.
[a] Not eligible for meta-analysis

Effects of Patient Navigation on Colorectal Cancer Screening

Results of meta-analyses are summarized in Figures 5 to 10 and Table 21. Twenty-two RCTs[31,53,58,62,76-78,80,82-87,90,94,98,101,102,105-107] (Table 22) and 6 observational studies[113,114,117-120] (Table 23) evaluated the effectiveness of patient navigation compared with usual care or other approaches to increase colorectal cancer screening. Although studies varied, results of all but 5 studies[53,62,87,102,119] indicated higher screening rates with patient navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups.

Combining results of all studies in meta-analysis indicated increased colorectal cancer screening with navigation in both RCTs (RR 1.64; 95% CI 1.42 to 1.92; I^2 = 93.7%; 22 trials) and observational studies (RR 2.63; 95% CI 1.46 to 4.85; I^2 = 90.9%; 6 studies). In RCTs, navigation was associated with increased screening for FOBT/FIT (RR 1.69; 95% CI 1.33 to 2.15; I^2 = 80.5%; 6 trials), colonoscopy/endoscopy (RR 2.08; 95% CI 1.08 to 4.56; I^2 = 94.6%; 6 trials), and trials reporting combined results that included all types of tests (RR 1.72; 95% CI 1.43 to 2.08; I^2 = 93.9%; 14 trials).

Patient navigation was associated with higher colorectal cancer screening for patients not adherent with screening recommendations at baseline (RR 1.74; 95% CI 1.48 to 2.09; I^2 = 87.4%; 17 trials), as well as for mixed populations of adherent and nonadherent patients (RR 1.38; 95% CI 1.01 to 1.89; I^2 = 93.9%; 5 trials). While screening was higher in studies reporting various lengths of followup time (6 months, 1 year, 18 months, 5 years), point estimates were highest in studies with shorter followup times (6 months RR 2.06; 95% CI 1.53 to 2.89; I^2 =82.4%; 8 trials; 1-year RR 1.72; 95% CI 1.41 to 2.15; I^2 = 82.7%; 8 trials). Patient navigation was associated with higher colorectal cancer screening in studies meeting criteria for good (RR 2.26; 95% CI 1.44 to 3.17; I^2 = 0.0%; 2 trials), fair (RR 1.54; 95% CI 1.29 to 1.86); I^2 = 95.4%; 12 trials), or poor (RR 1.74; 95% CI 1.27 to 2.53; I^2 = 75.6; 8 trials) quality ratings. The included studies demonstrated small study effects (asymmetric funnel plot, Appendix I, Egger test, p<0.001), which may be attributed to publication bias where small studies with null or negative results were not published. However, screening rates remained higher with patient navigation for colorectal cancer when only large clinical trials were included in the meta-analysis.

Table 21. Results of meta-analyses of colorectal cancer screening studies

Screening	Subgroup	Number of Studies	Risk Ratio (95% CI)	I^2, p-Value	Annualized Percentage Screened (%) Navigation; Control
Overall	RCTs	22	1.64 (1.42 to 1.92)	93.7%, p<0.0001	37.8; 25.1
	Observational	6	2.63 (1.46 to 4.85)	90.9%, p<0.0001	66.2; 39.4
By screening test	FOBT/FIT RCTs	6	1.69 (1.33 to 2.15)	80.5%, p<0.0001	35.6; 27.7
	FOBT/FIT observational	1	1.60 (1.06 to 2.42)	NA	60.6; 38.5
	Colon/Endo RCTs	6	2.08 (1.08 to 4.56)	94.6%, p<0.0001	42.3; 37.3
	Colon/Endo observational	1	4.44 (2.99 to 6.59)	NA	90.0; 20.3
	Any test RCTs	14	1.72 (1.43 to 2.08)	93.9%, p<0.0001	37.4; 21.3
	Any test observational	4	2.65 (1.20 to 5.85)	91.7%, p<0.0001	61.4; 40.6
By screening adherence at baseline	None	17	1.74 (1.48 to 2.09)	87.4%, p,0.0001	41.8; 26.4
	Some	5	1.38 (1.01 to 1.89)	93.9%, p<0.0001	27.3; 21.3
By followup time	6 months	8	2.06 (1.53 to 2.89)	82.4%, p<0.0001	77.0; 57.9
	1 year	8	1.72 (1.41 to 2.15)	82.7%, p<0.0001	31.4; 20.2

Screening	Subgroup	Number of Studies	Risk Ratio (95% CI)	I^2, p-Value	Annualized Percentage Screened (%) Navigation; Control
	18 months	2	1.28 (1.09 to 1.53)	5.5%, p=0.144	26.6; 20.4
	5 years	4	1.21 (0.96 to 1.58)	82.0%, p<0.0001	12.2; 11.3
By study quality rating	Good	2	2.26 (1.44 to 3.17)	0.0%, p=0.259	57.4; 31.6
	Fair	12	1.54 (1.29 to 1.86)	95.4%, p<0.0001	37.3; 26.8
	Poor	8	1.74 (1.27 to 2.53)	75.6%, p<0.0001	36.1; 15.8

Abbreviations: CI = confidence interval; Colon/Endo = colonoscopy/endoscopy; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; NA = not applicable; RCTs = randomized controlled trials

Table 22. Randomized controlled trials included in meta-analyses of colorectal cancer screening

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Baker et al., 2014[80]	Low-income	Automated call and text message, letter from primary care physician, mailed FIT kit, navigation at 3 months for nonresponders	No navigation (computerized reminders, standing orders for FIT, clinician feedback on rates)	FIT at 6 months: 82.2% vs. 37.3%, p<0.001
Braun et al., 2015[98]	Hawaiian/ Filipino	Patient navigation based on *Kukui Ahi* model involving lay health worker	General health education from another healthcare entity	FOBT at 1 year: 20.7% vs. 12.6%, p=0.02; endoscopy at 5 years: 43.0% vs. 27.2%, p<0.001
Blumenthal et al., 2010[53]	African American	Transportation, scheduling, and payment assistance including out of pocket expenses	1) One on one education 2) Group education 3) Pamphlet and resources	Any screening at 6 months: 16.7% navigation vs. 17.4% one on one education vs. 22.2% group education vs. 12.5% pamphlet
Christie et al., 2008[62]	Hispanic and African American	Navigator to schedule colonoscopy and discuss risks and benefits	Usual care	Colonoscopy at 6 months: 53.8% vs. 13.0%, p=0.058; RR 4.31 (95% CI 0.64 to 28.84)
Cole et al., 2017[31]	African-American men	Telephone navigation including assessment and management of barriers with or without motivational interviewing	Motivational interviewing	Any screening at 6 months: navigation vs. interviewing (17.5% vs. 8.4%); aOR 2.28 (95% CI 1.28 to 4.06); navigation plus interviewing vs. interviewing (17.8% vs. 8.4%); aOR 2.44 (95% CI 1.38 to 4.34)
DeGroff et al., 2017[82]	Low-income	Telephone navigation including management of screening barriers	Computerized reminders, standing orders for FIT, clinician feedback on screening rates	Colonoscopy at 6 months: 61.1% vs. 53.2%, p=0.02: OR 1.51 (95% CI 1.12 to 2.03)
Dietrich et al., 2006[83]	Low-income women	Telephone calls, motivational support, management of barriers, scheduling, reminders, transportation assistance	Telephone recommendation to receive screening	Any screening at 18 months increase by 0.24 (>60%) vs. control, p<0.001
Dietrich et al., 2013[84]	Low-income women	Telephone outreach addressing barriers, letter and overdue card, educational materials, reminders and scheduling	Usual care	Any screening at 18 months: 36.7% vs. 30.6%; aOR 1.32 (95% CI 1.08 to 1.62)
Enard et al., 2015[101]	Low-income Hispanic	Telephone calls addressing barriers, screening guidelines and Medicare	Mailed education materials	Any screening at 5 years: 43.7% vs. 32.1%, p=0.04; aOR 1.82, p=0.02
Fiscella et al., 2011[85]	Low-income	Two letters and a phone call, mailed kits, point-of-care prompts	Usual care	Any screening at 1 year: aOR 3.69 (95% CI 1.93 to 7.08)
Ford et al., 2006[102]	African American	Case management to reduce barriers, referrals to community services and agencies; at least monthly calls	Usual care	Flexible sigmoidoscopy over 3 years: low income (≤1.5x federal poverty level), 68.9% vs. 51.3%, p=0.10; moderate to high income, 53.8% vs. 62.5%, p=0.22
Fortuna et al., 2014[76]	Low-income, racial and ethnic minority	Personal call from outreach worker with motivational interviewing and navigation	Usual care	Screening rates: personal call, 21.5%; aOR 2.0 (95% CI 1.1 to 3.9); physician prompt, 19.6%; aOR 1.9 (95% CI 1.0 to 3.7); automated call, 15.3%; aOR 1.2 (95% CI 0.6 to 2.4)

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Goldman et al., 2015[86]	Low-income	Phone calls and text messages, navigation at 3 months, mailed FIT kits	Usual care	FIT at 6 months: 36.7% vs. 15.2%, p<0.001; at 12 months: 40.0% vs. 23.3%, p<0.001
Guillame et al., 2017b[87] De Mil et al., 2018[124]	Low-income	Introductory letter, telephone calls to address barriers, FOBT kit, home visit as needed	Usual care (FOBT kit)	FOBT at 9 months, overall: 24.3% vs. 21.1%, p=0.003; OR 1.19 (95% CI 1.10 to 1.29); deprived: 22.8% vs. 20.2%, p=0.07; affluent: 26% vs. 21.9%, p=0.001
Horne et al., 2015[90]	African American	Audit charts, manage reminder systems, coordinate screening, provide education, address barriers	Usual care	Any screening at 5 years: 94% vs. 91%, p=0.04; aOR 1.56 (95% CI 1.08 to 2.25); FOBT: aOR 1.09 (95% CI 0.72 to 1.64); colonoscopy/flexible sigmoidoscopy at 5 years: aOR 1.54 (95% CI 1.08 to 2.20)
Jandorf et al., 2005[105]	Low-income	Telephone calls with patient education, assessment of barriers, followup	Usual care	FOBT at 3 months: 42.1% vs. 25%, p>0.05; endoscopy at 6 months: 23.7% vs. 5%, p=0.02
Lasser et al., 2011[58]	Low-income racial/ethnic minority	Schedule colonoscopy and discuss risks and benefits	Usual care	Any screening at 12 months: 33.6% vs. 20.0%; RR 1.68 (95% CI 1.23 to 2.30)
Myers et al., 2019[77]	Hispanic	Telephone calls to identify preferred test, develop plan, schedule prescreen visit for colonoscopy or review kit	Usual care	Screening at 12 months: 77.7% vs. 43.3%; aOR 4.8 (95% CI 3.1 to 7.6); SBT at 12 months: 57.4% vs. 37.4%; aOR 4.2 (95% CI, 2.6 to 6.7); colonoscopy at 12 months: 20.3% vs. 5.9%; aOR 8.79 (95% CI 4.1 to 18.7)
Myers et al., 2014[94]	African American	Personalized message about barriers; mailed materials; colonoscopy contact number or FOBT kit	Similar but mailed	Any screening at 6 months: aOR 2.1 (95% CI 1.5 to 2.9); at 12 months: aOR 1.7 (95% CI 1.2 to 2.3)
Nguyen et al., 2015[106]	Vietnamese	Referrals, scheduling, transportation; lay health worker education session; telephone calls, home visits	Lay health worker education on healthy lifestyle	Any screening at 6 months: 56% vs. 19%, p<0.001; aOR 5.45 (95% CI 3.02 to 9.82)
Percac-Lima et al., 2009[107]	Low-income	Letter, educational materials, addressing barriers, scheduling, bowel prep assistance, transportation	Usual care	Any screening at 9 months: 27.4% vs. 11.9%, p<0.001; colonoscopy at 9 months: 20.8% vs. 9.6%, p<0.001
Reuland et al., 2017[78]	Low-income racial/ethnic minority	Tailored navigation using decision aid videos regarding FOBT/FIT or colonoscopy; FOBT/FIT kits	Food safety videos	Any at 6 months: 68% vs. 27%, p=NR; adjusted difference 40% (95% CI 29% to 51%); FOBT/FIT: 54% vs. 21%, p=NR; colonoscopy: 14% vs. 6%, p=NR

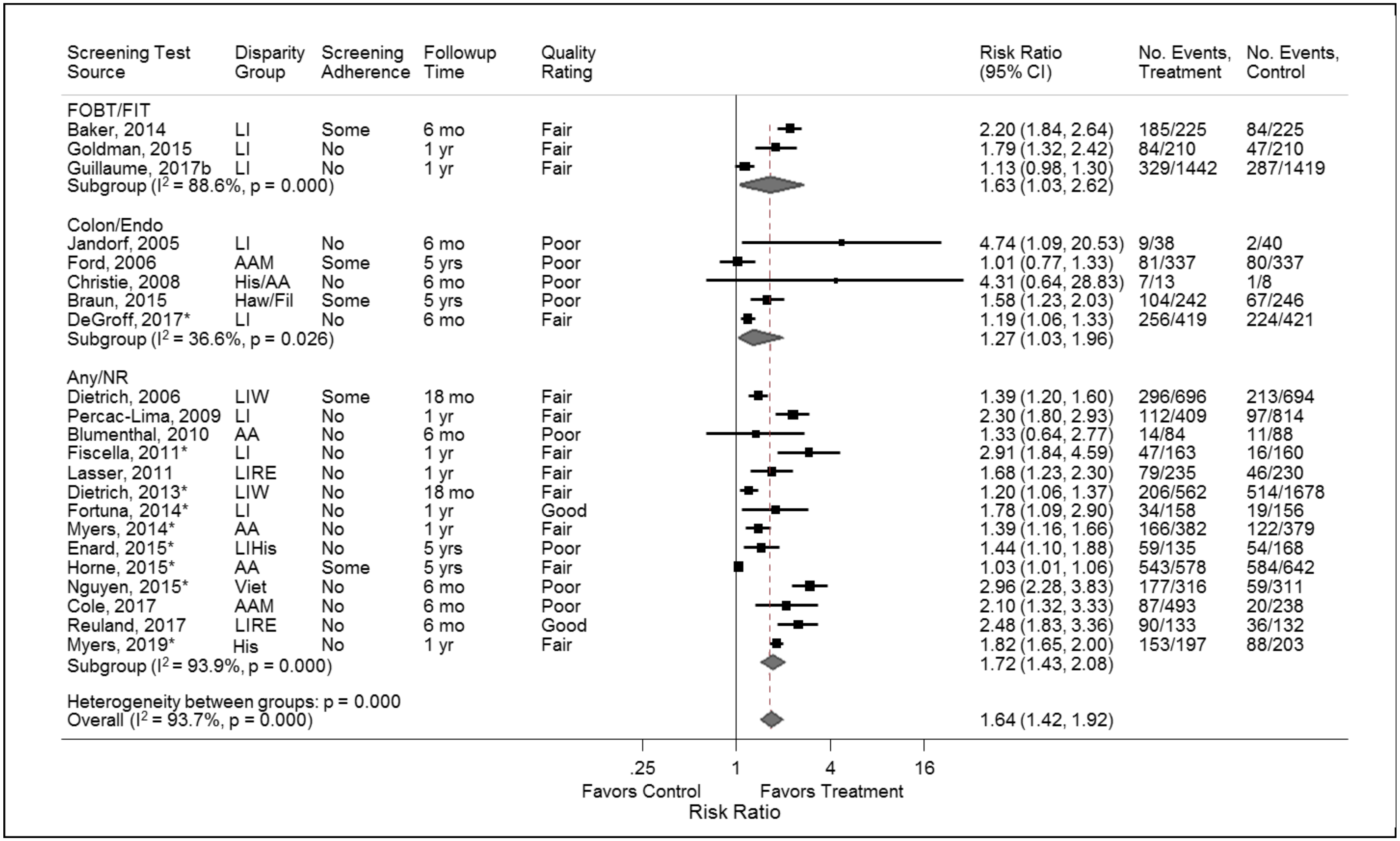
Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; NR = not reported; OR = odds ratio; RR = risk ratio; SBT = stool blood test; vs. = versus

Table 23. Observational studies included in meta-analyses of colorectal cancer screening

Author, Year	Design	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Davis et al., 2013[117]	Prospective cohort	Low-income	Nurse-led patient education, FOBT kit, motivational interview, followup calls	1) Staff-led patient education, video, FOBT kit 2) Usual care (FOBT kit)	FOBT at 12 months: navigation vs. usual care, adjusted screening ratio 1.60 (95% CI 1.06 to 2.42); navigation vs. staff education, 1.18 (95% CI 0.97 to 1.42)
Honeycutt et al., 2013[118]	Prospective cohort	Low-income	Letters, automated telephone calls, point-of-care prompts, and mailed FIT/FOBT kit	Usual care	Any screening (colonoscopy at 10 years, flexible sigmoidoscopy at 5 years, FOBT at 1 year): 42.6% vs. 10.8%, p<0.001
Leone et al., 2013[119]	Cluster nonrandomized trial	Medicaid	Telephone call to address barriers, assist with appointment scheduling	Usual care	Screening (colonoscopy, FOBT, sigmoidoscopy) at 6 months: 9.2% vs. 7.5%, aOR 1.44 (95% CI, 0.68 to 3.06); at 12 months: 16.3% vs. 10.3%, unadjusted OR 1.68 (95% CI, 0.80 to 3.56)
Ma et al., 2009[120]	Nonrandomized trial	Korean	Patient navigation and group education on screening	Group education on general preventive health	Any screening at 12 months: 77.4% vs. 10.8%; RR 7.14 (95% CI 3.81 to 13.37)
Nash et al., 2006[113]	Before-after study	Low-income racial/ethnic minorities	Patient navigation; direct endoscopic referral system, clinic enhancements	Pre/post	Colonoscopy at 6 months: 40% vs. 10%, p<0.001; RR 3.0 (95% CI 1.9 to 4.7)
Percac-Lima et al., 2014[114]	Before-after study	Hispanic	Culturally tailored patient navigation with assessment and management of barriers	Pre/post	Any at one year: Latino 73.5% vs. non-Latino 66%, p<0.001

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; FIT = fecal immunohistochemistry test; FOBT = fecal occult blood test; OR = odds ratio; RR = risk ratio; vs. = versus

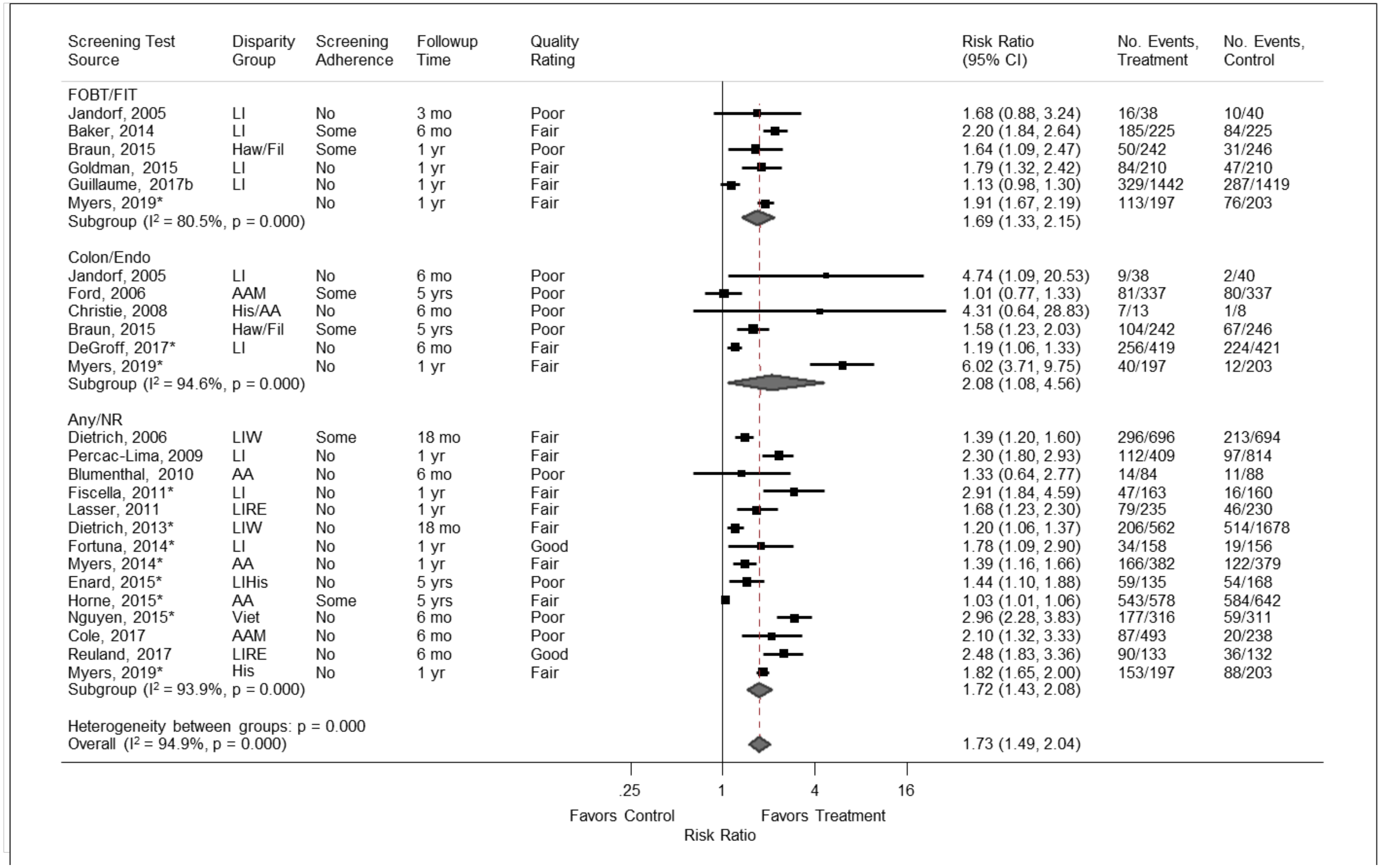
Figure 5. Meta-analysis of randomized controlled trials of the overall effect of patient navigation on colorectal cancer screening rates



Abbreviations: AA = African American; AAM = African-American men; CI = confidence interval; Colon/Endo = colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunochemistry test; Haw/Fil = Native Hawaiian/Filipino; His/AA = Hispanic/African American; His = Hispanic; LI = low-income; LIHis = low-income Hispanic/Latino; LIRE = low-income racial/ethnic minority; LIW = low-income women; mo = month; No. = number; Viet = Vietnamese American; yr = year

* Adjusted estimates used when reported in publications.

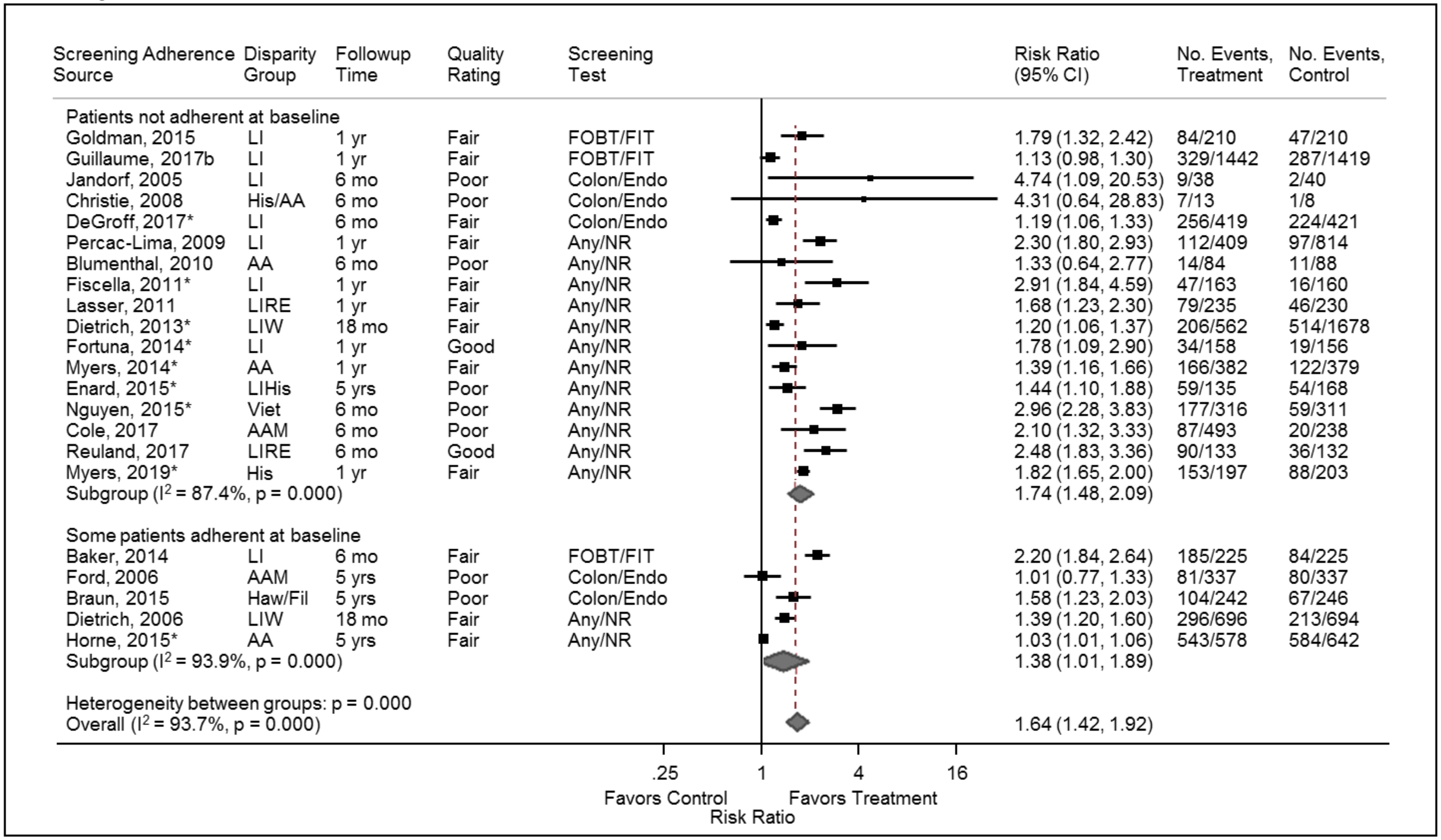
Figure 6. Meta-analysis of randomized controlled trials of the effect of patient navigation on colorectal cancer screening rates by screening test, where subgroup results include all relevant studies



Abbreviations: AA = African American; AAM = African-American men; CI = confidence interval; Colon/Endo = colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunochemistry test; Haw/Fil = Native Hawaiian/Filipino; His = Hispanic/Latino; His/AA = Hispanic/African American; LI = low-income; LIHis = low-income Hispanic/Latino; LIRE = low-income racial/ethnic minority; LIW = low-income women; mo = month; No. = number; NR = not reported; Viet = Vietnamese American; yr = year

* Adjusted estimates used when reported in publications.

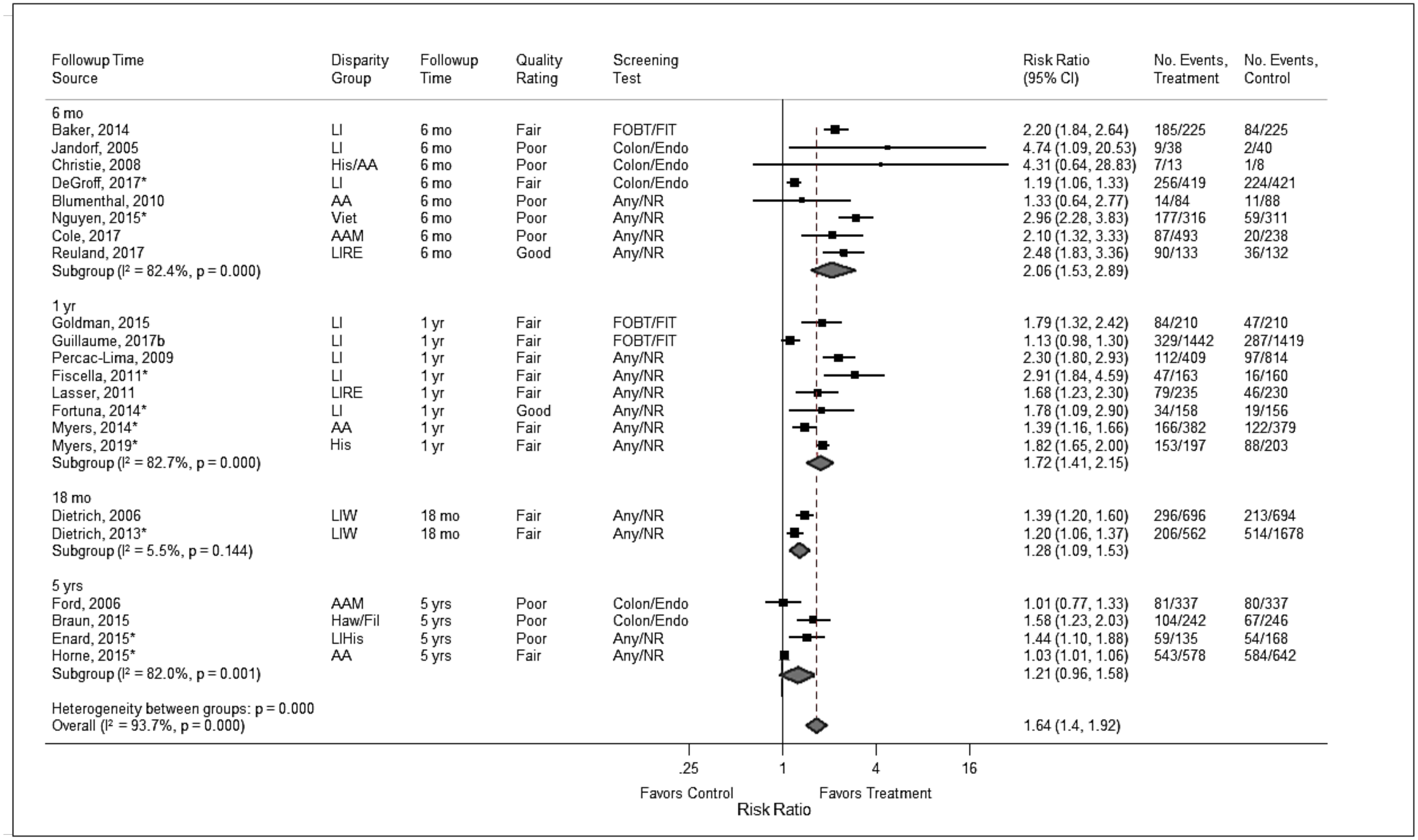
Figure 7. Meta-analysis of randomized controlled trials of the effect of patient navigation on colorectal cancer screening rates by screening adherence at baseline



Abbreviations: AA = African American; AAM = African American men; CI = confidence interval; Colon/Endo = colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunohistochemistry test; Haw/Fil = Native Hawaiian/Filipino; His = Hispanic; His/AA = Hispanic/African American; LI = low-income; LIHis = low-income Hispanic/Latino; LIRE = low-income racial/ethnic minority; LIW = low-income women; mo = month; No. = number; NR = not reported; Viet = Vietnamese American; yr = year

* Adjusted estimates used when reported in publications.

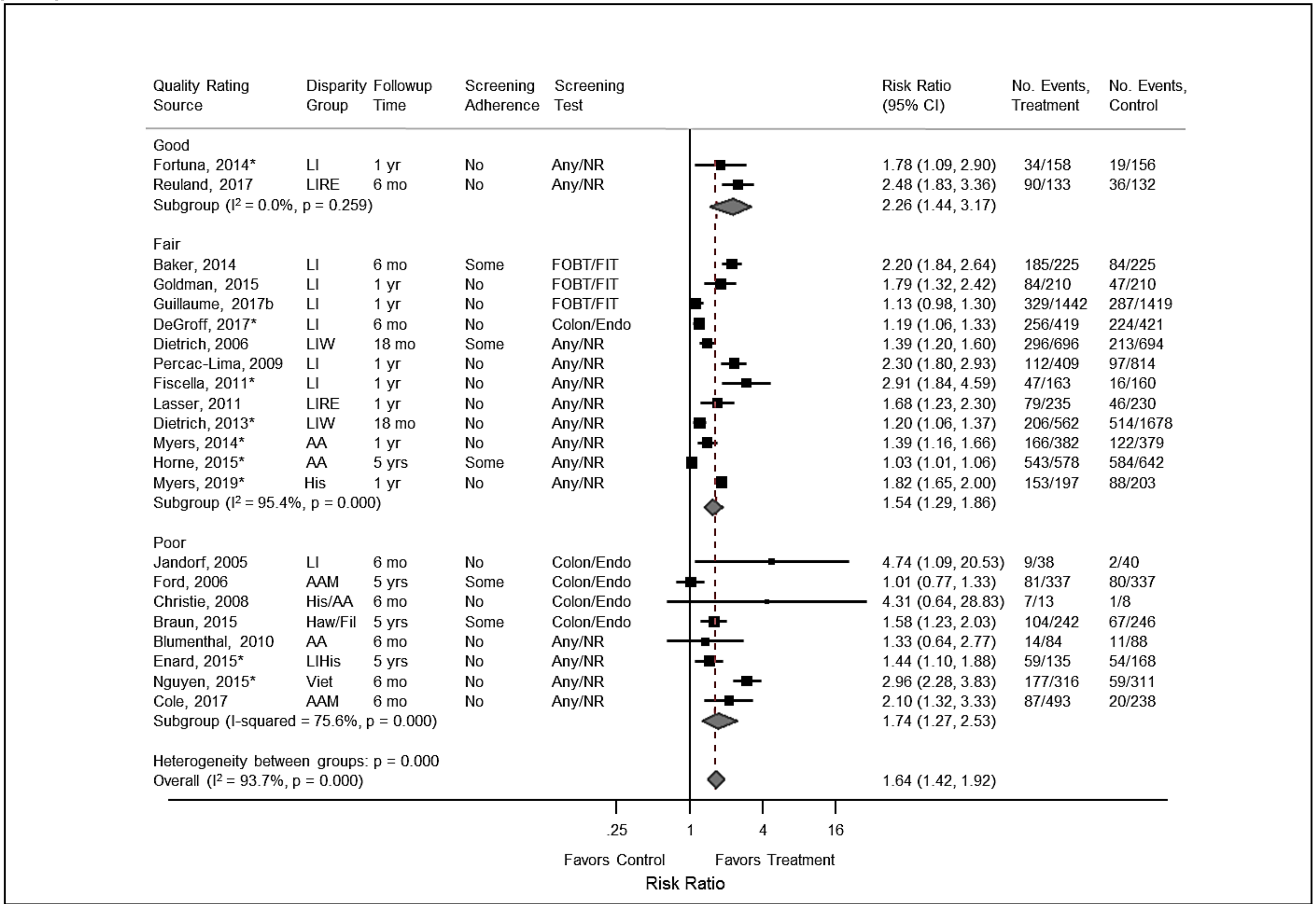
Figure 8. Meta-analysis of randomized controlled trials of the effect of patient navigation on colorectal cancer screening rates by followup time



Abbreviations: AA = African American; AAM = African-American men; CI = confidence interval; Colon/Endo = colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunohistochemistry test; Haw/Fil = Native Hawaiian/Filipino; His = Hispanic; His/AA = Hispanic/African American; LI = low-income; LIHis = low-income Hispanic/Latino; LIRE = low-income racial/ethnic minority; LIW = low-income women; mo = month; No. = number; NR = not reported; Viet = Vietnamese American; yr = year

* Adjusted estimates used when reported in publications.

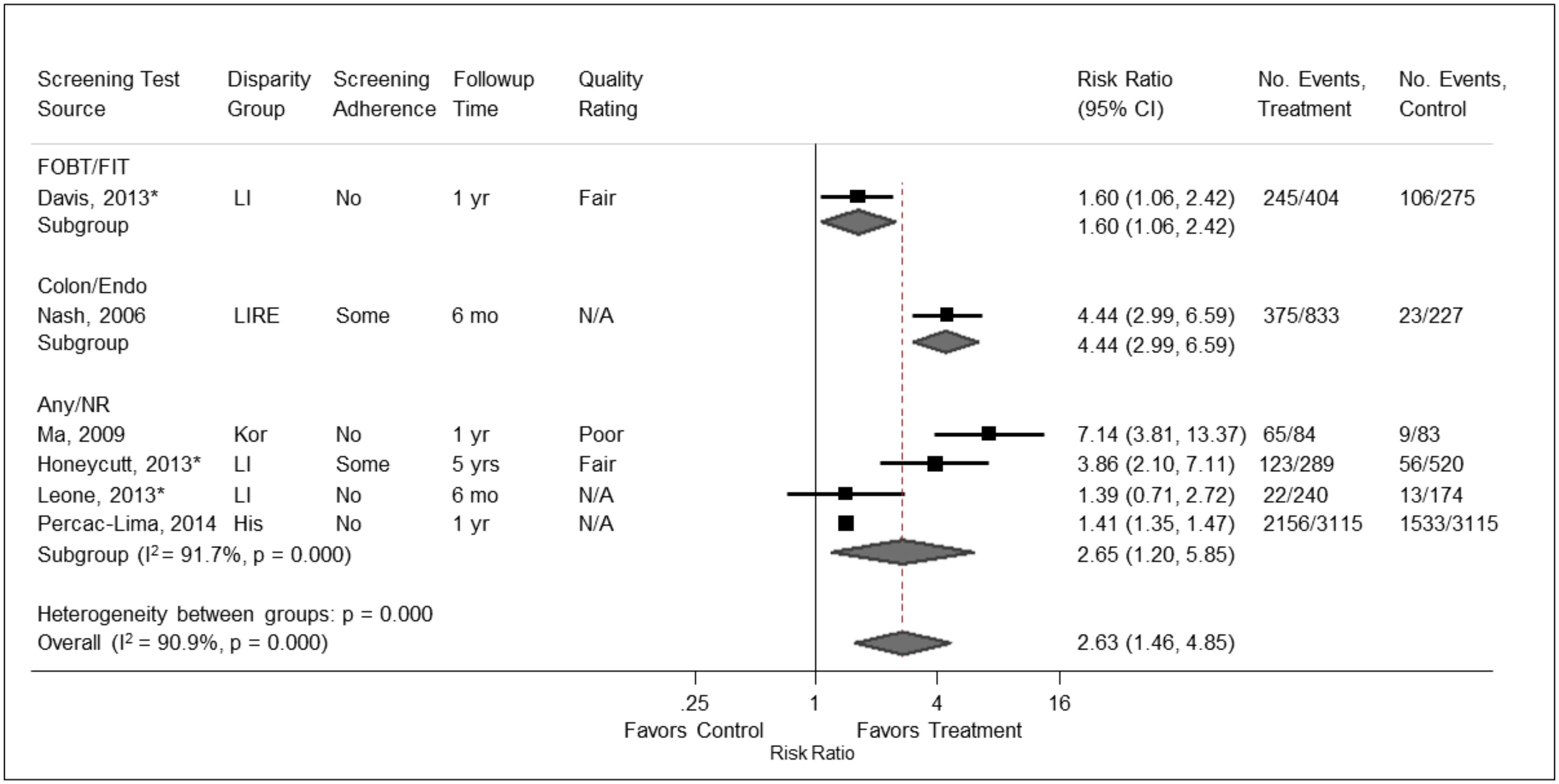
Figure 9. Meta-analysis of randomized controlled trials of the effect of patient navigation on colorectal cancer screening rates by study quality



Abbreviations: AA = African American; AAM = African-American men; CI = confidence interval; Colon/Endo= colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunohistochemistry test; Haw/Fil = Native Hawaiian/Filipino; His = Hispanic; His/AA = Hispanic/African American; LI = low-income; LIHis = low-income Hispanic/Latino; LIW = low-income women; LIRE = low-income racial/ethnic minority; No. = number; NR = not reported; mo = month; Viet = Vietnamese American; yr = year

* Adjusted estimates used when reported in publications.

Figure 10. Meta-analysis of observational studies of the effect of patient navigation on colorectal cancer screening rates by screening test



Abbreviations: CI = confidence interval; Colon/Endo = colonoscopy/endoscopy (colonoscopy and flexible sigmoidoscopy); FOBT/FIT = fecal occult blood test/fecal immunohistochemistry test; His = Hispanic; Kor = Korean American; LI = low-income; LIRE = low-income racial/ethnic minority; mo = month; N/A = not applicable; No. = number; NR = not reported; yr = year

* Adjusted estimates used when reported in publications.

Effects of Patient Navigation on Breast Cancer Screening

Results of meta-analyses are summarized in Figures 11, 12, 13 and Table 24. Ten RCTs[51,68,76,83,85,98,132,134,135,137] (Table 25) and one before-after observational study[133] (Table 26) evaluated the effectiveness of patient navigation compared with usual care or other approaches to increase breast cancer screening. All but one study[135] indicated higher screening rates with patient navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups.

Combining results of all RCTs in meta-analysis indicated increased breast cancer screening with navigation (RR 1.50; 95% CI 1.22 to 1.91; I^2 = 98.6%; 10 trials). The single observational study showed similar results (RR 1.52; 95% CI 1.16 to 2.00).

Patient navigation was associated with increased breast cancer screening for patients not adherent with screening recommendations at baseline (RR 2.30; 95% CI 1.87 to 2.81; I^2 = 0%; 4 trials), as well as for mixed populations of adherent and nonadherent patients (RR 1.20; 95% CI 1.07 to 1.38; I^2 = 93.3%; 6 trials). Screening was increased in studies reporting various lengths of followup time (1 year, 18 months, 2 years, 5 years), with followup at 1 year RR 1.56 (95% CI 1.16 to 2.13; I^2 = 73.2%; 5 trials).

Patient navigation was associated with point estimates indicating increased breast cancer screening in studies meeting criteria for fair (RR 1.51; 95% CI 1.08 to 2.16; I^2 = 96.9%; 6 trials) or poor (RR 1.43; 95% CI 0.94 to 2.37; I^2 = 89.1%; 3 trials) quality ratings, although CIs crossed 1.0 in the latter set of studies.

Table 24. Results of meta-analyses of breast cancer screening studies

Screening	Subgroup	Number of Studies	Risk Ratio (95% CI)	I^2, p-Value	Annualized Percentage Screened (%) Navigation; Control
Overall	RCTs	10	1.50 (1.22 to 1.91)	98.6%, p<0.0001	33.8; 25.8
	Observational	1	1.52 (1.16 to 2.00)	NA	67.0; 44.0
By screening adherence at baseline	No	4	2.30 (1.87 to 2.81)	0%, p=0.531	42.1; 17.9
	Some	6	1.20 (1.07 to 1.38)	93.3%, p<0.0001	32.7; 26.9
By followup time	6 months	1	2.71 (1.86 to 3.94)	NA	100.0; 35.6
	1 year	5	1.56 (1.16 to 2.13)	73.2%, p=0.003	44.0; 27.9
	18 months	1	1.17 (1.08 to 1.27)	NA	45.3; 38.7
	2 years	1	1.07 (1.05 to 1.10)	NA	46.6; 43.8
	5 years	1	1.16 (1.13 to 1.20)	NA	17.3; 15.3
	Other	1	2.23 (1.48 to 3.34)	NA	25.2; 9.8
By study quality rating	Good	1	1.81 (1.21 to 2.72)	NA	27.5; 17.8
	Fair	6	1.51 (1.08 to 2.16)	96.9%, p<0.0001	31.0; 22.6
	Poor	3	1.43 (0.94 to 2.37)	89.1%, p<0.0001	44.9; 37.8

Abbreviations: CI = confidence interval; NA = not applicable; RCTs = randomized controlled trials

Table 25. Randomized controlled trials included in meta-analyses of breast cancer screening

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Braun et al., 2015[98]	Hawaiian/ Filipino	Based on *Kukui Ahi* model with lay health worker	General health education from another healthcare entity	At 1 year: 61.7% vs. 42.4%, p=0.003
Dietrich et al., 2006[83]	Low-income	Telephone calls, support, management of barriers, scheduling, reminders, transportation assistance	Telephone recommendation to receive screening	At 18 months: increase by 0.1 (17%) vs. control, p<0.001
Fiscella et al., 2011[85]	Low-income	Two letters and a phone call, point-of-care prompt sheets for patients and clinicians	Usual care	At 1 year: aOR 3.44 (95% CI 1.91 to 6.19)
Fortuna et al., 2014[76]	Low-income, racial and ethnic minority	1) Personal call from outreach worker with interviewing and navigation; 2) automated message to call outreach worker, paper prompts for physician during patient's point of care; or 3) automated message to call outreach worker	Usual care (bilingual letter with scheduling information, contact for outreach worker, and information on free screening)	Screening rates: personal call, 27.5%; aOR 2.2 (95% CI 1.2 to 4.0); physician prompt, 28.2%; aOR 2.1 (95% CI 1.1 to 3.7); automated call, 22.8%; aOR 1.3 (95% CI 0.7 to 2.4)
Marshall et al., 2016[132]	African American	Appointment assistance, communication coaching, education materials	Patient education materials	At 2 years: 93.3% vs. 87.5%; aOR 2.26 (95% CI 1.59 to 3.42)
Paskett et al., 2006[51]	Rural	3 in-person visits, two phone calls, two postcard mailings to educate, manage barriers, schedule	Physician letter and brochure about Pap test	At 1 year: RR 1.56, 95% CI, 1.29 to 1.87, p<0.001
Phillips et al., 2011[134]	Low-income racial/ethnic minorities	Part of the primary care team with management of barriers	Usual care	At 9 months: 87% vs. 76%, p<0.001; aOR 2.5 (95% CI 1.9 to 3.2)
Powell et al., 2005[135]	Rural African American	Educational session with visit by home health educator with materials, needs and barriers assessment, basic navigation services	1) Educational sessions 2) Usual care	At 3 months: 63% navigation vs. 70% education vs. 61% usual care
Russell et al., 2010[68]	Low-income, African American	Interactive computer program providing tailored messages to assess health beliefs, self-efficacy, barriers, stage of readiness for screening; and a lay patient navigator	Pamphlet about screening, lay health advisor recommendation, and mailed postcards about nutrition	At 6 months: 50.6% vs. 17.8%; aOR 4.3 (95% CI 2.1 to 9.0); aRR 2.7 (95% CI 1.8 to 3.7)
Weber and Reilly, 1997[137]	Low-income	Personalized letter from primary care physician and community health worker, help with transportation, appointments, finances, and dependent care	Mailed letter and usual care	At 16 weeks: 25% vs. 9.8%; RR 2.57 (95% CI 1.53 to 4.35)

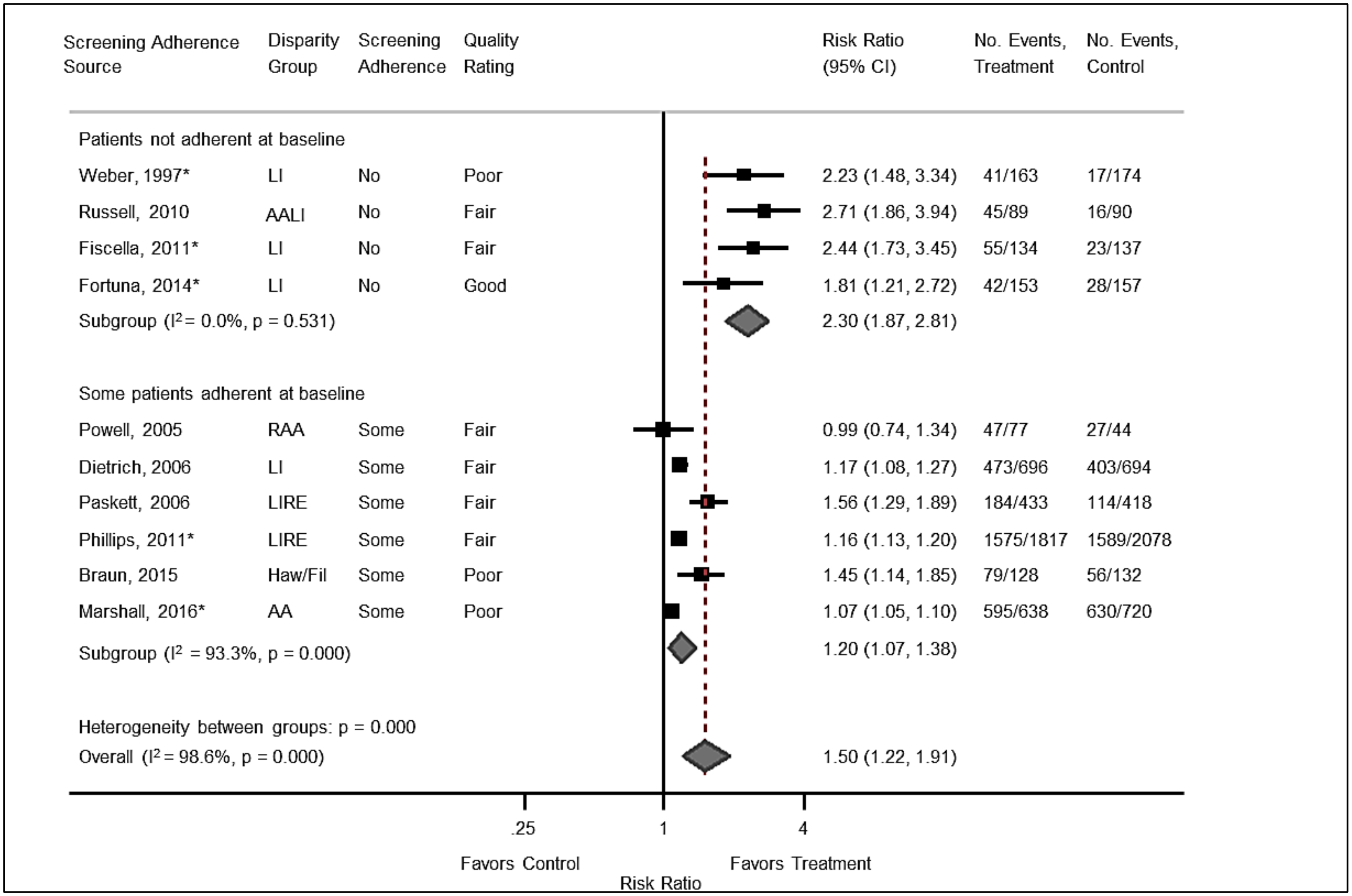
Abbreviations: aOR = adjusted odds ratio; aRR = adjusted risk ratio; CI = confidence interval; Pap = Papanicolaou; RR = risk ratio; vs. = versus

Table 26. Before-after study of breast cancer screening

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Percac-Lima et al., 2012[133]	Low-income racial/ethnic minorities	Education, assistance with transportation, insurance, appointment scheduling	Pre-intervention vs. post-intervention	At 1 year: 67% vs. 44%, p=0.001

Abbreviations: vs. = versus

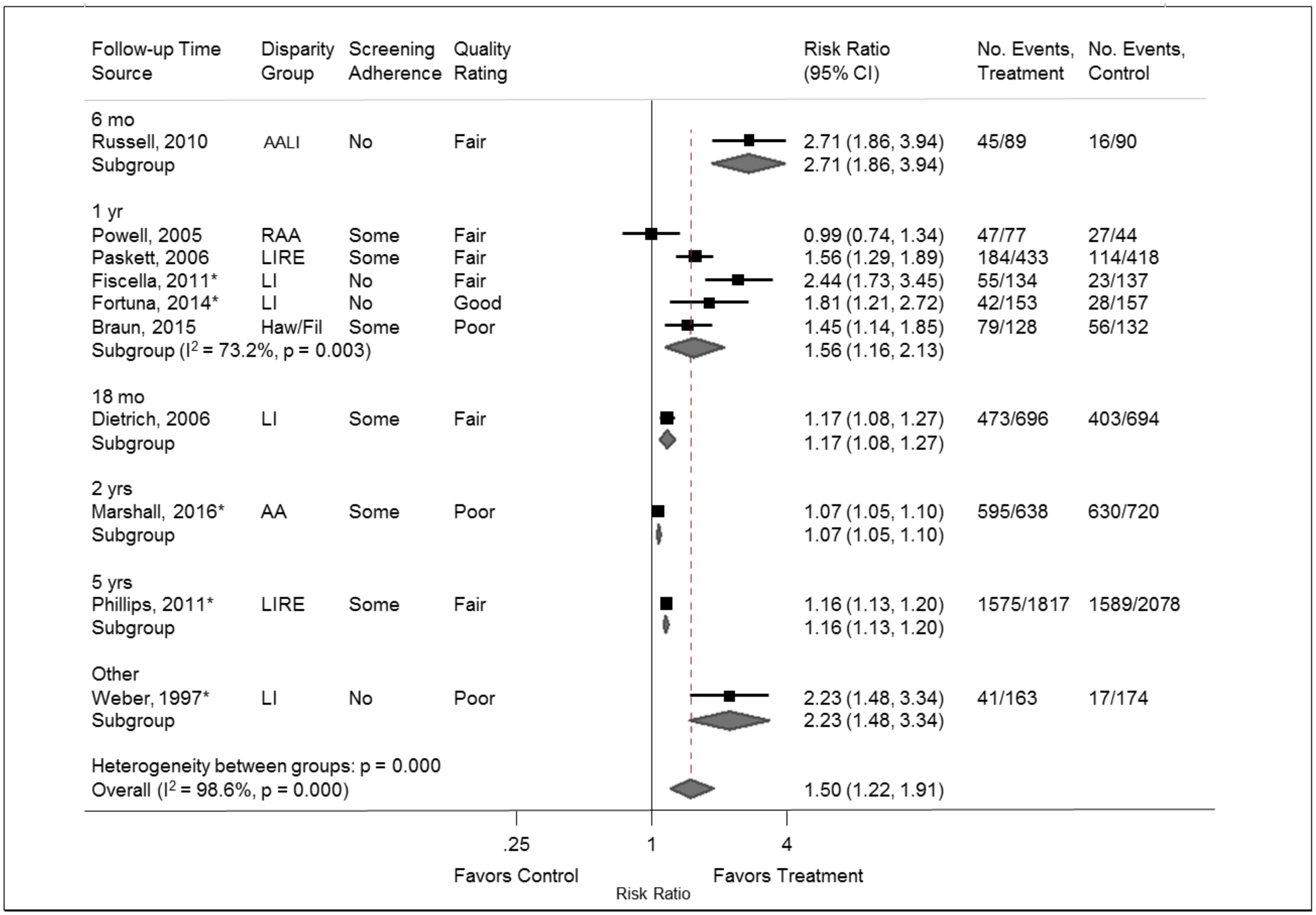
Figure 11. Meta-analysis of randomized controlled trials of the effect of patient navigation on breast cancer screening rates by adherence at baseline



Abbreviations: AA = African American; AALI = African-American low-income; CI = confidence interval; Haw/Fil = Native Hawaiian/Filipino; LI = low-income; LIRE = low-income racial/ethnic minority; No. = number; RAA = rural African American

* Adjusted estimates used when reported in publications.

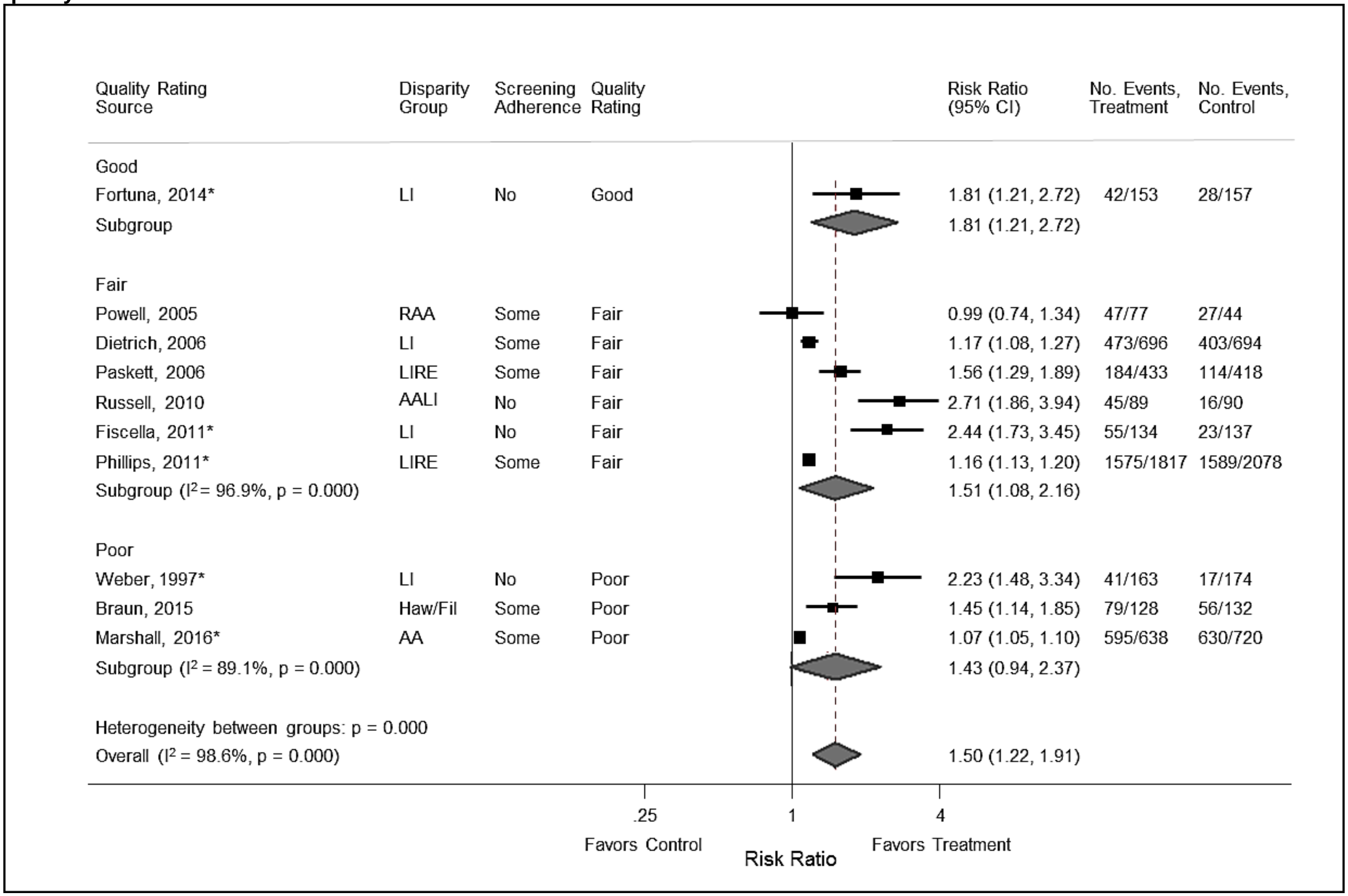
Figure 12. Meta-analysis of randomized controlled trials of the effect of patient navigation on breast cancer screening rates by followup time



Abbreviations: AA = African American; AALI = African-American low-income; CI = confidence interval; Haw/Fil = Native Hawaiian/Filipino; LI = low-income; LIRE = low-income racial/ethnic minority; mo = month; No. = number; RAA = rural African American; yr = year

* Adjusted estimates used when reported in publications.

Figure 13. Meta-analysis of randomized controlled trials of the effect of patient navigation on breast cancer screening rates by study quality



AA = African American; AALI = African-American low-income; CI = confidence interval; Haw/Fil = Native Hawaiian/Filipino; LI = low-income; LIRE = low-income racial/ethnic minority; No. = number; RAA = rural African American

* Adjusted estimates used when reported in publications.

Effects of Patient Navigation on Cervical Cancer Screening

Three RCTs[38,83,98] (Tables 27, 28) and one observational study[66] (Table 29) evaluated the effectiveness of patient navigation compared with usual care or other approaches to increase cervical cancer screening. All studies indicated statistically significantly higher screening rates with patient navigation regardless of the type of navigation, patient population, study design and quality, and comparison groups. However, these studies demonstrated high statistical heterogeneity, results of included studies varied widely, and the combined estimate did not reflect the results of included studies**.**

Table 27. Results of cervical cancer screening trials

Author, Year	Screening Adherence	Followup	Quality Rating	Risk Ratio (95% CI)	No. Events, Treatment	No. Events, Control
Braun et al., 2015[98]	Some	5 years	Poor	1.57 (1.20 to 2.06)	73/128	48/132
Dietrich et al., 2006[83]	Some	18 months	Fair	1.11 (1.05 to 1.19)	543/696	486/694
Fang et al., 2017[38]	No	1 year	Fair	9.14 (6.79 to 12.30)	209/347	30/358
Wang et al., 2010[66]	No	1 year	Poor	6.30 (2.92 to 13.58)	56/80	6/54

Abbreviations: CI = confidence interval; No. = number

Table 28. Randomized controlled trials of cervical cancer screening

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Braun et al., 2015[98]	Hawaiian/ Filipino	Based on *Kukui Ahi* model involving lay health worker	General health education from another healthcare entity	At 2 years: 57.0% vs. 36.4%, p=0.001
Dietrich et al., 2006[83]	Low-income	Telephone calls, support, management of barriers, appointment scheduling, reminders, and transportation assistance	Telephone recommendation to receive screening	Increase by 0.07 (10%) vs. control, p<0.001
Fang et al., 2017[38]	Korean	Navigation services and bilingual community health educators addressing cervical cancer screening perceptions, beliefs, and expectations	Bilingual community health educators delivering general health and cancer screening information	At 12 months: 72.1% vs. 10.1%; aOR 35.8 (95% CI 11.13 to 114.90)

Abbreviations: aOR = adjusted odds ratio; CI = confidence interval; vs. = versus

Table 29. Prospective cohort study of cervical cancer screening

Author, Year	Disparity Group	Navigation Description	Comparison Groups	Screening Rates Intervention vs. Comparison
Wang et al., 2010[66]	Chinese low-income	Cervical cancer education combined with patient navigation	General health and cancer education	At 12 months: 70% (56/80) vs. 11.1% (6/54), p<0.001

Abbreviations: vs. = versus

Discussion

Summary of Findings

Full summary of evidence tables for all Key Questions (KQs) are provided in Appendix J.

No eligible studies evaluated the effect of impediments and barriers on the part of providers to the adoption, promotion, and implementation of preventive services that contribute to disparities (KQ1). Although many studies describing impediments and barriers have been published, they generally do not focus on factors related to providers and frequently report cross-sectional associations between disadvantaged groups and hypothesized barriers without examining the effects of those barriers on preventive service use.

Eighteen studies evaluated the effect of impediments and barriers on the part of populations (KQ2). Studies included racial and ethnic minorities, including African Americans, Hispanics, Korean Americans, and Chinese Americans; and rural and low-income patients. Studies involved screening for colorectal, breast, or cervical cancer, including six studies of screening for multiple types of cancer (e.g., breast and cervical cancer screening), and smoking cessation.

Table 30 provides a summary of evidence for KQ2. The most commonly examined barrier was type of insurance coverage, however, results of studies were mixed, as were results for lack of a regular healthcare provider. Impediments and barriers with effects on the use of preventive services included older age, rural or economically deprived location, and issues related to access. Low income, Spanish or limited-English language, and low health literacy were not barriers.

Table 30. Summary of evidence for Key Question 2: effect of impediments and barriers of populations

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Low income	1 RCT (240)	No effect among safety net clinics	Low; low
	Insurance status and type	2 RCTs (1,436)	Less screening with Medicare compared with county health plans in 1 RCT; no effect in another RCT	Low; low
	Screening attitudes	1 RCT[a] (257)	Higher scores on attitudes scale associated with higher screening rates among African Americans	Insufficient; insufficient
	Language	1 RCT[b] (1,070)	No effect on screening with Spanish compared with English speakers	Low; low
	Health literacy	1 RCT (264)	No effect on screening among disadvantaged	Low; low
Breast cancer screening	Country of origin	1 RCT (1,333); 1 before-after study (437)	More screening among Puerto Rican vs. other non-U.S. born Latinas in 1 RCT, and African-American women born outside the U.S. in a before-after study	Insufficient; insufficient
	Older age at migration	1 RCT (300)	Less screening for older low-income Chinese immigrants	Low; low
	Low income	2 RCTs (491)	No effect in 2 RCTs	Low; low

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Insurance status and type	2 before-after studies (666); 5 RCTs (3,871); 1 retrospective chart review (8,347)	More screening with Medicare compared with no coverage in 1 RCT and with insurance in 2 studies; less with insurance in 1 before-after study; no effect in 3 studies; mixed results in chart review study (lower screening rates for Black, not Hispanic)	Low; low
	Rural access	1 cohort study (166)	Less screening with increasing distance from radiologist office and with living in economically-deprived areas	Low; low
	No provider	1 before-after study (437); 1 RCT (300)	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
	Language	2 RCTs (1,617); 1 before-after study (229)	No effect among low-income Chinese-American immigrants, Spanish speaking or limited-English speaking Hispanic women	Low; low
	Individual access-related barriers	1 RCT (851)	Some barriers decrease screening among rural, low-income women (not knowing where to get a mammogram, cost), while others had no effect (time, insurance status, difficulty getting to the facility)	Low; low
Cervical cancer screening	Country of origin	2 RCTs (1,678)	More screening among Puerto Rican vs. other non U.S.-born Latinas in 1 RCT; no effect in RCT of low-income rural women	Insufficient; insufficient
	Older age	1 RCT (345)	Less screening for older low-income rural women	Low; low
	Low income	1 RCT (345)	No effect among low-income rural women	Low; low
	Insurance status and type	3 RCTs (2,246); 1 before-after study (782)	Less screening with Medicare compared with county health plans in 1 RCT and with any insurance in 2 studies; no effect in 1 RCT	Low; low
	Language	1 RCT[b] (967)	No effect on screening among Spanish speaking women	Low; low
	No provider	1 RCT (705); 1 before-after study (732)	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
Smoking cessation	Attitudes	1 RCT[c] (314)	Motivations for smoking differed between African-American and White smokers, but did not explain lower quit rates for African Americans	Insufficient; insufficient

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	No provider	1 before-after study (879)	A regular source of healthcare was associated with planning to quit, ever receiving physician advice to quit, and smoking ≤10 cigarettes/day	Low; low
	Language	1 before-after moderation analysis (615)	Latinos preferring Spanish are more likely to quit vs. those preferring English	Insufficient; insufficient

Abbreviations: RCT = randomized controlled trial.
[a] Secondary data analysis of participants who did not undergo screening.
[b] Secondary analysis of RCT data.
[c] Mediation analysis of baseline data.

Twelve studies (in 13 publications) evaluated the effectiveness of approaches and strategies between patients and clinician providers that connect and integrate practices for reducing disparities in preventive services (KQ3). Studies evaluated colorectal, breast, and cervical cancer screening, tobacco smoking cessation, and obesity management and enrolled African-American, Hispanic, Asian, rural, and low-income patients.

Table 31 provides a summary of evidence for KQ3. Two studies of interventions with patient navigators showed improvement in colorectal cancer screening rates, while tailored and personalized risk assessment using printed materials and telephone counseling improved screening for first-degree relatives of patients with colorectal cancer. Educational videos with physician reminders and a screening decision aid also improved colorectal cancer screening rates in specific populations. Mailed or in-person reminders for mammography screening involving lay health workers increased rates in two studies. Cervical cancer screening rates increased for low-income Latina farm workers with outreach and health education, and for low-income Chinese-American women with education and navigation. A tobacco smoking cessation intervention for women smokers attending their child's pediatric visit improved smoking abstinence rates. A weight loss intervention provided by primary care physicians for low-income, overweight and obese African-American women was effective for initial weight loss, but not for sustained weight loss.

Table 31. Summary of evidence for Key Question 3: effectiveness of patient-provider approaches

Preventive service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	2 RCTs (486)	Increased screening rates in 2 RCTs of Hispanic, African-American, and low-income patients	Low; low
	Printed materials and telephone counseling	1 RCT (1,280)	Increased screening rates among first-degree relatives of colorectal cancer cases for Latinos, Asians, and Whites, but not African Americans	Low; low
	Mailed materials	1 RCT (1,430)	Higher screening rates in Whites than African Americans	Insufficient; insufficient
	Educational video and physician reminder	1 RCT (65)	Higher screening rates among Latinos	Insufficient; insufficient

Preventive service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Decision aid with or without personalized risk assessment	1 RCT (825)	Increased screening completion rates with decision aid among low-income patients	Insufficient; insufficient
Breast cancer screening	Reminders with lay health workers	1 RCT[a] (2,357); 1 nonrandomized trial (1,693)	Increased screening rates among low-income women in 2 trials	Moderate; moderate
Cervical cancer screening	Reminders with lay health workers	1 nonrandomized trial (1,693)	Increased screening rates among low-income women	Low; low
	Education video and *promotora*	1 RCT (443)	Increased screening rates among rural Latinas	Low; low
	Education with navigation	1 cohort (134)	Increased screening rates among low-income Chinese-American women	Insufficient; insufficient
Tobacco smoking cessation	Message from child's clinician, interview, telephone counseling	1 RCT (303)	Higher quit rates at 3 and 12 months among low-income women	Low; low
Obesity management	Tailored weight loss intervention from primary care physicians	1 RCT (137)	Improved weight loss in low-income African-American women at 9 months, but not at 12 or 18 months	Insufficient; insufficient

Abbreviations: RCT = randomized controlled trial
[a] Includes reminder letters followed by lay health worker counseling.

Eleven studies evaluated the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation and dissemination of preventive services in settings that serve populations adversely affected by disparities (Table 32). Interventions included methods to increase screening for colorectal, breast, or cervical cancer, smoking cessation, and obesity management. Studies used different technology-based approaches including automated reminders delivered via text message or telephone, web-based self-monitoring, interactive kiosks, telemedicine-based video counseling, and electronic decision aids. Studies enrolled low-income, Alaska Native and American Indian, and Latina patients.

Table 32 provides a summary of evidence for KQ4. Most technology interventions did not increase screening rates or smoking quit rates compared with alternative approaches. Screening rates were higher in a study using an electronic health record (EHR) to identify patients eligible for colorectal cancer screening for mailings and phone calls, and in a randomized controlled trial (RCT) using an electronic decision aid with patient-ordered screening tests. A trial of smoking cessation counseling using telemedicine compared with telephone calls showed an increase in pharmacotherapy use, but no improvement in quit rates. Rates were higher with an intervention combining technological approaches to identifying and recruiting eligible patients for smoking cessation counseling and pharmacotherapy. An intervention for obesity management using a web- or telephone-based self-monitoring component resulted in lower body mass index (BMI).

Table 32. Summary of evidence for Key Question 4: effectiveness of health information technologies

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Electronic decision aid with patient-ordered tests and followup messages	1 RCT (450)	Increased screening rates in low-income patients	Low; low
	Web-based electronic decision aid before healthcare visit	1 RCT (264)	No effect on screening rates in socioeconomically disadvantaged patients; increased patient readiness for screening	Insufficient; insufficient
	EHR-identified mailings and telephone calls	1 RCT (240)	Increased screening rates in low-income patients	Insufficient; insufficient
	Text messages added to usual telephone calls and mailings	1 RCT (808)	No differences among Alaska Native and American Indian patients	Low; low
Breast cancer screening	EHR-identified mailings and telephone calls	1 RCT (191)	No effect among low-income patients	Insufficient; insufficient
	EHR-triggered reminder letters	1 RCT (1,717)	No effect among low-income patients	Insufficient; insufficient
	Interactive computer program and patient navigation	1 RCT (179)	Increased mammography adherence and readiness among low-income African-American women	Insufficient; insufficient
Cervical cancer screening	Electronic education modules	1 RCT (943)	No effect among low-income Latinas	Low; low
Smoking cessation	Counseling by telemedicine	1 RCT (566)	No difference in quit rates among low-income rural patients	Low; low
	EHR-identified smokers followed by counseling and NRT	1 RCT (707)	Increased quit rates among low socioeconomic status patients	Low; low
Obesity Management	Behavioral change counseling with web- or telephone-based patient self-monitoring	1 RCT (365)	Decreased BMI among patients of ethnic and racial minorities	Low; low

Abbreviations**:** BMI = body mass index; EHR = electronic health record; NRT = nicotine replacement therapy; RCT = randomized controlled trial.

Eighty-eight studies (in 92 publications) evaluated the effectiveness of interventions implemented by healthcare organizations and systems to reduce disparities in use of preventive services (KQ5). These include 50 studies of colorectal cancer screening, 26 of breast cancer screening, 13 of cervical cancer screening, six of smoking cessation, seven of obesity screening and management, and single studies of screening for lung cancer and high blood pressure.

Studies generally compared enhanced interventions with usual care or alternative methods, and measured effectiveness with improved screening rates, smoking quit rates, or changes in BMI or blood pressure. Interventions included those provided within health system settings, such as patient navigators, telephone and mail contacts, checklists, and provider training; and those using community resources through partnerships or outreach, such as patient navigators in the community, lay health workers, telephone or mail contacts, patient education, and engagement with community resources. Study populations included racial and ethnic minority groups including Hispanic, African-American, and Asian; and rural and low-income patients.

Table 33 provides a summary of evidence for KQ5. Most studies demonstrated improved outcomes with health system interventions, although some reported mixed results. Studies were highly heterogeneous and many interventions included multiple components.

Fifty studies (in 53 publications) evaluated the effectiveness of interventions to improve colorectal cancer screening compared with standard screening procedures, general health education, or usual care. Of 25 studies evaluating patient navigation, screening rates were higher in all but four. Additional studies evaluating the effectiveness of telephone calls, prompts, and other outreach methods; educational videos; screening checklists; provider training; and practice changes involving community engagement also reported higher screening rates. However, results occasionally varied by subgroup and some interventions were evaluated in few studies.

Twenty-six studies (in 27 publications) evaluated the effectiveness of health system interventions for breast cancer screening. Seven studies of patient navigation showed higher breast cancer screening rates compared with standard screening procedures, general health education, or usual care, while one trial indicated no increase. Screening was not higher with telephone calls, prompts, and other outreach methods. Small numbers of additional studies of lay health workers, patient education, screening checklists, and practice changes involving community engagement reported higher breast cancer screening rates with interventions.

Thirteen studies (in 14 publications) evaluated the effectiveness of health system interventions for cervical cancer screening. Four studies of patient navigation showed increased screening and diagnostic resolution compared with general health education or usual care. Screening and colposcopy followup rates also increased with specific types of telephone calls and prompts. Interventions with lay health workers increased screening rates among Hispanic women in one trial, but were not effective in others. While a study of practice changes involving community engagement improved screening rates, a screening checklist that increased screening rates for breast cancer was not effective in increasing rates for cervical cancer.

Lung cancer screening rates were higher with patient navigation in a trial involving five community health centers. Interventions for tobacco smoking cessation were evaluated in six trials, although results were mixed: three trials indicated improved quit rates with patient navigation, counseling, and nicotine replacement therapy, while three showed no effects. Rates of high blood pressure were not reduced with an intervention involving lay health workers, education, community activities, and a behavior change prescription. Obesity education and counseling interventions showed mixed results with lower BMI in three studies and no differences in three. Case management with a lay health worker was also ineffective in a weight reduction trial of low-income Hispanic adults.

Table 33. Summary of evidence for Key Question 5: effectiveness of health system interventions

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	20 RCTs (30,736); 3 nonrandomized trials (1,392); 2 before-after studies (4,882)	Increased screening rates in all but 4 studies	High; high

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Telephone calls, prompts, and other outreach	10 RCTs (61,155); 2 nonrandomized trials (1,080); 2 before-after studies (918,667); 1 post intervention time series (4,423,734)	Increased screening rates for multiple types of outreach among several patient populations; no effect in 2 studies	High; high
	Educational videos	4 RCTs (1,823)	Increased screening for low-income patients in 2 RCTS; no effect in 2 others	Low; low
	Screening checklist	1 RCT (1,196)	Increased screening rates in low-income patients	Low; low
	Provider training	2 before-after studies (4,092)	Increased colonoscopy rates and documentation; no increase in FOBT	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low
Breast cancer screening	Patient navigation	7 RCTs (8,622); 1 before-after study (91); 1 post intervention time series (1,664)	Increased screening rates in all studies except 1 RCT	Moderate; moderate
	Telephone calls, prompts, and other outreach	5 RCTs (2,238)	Increased screening rates in 1 RCT; no increase in others	Low; low
	Patient education	2 RCTs (341)	Increased screening rates in Chinese and Korean-American women	Low; low
	Lay health workers	4 RCTs (2,573)	Increased screening rates in 3 RCTs of Hispanic and African-American women; no increase in another RCT of Hispanic women	Moderate; moderate
	Screening checklist	1 RCT (1,196)	Increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low
Cervical cancer screening	Patient navigation	3 RCTs (2,378); 1 nonrandomized trial (1,763)	Increased screening and diagnostic resolution	Moderate; moderate
	Telephone calls, prompts, and other outreach	2 RCTs (1,784)	Increased screening and colposcopy followup	Low; low
	Lay health workers	5 RCTs (3,641)	Increased screening rates among Hispanic women in 1 RCT; no increases in others	Low; low
	Screening checklist	1 RCT (1,196)	No increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Increased screening rates among underserved patients	Low; low
Lung cancer screening	Patient navigation	1 RCT (1,200)	Increased screening rates among low-income smokers	Insufficient; insufficient
Smoking cessation	Patient navigation	2 RCTs (960)	Higher quit rates in 1 RCT, but not another	Insufficient; insufficient

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
	Nicotine replacement	2 RCTs (5,705)	Higher quit rates with counseling and nicotine replacement	Insufficient; insufficient
	Education and counseling	2 RCTs (6,219)	Higher short-term quit rates, but not long-term rates in 1 RCT; no differences in another	Insufficient; insufficient
High blood pressure screening	Education and counseling	1 RCT (1,443)	No difference in rates of high blood pressure among underserved women	Insufficient; insufficient
Obesity screening; management	Education and counseling	4 RCTs (1,293); 1 cohort study (69); 1 before-after study (59)	Lower BMI in 3 studies; no differences in 3 others	Insufficient; insufficient
	Case management and outreach	1 RCT (207)	No differences in BMI among low-income Hispanic adults	Insufficient; insufficient

Abbreviations: BMI = body mass index; FOBT = fecal occult blood test; RCT = randomized controlled trial

Meta-analyses of 36 studies provide summary estimates of the effectiveness of patient navigation in increasing screening rates for colorectal, breast, and cervical cancer screening in primary care settings and healthcare systems. Results are consistent regardless of the type of cancer screening, components of navigation, patient population, study design and quality, and comparison groups. Results for colorectal cancer screening are supported by 28 studies, breast cancer screening by 11 studies, and cervical cancer screening by 4 studies. Although the evidence base includes several small, poor quality studies, results are supported by additional large, well-conducted studies reporting increased screening.

Results were generally similar across studies, although the magnitude of the observed effects varied. Risk ratios were highest for colorectal cancer screening (risk ratio [RR] 1.64; 95% confidence interval [CI] 1.42 to 1.92; I^2 = 93.7%; 22 trials), followed by breast cancer screening (RR 1.50; 95% CI 1.22 to 1.91; I^2 = 98.6%; 10 trials), and cervical cancer screening (RR 1.11; 95% CI 1.05 to 1.19) based on the largest, highest quality RCT.[83] However, these differences could be related to the numbers of trials and amount of data contributing to the estimates rather than to differences based on the type of screening. This is particularly true of the cervical cancer screening studies for which a second large RCT reported a much higher RR (9.14; 95% CI 6.79 to 12.30).[38]

Findings in Relation to What Is Already Known

Findings of this review illustrate an uneven evidence base addressing KQs on the effect of impediments and barriers to preventive services and the effectiveness of interventions to reduce disparities. While no previous reviews have focused on the same questions and 10 preventive services, this uneven evidence base is consistent with other systematic reviews of health disparities in general and for specific health services and populations.[159-171]

In this review, available published studies were limited to groups characterized by race and ethnicity, low-income, and rural location. While these are major groups to consider when reducing health disparities, other groups have not been well studied, such as sexual and gender minorities, non-English speakers, and specific immigrant populations.

Similar to other reviews, most studies identified in this review included a single disadvantaged population and evaluated the effectiveness of interventions within the population group, rather than across comparison groups. Interventions evaluated in the studies were either general (i.e., applied without consideration of group specific needs or preferences, such as quality improvement efforts); or tailored (i.e., addressed barriers specific to a disadvantaged group, such as peer lay health workers focused on the unique needs of patients belonging to the group). Although general interventions may reduce disparities by improving outcomes overall, they may also increase disparities if they are ineffective in specific populations. The literature is inconsistent about the effect on disparities of general population interventions that are not specifically tailored to groups experiencing disparities. In addition, studies focused on improving measures of screening, an indirect measure, and none evaluated the effects of interventions on health outcomes, such as cancer mortality.

Although the finding that insurance coverage did not affect screening is inconsistent with other data, insurance coverage may be a less important consideration since the Affordable Care Act (ACA) was implemented. Under the ACA, all of the U.S. Preventive Services Task Force (USPSTF) A and B level recommendations are mandated for coverage with no copay or deductible charges for most private health plans and Medicare, and most state Medicaid programs.[172] This could explain why few recent studies evaluated this factor. Other reports, including the Institute of Medicine's review of racial and ethnic disparities, *Unequal Treatment*,[5] have also demonstrated that while insurance coverage may facilitate preventive service use, differences in insurance coverage do not explain many observed disparities in healthcare utilization and quality.

Despite the unevenness of evidence in this review, several studies demonstrated the effectiveness of patient navigation services in clinical settings, within healthcare systems, and when using community resources to increase colorectal, breast, and cervical cancer screening. While navigation interventions varied across studies, this heterogeneity reflected tailoring for specific populations with additional services, such as lay health workers, reminder calls, and mailings. Another tailored intervention, reminders for breast cancer screening that included lay health workers, was also effective in increasing screening rates. Other reviews of interventions to reduce health disparities for various types of health services also found that tailored interventions including personnel (e.g., care managers, community health workers) and providing increased connectedness between patients and the healthcare systems were most effective. These interventions included care coordination, care management, community outreach, and culturally tailored education interventions.

Strength of Evidence

The strength of evidence for each KQ is based on overall study limitations (ranked low, medium, or high risk of bias); consistency (consistent, inconsistent, or unknown/not applicable); directness (direct or indirect); precision (precise or imprecise); and reporting bias (suspected or undetected). These ratings are listed in Tables 30 to 33 above and detailed in Appendix J.

For most KQs, the strength of evidence regarding the effect of a barrier (KQ2) or effectiveness of an intervention (KQs 3, 4, 5) is low or insufficient because of the lack of studies or studies met criteria for poor quality, were highly heterogeneous, reported different types of outcomes, or had inconsistent results. A low rating indicates limited confidence that the estimate of effect lies close to the true effect for the outcome because the body of evidence has major or numerous deficiencies, or is limited by having only one or two small studies. For these questions, additional evidence is required before concluding either that the findings are stable or that the estimate of effect is close to the true effect. A grade of insufficient indicates that no evidence is available, or the body of evidence has unacceptable deficiencies or limitations (e.g., small observational or poor quality studies) precluding reaching a conclusion.

Evidence is strongest for studies of patient navigation services to increase colorectal (high), breast (moderate), and cervical cancer screening (moderate). Although the evidence base includes several small, poor quality studies, results are supported by additional large, well-conducted studies reporting increased screening rates regardless of patient populations and settings. While results consistently indicated positive effects of navigation on screening, the magnitude of the observed effects varied across studies. Some patient navigation interventions included additional services, such as lay health workers, reminder calls and mailings, and motivational interviewing. These services likely enhance the effect of navigation, although additional effects of these services could not be determined from the studies themselves. Evidence is high for the effectiveness of telephone calls and prompts to improve colorectal cancer screening, and moderate for reminders including lay health workers encouraging breast cancer screening.

Applicability

The overall applicability for each KQ is based on the characteristics of the patient populations; sample sizes of the studies; clinical settings where the interventions occurred; and levels of influence that may impact specific populations adversely affected by disparities. These ratings are listed in Tables 30 to 33 above and detailed in Appendix J.

For most KQs, overall applicability regarding the effect of a barrier (KQ2) or effectiveness of a screening intervention (KQs 3, 4, 5) is low or insufficient because the study participants were highly selected and may not represent more general populations; and studies were small in size, usually involved only one or few clinical sites, and evaluated interventions tailored for specific population groups. However, applicability ratings may not be as important in studies of populations adversely affected by disparities as they are in studies of general populations. Different populations have different mediating and contributing factors, and interventions designed to reduce disparities may be targeted to the social, historical, and structural contexts of specific populations. Thus, interventions may be more or less effective across different populations. While variability across studies may limit the ability to apply results to other populations and settings, it also provides opportunities to evaluate unique approaches to reducing disparities in specific populations.

Limitations of the Systematic Review

Limitations of this review include using only English language articles and studies applicable to the United States, although this focus improves its relevance to the Pathways to Prevention Workshop on Achieving Health Equity in Preventive Services. This review is also subject to publication bias in which studies with negative or null findings are not included because they were never published.

This review addressed five KQs that limited its scope to the effects of provider and population barriers to preventive services; and the effectiveness of interventions to reduce disparities at the patient-provider and health system levels including interventions that use health technology. Most studies on health disparities are about treatment, not the 10 preventive services included in this review, and eligibility criteria for studies confined inclusion to specific populations, interventions, comparators, and outcomes. Selection criteria for KQ1 and KQ2 were focused on studies showing effect rather than association, although this is often an unclear distinction when reviewing studies at the abstract level.

Many additional issues relevant to achieving health equity in preventive services fall outside the scope of this review. Studies based in the community engaging clinician extenders or directly linking community members with specific clinicians were included in this review, while community-based interventions without connections to health systems were excluded. For example, an excluded church-based intervention[173] delivered by lay health workers provided education and identified local health system resources, but did not assist participants in making and attending appointments. An included church-based intervention[120] delivered by lay health workers provided education and identified local health system resources and assisted participants with appointment scheduling, language translation, transportation, and appointment paperwork. Additional examples of excluded community-based studies captured by the literature search for this review are described in Appendix H and include studies on colorectal cancer screening,[174-176] smoking cessation,[177-179] and healthy behaviors for cardiovascular disease prevention in adults with cardiovascular risk factors.[173,180,181]

The number, quality, and applicability of studies evaluated in the evidence review varied widely. Few studies addressed the effects of hypothesized impediments and barriers on preventive care use, including no studies of provider barriers. The limited number of health technology-based studies precludes any conclusions about using them to improve preventive services in disadvantaged populations. In addition, most studies in this review were conducted on highly selected samples of patients, and it is not known how results based on populations from unique settings translate to others. Also, studies based in specific healthcare systems may not be relevant to others, particularly small studies with highly tailored interventions. Healthcare organizations or systems may differ due to geographic location, policies, access to resources, or capacity, and studies may not translate to general primary care or primary care-referable settings. In addition, many studies meeting inclusion criteria incorporated elements of community-based participatory research, which are necessarily unique to the local organization or system context.

Limitations of Current Evidence

Current evidence on achieving health equity in preventive services is limited primarily by the lack of studies for preventive services related to cardiovascular disease and diabetes, specific population groups, and different types of interventions. Although the database search identified an expansive literature on the topic of health disparities, many studies were not relevant to the KQs of this systematic review. This reflects the dominance of first phase studies in the field (i.e., showing that disparities exist), in contrast to fewer second and third phase studies that are relevant to the KQs.[22] Most studies involved screening for colorectal, breast, or cervical cancer, and studies were not available for most of the preventive services that are the focus of this review. Studies enrolled participants from multiple groups experiencing disparities in healthcare, however, other groups were not studied. While the effectiveness of the preventive services covered in this review has been previously established and supported by A or B USPSTF recommendations, research evaluating the effectiveness of interventions to reduce disparities in receipt of these services is generally lacking. The lack of studies and methodological deficiencies of existing studies reflect a limited and fragmented evidence base, making it more difficult to identify effects of barriers and to understand effective methods to reduce them.

Although many studies are methodologically limited, some limitations are unavoidable. For example, disadvantaged groups are often difficult to study because they are hard to reach (e.g., homeless, low-income), potentially distrust the research enterprise (e.g., racial/ethnic minorities, sexual and gender minority groups), or pose other challenges to recruitment (e.g., low literacy, undocumented) restricting research of groups most likely to experience disparities. Also, comparison studies of some interventions, particularly in RCTs, may raise ethical concerns. In addition, the most informative intervention studies addressing disparities would be designed as difference-in-difference studies that show not only that the intervention improves outcomes, but also that it improves outcomes more in one group compared with another. Most studies are not designed this way and do not address the power/sample size implications of this study design.

Research on achieving health equity in preventive services may have limited applicability to clinical practice. Results of research conducted in one specific population, setting, or intervention may not be applicable to another because it may be unique to the conditions of the initial study. For example, barriers experienced by non-English speaking Chinese immigrant populations requiring colorectal cancer screening are likely different from those experienced by Hispanic farmworkers considering smoking cessation. Even among seemingly similar groups, racial, economic, or other differences may further differentiate them.

Future Research Needs and Opportunities

Future research is needed to address gaps and deficiencies of existing studies and expand on studies with promising results. The lack of studies addressing KQ1 indicates a need to better understand the impact of barriers and impediments related to providers and health systems on disparities in preventive service use. While there are many potential barriers hypothesized to contribute to disparities, and while there is some evidence of their impact on healthcare access and utilization, we found no studies addressing their impact on preventive care use. For instance, it is hypothesized that race bias among healthcare providers may influence decision making in a way that results in fewer services for minority populations. However, this hypothesis has not been directly studied. Similarly, group-level differences in availability of services (e.g., after-hours clinics) may exist, but the degree to which they contribute to disparities in preventive care use has not been directly addressed. Understanding these provider and system-level barriers would help inform targeted interventions to reduce disparities.

Studies indicate that patient navigation and reminders are effective in increasing cancer screening rates across different populations, settings, and services. These interventions provide high-touch services that are designed to troubleshoot multiple types of barriers and respond to the needs of individual patients. These types of interventions are difficult to combine and assess collectively and to apply broadly because of their heterogeneity. Additional research to identify the most effective and efficient methods to implement patient navigation and reminders into different healthcare settings would be a useful next step. These studies could also describe the most common barriers encountered and how they were remedied to inform planning of services.

Additional research on unstudied populations experiencing adverse effects of healthcare disparities would include racial and ethnic populations, socioeconomically disadvantaged populations, underserved rural populations, sexual and gender minority populations, non-English speakers, and others subject to discrimination. In addition to tailored studies, future research should increase the number of individuals from groups experiencing disparities in general intervention studies to provide more robust subgroup analysis. New studies should be consistent with the evolving definition of minority and examine social determinants of health. Currently, most studies do not collect sexual orientation or gender identity data, and future research could include this information as standard demographic data. Characteristics of populations should be clearly described and, for some groups, standardized definitions should be used to ensure comparability across studies. Studies should expand to include more than one site or geographic region to improve statistical power for subgroup comparisons and improve understanding of similarities and differences across defined groups. Members of the target population should be involved in planning studies to inform the study design, interventions, and outcome measures. Studies evaluating interventions found to be successful in existing studies, such as patient navigators or clinician-linked outreach and education, should be extended to additional populations and settings.

Additional research to inform the effectiveness of interventions to reduce disparities for other preventive services that have not been addressed by existing studies would be useful including services related to cardiovascular disease and diabetes and services that could be bundled. Interventions that address more than one preventive service concurrently could potentially improve efficiency and outcomes. With the increasing use of telemedicine, EHRs, and quality-based care using clinical quality measures, the potential impact of health technology in improving disparities in preventive care is important to understand. Future research evaluating the effectiveness of these technologies in improving preventive care in patient populations could expand services for patients, focus on additional populations, and incorporate the vast array of technology in clinical practice.

Conclusions

This review included 120 studies (in 125 publications) of populations adversely affected by disparities in preventive health services from multiple racial, ethnic, and socioeconomically disadvantaged groups. Studies primarily evaluated barriers and interventions related to screening for colorectal, breast, and cervical cancer, with additional studies on smoking cessation and obesity management, and single studies of screening for lung cancer and high blood pressure. No studies evaluated the effect of impediments and barriers on the part of providers to the adoption, promotion, and implementation of preventive services that contribute to disparities (KQ1).

Eighteen studies evaluated the effect of impediments and barriers on the part of populations (KQ2). Results of studies were mixed for type of insurance coverage and lack of a regular healthcare provider. Impediments and barriers with effects on the use of preventive services included older age, rural or economically deprived location, and issues related to access. Low income, Spanish or limited-English language, and low health literacy were not barriers.

Twelve studies evaluated the effectiveness of approaches and strategies between patients and clinician providers that connect and integrate practices for reducing disparities in preventive services (KQ3). Colorectal cancer screening rates were higher with patient navigation, personalized risk assessment and telephone counseling for first-degree relatives of patients with colorectal cancer, educational videos with physician reminders, and a screening decision aid. Breast cancer screening rates were higher with mailed or in-person reminders involving lay health workers. Cervical cancer screening rates were higher for low-income Latina farm workers with outreach and health education, and for low-income Chinese-American women with education and navigation. A tobacco smoking cessation intervention for women smokers attending their child’s pediatric visit improved smoking abstinence rates. A weight loss intervention provided by primary care physicians for low-income, overweight and obese African-American women was effective for initial weight loss, but not for sustained weight loss.

Eleven studies evaluated the effectiveness of health information technologies and digital enterprises to improve the adoption, implementation and dissemination of preventive services in settings that serve populations adversely affected by disparities (KQ4). Most technology interventions did not increase screening rates or smoking quit rates compared with alternative approaches. Screening rates were higher in a study using an EHR to identify patients eligible for colorectal cancer screening for mailings and phone calls, and in a RCT using an electronic decision aid with patient-ordered screening tests. A trial of smoking cessation counseling using telemedicine compared with telephone calls showed an increase in pharmacotherapy use, but no improvement in quit rates. Quit rates were higher with an intervention combining technological approaches to identifying and recruiting eligible patients for smoking cessation counseling and pharmacotherapy. An intervention for obesity management using a web- or telephone-based self-monitoring component resulted in lower BMI.

Eighty-eight studies evaluated the effectiveness of interventions implemented by healthcare organizations and systems to reduce disparities in use of preventive services (KQ5). These include 50 studies of colorectal cancer screening, 26 of breast cancer screening, 13 of cervical cancer screening, six of smoking cessation, seven of obesity screening and management, and single studies of screening for lung cancer and high blood pressure.

Colorectal cancer screening rates were higher with patient navigation; telephone calls, prompts, and other outreach methods; screening checklists; provider training; and practice changes involving community engagement. Results were mixed for educational videos. Breast cancer screening rates were higher with patient navigation; lay health workers; patient education; screening checklists; and practice changes involving community engagement, but not with telephone calls, prompts, and other outreach methods. Cervical cancer screening and diagnostic resolution rates were higher with patient navigation; telephone calls and prompts; and practice changes involving community engagement. Interventions with lay health workers and a screening checklist were not effective. Lung cancer screening rates were higher with patient navigation in a single trial of low-income smokers at five community health centers. Tobacco smoking quit rates were higher with counseling and nicotine replacement, but mixed with patient navigation and education and counseling. Rates of high blood pressure were not reduced in a single trial involving lay health workers, education, community activities, and a behavior change prescription. Obesity education and counseling interventions had mixed results in lowering BMI, while case management with a lay health worker was ineffective.

Meta-analyses of studies of patient navigation indicated increased screening rates for colorectal, breast, and cervical cancer regardless of the type of navigation, patient population, study design and quality, and comparison groups; and for the type of screening test and followup time for colorectal cancer.

Overall, evidence is strongest for patient navigation services to increase colorectal, breast, and cervical cancer screening, telephone calls and prompts to increase colorectal cancer screening, and for reminders including lay health workers encouraging breast cancer screening. Evidence is low or insufficient for most other interventions and outcomes because of the lack of studies and methodological limitations of existing studies.

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Abbreviations and Acronyms

AA	African American
AALI	African American low-income
AAM	African American men
ACA	Affordable Care Act
AHRQ	Agency for Healthcare Research & Quality
AMIGAS	Ayudando a las Mujeres con Información, Guía y Amor para su Salud
AMSTAR	A MeaSurement Tool to Assess systematic Reviews
aHR	adjusted hazard ratio
aOR	adjusted odds ratio
aPR	adjusted prevalence ratio
aRR	adjusted risk ratio
BMI	body mass index
CVD	cardiovascular disease
CHD	coronary heart disease
Chin	Chinese American
ChinLI	Chinese American low-income
CHOICE	Communicating Health Options through Interactive Computer Education
CI	confidence interval
CMS	Centers for Medicare and Medicaid Services
COL/FS	colonoscopy or flexible sigmoidoscopy
Colo	colonoscopy
CRC	colorectal cancer
CT	computed tomography
DALY	Disability Adjusted Life Years
DL	DerSimonian and Laird method
DVD	digital versatile disk
EHR	electronic health record
EMR	electronic medical record
Endo	endoscopy
Fil	Filipino American
FIT	fecal immunohistochemistry test
FOBT	fecal occult blood test
FQHC	Federally Qualified Health Center
GED	General Equivalency Diploma
GI	gastrointestinal
Haw	Native Hawaiian
His	Hispanic/Latino
HisW	Hispanic/Latino women
HIT	health information technology
HR	hazard ratio
Kor	Korean American
KQ	Key Question
LI	low-income
LIHis	low-income Hispanic/Latino

LIRE	low-income racial/ethnic minorities
LIW	low-income women
MD	mean difference
MI	myocardial infarction
mPATH-CRC	Mobile Patient Technology for Health-CRC
NA	not applicable
NCI	National Cancer Institute
NHLBI	National Heart, Lung, and Blood Institute
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIH	National Institutes of Health
NIMHD	National Institute on Minority Health and Health Disparities
NNS	number needed to screen
NR	not reported
NRT	nicotine replacement therapy
OR	odds ratio
PA	Physician's Assistant
Pap	Papanicolaou
PCP	primary care provider
PICOTS	populations, interventions, comparators, outcomes, timing, and setting
PL	profile likelihood
PRESS	Peer Review of Electronic Search Strategies
RAA	rural African American
RCT	randomized controlled trial
RR	risk ratio
SASE	self-addressed stamped envelope
SBT	stool blood test
SE	standard error
SES	socioeconomic status
U.S.	United States
USPSTF	U.S. Preventive Services Task Force
VA HSR&D	Veterans Affairs Health Services Research and Development Service
Viet	Vietnamese American
WISDM	Wisconsin Index of Smoking Dependence Motive
YMCA	Young Men's Christian Association

Appendix A. Literature Search Strategies

Database: Ovid MEDLINE® 1946 to July Week 1 2019

Broad search:

1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 or/16-19
21 exp diabetes mellitus, type 2/ or prediabetic state/
22 exp Cardiovascular Diseases/
23 Aspirin/
24 exp breast neoplasms/ or exp colorectal neoplasms/ or exp lung neoplasms/ or uterine cervical neoplasms/
25 exp Obesity/
26 Smoking/
27 exp "Tobacco Use Cessation"/
28 21 or (22 and 23) or 24 or 25 or 26
29 27 or 28
30 29 and pc.fs.
31 20 or 30
32 15 and 31
33 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new york city/ or san francisco/
34 ("united states" or "u.s." or alabama or alaska or arizona or arkansas or california or colorado or connecticut or delaware or florida or georgia or hawaii or idaho or illinois or indiana or iowa or kansas or kentucky or louisiana or maine or maryland or massachusetts or michigan or minnesota or mississippi or missouri or montana or nebraska or nevada or "new hampshire" or "new jersey" or "new mexico" or "new york" or "north carolina" or "north dakota" or ohio or

oklahoma or oregon or pennsylvania or "rhode island" or "south carolina" or "south dakota" or tennesee or texas or utah or vermont or virginia or washington or "west virginia" or wisconsin or wyoming).ti,ab,kw.
35 32 and (33 or 34)
36 africa/ or caribbean region/ or central america/ or canada/ or greenland/ or mexico/ or south america/ or exp asia/ or exp europe/
37 35 not 36
38 limit 37 to (meta analysis or systematic reviews)
39 (medline or systematic or metaanalysis or "meta analysis").ti,ab.
40 37 and 39
41 38 or 40
42 limit 41 to english language
43 37 not 42

Focused search: evidence gaps
1. Healthcare Disparities/
2. "Health Services Needs and Demand"/
3. exp Health Services Accessibility/
4. exp Socioeconomic Factors/
5. Minority Groups/
6. exp Population Groups/
7. vulnerable populations/ or working poor/
8. exp Disabled Persons/
9. exp Sexual Minorities/
10. Minority Health/
11. cultural competency/ or cultural diversity/
12. 1 or 2 or 3
13. or/4-11
14. 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15. 12 or 14
16. exp Preventive Health Services/
17. exp Mass Screening/
18. exp Health Promotion/
19. ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20. or/16-19
21. exp diabetes mellitus, type 2/ or prediabetic state/
22. exp Cardiovascular Diseases/
23. Aspirin/
24. exp breast neoplasms/ or exp colorectal neoplasms/ or exp lung neoplasms/ or uterine cervical neoplasms/
25. exp Obesity/
26. Smoking/
27. exp "Tobacco Use Cessation"/
28. 21 or (22 and 23) or 24 or 25 or 26

29. 27 or 28
30. 29 and pc.fs.
31. 20 or 30
32. 15 and 31
33. exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new york city/ or san francisco/
34. ("united states" or "u.s." or alabama or alaska or arizona or arkansas or california or colorado or connecticut or delaware or florida or georgia or hawaii or idaho or illinois or indiana or iowa or kansas or kentucky or louisiana or maine or maryland or massachusetts or michigan or minnesota or mississippi or missouri or montana or nebraska or nevada or "new hampshire" or "new jersey" or "new mexico" or "new york" or "north carolina" or "north dakota" or ohio or oklahoma or oregon or pennsylvania or "rhode island" or "south carolina" or "south dakota" or tennesee or texas or utah or vermont or virginia or washington or "west virginia" or wisconsin or wyoming).ti,ab,kw.
35. 32 and (33 or 34)
36. "Social Determinants of Health"/
37. 35 or 36
38. 37 and (gap* or limit* or lack* or barrier*).ti,ab.

Focused search: aspirin for colorectal cancer prevention

1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21

23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 22 and 23
26 22 not 24
27 25 or 26
28 Aspirin/
29 (aspirin or "acetylsalicylic acid").ti,ab,kw.
30 exp Colorectal Neoplasms/pc [Prevention & Control]
31 ((colon or colorectal) adj3 cancer).ti,ab,kw.
32 31 and pc.fs.
33 28 or 29 or 30 or 32
34 27 and 33

Focused search: aspirin for cardiovascular disease prevention
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/

24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 22 and 23
26 22 not 24
27 25 or 26
28 Aspirin/
29 (aspirin or "acetylsalicylic acid").ti,ab,kw.
30 exp Cardiovascular Diseases/pc [Prevention & Control]
31 ("cardiovascular disease*" or CVD or (coronary adj3 disease) or (heart adj3 disease) or (microvascular adj3 disease) or CHD or "myocardial infarction" or stroke).ti,ab,kw.
32 31 and pc.fs.
33 28 or 29 or 30 or 32
34 27 and 33

Focused search: breast cancer screening
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/ (1250310)
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/

25 exp Breast Neoplasms/pc [Prevention & Control]
26 ((breast adj3 cancer) or mammogram or mammography or "clinical breast exam" or (breast adj3 self)).ti,ab,kw.
27 exp Mass Screening/
28 screen*.ti,ab,kw.
29 (25 or 26) and (27 or 28)
30 12 and 21 and 29
31 14 and 21 and 29
32 30 or 31
33 23 and 32
34 32 not 24
35 33 or 34

Focused search: cervical cancer screening
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 Uterine Cervical Neoplasms/
26 ((cervical or cervix) adj3 cancer).ti,ab,kw.

27 exp Mass Screening/ or exp early diagnosis/
28 screen*.ti,ab,kw.
29 (25 or 26) and (27 or 28)
30 12 and 21 and 29
31 14 and 21 and 29
32 30 or 31
33 23 and 32
34 32 not 24
35 33 or 34

Focused search: colon cancer screening
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 exp Colorectal Neoplasms/pc [Prevention & Control]
26 (((colon or colorectal) adj3 cancer) or colonoscopy).ti,ab,kw.
27 exp Mass Screening/
28 screen*.ti,ab,kw.
29 (25 or 26) and (27 or 28)

30 12 and 21 and 29
31 14 and 21 and 29
32 30 or 31
33 23 and 32
34 32 not 24
35 33 or 34

Focused search: diabetes
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 diabetes mellitus, type 2/ or prediabetic state/
24 ("type 2 diabetes" or "diabetes mellitus" or prediabet* or (glucose adj3 test*) or A1c).ti,ab,kw.
25 23 or 24
26 12 and 21 and 25
27 15 and 21 and 24
28 26 or 27
29 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
30 28 and 29
31 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/

32 28 not 31
33 30 or 32

Focused search: healthy diet
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 exp Diet/
26 exp Diet Therapy/
27 exp Exercise/
28 exp Exercise Therapy/
29 exp Physical Fitness/
30 exp Life Style/
31 (diet or exercise or "physical activity" or lifestyle or "life style").ti,ab,kw.
32 or/25-31
33 counseling/ or directive counseling/ or distance counseling/
34 exp health promotion/ or patient education as topic/
35 Health Education/
36 risk reduction behavior/

37 (counsel* or advice or advise or recommend*).ti,ab,kw.
38 or/33-37
39 22 and 32 and 38
40 39 and 23
41 39 not 24
42 40 or 41

Focused search: high blood pressure screening
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 exp Hypertension/pc [Prevention & Control]
26 (hypertension or "high blood pressure" or systolic or diastolic).ti,ab,kw.
27 Mass Screening/
28 early diagnosis/
29 (screen* or test* or diagnosis).ti,ab,kw.
30 25 or 2
31 or/27-30
32 22 and 30 and 31

33 32 and 23
34 32 not 24
35 33 or 34

Focused search: lung cancer
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 exp Lung Neoplasms/
26 (lung adj2 cancer).ti,ab,kw.
27 ((("small cell" or "non small cell") adj3 lung) and cancer*).ti,ab,kw.
28 or/25-27
29 mass screening/ or mass chest x-ray/
30 exp early diagnosis/
31 (screen* or test* or diagnosis).ti,ab,kw.
32 or/29-31
33 28 and 32
34 33 and 22
35 34 and 23

36 34 not 24
37 35 or 36

Focused search: obesity
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 exp Obesity/
26 Overweight/
27 exp "Body Weights and Measures"/
28 (obese or obesity or overweight or "body mass" or bmi or weight).ti,ab,kw.
29 or/25-28
30 22 and 29
31 30 and 23
32 30 not 24
33 31 or 32

Focused search: smoking cessation
1 Healthcare Disparities/

2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/ or health status disparities/ or "social determinants of health"/
4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or parity or unequal* or inequal* or inequit* or undertreat* or under-treat* or access* or disparit* or discriminat*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 prevent*.ti,ab.
21 or/16-20
22 15 and 21
23 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new orleans/ or new york city/ or philadelphia/ or san francisco/
24 exp africa/ or caribbean region/ or central america/ or latin america/ or canada/ or greenland/ or mexico/ or south america/ or exp antarctic regions/ or exp arctic regions/ or exp asia/ or exp europe/ or exp islands/ or exp oceania/
25 smoking cessation/ or smoking reduction/ or "tobacco use cessation"/
26 Smokers/
27 exp Smoking/
28 Tobacco/
29 (smoker* or smoking or cigarette$ or tobacco or nicotine).ti,ab,kw.
30 or/26-29
31 30 and (cessation or stop* or cease* or reduction).ti,ab,kw.
32 25 or 30
33 22 and 32
34 33 and 23
35 33 not 24
36 34 or 35

Systematic reviews:
1 Healthcare Disparities/
2 "Health Services Needs and Demand"/
3 exp Health Services Accessibility/

4 exp Socioeconomic Factors/
5 Minority Groups/
6 exp Population Groups/
7 vulnerable populations/ or working poor/
8 exp Disabled Persons/
9 exp Sexual Minorities/
10 Minority Health/
11 cultural competency/ or cultural diversity/
12 1 or 2 or 3
13 or/4-11
14 13 and (equity or equitable or equal* or fair or disparit*).ti,ab,kw.
15 12 or 14
16 exp Preventive Health Services/
17 exp Mass Screening/
18 exp Health Promotion/
19 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
20 or/16-19
21 exp diabetes mellitus, type 2/ or prediabetic state/
22 exp Cardiovascular Diseases/
23 Aspirin/
24 exp breast neoplasms/ or exp colorectal neoplasms/ or exp lung neoplasms/ or uterine cervical neoplasms/
25 exp Obesity/
26 Smoking/
27 exp "Tobacco Use Cessation"/
28 21 or (22 and 23) or 24 or 25 or 26
29 27 or 28
30 29 and pc.fs.
31 20 or 30
32 15 and 31
33 exp united states/ or baltimore/ or boston/ or chicago/ or "district of columbia"/ or los angeles/ or new york city/ or san francisco/
34 ("united states" or "u.s." or alabama or alaska or arizona or arkansas or california or colorado or connecticut or delaware or florida or georgia or hawaii or idaho or illinois or indiana or iowa or kansas or kentucky or louisiana or maine or maryland or massachusetts or michigan or minnesota or mississippi or missouri or montana or nebraska or nevada or "new hampshire" or "new jersey" or "new mexico" or "new york" or "north carolina" or "north dakota" or ohio or oklahoma or oregon or pennsylvania or "rhode island" or "south carolina" or "south dakota" or tennesee or texas or utah or vermont or virginia or washington or "west virginia" or wisconsin or wyoming).ti,ab,kw.
35 32 and (33 or 34)
36 africa/ or caribbean region/ or central america/ or canada/ or greenland/ or mexico/ or south america/ or exp asia/ or exp europe/
37 35 not 36
38 limit 37 to (meta analysis or systematic reviews)

39 (medline or systematic or metaanalysis or "meta analysis").ti,ab.
40 37 and 39
41 38 or 40
42 limit 41 to english language

Database: Ovid MEDLINE® Epub Ahead of Print , In-Process & Other Non-Indexed Citations to July 5, 2019

1 ((health or healthcare or "health care" or care) and (equit* or disparit* or inequal* or accessibilit*)).ti,ab,kw.
2 (socioeconomic or economic or poor or vulnerable or disenfranchis* or (social adj3 class)).ti,ab,kw.
3 (divers* or minorit* or ethnicit* or race or racial or black* or "african american*" or asian* or "native american*" or indian or hispanic or latin*).ti,ab,kw.
4 (disabled or challenged or handicapped).ti,ab,kw.
5 ("sexual adj3 minorit*" or homosexual* or bisexual* or gay* or lesbian* or transgender* or queer or lbg*).ti,ab,kw.
6 ("cultural competency" or "cultural diversity").ti,ab,kw.
7 (preventive or prevention or prevent).ti,ab,kw.
8 screen*.ti,ab,kw.
9 ("United States Preventive Services Task Force" or "U.S. Preventive Services Task Force" or "U.S.P.S.T.F." or "USPSTF").ti,ab,kw,au.
10 or/2-6
11 10 and (equit* or disparit* or inequal* or accessibilit*).ti,ab,kw.
12 1 or 11
13 12 and (7 or 8 or 9)
14 (diabetes or glucose or aspirin or cardiovascular or heart or coronary or "myocardial infarction" or stroke or colorectal or colon or breast or cervical or human papillomavirus or HPV or diet or exercise or "physical activity" or overweight or obese or obesity or metabolic or hypertension or "blood pressure" or lung or tobacco or smoke* or smoking).ti,ab,kw.
15 13 and 14
16 ("united states" or "u.s." or alabama or AL or alaska or AK or arizona or AZ or arkansas or AR or california or CA or Colorado or CO or Connecticut or CT or delaware or DE or florida or FL or georgia or GA or hawaii or HI or Idaho or ID or Illinois or IL or indiana or iowa or IA or Kansas or KS or kentucky or KY or Louisiana or LA).ti,ab,kw,in.
17 (maine or ME or maryland or MD or Massachusetts or MA or michigan or MI or Minnesota or MN or mississippi or MS or missouri or MO or montana or MT or nebraska or NE or Nevada or NV or "new hampshire" or NH or "new jersey" or NJ or "new mexico" or NM or "new york" or NY or "north carolina" or NC or "north dakota" or ND).ti,ab,kw,in.
18 (ohio or OH or oklahoma or OK or oregon or pennsylvania or PA or "rhode island" or RI or "south carolina" or SC or "south dakota" or SD or tennesee or TN or texas or TX or Utah or UT or vermont or VT or Virginia or VA or Washington or WA or "west virginia" or WV or wisconsin or WI or Wyoming or WY).ti,ab,kw,in.
19 15 and (16 or 17 or 18)
20 limit 19 to english language

Database: PsycINFO 1806 to July Week 1 2019

1 health disparities/ or treatment barriers/

2 (equit* or disparit* or inequal* or accessibilit*).ti,ab.

3 exp sociocultural factors/

4 exp group differences/

5 minority groups/ or alaska natives/ or american indians/ or asians/ or blacks/ or cultural sensitivity/ or hawaii natives/ or indigenous populations/ or "latinos/latinas"/ or pacific islanders/ or "race and ethnic discrimination"/ or "racial and ethnic groups"/

6 exp disabilities/

7 exp gender identity/

8 exp sexual orientation/

9 (divers* or minorit* or ethnicit* or race or racial or black* or "african american*" or asian* or "native american*" or indian or hispanic or latin*).ti,ab.

10 ("sexual adj3 minorit*" or homosexual* or bisexual* or gay* or lesbian* or transgender* or queer or lbg*).ti,ab.

11 (disabled or challenged or handicapped).ti,ab.

12 (1 or 2) and (or/3-11)

13 exp health promotion/

14 exp DIABETES/

15 exp cardiovascular disorders/

16 exp ASPIRIN/

17 exp breast neoplasms/

18 cancer screening/

19 exp overweight/

20 tobacco smoking/ or smoking cessation/

21 (diabetes or glucose or aspirin or cardiovascular or heart or coronary or "myocardial infarction" or stroke or colorectal or colon or breast or cervical or human papillomavirus or HPV or diet or exercise or "physical activity" or overweight or obese or obesity or metabolic or hypertension or "blood pressure" or lung or tobacco or smoke* or smoking).ti,ab.

22 or/13-21

23 12 and 22

24 ("united states" or "u.s." or alabama or AL or alaska or AK or arizona or AZ or arkansas or AR or california or CA or Colorado or CO or Connecticut or CT or delaware or DE or florida or FL or georgia or GA or hawaii or HI or Idaho or ID or Illinois or IL or indiana or iowa or IA or Kansas or KS or kentucky or KY or Louisiana or LA).ti,ab,in.

25 (maine or ME or maryland or MD or Massachusetts or MA or michigan or MI or Minnesota or MN or mississippi or MS or missouri or MO or montana or MT or nebraska or NE or Nevada or NV or "new hampshire" or NH or "new jersey" or NJ or "new mexico" or NM or "new york" or NY or "north carolina" or NC or "north dakota" or ND).ti,ab,in.

26 (ohio or OH or oklahoma or OK or oregon or pennsylvania or PA or "rhode island" or RI or "south carolina" or SC or "south dakota" or SD or tennesee or TN or texas or TX or Utah or UT or vermont or VT or Virginia or VA or Washington or WA or "west virginia" or WV or wisconsin or WI or Wyoming or WY).ti,ab,in.

27 23 and (24 or 25 or 26)

28 limit 27 to english language

29 limit 28 to yr="1996 -Current"

Database: EBSCO SocINDEX to July 5, 2019

1 SU health disparities

2 SU socioeconomic factors

3 DE "RACE" OR DE "BLACK race" OR DE "CRIME & race" OR DE "DANCE & race" OR DE "ETHNOCENTRISM" OR DE "HEALTH & race" OR DE "MORTALITY & race" OR DE "MUSIC & race" OR DE "OCCUPATIONS & race" OR DE "PERSONAL beauty & race" OR DE "RACE & social status" OR DE "RACIAL classification" OR DE "RACIAL minorities" OR DE "RACIALIZATION"

4 DE "ETHNICITY" OR DE "CHEROKEE (North American people) -- Ethnic identity" OR OR DE "ETHNIC identity of African American women" OR DE "ETHNIC identity of Africans" OR DE "ETHNIC identity of Amerasians" OR DE "ETHNIC identity of Arab Americans" OR DE "ETHNIC identity of Arabs" OR DE "ETHNIC identity of Armenian Americans" OR DE "ETHNIC identity of Asian Americans" OR DE "ETHNIC identity of Creoles" OR DE "ETHNIC identity of Cuban Americans" OR DE "ETHNIC identity of Dominican Americans" OR DE "ETHNIC identity of East Indian Americans" OR DE "ETHNICITY in children" OR DE "ETHNICITY in women" OR DE "HAWAIIANS -- Ethnic identity" OR DE "HISPANIC Americans -- Ethnic identity" OR DE "INDIGENOUS peoples -- Ethnic identity" OR DE "INDIGENOUS peoples of the Americas -- Ethnic identity" OR DE "LATIN Americans -- Ethnic identity" OR DE "MAORI (New Zealand people) -- Ethnic identity" OR DE "MAYAS -- Ethnic identity" OR DE "MEXICANS -- Ethnic identity" OR DE "MULTIGROUP Ethnic Identity Measure" OR DE "NATIVE Americans -- Ethnic identity" OR DE "NAVAJO (North American people) -- Ethnic identity" OR DE "PACIFIC Islanders -- Ethnic identity" OR DE "POLISH Americans -- Ethnic identity" OR DE "PUERTO Ricans -- Ethnic identity" OR DE "RACIAL identity of blacks" OR DE "RACIAL identity of racially mixed people"

5 DE "SEXUAL orientation" OR DE "ASEXUALITY (Human sexuality)" OR DE "BISEXUALITY" OR DE "GYNEPHILIA" OR DE "HETEROSEXUALITY" OR DE "HOMOSEXUALITY" OR DE "LESBIANISM" OR DE "PANSEXUALITY (Sexual orientation)"

6 DE "GENDER identity" OR DE "ANDROGYNOUS identity" OR DE "FEMININE identity" OR DE "GENDER identity & clothing" OR DE "GENDER identity in education" OR DE "GENDER identity in mass media" OR DE "INTERSEXUAL identity" OR DE "MASCULINE identity" OR DE "SEXUAL diversity" OR DE "TRANSGENDER identity" OR DE "TRANSGENDERISM" OR DE "TRANSSEXUALISM"

7 DE "LGBT people" OR DE "BEARS (Gay culture)" OR DE "CLOSETED LGBT people" OR DE "GAY people" OR DE "LESBIANS" OR DE "LGBT counselors" OR DE "LGBT fathers" OR DE "LGBT immigrants" OR DE "LGBT mothers" OR DE "LGBT people in the military" OR DE "LGBT people on television" OR DE "LGBT students" OR DE "LGBT teachers" OR DE "LGBT youth" OR DE "MASS media & LGBT people" OR DE "MINORITY LGBT people" OR DE "MUSLIM LGBT people" OR DE "RURAL LGBT people" OR DE "TRANSGENDER people" OR DE "WORKING class LGBT people"

8 AB prevent OR AB prevention OR AB preventive

9 S1 AND S8

10 S2 OR S3 OR S4 OR S5 OR S6 OR S7

11 S1 AND S10

12 S9 OR S11
13 S12 limiters - Date of Publication: 19960101-20181231

Appendix B. Included Studies List

1. Abood DA, Black DR, Coster DC. Loss-framed minimal intervention increases mammography use. Womens Health Issues. 2005 Nov-Dec;15(6):258-64. doi: 10.1016/j.whi.2005.07.005. PMID: 16325139.
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3. Ahmed NU, Haber G, Semenya KA, et al. Randomized controlled trial of mammography intervention in insured very low-income women. Cancer Epidemiol Biomarkers Prev. 2010 Jul;19(7):1790-8. doi: 10.1158/1055-9965.EPI-10-0141. PMID: 20587669.
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125. Wu TY, Lin C. Developing and evaluating an individually tailored intervention to increase mammography adherence among Chinese American women. Cancer Nurs. 2015 Jan-Feb;38(1):40-9. doi: 10.1097/NCC.0000000000000126. PMID: 24621965.

Appendix C. Excluded Studies List

1. Updated recommendations for client- and provider-oriented interventions to increase breast, cervical, and colorectal cancer screening. Am J Prev Med. 2012 Jul;43(1):92-6. doi: 10.1016/j.amepre.2012.04.008. PMID: 22704753. **Exclusion reason**: Systematic review used to identify primary studies
2. 2017 National Healthcare Quality and Disparities Report. Rockville, MD: Agency for Healthcare Research and Quality; 2018. http://www.ahrq.gov/research/findings/nhqrdr/nhqdr17/index.html. Accessed April 9 2019. **Exclusion reason:** Background information only
3. Aadahl M, von Huth Smith L, Toft U, et al. Does a population-based multifactorial lifestyle intervention increase social inequality in physical activity? The Inter99 study. Br J Sports Med. 2011 Mar;45(3):209-15. doi: 10.1136/bjsm.2009.064840. PMID: 19850570. **Exclusion reason:** Ineligible outcome
4. Aakhus L. Lifeline education program helps patients see the value of access care. Nephrol News Issues. 2009 Aug;23(9):24-6. PMID: 19753930. **Exclusion reason:** Ineligible publication type
5. Abbott LS. Evaluation of nursing interventions designed to impact knowledge, behaviors, and health outcomes for rural African-Americans: An integrative review. Public Health Nurs. 2015 Sep-Oct;32(5):408-20. doi: 10.1111/phn.12174. PMID: 25475990. **Exclusion reason**: Systematic review used to identify primary studies
6. Abbott LS. The effect of a culturally relevant cardiovascular health promotion program on rural African Americans. Dissertation abstracts international. 2017;78(1-B(E)):No Pagination Specified. **Exclusion reason:** Ineligible study design
7. Abdou CM, Fingerhut AW, Jackson JS, et al. Healthcare stereotype threat in older adults in the Health and Retirement Study. Am J Prev Med. 2016 Feb;50(2):191-8. doi: 10.1016/j.amepre.2015.07.034. PMID: 26497263. **Exclusion reason:** Ineligible comparison
8. Abdus S, Mistry KB, Selden TM. Racial and ethnic disparities in services and the Patient Protection and Affordable Care Act. Am J Public Health. 2015 Nov;105 Suppl 5:S668-75. doi: 10.2105/AJPH.2015.302892. PMID: 26447920. **Exclusion reason:** Ineligible study design
9. Abidoye O, Ferguson MK, Salgia R. Lung carcinoma in African Americans. Nature Clinical Practice Oncology. 2007 Feb;4(2):118-29. PMID: 17259932. **Exclusion reason:** Ineligible publication type
10. Abraido-Lanza AF, Chao MT, Gammon MD. Breast and cervical cancer screening among Latinas and non-Latina whites. Am J Public Health. 2004 Aug;94(8):1393-8. PMID: 15284049. **Exclusion reason:** Ineligible study design
11. Abraido-Lanza AF, Martins MC, Shelton RC, et al. Breast cancer screening among Dominican Latinas: A closer look at fatalism and other social and cultural factors. Health Educ Behav. 2015 Oct;42(5):633-41. doi: 10.1177/1090198115580975. PMID: 25869406. **Exclusion reason:** Ineligible study design
12. Abrams SE. The most effective prevention program. Public Health Nurs. 2005 May-Jun;22(3):187-8. PMID: 15982191. **Exclusion reason:** Ineligible publication type
13. Ackerson K, Gretebeck K. Factors influencing cancer screening practices of underserved women. J Am Acad Nurse Pract. 2007 Nov;19(11):591-601. PMID: 17970859. **Exclusion reason**: Systematic review used to identify primary studies

14. Ackerson K, Pohl J, Low LK. Personal influencing factors associated with pap smear testing and cervical cancer. Policy, Politics, & Nursing Practice. 2008 Feb;9(1):50-60. doi: 10.1177/1527154408318097. PMID: 18492942. **Exclusion reason**: Sample size <20

15. Ackerson LK, Viswanath K. Communication inequalities, social determinants, and intermittent smoking in the 2003 Health Information National Trends Survey. Prev Chronic Dis. 2009 Apr;6(2):A40. PMID: 19288983. **Exclusion reason:** Ineligible study design

16. Acton GJ, Carter PA. Health promotion research: addressing the needs of older adults and their caregivers. J Gerontol Nurs. 2006 Feb;32(2):5. PMID: 16502755. **Exclusion reason:** Ineligible publication type

17. Adams AK, Scott JR, Prince R, et al. Using community advisory boards to reduce environmental barriers to health in American Indian communities, Wisconsin, 2007-2012. Prev Chronic Dis. 2014 Sep 18;11:E160. doi: 10.5888/pcd11.140014. PMID: 25232747. **Exclusion reason:** Ineligible comparison

18. Adams CE, Chen M, Guo L, et al. Mindfulness predicts lower affective volatility among African Americans during smoking cessation. Psychol Addict Behav. 2014 Jun;28(2):580-5. doi: 10.1037/a0036512. PMID: 24955676. **Exclusion reason:** Ineligible outcome

19. Adams EK, Breen N, Joski PJ. Impact of the National Breast and Cervical Cancer Early Detection Program on mammography and Pap test utilization among white, Hispanic, and African American women: 1996-2000. Cancer. 2007 Jan 15;109(2 Suppl):348-58. PMID: 17136766. **Exclusion reason:** Ineligible study design

20. Adams EK, Chien L-N. Racial disparities in breast and cervical cancer: Can legislative action work? [References]. Cancer disparities: Causes and evidence-based solutions. New York, NY ; Atlanta, GA: Springer Publishing Co; American Cancer Society; US; US; 2012:253-74. **Exclusion reason:** Ineligible publication type

21. Adams EK, Kenney GM, Galactionova K. Preventive and reproductive health services for women: the role of California's family planning waiver. Am J Health Promot. 2013 Jan-Feb;27(3 Suppl):eS1-eS10. doi: 10.4278/ajhp.120113-QUAN-28. PMID: 23286651. **Exclusion reason:** Ineligible study design

22. Adams J, Mytton O, White M, et al. Why are some population interventions for diet and obesity more equitable and effective than others? The role of individual agency.[Erratum appears in PLoS Med. 2016 May;13(5):e1002045; PMID: 27218824]. PLoS Medicine / Public Library of Science. 2016 Apr;13(4):e1001990. doi: 10.1371/journal.pmed.1001990. PMID: 27046234. **Exclusion reason:** Ineligible publication type

23. Adams J, White M. Smoking cessation services may not reduce inequalities. J Epidemiol Community Health. 2004 Feb;58(2):158; author reply -9. PMID: 14729903. **Exclusion reason:** Ineligible publication type

24. Adams LB, Richmond J, Corbie-Smith G, et al. Medical mistrust and colorectal cancer screening among African Americans. J Community Health. 2017 Oct;42(5):1044-61. doi: 10.1007/s10900-017-0339-2. PMID: 28439739. **Exclusion reason**: Systematic review used to identify primary studies

25. Adams ML. The African American breast cancer outreach project: partnering with communities. Fam Community Health. 2007 Jan-Mar;30(1 Suppl):S85-94. PMID: 17159636. **Exclusion reason:** Ineligible outcome

26. Adams SA, Choi SK, Eberth JM, et al. Is availability of mammography services at Federally Qualified Health Centers associated with breast cancer mortality-to-incidence ratios? An ecological analysis. J Womens Health. 2015 Nov;24(11):916-23. doi: 10.1089/jwh.2014.5114. PMID: 26208105. **Exclusion reason:** Ineligible study design

27. Adams SA, Choi SK, Khang L, et al. Decreased cancer mortality-to-incidence ratios with increased accessibility of Federally Qualified Health Centers. J Community Health. 2015 Aug;40(4):633-41. doi: 10.1007/s10900-014-9978-8. PMID: 25634545. **Exclusion reason:** Ineligible study design

28. Adams SA, Hebert JR, Bolick-Aldrich S, et al. Breast cancer disparities in South Carolina: early detection, special programs, and descriptive epidemiology. J S C Med Assoc. 2006 Aug;102(7):231-9. PMID: 17319236. **Exclusion reason:** Ineligible publication type

29. Adams SA, Heiney SP, Brandt HM, et al. A comparison of a centralized versus de-centralized recruitment schema in two community-based participatory research studies for cancer prevention. J Community Health. 2015 Apr;40(2):251-9. doi: 10.1007/s10900-014-9924-9. PMID: 25086566. **Exclusion reason:** Ineligible intervention

30. Adams SA, Smith ER, Hardin J, et al. Racial differences in follow-up of abnormal mammography findings among economically disadvantaged women. Cancer. 2009 Dec;115(24):5788-97. doi: 10.1002/cncr.24633. PMID: 19859902. **Exclusion reason:** Ineligible population

31. Adams-Campbell LL, Makambi K, Mouton CP, et al. Colonoscopy utilization in the Black Women's Health Study. J Natl Med Assoc. 2010 Mar;102(3):237-42. doi: 10.1016/S0027-9684%2815%2930530-7. PMID: 20355353. **Exclusion reason:** Ineligible study design

32. Addison CC, Campbell Jenkins BW, Odom D, et al. Building collaborative health promotion partnerships: The Jackson Heart Study. Int J Environ Res Public Health. 2015 Dec 22;13(1):ijerph13010025. doi: 10.3390/ijerph13010025. PMID: 26703681. **Exclusion reason:** Ineligible publication type

33. Adebayo OW, Gonzalez-Guarda RM. Factors associated with HIV testing in youth in the United States: An integrative review. J Assoc Nurses AIDS Care. 2017 May - Jun;28(3):342-62. doi: 10.1016/j.jana.2016.11.006. PMID: 27993497. **Exclusion reason:** Ineligible outcome

34. Adedoyin ACA. A systematic review of evidence-based cancer education media interventions to improve cancer screening behaviors among African Americans in the United States. Dissertation abstracts international. 2014;75(6-A(E)):No Pagination Specified. **Exclusion reason:** Ineligible study design

35. Adepoju OE, Preston MA, Gonzales G. Health care disparities in the post-Affordable Care Act era. Am J Public Health. 2015 Nov;105 Suppl 5:S665-7. doi: 2015.302611. PMID: 25879149. **Exclusion reason:** Ineligible publication type

36. Adimora AA, Auerbach JD. Structural interventions for HIV prevention in the United States. J Acquir Immune Defic Syndr. 2010 Dec;55 Suppl 2:S132-5. doi: 10.1097/QAI.0b013e3181fbcb38. PMID: 21406983. **Exclusion reason:** Ineligible outcome

37. Aggarwal A. Socioeconomic disparities in obesity prevalence: Role of diet quality and diet cost. Dissertation abstracts international. 2012;72(10-B):5889. **Exclusion reason:** Ineligible publication type

38. Aggarwal A, Pandurangi A, Smith W. Disparities in breast and cervical cancer screening in women with mental illness: a systematic literature review. Am J Prev Med. 2013 Apr;44(4):392-8. doi: 10.1016/j.amepre.2012.12.006. PMID: 23498106. **Exclusion reason:** Ineligible population

39. Ahluwalia J, Richter K, Mayo M, et al. Quit for Life: A randomized trial of culturally sensitive materials for smoking cessation in African Americans. J Gen Intern Med. 1999;14(6). **Exclusion reason:** Ineligible publication type

40. Ahluwalia JS, Gibson CA, Kenney RE, et al. Smoking status as a vital sign. J Gen Intern Med. 1999 Jul;14(7):402-8. PMID: 10417597. **Exclusion reason:** Ineligible outcome

41. Ahluwalia JS, Harris KJ, Catley D, et al. Sustained-release bupropion for smoking cessation in African Americans: a randomized controlled trial. JAMA. 2002 Jul 24-31;288(4):468-74. PMID: 12132977. **Exclusion reason:** Ineligible setting

42. Ahluwalia JS, McNagny SE, Clark WS. Smoking cessation among inner-city African Americans using the nicotine transdermal patch. J Gen Intern Med. 1998 Jan;13(1):1-8. PMID: 9462488. **Exclusion reason:** Ineligible setting

43. Ahluwalia JS, Okuyemi K, Nollen N, et al. The effects of nicotine gum and counseling among African American light smokers: a 2 x 2 factorial design. Addiction. 2006 Jun;101(6):883-91. doi: 10.1111/j.1360-0443.2006.01461.x. PMID: 16696632. **Exclusion reason:** Ineligible setting

44. Ahmad F, Stewart DE, Cameron JI, et al. Rural physicians' perspectives on cervical and breast cancer screening: a gender-based analysis. J Womens Health Gend Based Med. 2001 Mar;10(2):201-8. PMID: 11268303. **Exclusion reason:** Ineligible study design

45. Ahmed NU, Fort JG, Elzey JD, et al. Empowering factors for regular mammography screening in under-served populations: pilot survey results in Tennessee. Ethn Dis. 2005;15(3):387-94. PMID: 16108297. **Exclusion reason:** Ineligible study design

46. Ahmed NU, Fort JG, Micah TH, et al. How the health care system can improve mammography-screening rates for underserved women: a closer look at the health care delivery system. J Ambul Care Manage. 2001 Jul;24(3):17-26. PMID: 11433552. **Exclusion reason:** Ineligible comparison

47. Ahmed NU, Pelletier V, Winter K, et al. Factors explaining racial/ethnic disparities in rates of physician recommendation for colorectal cancer screening. Am J Public Health. 2013 Jul;103(7):e91-e9. doi: 10.2105/AJPH.2012.301034. PMID: 23678899. **Exclusion reason:** Ineligible outcome

48. Ahmed SM, Size T, Crouse B, et al. Strong Rural Communities Initiative (SRCI) program: challenges in promoting healthier lifestyles. WMJ. 2011 Jun;110(3):119-26. PMID: 21748996. **Exclusion reason:** Ineligible intervention

49. Aitaoto N, Braun KL, Estrella J, et al. Design and results of a culturally tailored cancer outreach project by and for Micronesian women. Prev Chronic Dis. 2012;9:E82. PMID: 22480611. **Exclusion reason:** Ineligible comparison

50. Akers AY, Newmann SJ, Smith JS. Factors underlying disparities in cervical cancer incidence, screening, and treatment in the United States. Curr Probl Cancer. 2007 May-Jun;31(3):157-81. PMID: 17543946. **Exclusion reason:** Ineligible publication type

51. Akindana A, Ogunedo C. Managing type 2 diabetes in Black patients. Nurse Pract. 2015 Sep 13;40(9):20-7; quiz 7-8. doi: 10.1097/01.NPR.0000470354.00838.eb. PMID: 26259037. **Exclusion reason:** Ineligible population

52. Akinlotan M, Bolin JN, Helduser J, et al. Cervical cancer screening barriers and risk factor knowledge among uninsured women. J Community Health. 2017 Aug;42(4):770-8. doi: 10.1007/s10900-017-0316-9. PMID: 28155005. **Exclusion reason:** Background information only

53. Akinyemiju T, Wiener H, Pisu M. Cancer-related risk factors and incidence of major cancers by race, gender and region; analysis of the NIH-AARP diet and health study. BMC Cancer. 2017 Aug 30;17(1):597. doi: 10.1186/s12885-017-3557-1. PMID: 28854891. **Exclusion reason:** Ineligible outcome

54. Alatrash MH. Behaviors and views of three Arab American women subgroups regarding breast cancer screening: A comparative study. Dissertation abstracts international. 2016;77(3-B(E)):No Pagination Specified. **Exclusion reason:** Ineligible study design

55. Alberg AJ, Horner MJ, Daguise VG, et al. Lung and bronchus cancer disparities in South Carolina: epidemiology and strategies for prevention. J S C Med Assoc. 2006 Aug;102(7):183-91. PMID: 17319229. **Exclusion reason:** Ineligible publication type

56. Alberg AJ, Stashefsky Margalit R, Burke A, et al. The influence of offering free transdermal nicotine patches on quit rates in a local health department's smoking cessation program. Addict Behav. 2004 Dec;29(9):1763-78. PMID: 15530720. **Exclusion reason:** Ineligible population

57. Albrecht SS, Gordon-Larsen P. Ethnic differences in body mass index trajectories from adolescence to adulthood: a focus on Hispanic and Asian subgroups in the United States. PLoS ONE [Electronic Resource]. 2013;8(9):e72983. doi: 10.1371/journal.pone.0072983. PMID: 24039835. **Exclusion reason:** Ineligible outcome

58. Albright K, Krantz MJ, Backlund Jarquin P, et al. Health promotion text messaging preferences and acceptability among the medically underserved. Health Promotion Practice. 2015 Jul;16(4):523-32. doi: 10.1177/1524839914566850. PMID: 25586133. **Exclusion reason:** Ineligible outcome

59. Albright K, Richardson T, Kempe KL, et al. Toward a trustworthy voice: increasing the effectiveness of automated outreach calls to promote colorectal cancer screening among African Americans. Perm J. 2014 Spring;18(2):33-7. doi: 10.7812/tpp/13-139. PMID: 24867548. **Exclusion reason:** Ineligible outcome

60. Alcala HE, Albert SL, Roby DH, et al. Access to care and cardiovascular disease prevention: A cross-sectional study in 2 Latino communities. Medicine. 2015 Aug;94(34):e1441. doi: 10.1097/MD.0000000000001441. PMID: 26313803. **Exclusion reason:** Ineligible study design

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1850. Zimmerman RK, Tabbarah M, Trauth J, et al. Predictors of lower endoscopy use among patients at three inner-city neighborhood health centers. J Urban Health. 2006 Mar;83(2):221-30. PMID: 16736371. **Exclusion reason:** Ineligible study design

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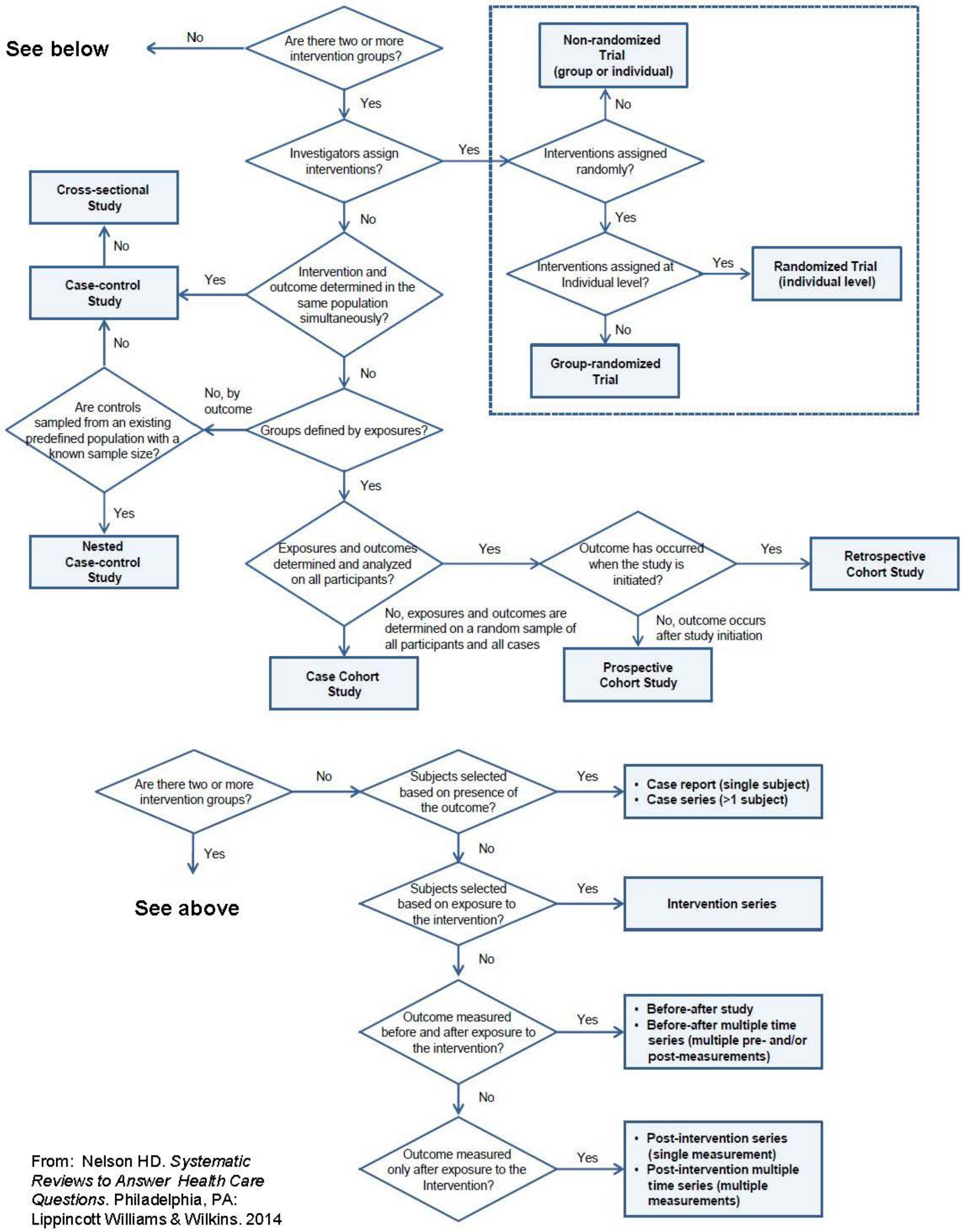
Appendix D. Study Design Algorithm

Figure D-1. Study design algorithm



From: Nelson HD. *Systematic Reviews to Answer Health Care Questions*. Philadelphia, PA: Lippincott Williams & Wilkins. 2014

Appendix E. Criteria for Assessing Quality and External Validity of Individual Studies

USPSTF Criteria for Assessing Quality

Randomized Controlled Trials and Cohort Studies*

Criteria:

- Initial assembly of comparable groups:
- For randomized controlled trials (RCTs): Adequate randomization, including first concealment and whether potential confounders were distributed equally among groups
- For cohort studies: Consideration of potential confounders, with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts
- Maintenance of comparable groups (includes attrition, cross-overs, adherence, contamination)
- Important differential loss to followup or overall high loss to followup
- Measurements: equal, reliable, and valid (includes masking of outcome assessment)
- Clear definition of interventions
- All important outcomes considered
- Analysis: adjustment for potential confounders for cohort studies or intention-to treat analysis for RCTs

Definition of ratings based on above criteria:
Good: Meets all criteria: Comparable groups are assembled initially and maintained throughout the study (followup ≥80%); reliable and valid measurement instruments are used and applied equally to all groups; interventions are spelled out clearly; all important outcomes are considered; and appropriate attention to confounders in analysis. In addition, intention-to-treat analysis is used for RCTs.
Fair: Studies are graded “fair” if any or all of the following problems occur, without the fatal flaws noted in the “poor” category below: Generally comparable groups are assembled initially, but some question remains whether some (although not major) differences occurred with followup; measurement instruments are acceptable (although not the best) and generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention-to-treat analysis is used for RCTs.
Poor: Studies are graded “poor” if any of the following fatal flaws exists: Groups assembled initially are not close to being comparable or maintained throughout the study; unreliable or invalid measurement instruments are used or not applied equally among groups (including not masking outcome assessment); and key confounders are given little or no attention. Intention-to-treat analysis is lacking for RCTs.

USPSTF Criteria for Assessing External Validity*

Each study that is identified as providing evidence to answer a key question is assessed according to its external validity (generalizability), using the following criteria.

Study population: The degree to which a study's subjects constitute a special population—either because they were selected from a larger eligible population or because they do not represent persons who are likely to seek or be candidates for the preventive service. The selection has the potential to affect the following:

- Absolute risk: The background rate of outcomes in the study could be greater or less than what might be expected in asymptomatic persons because of the inclusion/exclusion criteria, nonparticipation, or other reasons.
- Harms: The harms observed in the study could be greater or less than what might be expected in asymptomatic persons.

The following are features of the study population and the study design that may cause a participant's experience in the study to be different from what would be observed in the U.S. primary care population:

- Demographic characteristics (i.e., age, sex, ethnicity, education, income): The criteria for inclusion/exclusion or nonparticipation do not encompass the range of persons who are likely to be candidates for the preventive service in the U.S. primary care population.
- Comorbid conditions: The frequency of comorbid conditions in the study population does not represent the frequency likely to be encountered in persons who seek the preventive service in the U.S. primary care population.
- Special inclusion/exclusion criteria: There are other special inclusion/exclusion criteria that make the study population not representative of the U.S. primary care population.
- Refusal rate (i.e., ratio of included to not included but eligible participants): The refusal rate among eligible study subjects is high, making the study population not representative of the U.S. primary care population, even among eligible enrollees.
- Adherence (i.e., run-in phase, frequent contact to monitor adherence): The study design has features that may increase the effect of the intervention in the study more than would be expected in a clinically observed population.
- Stage or severity of disease: The selection of subjects for the study includes persons at a disease stage that is earlier or later than would be found in persons who are candidates for the preventive service.
- Recruitment: The sources for recruiting subjects for the study and/or the effort and intensity of recruitment may distort the characteristics of the study subjects in ways that could increase the effect of the intervention as it is observed in the study.

Study setting: The degree to which the clinical experience in the setting in which the study was conducted is likely to be reproduced in other settings:

- Health care system: The clinical experience in the system in which the study was conducted is not likely to be the same as that experienced in other systems (e.g., the system provides essential services for free when these services are only available at a high cost in other systems).

- Country: The clinical experience in the country in which the study was conducted is not likely to be the same as that in the United States (e.g., services available in the United States are not widely available in the other country or vice versa).
- Selection of participating centers: The clinical experience in which the study was conducted is not likely to be the same as in offices/hospitals/settings where the service is delivered to the U.S. primary care population (e.g., the center provides ancillary services that are not generally available).
- Time, effort, and system cost for the intervention: The time, effort, and cost to develop the service in the study is more than would be available outside the study setting.

Study providers: The degree to which the providers in the study have the skills and expertise likely to be available in general settings:

- Training to implement the intervention: Providers in the study are given special training not likely to be available or required in U.S. primary care settings.
- Expertise or skill to implement the intervention: Providers in the study have expertise and/or skills at a higher level than would likely be encountered in typical settings.
- Ancillary providers: The study intervention relies on ancillary providers who are not likely to be available in typical settings.

Global Rating of External Validity (Generalizability; Applicability)

External validity is rated "good" if:

- The study differs minimally from the U.S. primary care population/setting/providers and only in ways that are unlikely to affect the outcome; it is highly probable (>90%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

External validity is rated "fair" if:

- The study differs from the U.S. primary care population/setting/providers in a few ways that have the potential to affect the outcome in a clinically important way; it is moderately probable (50% to 89%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

External validity is rated "poor" if:

- The study differs from the U.S. primary care population/setting/providers in many ways that have a high likelihood of affecting the clinical outcome; probability is low (<50%) that the clinical experience with the intervention observed in the study will be attained in the U.S. primary care setting.

*Reference: U.S. Preventive Services Task Force Procedure Manual. December 2018. Accessed at https://www.uspreventiveservicestaskforce.org/Page/Name/methods-and-processes

Appendix F. Evidence Tables

Table F-1. Key Question 2 study characteristics

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Ahluwalia et al., 2002	Tobacco smoking cessation	African Americans	Secondary data analysis of a physician counseling intervention study for smoking cessation to examine the effect of having a regular source of healthcare on smoking behaviors (879)	Intervention vs. Control Mean age (SD): 44.1 ±13.2 vs. 43.2 ±12.5 Male: 47% vs. 53% Race/ethnicity: African American: 100%	Large inner-city hospital; geographic location not reported	Secondary data analysis of a physician counseling intervention study for smoking cessation to examine the effect of having a regular source of healthcare on smoking behaviors	Having regular source of healthcare (202) vs. not having usual source of care (677)	Cross sectional analysis at posttest time point
Bacio et al., 2014	Tobacco smoking cessation	African American	Secondary data analysis of baseline data for an RCT before participants were randomized to smoking cessation medication. Eligible participants were non-treatment seeking daily smokers (smoked ≥10 cigarettes per day) who were also heavy drinkers (≥14 drinks/week for men; ≥7 for women). (314)	Mean age: 36.29 (SD 10.7) Female: 31% Race/ethnicity: African American: 155 White: 159	Community sample; geographic location not reported	Mediation OLS and logistic regression analyses to identify potential smoking motive (WISDM scale) mediators in racial and ethnic differences in smoking patterns	Mediation analyses testing whether smoking motives as measured by WISDM subscales explain higher rates of failed quit attempts reported by Black (155) compared to White (159) regular smokers.	Mediation analysis of larger RCT

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Beach et al., 2007	Breast, cervical, colorectal cancer screening	Spanish-speaking women	RCT (1,346) subgroup analysis of Dietrich, 2006	Age: NR Female: 100% Race Latina: 71.2% Non-Latina Black: 19.7% Other: 9.1% Language Spanish-speaking: 63% English-speaking: 37%	11 Federally Qualified Community/Migrant Health Centers New York City, NY	Prevention care management intervention using a care manager who made reminder calls to women overdue for targeted screenings, helped overcome screening barriers, provided emotional support, and scheduled appointments (breast cancer n=670; cervical cancer n=491; colorectal cancer n=528)	Usual care (breast cancer n=677; cervical cancer n=476; colorectal cancer n=542)	Duration: 18 months Followup: 18 months (end of intervention)

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Bock et al., 2005	Tobacco smoking cessation	Latinos	Before-after study (615)	Age, mean ± SD: 39 ± 11.5 Female: 68% Race/ethnicity Non-Latino White: 67.8% Latino: 32.2% -More acculturated: 12.4% -Less acculturated: 19.8% Acculturation measured by language fluency	3 Urban hospital-based primary care clinics; New England	Brief smoking cessation intervention using '5 A's' model. Participants who decided to quit received 2 followup counseling calls, free NRT patch, behavioral skills training, a self-help manual, community resource guide, and additional followup calls; others received two followup counseling calls. Analyses included binary logistic regression for primary smoking outcomes and moderator analysis following the Baron and Kenny model for testing acculturation as a moderator between cognitive and psychosocial variables and smoking cessation outcomes (615)	Pre-post (615) Comparisons between racial/ethnic groups	Duration: 6-months Followup: 3 and 6 months post-baseline
Clark et al., 2009	Breast cancer screening	African American women	Before-after study (437)	Mean age: 51 (SD 8.5) Female: 100% African American: 100%	Community health centers and primary care clinics; Boston, MA	Multipronged case management intervention provided tailored services designed to address barriers to screening	Women as own comparators over time: changes in screening uptake after the intervention (437)	5 years (January 2002-February 2007)

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Clark et al., 2011	Cervical cancer screening	African American women	Before-after study (732)	Mean age NR Age 18 to 49: 78% Age ≥50 22% Female: 100% African American: 100%	Community health centers and primary care clinics; Boston MA	Multipronged case management intervention provided tailored services designed to address barriers to screening	Women as own comparators over time: changes in screening uptake after the intervention (732)	5 years (January 2002-February 2007)
Fang et al., 2017	Cervical cancer screening	Korean American women	2-arm group randomized RCT. Mixed-methods logistic regression analyses at 12-months after the program to examine patient-level effects for factors that were not balanced in the randomization. (705)	Mean age±SD control: 53.9±11.6 intervention: 51.9±9.5 Female: 100% Korean American: 100%	Churches (community setting); Southeastern PA and NJ	Multicomponent program that includes navigation services and bilingual community health educators to address individual beliefs and expectations on cervical cancer screening including perceived risks, perceived benefits, perceived barriers, and cultural norms. (347)	Information-only control group: bilingual community health educators deliver general information on health, cancer education, screening guidelines (358)	Duration: February 2009 to December 2014 Followup: 12 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Guillaume et al., 2017a	Breast cancer screening	Rural and/or Low-Income Women	Longitudinal cohort study (64,102)	Mean age NR ≤54: 42.22% 55 to 59: 17.52% 60 to 64: 13.21% 65 to 69: 13.51% 70+: 13.54% Female: 100%	Orne, France	Assess the efficacy of mobile mammography in reducing social and geographic inequalities in breast cancer screening using multilevel mixed logistic models with random effects. Estimated the following: the screening participation rate according to deprivation and remoteness in both groups and in the total population; differences observed in the only RO group (reflecting screening without MM); and those observed in the total population (reflecting access to MM among specific populations).	Two groups: women invited to screening through their radiologist office (RO group) (35,804) and women invited to screening though their radiologist office or the mobile mammography van (MM or RO group) (28,298)	September 2003 to December 2012

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Hendren et al., 2014	Colorectal and breast cancer screening	Low-income	RCT (366) CRC screening: 240 Mammography: 191	Control vs. Intervention <u>CRC Screening</u> Age 50 to 59: 61.1% vs. 62.3% 60+: 38.9% 37.7% Race Black: 36.3% vs. 43.0% White: 54.9% vs. 52.0% Other: 8.8% vs. 5.0% Female: NR <u>Mammography</u> Age 40 to 49: 45.6% vs. 59.4% 50 to 59: 23.3% vs. 25.7% 60+: 31.1% vs. 14.9% Race Black: 45.8% vs. 41.1% White: 47.0% vs. 47.8% Other: 7.2% vs. 11.1% Female: NR	Large safety net primary care practice; Rochester NY	Using EHR record review patients past due for CRC screening and/or mammography were randomized to a multi-modal intervention including: 1) letters; 2) automated telephone calls; 3) point-of-care prompts reminding clinicians and patients the patient was past due for the service; 4) mailing of home test kit for CRC screening patients (185) Type of CRC screening: colonoscopy, FIT, FOBT	Control group (181)	Duration: 6 months Followup: 1 year

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Jandorf et al., 2014	Breast and cervical cancer screening	Latinas	Cluster randomized study (1,333) Univariate and multivariate analyses of adherence to screening (CBE, mammography, Pap). Multivariate generalized linear-mixed model controlling for demographic, geographic, barriers to screening (yes/no), and navigation characteristics (e.g., number of calls).	Mean age NR Female: 100% Latina: 100%	Community-based settings in Arkansas, Buffalo, and NYC	Faith-based intervention using of peer/lay health workers (LHA, promotoras) (803)	Diabetes prevention education group vs. breast and cervical cancer education group (530)	Duration: 2007 to 2009 Followup: 2 months, 8 months
Lee-Lin et al., 2015	Breast cancer screening	Low-income Chinese-American immigrant women	RCT (300)	Mean age: 58.8 (range 40 to 85) Female: 100% Chinese immigrant: 100%	Chinese communities in Portland, OR	The two-part culturally-targeted educational intervention consisted of group teaching with targeted, theory-based messages followed by individual counseling sessions (147)	Control received a mammography screening brochure published by the National Cancer Institute (153)	Duration: April 2010 to September 2011 Followup: 3, 6, 12 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Miller, Jr. et al., 2011	Colorectal cancer screening	Socioeconomically disadvantaged population	RCT (264)	Age, mean: 57.8 Female: 67.0% African American: 73.1	Community-based, university-affiliated internal medicine practice in Winston-Salem, North Carolina	A. Communicating Health Options through Interactive Computer Education (CHOICE) interactive, web-based decision aid delivered immediately before a healthcare provider visit. Subanalysis of patients with limited health literacy and adequate health literacy (132)	B. Control group receiving web-based program about prescription drug refills and safety delivered immediately before a healthcare provider visit (132)	Duration, median: 10.1 minutes (IQR, 7.7 to 13. minutes) Followup: 24 weeks
Paskett et al., 2006	Breast cancer screening	Rural, low-income women	RCT (851)	Age, mean: 55.08 years (95% CI, 54.33 to 55.83) Female: 100% Race African American: 33% Native American: 42% White: 25%	Federally funded consortium of four community health centers Robeson County, North Carolina	A. Lay health advisor intervention consisting of 3 in-person visits with educational materials and followup phone calls/mailings after each visit (433)	B. Control group receiving National Cancer Institute brochure about cervical cancer screening (418)	Duration: 9 to 12 months Followup: 12 to 14 months
Roetzheim et al., 2004	Breast, cervical, colorectal cancer screening	Insurance status	Cluster RCT (1,196) 8 Practices	Age 50 to 56: 37.1% 57 to 63: 33% 64 to 75: 29.8% Female: 78.2% Race AA/Black: 29.1% White: 48.4% Hispanic: 22.5%	8 clinics; Hillsborough County FL	Cancer screening checklist completed by patients, stickers to designate whether screening was ordered/completed. (600) Type of CRC screening: FOBT	Usual care (596)	12 months and 24 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Intervention (n) /Analyses	Comparison (n)	Duration; Followup
Smith et al., 2017 (Blumenthal et al., 2010)	Colorectal cancer screening	African American	Secondary analysis of participants who did not receive screening in a RCT (257)	Mean age: NR Gender: NR Race/ethnicity: African American: 100%	Community (no details provided in this publication)	Randomized to one of the following: 1. Reduced out of pocket cohort: members reimbursed for personal expenses incurred in screening (63) 2. One-on-one education cohort: members met with health educator in 3 weekly sessions (67) 3. Group education cohort: members met with health educator in four weekly sessions (65) Type of CRC Screening: any type of CRC screening	B) Control cohort: members received no intervention (62)	Duration: 6 months Followup at 3 and 6 months; losses not reported
Studts et al., 2012	Cervical cancer screening	Rural, low income	Single-blind (data collectors and investigators) RCT (345)	Age: mean not reported; 40% <50 years Female: 100% Race/ethnicity: White: 95.1% Black: 4.6% American Indian: 0.3%	Recruitment: Churches initially then replaced with snowball sampling in which staff personally contacted church representatives Intervention: In-home Geographic region: Appalachian KY: Harlan, Knott, Letcher, and Perry counties	Trained lay health advisors (LHA) similar in characteristics to participants delivered tailored home visits and newsletters that addressed participant-identified barriers from baseline assessment (176) All participants attended an educational lunch program that delivered information on cervical cancer screening and prevention	Wait list (deferred) until post followup at 8 months; between 8-month followup and end of study all participants received intervention (169)	Duration: 14 months Followup: 4, 8, 14 months; 96% followup overall (95% in treatment, 97% in intervention)

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Intervention (n) /Analyses**	**Comparison (n)**	**Duration; Followup**
Wang et al., 2018	Breast cancer screening	Rural women	Retrospective chart review (8,347)	Age 50-64: 68.2% >64: 31.8% Female: 100% Race Non-Hispanic White: 83.9% Non-Hispanic Black: 0.3% Hispanic: 4.3% Other: 11.5%	8 rural ACO primary care clinics Nebraska	Generalized estimating equations model and multi-level logistic regression models assessing receipt of mammogram (5,054)	Patients not receiving bi-annual mammogram (3,293)	Duration: NA Followup: NA
White et al., 2012	Cervical and breast cancer screening	Latina immigrants	Before-after study (782) Pap smear: 782 Mammogram: 229	Age Median: 33 years 19-39 years: 70.7% 40-49 years: 19.4% 50-88 years: 9.9%	Public hospital, private non-profit hospital, local health department, community health clinic. Birmingham, AL	Low-cost pap smears, no-cost mammograms offered to attendees at educational luncheons	Pre-post (782)	6 years (2003-2009)

Abbreviations: ACO = accountable care organization; AOR = adjusted odds ratio; CBE = clinical breast exam; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; CRC = colorectal cancer; FIT = fecal immunochemical test; FOBT = fecal occult blood test; GED = general equivalency diploma; IQR = interquartile range; ITT = intention to treat; LHA = lay health advisor MM = mobile mammography; NR = not reported; NRT = nicotine replacement therapy; NS = not significant; OLS = ordinary least squares; OR = odds ratio; RCT = randomized controlled trial; RO = radiologist office; RR = relative risk; SD = standard deviation; WISDM = Wisconsin Index of Smoking Dependence Motive

Table F-2. Key Question 2 results

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Ahluwalia et al., 2002	Multivariate analysis of the effect of regular source of healthcare on smoking related behavior adjusted for history of diabetes, hypertension, age group, gender, and experimental group, AOR (95% CI): Quit attempts in the past year: 0.98 (95% CI, 0.69 to 1.41), p=0.94 Intent to quit in the next 6 months: 0.90 (95% CI, 0.61 to 1.32), p=0.59 Intent to quit in the next 30 days: 1.46 (95% CI, 1.04 to 2.05), p=0.03 Ever receiving physician advice to quit: 1.46 (95% CI, 1.02 to 2.10), p=0.04 Light smoking (≤10 cig/day): 1.42 (95% CI, 1.00 to 2.03), p=0.05	NA	Fair 1. Exclusive population of African-American smokers in one geographically confined community setting
Bacio et al., 2014	Race had a significant indirect effect on failed quit attempts through following motives: Negative reinforcement (indirect effect b=0.05, SE 0.02; 95% CI, 0.02 to 0.11) Positive reinforcement (indirect effect b=0.05, SE 0.02; 95% CI, 0.17 to 0.12) Taste/sensory processes (indirect effect b=0.06, SE 0.3; 95% CI, 0.02 to 0.12) Behavioral choice and craving were not significant mediators of the relationship between race and failed quit attempts Specifically, Black, compared to White, daily smokers were less motivated to smoke to experience the positive reinforcement, negative reinforcement, and taste/sensory processes related to smoking. However, endorsing lower motivation to smoke did not appear to be sufficient to help Black daily smokers successfully quit smoking Results suggest that smoking cessation interventions may help reduce tobacco-related health disparities by recognizing that lower endorsement of some smoking motives are less consistently linked to quit attempts in Black, compared to White, smokers	NA	Fair 1. Exclusive population consisting of a community sample of non-treatment seeking daily smokers who drank heavily and responded to an ad.

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Beach et al., 2007	Intervention vs. usual care Breast cancer screening up-to-date at followup Spanish-speaking: 72% (310/431) vs. 58% (243/417), AOR 1.86 (95% CI, 1.39 to 2.50), p<0.001 English-speaking: 60% (144/239) vs. 56% (144/259), AOR 1.23 (95% CI, 0.85 to 1.78), p=NR Interaction, Spanish language/study group: AOR 1.51 (95% CI, 0.94 to 2.42), p=NR Cervical cancer screening up-to-date at followup Spanish-speaking: 76% (237/310) vs. 60% (173/289), AOR 2.18 (95% CI, 1.52 to 3.13), p<0.001 English-speaking: 59% (106/181) vs. 53% (100/187), AOR 1.25 (95% CI, 0.81 to 1.91), p=NR Interaction, Spanish language/study group: AOR 1.75 (95% CI, 1.00 to 3.06), p=NR Colorectal cancer screening up-to-date at followup Spanish-speaking: 54% (184/338) vs. 37% (126/338), AOR 2.12 (95% CI, 1.54 to 2.90), p<0.001 English-speaking: 50% (95/190) vs. 39% (79/204), AOR 1.62 (95% CI, 1.08 to 2.45), p=NR Interaction, Spanish language/study group: AOR 1.31 (95% CI, 0.78 to 2.19) Up-to-date ≥ 1 screening test at followup Spanish-speaking: 87% (215/246) vs. 76% (182/241), OR 2.28 (95% CI, 1.38 to 3.77), p<0.01 English-speaking: 80% (117/146) vs. 77% (111/144), OR 1.32 (95% CI, 0.73 to 2.40), p=NR Interaction, language/study group: AOR 1.73 (95% CI, 0.79 to 3.77), p=NR Up-to-date ≥2 screening tests at followup Spanish-speaking: 74% (181/246) vs. 54% (129/241), AOR 2.44 (95% CI, 1.65 to 3.63), p<0.001 English-speaking: 56% (82/146) vs. 46% (66/144), AOR 1.57 (0.97 to 2.54), p=NR Interaction, language/study group: AOR 1.56 (95% CI, 0.84 to 2.90), p=NR Up-to-date on all tests at followup Spanish-speaking: 40% (98/246) vs. 25% (61/241), AOR 1.98 (95% CI, 1.33 to 2.95), p<0.001 English-speaking: 29% (42/146) vs. 19% (27/144), AOR 1.89 (95% CI, 1.08 to 3.33), p<0.05 Interaction, language/study group: AOR 1.05 (95% CI, 0.53 to 2.09)	Fair 1. Unclear whether clinicians were masked. 2. Subjects not blinded	Fair 1. Population: Multi-site study, but in a single state w/similar population 2. Intervention: Specific training/resources required.

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Bock et al., 2005	7-day point-prevalence abstinence <u>At 3 months</u> Non-Latino White: 23.5% (98/417) Latino, more acculturated: 19.7% (15/76) Latino, less acculturated: 33.6% (41/122) <u>At 6 months</u> Non-Latino White: 12.9% (54/417) Latino, more acculturated: 9.2% (7/76) Latino, less acculturated: 21.3% (26/122) Moderator analysis of acculturation and 6-month cessation <u>Step 1, logistic regression</u> Non-Latino White: Reference Latino, more acculturated: OR 0.82 (95% CI, 0.37 to 1.79) Latino, less acculturated: OR 2.15 (95% CI, 1.74 to 5.02) <u>Step 2, identifying variables predictive of cessation</u> Nicotine dependence (p<0.01), confidence in ability to quit (p<0.01), and endorsement of the cons of smoking (p<0.05) were significantly predictive of cessation <u>Step 3, interaction of terms using predictive variables and acculturation</u> Acculturation interaction term with confidence and nicotine dependence (p<0.001 for both) significantly predictive of cessation Difference in confidence scores between those who quit at 6 months vs. those who did not: Non-Latino White: 0.57, p=0.05 compared with other 2 groups Latino, more acculturated: 0.12 Latino, less acculturated: 0.19 Difference in nicotine dependences scores between those who quit at 6 months vs. those who did not: Non-Latino White: -0.56 Latino, more acculturated: -1.11, p=0.05 compared with other 2 groups Latino, less acculturated: -0.59 A final logistic regression was conducted that included these three interaction terms. Results indicated that the acculturation interaction term with confidence (p<0.01) and nicotine dependence (p<0.01) were significantly predictive of cessation, suggesting that acculturation moderates the relationship between smoking cessation and both confidence and nicotine dependence.	NA	Fair 1. Intervention is replicable, but results may only reflect the specific population 2. Relatively small sample size in one group

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Clark et al., 2009	Patient related predictors of mammography uptake among women age 40+ for women who had at least one mammogram Women ≥ 40 (n=437) No regular provider: AOR 0.20 (95% CI, 0.07 to 0.62), p<0.05 Housing concerns at baseline: AOR 0.40 (95% CI, 0.21 to 0.77), p<0.05 Having public insurance (Medicare/Medicaid): AOR 0.98 (95% CI, 0.45 to 2.12), NS Uninsured relative to being privately insured: AOR 2.08 (95% CI, 0.73 to 5.91), NS Women ≥ 50 (n=223) Housing concerns at baseline: AOR 0.65 (95% CI, 0.21 to 2.03), NS Having public insurance (Medicare/Medicaid): AOR 1.34 (95% CI, 0.39 to 4.61), NS Uninsured relative to being privately insured: AOR 2.25 (95% CI, 0.47 to 10.77), NS Patient related predictors of repeated (longitudinal) mammography screening among women Women ≥ 40 (n=390) Public insurance: AOR 0.72 (95% CI, 0.50 to 1.05), NS Housing concerns at baseline: AOR 0.85 (95% CI, 0.61 to 1.18), NS Uninsured: AOR 0.54 (95% CI, 0.35 to 0.85), p<0.05 Family history of breast cancer: AOR 0.64 (95% CI, 0.44 to 0.94), p<0.05 Recent mammogram at baseline: AOR 2.16 (95% CI, 1.51 to 3.09), p<0.05 Non-U.S. born: AOR 1.68 (95% CI, 1.15 to 2.47), p<0.05 Women ≥ 50 (n=196) Public insurance: AOR 0.85 (95% CI, 0.47 to 1.54), NS Housing concerns at baseline: AOR 0.86 (95% CI, 0.51 to 1.45), NS Uninsured: AOR 0.42 (95% CI, 0.20 to 0.87), p<0.05 Family history of breast cancer: AOR 0.74 (95% CI, 0.42 to 1.32), NS Recent mammogram at baseline: AOR 1.94 (95% CI, 1.07 to 3.52), p<0.05 Non-U.S. born: AOR 2.41 (95% CI, 1.29 to 4.49), p<0.05	NA	Fair 1. Used request for proposal process to identify intervention sites (large community health centers servicing large numbers of women of African descent).

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Clark et al., 2011	Barriers defined by the study included social and healthcare system barriers: insurance coverage, lacking a regular provider, concerns communicating with provider, poor self-rated health, educational attainment, housing concerns, and social support for childcare. Barriers to receiving Pap smear screening Lacking a regular clinical provider: AOR 0.20 (95% CI, 0.11 to 0.37) Concerns communicating with clinical providers: AOR 0.45 (95% CI, 0.27 to 0.74) Poor self-rated health: AOR 0.71 (95% CI, 0.52 to 0.96) Low educational attainment-less than high school: AOR 0.54 (95% CI, 0.30 to 0.99) Low educational attainment-high school/GED: AOR 0.50 (95% CI, 0.28 to 0.88) Impact of case management on obtaining repeated, longitudinal Pap smear screenings at recommended intervals Having social support for childcare: All participants due for screening: AOR 1.94 (95% CI, 1.28 to 2.93), $p<0.05$ Did not have a Pap smear at baseline: AOR 3.52 (95% CI, 1.28 to 9.69), $p<0.05$ Did have a Pap smear at baseline: AOR 1.57 (95% CI, 0.98 to 2.5), $p<0.06$ Insurance status-Public insurance (Medicare/Medicaid) All participants due for screening: AOR 0.65 (95% CI, 0.38 to 1.09) Did not have a Pap smear at baseline: AOR 1.11 (95% CI, 0.32 to 3.85) Did have a Pap smear at baseline: AOR 0.51 (95% CI, 0.27 to 0.97), $p<0.05$ No other barriers were statistically significant in models.	NA	Fair 1. Used request for proposal process to identify intervention sites (large community health centers servicing large numbers of women of African descent).

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Fang et al., 2017	Barriers identified in paper: language and access barriers, lack of insurance, lack of familiarity with the U.S. healthcare system Receipt of cervical cancer screening: Intervention: OR 25.9; 95% CI, 10.1 to 66.1, p<0.001 Receipt of cervical cancer screening, covariate adjusted model (age, marital status, prior pap receipt, insurance coverage, usual source of care): Intervention: AOR 35.8; 95% CI, 11.1 to 114.9, p<0.001 Being insured: AOR 0.440; 95% CI, 0.22 to 0.90; p=0.03 Having a regular physician: AOR 0.93; 95% CI, 0.46 to 1.86; p=0.85 Authors note that fewer intervention group participants were insured or had a usual source of care compared to controls. Unscreened women were asked to descriptively provide reasons for not obtaining screening Intervention group (81 women): Perception that they were healthy or had no health problems (72 women, 80.9%), no time or being too busy (42 women; 47.2%), lack of insurance (18 women; 20.2%), physician did not mention screening (1 woman), no transportation (1 woman), and forgetting (1 woman). Control (268 women): Healthy or had no problems (97; 36.2%), lack of insurance (70; 26.1%), not knowing where to go or how to obtain screening (20 women; 7.4%), lack of time (18 women; 6.7%), did not like the Pap test (3 women), forgetting to obtain screening (1 woman), being too shy to undergo screening (2 women), and not having a physician (1 woman)	Fair 1. Differences in groups at baseline	Fair 1. Exclusive population consisting of only Korean American women
Guillaume et al., 2017a	RO group Individual participation was associated with deprivation quintile Lowest in deprived areas: Q4, aOR 0.83 (95% CI, 0.71 to 0.96); Q5, aOR 0.81 (95% CI, 0.69 to 0.95) Individual participation was associated with distance to an RO: Participation decreasing with remoteness: 5 to 10km, aOR 0.91 (95% CI, 0.81 to 1.01); 10 to 15km, aOR 0.75 (95% CI, 0.66 to 0.85); 15 to 20km, aOR 0.61 (95% CI, 0.53 to 0.70); 20 to 25km, aOR 0.47 (95% CI, 0.40 to 0.56); 25 to 30km, aOR 0.47 (95% CI, 0.39 to 0.57); >30km, aOR 0.54 (95% CI, 0.42 to 0.69) MM or RO group Participation was not significantly associated with deprivation quintile or distance to an RO. Total population Influence of deprivation quintile and remoteness on participation was markedly lower than in the RO population. Influence of deprivation was significant only for the extreme most deprived quintile (Q5, AOR 0.85 [95% CI, 0.75 to 0.97]). After adjustment, MM invitation was associated with statistically significant increase in individual participation (aOR 2.9; 95% CI, 2.7 to 3.03).	Fair 1. Groups were not similar at baseline. 2. Unclear allocation concealment.	Fair 1. Geographic-level study of one regional area in France

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Hendren et al., 2014	Mammography Insurance Private: OR 1.50 (95% CI, 0.36 to 6.19) Medicare: OR 6.24 (95% CI, 1.23 to 31.61), $p<0.05$ Medicaid: OR 2.57 (95% CI, 0.57 to 11.59) None: reference Household income: >$40,000:OR 2.65 (95% CI, 0.84 to 8.43) $30,000 to $39,000: OR 1.44 (95% CI, 0.49 to 4.29) <$30,000: reference CRC screening Insurance Private: OR 1.58 (95% CI, 0.38 to 6.53) Medicare: OR 3.61 (95% CI, 0.83 to 15.55) Medicaid: OR 2.53 (95% CI, 0.57 to 11.21) None: reference Household income >$40,000: OR 1.88 (95% CI, 0.69 to 5.09) $30,000 to $39,000: OR 1.98 (95% CI, 0.83 to 4.76) <$30,000: reference	Fair 1. Care providers not masked, unclear if patients masked, attrition and loss to followup not reported	Good

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Jandorf et al., 2014	Barriers: lack of money and lack of time, although other demographic factors were considered. Only significant associations were reported in the paper, therefore it was not possible to report results of non-significant findings for the barriers of interest. Mammography adherence Baseline to 2-month assessment: OR 2.16; 95% CI, 1.69 to 2.76 Baseline to 8 months: OR 8.56; 95% CI, 5.85 to 12.53 2 months vs. 8 months: OR 3.97; 95% CI, 2.70 to 5.82 Residing in NYC vs, Western NY: OR 0.55; 95% CI, 0.37 to 0.80 No significant differences between living in AR and NYC or AR vs. WNY Puerto Rican ethnicity were marginally more likely to be adherent than those born in countries outside the USA or Puerto Rico. Having health insurance: OR 2.48 95% CI, 1.67 to 3.70 Pap adherent at baseline: OR 5.85; 95% CI, 4.24 to 8.06 Pap adherence Baseline to 2-month assessment: OR 2.14; 95% CI, 1.87 to 2.45 Baseline to 8 months: OR 2.35; 95% CI, 2.00 to 2.76 2 months vs. 8 months: OR 1.78; 95% CI, 1.52 to 2 Participants of Puerto Rican ethnicity vs. born elsewhere, adherent at 2 and 8 months: OR 1.35; 95% CI, 1.09 to 1.67 Significant time by program type interaction (Wald chi-square=6.10; p=0.0472). Baseline: no significant difference in adherence between groups 2-month assessment- women in cancer group were less likely to be adherent: OR 0.74; 95% CI, 0.59 to 0.94 8-month assessment- no adherence differences	Fair 1. Allocation concealment not reported. 2. Unclear whether groups were similar at baseline.	Fair 1. Exclusive population consisting of only Latinas
Lee-Lin et al., 2015	Barriers: older age, lower education and income, poor cancer knowledge, lack of time, absence of symptoms, lower perceived susceptibility to breast cancer, and limited ability to communicate in English Controlled for: marital status, age of participant, and age at migration to US When variables were controlled together, women in the intervention group were nine times more likely to complete a mammogram at 6 months post intervention, the highest point of the intervention effect 3-month: aOR 8.81, 95% CI, 4.83 to 16.05, p<0.001 6-month: aOR 9.10, 95% CI, 3.50 to 23.62, p<0.001 12-month aOR 4.61, 95% CI, 1.59 to 13.37, p<0.001 None of the included covariates were significant in the multivariable model. Overall, education, employment, income, English proficiency, having a regular healthcare provider, reporting healthcare provider recommendation, and having mammography insurance coverage were not significant predictors in this study.	Fair 1. Poor reporting re: allocation concealment, randomization 2. Unclear whether ITT was used or post randomization exclusions to synthesis.	Fair 1. Exclusive population consisting of only Chinese American immigrant women

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Miller, Jr. et al., 2011	Completed CRC screening A. 19% (25/132) B. 14% (18/132) AOR 1.7, 95% CI, 0.88 to 3., p=0.12 <u>Limited literacy vs. Adequate literacy</u> Completed CRC screening A. 21% (15/73) vs. 17% (10/59) B. 16% (12/74) vs. 10% (6/58) Limited literacy aOR 1.7 (95% CI, 0.69 to 4.4), p=NR Adequate literacy aOR 1.9, 95% CI, 0.70 to 5.0, p=NR Increased readiness for screening (only for participants in precontemplation and contemplation stages at baseline) A. 60% (24/40) vs. 42% (14/33) B. 24% (8/33) vs. 15% (4/27) Limited literacy aOR 4.9, 95% CI, 1.4 to 16.4, p≤0.01 Adequate literacy aOR 5.7, 95% CI, 1.1 to 30.2, p≤0.001	Fair 1. Randomization method not reported 2. Allocation concealment not reported	Fair 1. Patients recruited from a single clinic

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Paskett et al., 2006	A vs. B Completed mammography 42.5% (184/433) vs. 27.3% (114/418) RR 1.56 (95% CI, 1.29 to 1.87), p<0.001 By race African American: RR 1.54 (95% CI, 1.11 to 2.14), p=0.008 Native American: RR 1.58 (95% CI, 1.18 to 2.13), p=0.002 White: RR 1.54 (95% CI, 1.05 to 2.25), p=0.024 By baseline factors Composite barrier score (0 to 10), 1 unit increase: OR 0.93 (95% CI, 0.87 to 1.00) Composite belief score (0 to 10), 1 unit increase: OR 1.04 (95% CI, 0.98 to 1.10) Higher vs. lower socioeconomic status: RR 0.93 (95% CI, 0.73 to 1.19) White vs. African American: RR 0.99 (95% CI, 0.78 to 1.26) Native American vs. African American: RR 0.98 (95% CI, 0.79 to 1.21) Health insurance, No vs. Yes: RR 1.04 (95% CI, 0.85 to 1.27) Individual barriers Too hard to find time: RR 0.77 (95% CI, 0.59 to 1.02), p=NR Do not know where to get a mammogram: RR 0.44 (95% CI, 0.24 to 0.82), p=0.008 No insurance: RR 0.96 (95% CI, 0.83 to 1.10), p=NR Too hard to get to the doctor's office: RR 1.01 (95% CI, 0.71 to 1.45) Doctors and nurses do not treat me with respect: RR 0.43 (95% r0.11 to 1.65) Cost is a barrier: RR 0.83 (95% CI, 0.70 to 0.97), p=0.022	Fair 1. Unclear randomization technique and allocation 2. Unclear masking of patients	Poor 1. Population composition unique to setting 2. Potentially time-intensive intervention

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Roetzheim et al., 2004	Mammography <u>Health insurance</u> County: reference Medicare: OR 0.77 (95% CI, 0.57 to 1.06), p=0.11 Medicaid: OR 0.89 (95% CI, 0.64 to 1.26),p= 0.52 Other: OR 0.86 (95% CI, 0.57 to 1.31), p=0.48 Pap smear <u>Health insurance</u> County: reference Medicare: OR 0.63 (95% CI, 0.43 to 0.92), p=0.02 Medicaid: OR 0.73 (95% CI, 0.48 to 1.09),p= 0.12 Other: OR 1.04 (95% CI, 0.63 to 1.72), p=0.89 CRC/FOBT <u>Health insurance</u> County: reference Medicare: OR 0.73 (95% CI, 0.54 to 0.998), p=0.047 Medicaid: OR 0.83 (95% CI, 0.60 to 1.16), p=0.28 Other: OR 0.82 (95% CI, 0.54 to 1.23), p=0.34	Fair 1. No info about randomization/allocation	Fair 1. Population - NY vs. other states

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Smith et al., 2017 (Blumenthal et al., 2010)	Overall 64/257 (24.7%) screened A1: 14/63 (22.2%) A2: 17/67 (25.4%) A3: 22/65 (33.9%) B: 11/62 (17.7%) A3 vs. B, p=0.039; all other interventions did not significantly change screening vs. control Post-intervention among those in group A3, psychological and attitudinal testing for those who sought screening were compared with those who did not screen; mean scores on the Attitudes, Benefits, and Barriers Assessment approached significance (screened: mean score 19.0, SD 3.5 vs. not screened: mean score 16.0, SD 4.8; p=0.0816); in logistic regression model, this scale demonstrated statistical significance (p=0.0276); fatalism, perceived stress, and self-esteem scores were not associated with screening; social support and social network diversity were greater among those who screened vs. not screened, but this difference was not statistically significant Group: OR 1.168 (95% CI, 0.837 to 1.611), p=0.3437 Fatalism Scale: OR 1.168 (95% CI, 0.965 to 1.196), p=0.1883 Attitudes, Barriers, and Beliefs Scale: OR 1.121 (95% CI, 1.013 to 1.242), p=0.0276 Rosenberg Self-esteem Scale: OR 1.002 (95% CI, 0.925 to 1.087), p=0.9523 Social Support Scale: OR 1.004 (95% CI, 0.986 to 1.021), p=0.6718 Social Network Diversity Scale: OR 1.009 (95% CI, 0.814 to 1.249), p=0.9364 Note: Attitudes, Benefits, Barriers Assessment was constructed by research team to get perspective of participants on cancer screening. References 2-3 may have more information on how the scale is coded.	NA	Fair 1. Exclusive population consisting of only African American immigrant women

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Studts et al., 2012	Intervention vs. Control Pap at 4-month followup, n (%): 12 (6.8%) vs. 11 (6.5%) Pap at 8-month followup (primary outcome): 31 (18%) vs. 19 (11%); AOR1 2.56, 95% CI, 1.03 to 6.38, p=0.04; AOR2 2.73, 95% CI, 1.08 to 6.89, p=0.03 AOR1: adjusted for effect of church AOR2: adjusted for church and participant characteristics (age, marital status, perceived health status, baseline screening status) Excluding 23 participants who obtained Pap test between 4-and 8-months: 19 (11.6%) vs. 8 (5.1%); OR 2.59 (95% CI, 1.04 to 6.46), p=0.04 Pap at 14-month followup (including only women who were still need of a Pap: 20/145 (13.8%) vs. 40/158 (25.3%) Among controls, women obtaining Pap between baseline and 8-month followup vs. post-8-month followup and end of study increased from 8 (5.1%) to 40 (25.3%); McNemar's X2 21.3 (1 df, n=158), p<0.001 Factors associated with getting Pap Women age 55 to 59 years were less likely than those age 40-44 years to get a Pap; OR 0.41 (95% CI, 0.20 to 0.86) p<0.05 Women who had Pap smear >1 year and <5 years ago were more likely than those with Pap >5 years ago to get a Pap; OR 2.50 (95% CI, 1.47 to 4.25), p<0.001 No other factors were statistically significant including race, marital status, education, employment status, annual household income, perceived financial status, health insurance, perceived health status (all adjusted for treatment group and church)	Good	Fair 1. Limited to rural Appalachian women in Kentucky
Wang et al., 2018	Multivariate analysis of receipt of biennial mammogram, adjusting for patient, provider, and county characteristics Race/ethnicity Hispanic: OR 0.85 (95% CI, 0.56 to 1.28), p=0.79 Non-Hispanic Black: OR 0.32 (95% CI, 0.14 to 0.75), p<0.01 Other: OR 0.76 (95% CI, 0.61 to 0.94), p<0.01 Non-Hispanic White: Reference Preferred language is English: OR 1.02 (95% CI, 0.74 to 1.43), p=0.89 Health insurance status Uninsured: OR 0.22 (95% CI, 0.10 to 0.46), p<0.01 Public: OR 0.83 (95% CI, 0.69 to 1.00), p>0.05 Private: Reference County of residence has mammogram facility: OR 0.89 (95% CI, 0.66 to 1.20), p=0.43	NA	Fair 1. Healthcare system may not be applicable in other places 2. Population limited to Nebraska

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
White et al., 2012	Scheduled Pap smear: 80% Of those scheduling Pap (N=626), attended appointment: 65% Multivariable-adjusted prevalence ratio, % Scheduled a Pap Smear: Prior screening <1 year: 70%, 1.00 Prior screening in past 1 to 3 years: 87.5%, 1.18 (95% CI, 1.09 to 1.28), p<0.001 Prior screening ≥ 3 years ago or does not remember: 1.16 (95% CI, 1.05 to 1.28), p<0.01 No prior screening: 1.01 (95% CI, 0.88 to 1.17) Does not know where to get screening: 87.7%, 1.00 Does know where to get screening: 73.6%, 0.90 (95% CI, 0.83 to 0.96), p<0.01 Has not lived in Alabama ≥5 years: 82.9%, 1.00 Has lived in Alabama ≥5 years: 75.4%, 0.96 (95% CI, 0.89 to 1.03) Does not have health insurance: 82.2%, 1.00 Does have health insurance: 50.9%, 0.64 (95% CI, 0.50 to 0.84), p<0.01 Scheduled mammogram (analytic sample only includes women ≥40 years; n=229): 77.7% Of those scheduling mammogram (N=178), attended appointment: 79.2% Multivariable-adjusted prevalence ratio, % Scheduled a mammogram: Prior screening <1 year: 41%, 1.00 Prior screening in past 1 to 3 years: 88%, 2.09 (95% CI, 1.46 to 3.00), p<0.001 Prior screening ≥3 years ago or does not remember: 76%, 1.77 (95% CI, 1.17 to 2.67), p<0.01 No prior screening: 85.6%, 1.90 (95% CI, 1.31 to 2.76), p<0.01 Does not know where to get screening: 81.4%, 1.00 Knows where to get screening; 69.1%, 1.07 (95% CI, 0.92 to 1.24) Has not lived in Alabama ≥ 5 years: 25.5%, 1.00 Has lived in Alabama ≥ 5 years: 81.7%, 1.09 (95% CI, 0.96 to 1.24) Does not have health insurance: 81.8%, 1.00 Has health insurance: 35%, 0.45 (95% CI, 0.26 to 0.78), p<0.01	NA	Poor 1. Study population (demographics, inclusion / exclusion criteria) 2. Study setting (healthcare system, time, effort) 3. Study providers (training, ancillary providers)

Abbreviations: ACO = accountable care organization; AOR = adjusted odds ratio; CBE = clinical breast exam; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; CRC = colorectal cancer; FIT = fecal immunochemical test; FOBT = fecal occult blood test; GED = general equivalency diploma; IQR = interquartile range; ITT = intention to treat; LHA = lay health advisor; MM = mobile mammography; NR = not reported; NRT = nicotine replacement therapy; NS = not significant; OLS = ordinary least squares; OR = odds ratio; RCT = randomized controlled trial; RO = radiologist office; RR = relative risk; SD = standard deviation; WISDM = Wisconsin Index of Smoking Dependence Motive

Table F-3. Key Question 3 study characteristics

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age; Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Ahmed et al., 2010	Breast cancer screening	Low-income women	RCT (2,357)	Very low-income insured women Mean age, in years (SD) Control: 52.8 (9.8) Intervention, simple: 52.9 (9.9) Intervention, stepwise: 52.8 (9.8) Race/ethnicity, % (n) White Control: 32.8 (349) Intervention, simple: 33.7 (358) Intervention, stepwise: 33.5 (356) Black Control: 33.7 (340) Intervention, simple: 32.8 (331) Intervention, stepwise: 33.4 (337) Hispanic Control: 33.3 (97) Intervention, simple: 33.4 (96) Intervention, stepwise: 32.8 (94)	Tennessee Coordinated Care Network	A1. Simple intervention: reminder letters from managed care organization medical director (785) A2. Stepwise intervention: Reminder letters from managed care organization medical director, if noncompliant (meaning no mammography within 3 months), a second prompt letter from primary care doctor, and if still noncompliant, counseling from lay health workers (786)	B. Usual care, which included monthly newsletters, health pamphlets, and access to Community Health Outreach workers (786)	1999 to 2001 end of 1 year intervention period
Aragones et al., 2010	Colorectal Cancer Screening	Latino, Urban	RCT (65)	Mean age: 56.6 vs. 58.9 years Gender: 52% vs. 50% female Race/ethnicity: 100% Latino	New York City, large teaching hospital	A. Spanish language CRC educational video developed by national alliance for Hispanic health; brochure in Spanish with key information; patient-delivered one page reminder for the physician (31)	B. No educational material, brochure, or letter (34)	15 months; 3-month post-intervention follow up

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age; Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Bastani et al., 2015	Colorectal Cancer Screening	Unscreened first-degree relatives of people with colorectal cancer; Latino, African American, Asian, white	RCT (1,280)	Mean age: 51 years Gender: 56% female Race/ethnicity: 35% Latino, 27% Asian, 25% White, 19% African American	California Cancer Registry/ Community	A. Culturally-tailored printed educational materials sent 2 weeks after baseline, as well as barriers counseling via telephone at 6 months in those still unscreened (670)	B. No educational material or counseling (telephone followup only to ascertain use of screening) (610)	12 months
Christie et al., 2008	Colorectal Cancer Screening	Hispanic, African American	RCT (21)	Mean age: 58 years Gender: 75% female Race/ethnicity: 71% Hispanic, 21% African American, 8% other	Community Health Center; New York, New York	A. Patient navigator assigned to coordinate scheduling of colonoscopy and discuss risks and benefits (13)	B. No patient navigator (8)	6 months
Curry et al., 2003	Tobacco smoking cessation in adults	Low income women	RCT (303)	Mean age: 34.2 vs. 33.6 years Gender: 100% female Race/ethnicity: 62 vs. 63% African American; 33 v 32% European American; 2 vs. 5% Hispanic Annual household income <10k 67 vs. 64% Finished high school 74 vs. 76%	Urban, university based clinics, Seattle, WA	A. Brief motivational message from child's clinician during scheduled clinic visit, self help guide to quitting smoking, in-person motivational interview with clinic nurse or study interventionist; up to 3 outreach telephone counseling calls from nurse or interventionist (156)	B. No message, educational material, outreach or motivational interview (147)	3 and 12 month follow up surveys after initial enrollment
Lasser et al., 2011	Colorectal Cancer Screening	Low-income	RCT (465)	Mean age: 61 years Gender: 62% female Ethnicity: White 47%, Black 27%, other 18%, unknown 8%	Community Health Centers; Cambridge, Massachusetts	A. Patient navigator assigned to coordinate scheduling of colonoscopy and discuss risks and benefits (235)	B. Usual care (230)	12 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age; Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Margolis et al., 1998	Breast and Cervical Cancer Screening	Low-income women	Non-randomized controlled trial (1,693)	<u>Breast cancer screening</u> Age, mean ±SD A. 54.5 ± 11.2 B. 55.9 ± 12.0 Gender: 100% Female Race, %, A vs. B White: 61 vs. 64 African American: 20 vs. 17 Native American: 12 vs. 14 Other: 7 vs. 5 Insurance payer, %, A vs. B Private: 26 vs. 21 Medicaid: 46 vs. 46 Medicare: 20 vs. 27 Self: 8 vs. 5 <u>Cervical cancer screening</u> Age, mean ±SD A. 53.7 ± 11.6 B. 54.8 ± 13.4 Gender: 100% Female Race, %, A vs. B White: 63 vs. 65 African American: 18 vs. 15 Native American: 12 vs. 15 Other: 7 vs. 5 Insurance payer, %, A vs. B Private: 27 vs. 23 Medicaid: 47 vs. 47 Medicare: 19 vs. 25 Self: 8 vs. 6	Outpatient Primary Care Clinics; Minneapolis, Minnesota	A. Reminders from lay health aides of screenings due, with referral to a culturally sensitive Women's Cancer Screening Clinic (874)	B. No additional contact until followup (819)	12 months from latest screening due date (12 months for those due at baseline)

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age; Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Martin et al., 2006 and 2008	Obesity management	Low-income, African American women	RCT (137)	Mean age: 41.8±12.0 Mean baseline weight: 101.95±19.37kg 100% African American women	Outpatient Primary Care Clinics; Baton Rouge, Louisiana	A. Tailored weight loss intervention delivered by primary care provider including 5 physician counseled office visits on a monthly basis. Included information on weight loss, ways to decrease dietary fat, ways to increase physical activity, barriers to weight loss, healthy food alternatives when eating out or shopping. Total intervention time = 90 minutes (68)	B. Standard care: usual obesity management conducted during a typical office visit (69)	9 to 18 months
Schroy et al., 2012	Colorectal Cancer Screening	Low-income	RCT (825)	Mean age: <65 year 83% vs. 87% Gender: 58% vs. 61% female Ethnicity: 94% vs. 96% non-Hispanic Race: 61% vs. 59% Black; 35% vs. 36% White; 1% vs. 3% Asian Medicare/Medicaid/free care: 64% vs. 60%	Urban, ambulatory care settings, Boston MA	A1. Decision aid alone (269) A2. Decision aid + personalized risk assessment tool with feedback (280)	B. Usual care with modified online version of "9 ways to stay healthy" generic lifestyle changes other than screening for preventable diseases (276)	12 months
Siddiqui et al., 2011	Colorectal Cancer Screening	African Americans	RCT (1,430)	Mean age: NR (67% were younger than 60 years and 33% were aged 60 or older) Gender: 67% female Ethnicity: 100% African American	Academic primary care practice; Philadelphia, Pennsylvania	A1. Mailed educational intervention-screening invitation, informational booklet, stool blood test, and a reminder letter (362) A2. Mailed educational intervention plus 2 tailored messages addressing personal barriers to screening (349) A3. Mailed educational intervention, tailored messages, and a reminder call (358)	B. Usual care (361)	12 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age; Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Thompson et al., 2017	Cervical cancer screening	Latina, rural	RCT (443)	Mean age (SD) A1. 43.8 (10.4) A2. 43.2 (9.3) B. 44.6 (9.6)	FQHC in the Yakima area, WA- Yakima Valley Farm Workers Clinic (YVFWC)	A1. Low-intensity intervention: Spanish-language video that was sent to participants' homes, informed women of importance of cervical cancer screening (150) A2. High intensity intervention: promotora-led educational session at participants' homes as well as viewing the low-intensity video (146)	B. Usual-care (147): had access to information about cervical cancer and the importance of Pap testing via public health education and from health care provider at FQHC	September 2011 to April 2015; 7 months after randomization

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age; Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Wang et al., 2010	Cervical cancer screening	Low income Chinese-American women	Cohort (134)	Mean age (SD) A: 51.35 (14.82) B: 59.35 (12.72), p<0.01	Community-based organizations (CBO), New York, NY	A. 2 CBOs that offered cervical cancer education combined with patient navigation (80) Education - two education sessions designed to increase knowledge and enhance attitudes towards cervical-cancer screening; participated in an open discussion with a Chinese-speaking physician; received handouts on cervical cancer; watched a Chinese-language video on the subject; and received information about healthcare sites that provided free cervical-cancer screening Patient navigation assistance - arranging Pap test appointments, language translation, transportation assistance, paperwork for obtaining free or low-cost screening	B. 2 CBOs that acted as the control (54) - women received two education sessions on general health and cancer education, received written materials on general health and cancer screening guidelines, and information on healthcare sites that provided free cervical cancer screening	NR; 12 months

Abbreviations: aOR = adjusted odds ratio; CBO = community-based organization; CI = confidence interval; CRC = colorectal cancer; FQHC = Federally Qualified Health Center; ITT = intention to treat; NR = not reported; OR = odds ratio; RCT = randomized control trial; RR = relative risk; SD = standard deviation

Table F-4. Key Question 3 results

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Ahmed et al., 2010	Completion of screening mammography extracted from medical records Mammograms completed, % (n) A1: 16% (126) A2: 27% (213) B: 13% (105) RR A1 vs. B: 1.20 (95% CI, 0.95 to 1.53) RR A2 vs. B: 2.03 (95% CI, 1.64 to 2.51), p≤0.001	Good	Good
Aragones et al., 2010	Completed CRC screening, A vs. B: 15 (55%) vs. 6 (18%); AOR 5.4 (95% CI, 1.6 to 18.5)	Fair 1. Unclear blinding of outcome assessors 2. Unclear ITT analysis	Poor 1. Spanish speaking immigrant population 2. Very small sample size
Bastani et al., 2015	6 months, A vs. B Screening rate, total sample: 15% vs. 10%; OR 1.6 (p=0.006) Screening rate, whites: 15% vs.10%; OR 1.5 (p=0.182) Screening rate, Latinos: 14% vs. 8%; OR 1.7 (p=0.117) Screening rate, African Americans: 12% vs. 10%; OR 1.3 (p=0.684) Screening rate, Asians: 18% vs. 10%; OR 2.0 (p=0.073) 12 months, A vs. B Screening rate, total sample: 26% vs.18%; OR 1.6 (p=0.001) Screening rate, whites: 30% vs. 20%; OR 1.7 (p=0.045) Screening rate, Latinos: 24% vs.14%; OR 1.9 (p=0.027) Screening rate, African Americans: 23% vs. 22%; OR 1.1 (p=0.906) Screening rate, Asians: 28% vs. 17%; OR 1.9 (p=0.039)	Fair 1. Unclear randomization and concealment. 2. Unclear whether groups are similar at baseline.	Fair 1. 1st degree relatives of CRC patients randomized
Christie et al., 2008	Screening rate, A vs. B 53.8% vs. 13.0%, p=0.058 RR 4.31 (95% CI, 0.64 to 28.84) Refused screening, A vs. B 23% vs. 63%, p=NR RR not calculable (reported percentages do not correspond to whole patients)	Poor 1. Randomization not reported. 2. Unclear allocation concealment. 3. Not powered to assess outcome	Poor 1. Patient navigation intervention is resource intensive and may not be plausible in all health systems. 2. Implemented in a specific population and with a small sample size - may not be applicable in larger, more diverse groups.

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Curry et al., 2003	<u>Self-reported 7-day prevalent abstinence at the 3- and 12-month followup, ITT:</u> Serious attempt to quit, month 12: 61% vs. 51%; AOR 1.53 (95% CI, 0.96 to 2.44) Prevalent abstinence, 3 months: 8% vs. 3%, AOR 2.40 (95% CI, 0.85 to 1.80) Prevalent abstinence, 12 months: 14% vs. 7%, AOR 2.77 (95% CI, 1.24 to 6.60) Sustained abstinence: 2% vs. 1%; AOR 2.39 (95% CI, 0.29 to 14.30) <u>Self-reported 7-day prevalent abstinence at the 3- and 12-month followup, COMPLETED Cases analysis:</u> Serious attempt to quit, month 12: 79% vs. 60%, AOR 2.62 (95% CI, 1.47 to 4.80) Prevalent abstinence, 3 months: 10% vs. 4%, AOR 2.43 (95% CI, 0.80 to 8.30) Prevalent abstinence, 12 months: 17% vs. 8%, AOR 3.47 (95% CI, 1.52 to 8.50) Sustained abstinence: 3% vs. 2%; AOR 2.39 (95% CI, 0.38 to 19.10)	Fair 1. Unclear if groups remained comparable 2. Unclear/no masking 3. Unclear post-randomization exclusions	Fair 1. Women only 2. Intervention in pediatrician office, aimed at parents (mothers) of patients to improve child health/increase smoking cessation rates
Lasser et al., 2011	Screening rate, A vs. B % (n) 33.6% (79) vs. 20.0% (46) RR 1.68 (95% CI, 1.23 to 2.30)	Fair 1. Unclear allocation concealment.	Fair 1. Patient navigation intervention is resource intensive and may not be plausible in all health systems.
Margolis et al., 1998	Breast cancer screening rates, A vs. B Overall: 69.3% vs. 62.9%, p=0.009 Due at baseline: 59.9% vs. 50.3%, p=0.006 Up-to-date at baseline: 79.4% vs. 82.1%, p=0.37 Age 40-59 years: 56% vs. 48% Age ≥60 years: 68% vs. 54%, p=0.003 Whites: 55% vs. 55%, p=0.900 African American: 70% vs. 57%, p=0.110 Native American: 55% vs. 33%, p=0.010 Other: 76% vs. 40%, p=0.007, summary p=0.01 Cervical cancer screening rates, A vs. B Overall: 70.3% vs. 62.9%, p=0.02 Due at baseline: 63.2% vs. 50.3%, p=0.002 Up-to-date at baseline: 80.5% vs. 84.3%, p=0.33 Age 40-59 years: 65% vs. 56% Age ≥60 years: 59% vs. 41%; p=0.002 Whites: 62% vs. 51%, p=0.020 African Americans: 66% vs. 71%, p=0.230 Native Americans: 56% vs. 37%, p=0.060 Others: 76% vs. 45%, p=0.040, summary p=0.004	Fair 1. Randomization not adequate. 2. Unclear allocation concealment.	Fair 1. Intervention is resource intensive and may not be plausible in all health systems.

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Martin et al., 2006 and 2008	Weight loss at 9, 12, 18 month followups, A vs. B 9 months: -1.52±3.72kg vs. 0.61±3.37kg, p=0.01 12 months: -1.38±3.72kg vs. -0.16±3.63, p=0.10 18 months: -0.49±3.33kg vs. +0.07±3.75kg, p=0.39	Fair 1. Unclear allocation concealment.	Fair 1. Implemented in a specific population and geographic region, may not be applicable elsewhere.
Schroy et al., 2012	Screening test completed: 6 months, A1 vs. B: 34.2% vs. 26.4%; p=0.049 12 months: A1 vs. B: 43.1% vs. 34.8%, p=0.046 6 months A2 vs. B: 34.2 vs. 30%, p=0.292 12 months A2 vs. B: 43.1 vs. 37.1%, p=0.153	Poor: 1. Lack of provider blinding 2. Unclear blinding of outcome assessors	Fair 1. Implemented in a single geographic location 2. Expertise needed for intervention
Siddiqui et al., 2011	Screening rates, Whites vs. African Americans A1+A2+A3: 53% (230/432) vs. 43% (273/637); AOR 1.44 (95% CI, 1.12 to 1.86) B: 33% (48/146) vs. 32% (69/215); AOR 1.01 (95% CI, 0.64 to 1.61) A1: 55% (86/156) vs. 41% (84/206); AOR 1.68 (95% CI, 1.10 to 2.58) A2: 50% (68/135) vs. 40% (86/214); AOR 1.42 (95% CI, 0.92 to 2.21) A3: 54% (76/141) vs. 47% (103/217); AOR 1.25 (95% CI, 0.81 to 1.92)	Poor 1. Unclear randomization. 2. Unclear allocation concealment. 3. Unclear whether groups were similar at baseline.	Poor 1. Intervention is resource intensive and may not be plausible in all health systems.
Thompson et al., 2017	Completion of a Pap test within the 7 months after randomization % (n) A1. 38.7% (58) A2. 53.4% (78) B. 34% (50) A2 vs. B, p<0.001 A2 vs. A1, p<0.01 A2 vs. B, p=0.40	Fair 1. Unclear randomization. 2. Unclear allocation concealment.	Fair 1. The at home promotora visit may not be plausible in all health systems (resource heavy)
Wang et al., 2010	Received screening 12 months after intervention, % (n) A: 70% (56) B: 11.1% (6), p<0.001	Poor 1. Did not enroll consecutive or random sample. 2. Groups were not comparable at baseline. 3. Unclear whether accurate methods were used for confounders and outcomes.	Good

Abbreviations: aOR = adjusted odds ratio; CBO = community-based organization; CI = confidence interval; CRC = colorectal cancer; FQHC = Federally Qualified Health Center; ITT = intention to treat; NR = not reported; OR = odds ratio; RCT = randomized control trial; RR = relative risk; SD = standard deviation

Table F-5. Key Question 4 study characteristics

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Bennett et al., 2012	Obesity management	Racial and ethnic minorities	RCT (365)	Age, mean: 54.5 Female: 68.5% Race Non-Hispanic Black: 71.2% Non-Hispanic White: 3.6% Hispanic: 13.2% >1 race: 8.5% Medicaid: 33.7% Medicare: 20.5%	Three urban community health centers serving predominantly racial and ethnic minorities in Boston, MA	A. Multi-modal intervention including: 1) 3 tailored behavioral change goals with new goals at 13-week intervals; 2) Patient self-monitoring of progress and receipt of real-time feedback through website or interactive voice response system; 3) Counseling calls delivered by community health educators and optional monthly group sessions; 4) ≥1 brief standardized message from primary care provider; 5) Behavioral skills training materials, information on community resources and a walking kit with pedometer and maps (180)	B. Usual care (185)	Duration: 24 months Followup: 24 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Bennett et al., 2013	Obesity management	Black women	RCT (185)	Age, mean ± SD: 35.4 (5.5) Female: 100% Black: 100%	6 community health centers in a nonprofit, federally qualified community health center system in central North Carolina	Shape program, Interactive obesity treatment approach using 1) tailored behavior change goals (beginning with 3 goals identified through a computer algorithm with personalized progress reports and updated goals every 2 months); 2) weekly self-monitoring via IVR telephone calls; 3) 12 monthly counseling calls with dietitian; 4) tailored skills training materials; 5) 12 month YMCA membership (91)	B. Usual care (94)	Duration: 12 months Followup: 6 months after trial
Haas et al., 2015	Tobacco smoking cessation	Low-socioeconomic status	RCT (707)	A vs. B Age, median: 49 vs. 51 Female: 67.9% vs. 68.5% Race Hispanic: 21.3% vs. 18.8% White: 61.4% vs. 62.0% Black: 26.8% vs. 28.9% Other: 13.8% vs. 11.7%+E8	13 primary care practices in a large health care delivery system in greater Boston, Massachusetts	Smokers identified through practice EHR and recruited through an automated Interactive voice response outreach call to receive a multimodal intervention consisting of 1) telephone-based motivational counseling calls with a tobacco treatment specialist; 2) free NRT patches; 3) personalized community-based referrals to reduce social mediators of tobacco; 4) integration of all components through updated documentation in EHR (399)	B. Smokers identified and recruited through same process, but received usual care (308)	Duration: 8 to 10 weeks of calls, 6 weeks of NRT Followup: 9 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Hendren et al., 2014	Colorectal and breast cancer screening	Low-income	RCT (366; CRC screening=240; mammography=191)	A vs. B CRC Screening Age 50 to 59: 62.3% vs. 61.1% 60+: 37.7% vs. 38.9% Race Black: 43.0% vs. 36.3% White: 52.0% vs. 54.9% Other: 5.0% vs. 8.8% Female: NR Mammography Age 40 to 49: 59.4% vs. 45.6% 50 to 59: 25.7% vs. 23.3% 60+: 14.9% vs. 31.1% Race Black: 41.1% vs. 45.8% White: 47.8% vs. 47.0% Other: 11.1% vs. 7.2% Female: NR	Large safety net primary care practice; New York	A. Multi-modal intervention including: 1) letters; 2) automated telephone calls; 3) point-of-care prompts reminding clinicians and patients the patient was past due for the service; 4) mailing of home test kit for CRC screening patients (185) Type of CRC screening: colonoscopy, FIT, FOBT	B. Control group (181)	Duration: 6 months Followup: 1 year
Miller, Jr. et al., 2011	Colorectal cancer screening	Socio-economically disadvantaged population	RCT (264)	Age, mean: 57.8 Female: 67.0% African American: 73.1 Insured: 61.7%	Community-based, university-affiliated internal medicine practice in Winston-Salem, North Carolina	A. Communicating Health Options through Interactive Computer Education (CHOICE) interactive, web-based decision aid delivered immediately before a healthcare provider visit (132)	B. Control group receiving web-based program about prescription drug refills and safety delivered immediately before a healthcare provider visit (132)	Duration, median: 10.1 minutes (IQR, 7.7 to 13. minutes) Followup: 24 weeks

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Miller, Jr. et al., 2018	Colorectal cancer screening	Vulnerable patients	RCT (450)	Age, median (range): 57 (50 to 74) Female: 54% Race/ethnicity Non-Hispanic White: 57% African American: 38% Hispanic/Latino: 2% Uninsured: 14% Publicly insured: 42% Income <$20,000: 53%	Six community-based primary care practices within a large health system in North Carolina	A. Mobile Patient Technology for Health-CRC (mPATH-CRC) used an iPad to deliver an 8.6-minute decision aid about CRC screening followed by ability of patient to order screening tests, and if ordered, then patients received followup electronic messages to help complete screening procedures (223)	B. Usual care, receiving a 4.3-minute CDC video about diet and exercise and no option for self-ordering screening tests (227)	Duration: 4.3 to 8.6 minutes for iPad; variable and unclear how long for followup electronic messages Followup: 24 weeks
Muller et al., 2017	Colorectal cancer screening	Alaska Native and American Indian People	RCT (808)	Age: 50 to 75 Female: 57.4% Race: 100% Alaska Native and American Indian	Tribally owned and operated healthcare organization offering primary care; Alaska	A. Text message reminders for CRC screening. All patients received screening reminders via telephone, mail, and physicians during in-person visits (404) Type of CRC screening: FIT, FOBT, or colonoscopy	B. Standard reminders (404)	Duration: 2 months (up to 3 messages) Followup: 6 months
Richter et al., 2015	Tobacco smoking cessation	Rural, Low-income	RCT (566)	Age, mean ± SD: 47.4±12.9 Female: 64.8% Race Caucasian: 82.9% Hispanic/Latino: 9.0%	20 primary care clinics; Kansas	A. Four counseling sessions delivered in the primary care office through telemedicine. Eligible patients in both groups were assisted in applying for cessation medication from pharmacy assistance programs (280)	B. Usual care - telephone cessation counseling (286)	Duration: 3 months (4 sessions) Followup: 6 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Russell et al., 2010	Breast cancer screening	Low-income, African-American Women	RCT (179)	Age, mean: 51.2 Female: 100% Black: 100% Insured: 55.4%	FQHC in Indianapolis, Indiana	A. 1) Interactive computer program providing algorithm of tailored messages to identify views of breast cancer; to assess health beliefs, self-efficacy, and barriers to screening; and to assess stage of readiness for breast cancer screening; and 2) lay health advisor assisting in patient navigation services including barriers counseling, referrals to low- or no-cost mammograms, assistance scheduling appointments, and assistance with transportation (89)	B. Low-dose group receiving culturally appropriate pamphlet about breast cancer and screening coupled with a lay health advisor recommendation to schedule a mammography. Also, received mailed postcards with general nutrition information periodically (90)	Duration: Unclear, appears to be 18 weeks Followup: 6 months
Simon et al., 2001	Breast cancer screening	Low-income women	RCT (1,717)	Clinic 1 vs. Clinic 2 Age, range: 40-65+ Female: 100% Race: NR Insurance status Medicaid: 12% vs. 16% Medicare: 12% vs. 12% Commercial: 11% vs. 16% None: 64% vs. 57%	Two Detroit Health Department primary care clinics; Michigan	A1. Letter 1- a physician referral letter, was directed women due for mammography to visit primary care physicians for a mammogram referral (559) A2. Letter 2- a direct access letter, instructed women to arrange a mammogram directly (591)	B. Usual care - no letter (567)	Duration: 1 year Followup: 1 year

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Valdez et al., 2018	Cervical cancer screening	Low-income, Latina women	RCT (943)	Age, mean ± SD: 39.1 ± 11.8 Female: 100% Latina: 100% Foreign-born: 20% Insured: 51% Education, mean ± SD: 8.2 ± 3.8 years	Community clinics in Los Angeles, San Jose, and Fresno, CA	A. Interactive modules delivered in English or Spanish via an electronic, touch-screen kiosk to address cervical cancer knowledge, risk factors, and screening procedures (480)	B. Control group, receiving Spanish or English-language educational material in the mail (463)	Duration: 24 to 28 minutes, mean Followup: 6 months

Abbreviations: aOR = adjusted odds ratio; CDC = Centers for Disease Control and Prevention; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; CRC = colorectal cancer; EHR = electronic health record; FIT= fecal immunohistochemistry test; FOBT = fecal occult blood test; FQHC = federally qualified health center; HR = hazard ratio; IQR = interquartile range; ITT = intention to treat; IVR = interactive voice response; mPATH = mobile patient technology; NA = not applicable; NR = not reported; NRT= nicotine replacement therapy; OR = odds ratio; RCT = randomized controlled trial; RR = risk ratio; SD = standard deviation; SE = standard error

Table F-6. Key Question 4 outcomes

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Bennett et al., 2012	BMI Baseline, mean (SE) A. 37.04 (4.96) B. 36.99 (5.24) Change from baseline at 24 months, mean (SE) A. -0.58 (0.14); AUC: -0.54 (0.12) B. -0.20 (0.13); AUC: -0.13 (0.11) Difference between arms: −0.41 (95% CI, -0.73 to -0.09) Adverse events A. 1 serious musculoskeletal injury B. 1 cardiovascular event, 2 cases of bladder disease	Fair 1. Allocation not concealed 2. Blinding not possible 3. Unclear if baseline differences exist	Fair 1. Intervention components difficult to replicate elsewhere 2. Population likely to be different in other locations 3. Settings and clinical experience likely to differ

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Bennett et al., 2013	Weight change, mean (SE) <u>6 months</u> A. -1.0 (0.4) B. 0.1 (0.4) Difference, mean: -1.1 (95% CI, -2.3 to 0.04) <u>12 months</u> A. -1.0 (0.5) B. 0.5 (0.5) Difference, mean: -1.4 (95% CI, -2.8 to -0.1), p=0.04 <u>18 months</u> A. -0.9 (0.6) B. 0.8 (0.6) Difference, mean: -1.7 (95% CI, -3.3 to -0.2), p=0.03 BMI change, mean (SE) <u>6 months</u> A. -0.3 (0.2) B. 0.1 (0.2) Difference, mean: -0.4 (95% CI, -0.8 to 0.03) <u>12 months</u> A. -0.3 (0.2) B. 0.3 (0.2) Difference, mean: -0.6 (95% CI, -1.1 to -0.1), p=0.02 <u>18 months</u> A. -0.2 (0.2) B. 0.4 (0.2) Difference, mean: -0.6 (-1.2 to -0.1), p=0.03 Serious adverse events A. 6 (2 gynecological surgeries, 1 knee replacement, 1 breast abscess, 1 musculoskeletal injury, 1 cancer diagnosis) B. NR	Fair 1. Allocation not concealed 2. Blinding not possible	Fair 1. Specific population 2. Expertise/staffing requirements may be difficult to replicate elsewhere 3. Settings and clinical experience likely to differ
Haas et al., 2015	7-day tobacco abstinence A. 17.8% (71/399) B. 8.1% (25/308) OR 2.5 (95% CI, 1.5 to 4.0), p<0.001	Fair 1. Allocation concealment NR 2. Unclear masking 3. High loss-to-followup	Good

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Hendren et al., 2014	CRC screening Unadjusted rates A. 37.7% B. 16.7%, p=0.0002 Adjusted OR: 3.22 (95% CI, 1.65 to 6.30) Mammography Unadjusted rates: A. 29.7% B. 16.7%, p=0.034 Adjusted OR: 1.96 (95% CI, 0.87 to 4.39) Sub-analysis based on race Black vs. White vs. Other CRC Screening Unadjusted rates A: 44.19% vs. 34.62% vs. 20.00% B: 14.63% vs. 16.13% vs. 30.00% Mammography Unadjusted rates A: 27.03% vs. 25.58% vs. 60.00% B: 10.53% vs. 20.51% vs. 33.33%	Fair 1. Care providers not masked, unclear if patients masked, attrition and loss to followup not reported	Good
Miller, Jr. et al., 2011	Completed CRC screening A: 19% (25/132) B: 14% (18/132) AOR: 1.7 (0.88 to 3.2), p=0.12 Increased readiness for screening after program (only for participants in precontemplation and contemplation stages at baseline) A: 52% (38/73) B: 20% (12/61) Adjusted OR: 4.7 (95% CI, 1.9 to 11.9), p=0.0001	Fair 1. Randomization method not reported 2. Allocation concealment not reported	Fair 1. Patients recruited from a single clinic

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Miller, Jr. et al., 2018	Overall CRC screening rates: A. 30.0% (67/223) B. 15.0% (34/227) Percent difference: 15% (95% CI, 7 to 23) Adjusted odds ratio (usual care=reference): 2.5 (95% CI, 1.6 to 4.0) CRC screening rate by income: <$20,000/yr vs. ≥$20,000/yr A. 24.6% (29/118) vs. 37.5% (36/96) B. 15.0% (17/113) vs. 15.5% (17/110) Percent difference: 9.6% (95% CI, -1 to 20) vs. 22.0% (95% CI, 10 to 34) CRC screening rate by race/ethnicity Non-Hispanic White vs. other race/ethnicity A. 27.2% (34/125) vs. 33.7% (33/98) B. 12.0% (16/133) vs. 19.1% (18/94) Percent difference: 15.2% (95% CI, 6 to 25) vs. 14.6% (95% CI, 2 to 27)	Fair 1. Unclear if groups were similar at baseline 2. Unclear masking of care provider 3. Unclear if authors used intention-to-treat analysis	Good
Muller et al., 2017	Completed CRC screening A. 15.6% B. 11.1% HR: 1.42, 95% CI, 0.97 to 2.09, p=0.07	Good	Fair 1. Tailored messaging targeted to specific population in Alaska 2. Patients are 'customer-owners' of the clinic 3. Patients receive screening at no cost 4. Sampling frame is of participants who opted in to receive text messages and participate in studies
Richter et al., 2015	7-day point prevalence smoking cessation A. 9.8% B. 12.0%, p=0.406 Prolonged abstinence A. 8.1% B. 7.6%, p=0.839 Pharmacotherapy use A. 55.9% B. 46.1%, p=0.03	Fair 1. No blinding of patients or providers 2. Blinding of outcome assessors unclear	Fair 1. Clinic capacity in terms of costs, staffing, and space to implement intervention may not be replicable

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Russell et al., 2010	Mammography adherence A: 50.6% (45/89) B: 17.8% (16/90) adjusted RR: 2.7 (95% CI, 1.8 to 3.7), p<0.0001 AOR: 4.3 (95% CI, 2.1 to 9.0), p<0.0001 Forward movement in stage of screening adoption A: 76.3% (61/89) B: 38.5% (25/90) adjusted RR: 2.0 (95% CI, 1.5 to 2.3), p<0.0001 AOR: 4.9 (95% CI, 2.3 to 10.4, p<0.0001	Fair 1. Allocation not concealed 2. Patients and interventionists not masked	Fair 1. Specific population 2. Patients recruited from a single clinic 3. Expertise needed for implementation of intervention
Simon et al., 2001	Receipt of mammogram A1: AOR 1.10 (95% CI, 0.77 to 1.56) A2: AOR 1.28 (95% CI, 0.92 to 1.82) B: Reference (77/567) Receipt of mammogram, Clinic 1 A1: 19% A2: 20% B: 17%, p=0.743 Clinic 2 A1: 11% A2: 14% B: 11%, p=0.376	Poor 1. Randomization, allocation concealment, and blinding not described 2. Unclear if groups were similar at baseline.	Fair 1. Insurance requirements may make the intervention difficult to implement in some places
Valdez et al., 2018	Appointment or receipt of Pap test within 6 months A. 79.8% (383/480) B. 74.3% (344/463) AOR of patients receiving pap test (n=727): Intervention group OR 1.14 (95% CI, 0.84 to 1.55)	Fair 1. Blinding of patients and outcome assessors not reported 2. Attrition and post-randomization exclusions not reported	Fair 1. Sample derived within clinics and intervention targeted to specific population 2. Followup procedures may not be replicable everywhere

Abbreviations: aOR = adjusted odds ratio; CDC = Centers for Disease Control and Prevention; CHOICE = Communicating Health Options through Interactive Computer Education; CI = confidence interval; CRC = colorectal cancer; EHR = electronic health record; FIT= fecal immunohistochemistry test; FOBT = fecal occult blood test; FQHC = federally qualified health center; HR = hazard ratio; IQR = interquartile range; ITT = intention to treat; IVR = interactive voice response; mPATH = mobile patient technology; NA = not applicable; NR = not reported; NRT= nicotine replacement therapy; OR = odds ratio; RCT = randomized controlled trial; RR = risk ratio; SD = standard deviation; SE = standard error

Table F-7. Key Question 5 study characteristics

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Abood et al., 2005	Breast cancer screening	Low income	Cluster RCT (1,104)	A vs. B: Mean age: 56.8 vs 53.8 White: 81% vs 94%, p=0.0105 Black: 19% vs 6%	County Health Departments, Florida	A. Loss/risk framed messages (incoming calls) (112)	B. Standard messages (992)	6 months
Allen & Bazargan-Hejazi, 2005	Breast cancer screening	African Americans and Hispanic	RCT (430)	Mean age: 51.9 years Gender: 100% female Race/ethnicity: 45% Hispanic, 38% African American, 17% other	Community Health Center in Los Angeles, California	A. Culturally-tailored telephone counseling to overcome barriers (219)	B. No telephone counseling (211)	6 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Arnold et al., 2016a Arnold et al., 2016b	Colorectal cancer screening	Underserved (FQHC)	Group-randomized trial (961)	*Note: significantly different groups by age (p=0.014), race (p<0.001) (and others, see Table 1) A1. Intervention-Nurse Age, mean (SD): 59.2 years (7.5) Female: 77% Race Black: 83% White/Hispanic: 17% A2. Intervention-Education Age, mean (SD): 57.8 years (6.5) Female: 79% Race Black: 40% White/Hispanic: 60% B. Enhanced usual care Age, mean (SD): 57.7 years (7.5) Female: 75% Race Black: 72% White/Hispanic: 28%	Printed material, telephone at FQHC; Louisiana	A. Clinic nurse provided education and FOBT kit, plus tailored telephone problem solving of barriers, mailed materials, and assistance with scheduling. (404) A2. Research assistant provided education, printed materials, and FOBT kit during clinic visit, plus yearly mailed reminders and kit (282)	B. Enhanced usual care - research assistant provided a recommendation for screening and FOBT kit during clinic visit, plus yearly mailed reminders and kit (275)	Duration: 3 years Followup A1. Followup within 2 weeks and then 1 month if no appointment scheduled, plus yearly mailed reminders A2 and B. Yearly mailed reminders

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Baker et al., 2014	Colorectal cancer screening	Underserved (FQHC)	RCT (450)	A. Intervention Age, mean (SD): 59.5 years (6.1) Female: 70.2% Race Latino/Hispanic: 87.6% Other: 12.4% B. Usual care Age, mean (SD): 59.6 years (5.7) Female: 72.9% Race Latino/Hispanic: 91.1% Other: 8.9%	FQHC; Chicago, Illinois	A. Mailed FOBT/FIT kit, letter from PCP, followed by automated call and text message; second call and text 2 weeks later for non-responders; patient navigation 3 months later for non-responders (225)	B. Usual care - computerized reminders, standing orders for medical assistants to give patients home FIT, and clinician feedback on CRC screening rates (225)	Duration: 2 years 2 weeks and then 3 months for those not responding to FOBT/FIT
Battaglia et al., 2012	Cervical cancer screening	Low income racial and ethnic minority	Non-randomized trial (1,763)	Age 18-20: 11% 21-30: 57% 30+: 32% Female: 100% Race African American: 32% Hispanic: 31% White: 30% Other: 7%	6 FQHCs; Boston, MA	A. Patient navigators contacted patients with abnormal screens by phone. Identified barriers to care, timely competition of diagnostic evaluation. Followup by phone, mail, in-person. PNs were language matched to patients. (3 FQHCs with 959 eligible patients)	B. Usual care (3 FQHCs with 804 eligible patients)	1 year

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Berkowitz et al., 2015	Colorectal cancer screening	Socio-economically disadvant-aged	Before-after (49,733)	Age, mean years (SD) A. 62.5 (6.8) B. 61.7 (6.4), p<0.001 Female A. 56.6% B. 55%, p=0.001 <u>Race</u> White A. 68.5% B. 89.5% Black A. 9% B. 4.2% Hispanic A. 15% B. 2.3% Asian/other A. 7.4% B. 3.8% All p<0.001	18 primary care practice sites Boston, MA	Health IT platform and population management workforce: (1) electronic identification of eligible patients overdue for screening, and (2) workflow to contact and track patients, including initial reminder letter with educational and contact information, plus assignment to a patient delegate; after 4 months, if not screened (or if high risk patient), referred to PN for individualized counseling and education, assistance identifying and managing barriers such as transportation or accompanying to visits. A. ≤HS education, indicating socioeconomic disadvantage (14,693) B. >HS education (35,040)	After platform/workforce implemented	Duration: 1 year Followup: 3 years

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Blumenthal et al., 2010	Colorectal cancer screening	African Americans	RCT (369)	A1. Intervention-financial support Age, mean (SD): 65.6 years (10.4) Female: 72.6% A2. Intervention-one on one education Age, mean (SD): 69.2 years (9.1) Female: 76.5% A3. Intervention-group education Age, mean (SD): 68.6 years (11.5) Female: 66.7% B. Control Age, mean (SD): 69.5 years (10.3) Female: 76.1%	Community-based organizations; Atlanta, Georgia	A1. Financial support Up to $500 for out of pocket expenses, health navigator to assist with transportation, scheduling, payment (84) A2. One on one education Three 45-minute sessions with health educator (98) A3. Group education Four 45-minute sessions with health educator (99)	B. Gift bag at introductory session-pamphlet, list of resources (88)	Duration: Up to four weeks of sessions Followup: 3 months, and 6 month followup for those not screened by 3 months
Braun et al., 2015	Breast cancer, cervical cancer, colorectal cancer screening	Native Hawaiian and Filipino	RCT (488)	A vs. B. Age, mean: 68.4 years vs. 66.7 years Female: 52.9% vs. 53.7% Ethnicity Chinese: 0.8% vs. 0.8% Filipino: 37.2% vs. 32.1% Hawaiian: 43.0% vs. 47.2% Japanese: 12.4% vs. 9.8% Other: 7.9% vs. 8.5%	Hospital; Moloka'I, Hawai'i	A. Patient navigation based on *Kukui Ahi* model (242)	B. Control-relevant education from another healthcare entity (246)	3 years
Byrd et al., 2013	Cervical cancer screening	Hispanic	RCT (613)	NR, but women were of Mexican origin and 21 years or older	Community settings in El Paso and Houston, Texas and Yakima Valley, Washington	1-on-1 delivery of AMIGAS program by promotor, including: A1. Screening contract, games and activities, video on barriers and facilitators, and flip chart to review video (151) A2. All but the video (154) A3. All but the flip chart (155)	B. Usual care at clinic (153) Women in control group who completed study were offered full program (A) after final followup	Followup 6 months post-intervention

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Cole et al., 2017	Colorectal cancer screening	African-American men	RCT (731)	A1. Patient navigation (PN) Age, mean (SD): 57.2 years (6.5) A2. PN plus motivational interviewing Age, mean (SD): 56.9 years (6.0) B. Motivational interviewing Age, mean (SD): 58.2 years (7.1)	Telephone navig ation with patients recruited from barbershops; New York City, New York	A1. Patient navigation with 2+ telephone sessions, including assessment of/managing barriers (234) A2. Patient navigation plus motivational interviewing (259)	B. Motivational interviewing (238)	6 months
Coronado et al., 2011	Colorectal cancer screening	Hispanic, underserved socio-economic	RCT (501)	A1 vs. A2 vs. B Age 50-59 years: 56.5% vs. 57.1% vs. 57.5% 60-69 years: 32.7% vs. 33.3% vs. 32.9% 70-79 years: 10.7% vs. 9.5% vs. 11.4% Female: 53% vs. 52.7% vs. 52.7% Race: 100% Hispanic	Community-based clinic; King County, Washington	A1. Mail packet plus outreach: Mailed packet, plus 10-min telephone calls from promotors to remind, educate, and answer questions about screening, followed by 50-min home visits including colon models and flip charts to reinforce education (168) A2. Mail packet only: Mailed packet containing letter signed by medical director, FOBT card, instructions, and stamped envelope to return card (168)	B. Usual care: no formal prompting of CRC screening (165)	9 months
Coronado et al., 2016	Breast cancer screening	Hispanic women	Block RCT (536)	Age: Female: 100% Race: 100% Hispanic	FQHCs, Washington	A. A promotor-led, motivational interviewing intervention that included a home visit and telephone followup. (210)	B. Usual care (326)	12 months
Coronado et al., 2018	Colorectal cancer screening	Underserved	Cluster RCT (41,193)	A vs. B Age, 50-64, median: 80% vs. 83% Female, median: 44% vs. 45% White, median: 93% vs. 91% Other, median: 3% vs. 5%	26 FQHCs; Oregon and California	A. Introductory letter, FIT kit and instructions, reminder letter for patients; process improvement for clinics (13 clinics, 21,134)	B. Usual care (13 clinics, 20,059)	Duration: 18 months Followup: 12 months

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Davis et al., 2013	Colorectal cancer screening	Underserved	Prospective cohort (961)	Age: 58.4 years (7.3) Female: 77% Black: 67% White/Hispanic: 33%	8 FQHC-associated clinics; Louisiana	A1. Nurse provided education, motivational interviewing, followup calls (404) A2. Staff provided education via video, pamphlet, instructions, FOBT kit and SASE (282)	B. Usual care-FOBT kit and SASE (275)	Duration: 1 month Followup: 1 year
DeGroff et al., 2017	Colorectal cancer screening	Low-income	RCT (856; analyzed 840)	A. Intervention Age 50 to 54: 53% 55 to 64: 33.9% 65 to 74: 13.1% Female: 55.4% Race Hispanic: 39.2% NH Black: 40.7% NH White: 15.1% Other: 5.0% B. Control Age 50 to 54: 54.4% 55 to 64: 32.3% 65 to 74: 13.3% Female: 58.9% Race Hispanic: 41.7% NH Black: 40.2% NH White: 13.3% Other: 4.8%	Telephone navigation with patients recruited from EHRs at a hospital and community health center; Boston, Massachusetts	A. Patient navigation to address multilevel patient-defined barriers to CRC screening (419)	B. Computerized reminders, standing orders for medical assistants to give patients home fecal immunochemical tests (FIT), and clinician feedback on CRC screening rates (421)	Followup at 6 months

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Dietrich et al., 2006	Breast cancer, cervical cancer, colorectal cancer screening	Low income	RCT (1,413) 11 sites	Age: 58.1 (5.25) Female: 100% Language Spanish: 61.8% Haitian Creole: 0.3%	Community and Migrant Health Centers; New York City, New York	A. Telephone intervention by prevention care managers. Subjects received an average of 4 calls over 18 months: confirming screening dates, determining readiness to act, providing motivational support, working to prioritize screening, helping to overcome individual barriers. Care managers also scheduled appointments, made reminder calls, provide directions, helped find transportation.	B. A single telephone call during which trial staff answered questions about preventive care, informed women of their usual care status, advised them to obtain needed preventive care from their primary care clinician, and thanked them for their participation.	18 months
Dietrich et al., 2013	Colorectal cancer screening	Low income women	RCT (2,240)	A. vs. B. Age: 55.8 years vs. 55.8 years Female: 100% Race: NR	3 Medicaid managed care organization plans; New York City, New York	A. Personalized letter, educational materials, list of overdue screenings to share with physician, telephone outreach to address barriers and provide appointment reminders; scheduled appointments only for women requesting help (562)	B. Usual care (1,678)	18 months
Dignan et al., 2014	Colorectal cancer screening	Rural	Before-after study (66 practices with 3,844 patient records, 3751 at followup)	Age: 64.8 at baseline; 64.1 at followup Female: 60.5% at baseline; 60.1% at followup Race: NR	Primary care practices; Appalachian Kentucky	A. Academic detailing for providers: screening efficacy, clinical performance measures, patient counseling, and creating a screening-friendly practice environment. (33 practices)	B. No treatment for 6 months (33 practices), offered intervention after 6-month followup	6 months
Doorenbos et al., 2011	Tobacco smoking cessation Breast cancer, colorectal cancer screening	American Indian / Alaska Native	RCT (5,065)	Age group, years 13-39: 51% vs. 47% 40-49: 24% vs. 25% 50-64: 19% vs. 21% 65-93: 7% vs. 7% p=0.04 Female: 56% vs 55% AI/AN: 100%	Community Health Clinic Seattle, WA	A. Calendar with cancer health-reacted messages (2,805)	B. Calendar without messages (2,800)	15 months

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Enard et al., 2015	Colorectal cancer screening	Low Income, Hispanic	RCT (303)	Age 50 to 64: 75 (24.7%) 65 to 75: 228 (75.3%) Female: 54.8% 100% Hispanic	Telephone navigation with patients recruited from Medicare list and contacts at community-based organizations; Texas	A. Bilingual Tailored Patient Navigation: needs, barriers, services assessed; education about screening guidelines and Medicare's coverage, navigation around barriers. CMS Demonstration Project (135)	B. Mailed educational materials about screening and risk factors (168)	March 2007 to December 2010 Followup: adherence during observation period
Fang et al., 2017	Cervical cancer screening	Korean American women	RCT (705)	Mean age control: 53.9 (±11.6) Mean age intervention: 51.9 (±9.5) Female: 100% Korean American: 100%	Churches (community setting); Southeastern Pennsylvania and New Jersey	A. Intervention group: multicomponent program that includes navigation services and bilingual community health educators to address individual beliefs and expectations on cervical cancer screening including perceived risks, perceived benefits, perceived barriers, and cultural norms. (347)	B. Information-only control group: bilingual community health educators deliver general information on health, cancer education, screening guidelines (358)	Duration: February 2009 to December 2014 Followup: 12 months
Fiscella et al., 2011	Breast cancer, colorectal cancer screening	Low-income	RCT (469; CRC screening=323 mammography=271)	A vs. B <u>CRC Screening</u> Age 50-59 :63.8% vs. 61.3% ≥60: 36.2% vs. 38.8% Race Black: 18.9% vs. 30.8% White: 68.6% vs. 59.8% Other: 12.6% vs. 9.4% Female: 54.6% vs. 58.1% <u>Mammography</u> Age 40 to 49: 36.6% vs. 40.9% 50 to 59: 42.5% vs. 38.7% ≥60: 20.9% vs. 20.4% Race Black: 25.8% vs. 33.1% White: 66.6% vs. 55.2% Other: 7.6% vs. 11.8%	Large safety net primary care practice; New York	A. Multi-modal intervention delivered by a patient navigator including: 1) Outreach consisting of two letters and a phone call; 2) Mailed kits for insured patients needing CRC screening who did not respond to outreach; 3) Point-of-care prompt sheets for patients and clinicians (CRC screening, n=163; mammography, n=134)	B. Control group (CRC screening, n=160; mammography, n=137)	Duration: 1 year followup: 1 year lookback

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Ford et al., 2006	Colorectal cancer screening	Older African-American men	RCT (703)	Age, mean: 63.2 African American: 100% Female: 0%	Adherence trial conducted at 1 of 10 screening centers within the context of the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial Detroit, Michigan	A. Case management - 2 case managers provided referrals to community services and agencies and provided at least monthly calls; both calls and referrals were intended to address sociocultural, economic, and individual barriers (352)	B. Usual care consisting of yearly calls to schedule annual screening exams (351)	Duration: 3 years Followup: 3 years
Fortuna et al., 2014	Breast cancer, colorectal cancer screening	Low-income Racial/ethnic minority	Pragmatic RCT (1,008; breast cancer screening=624; CRC screening n=629)	See Tables 1 and 2; rough estimates below Breast cancer screening Age 49% age 40-49 years 51% 50+ 100% Female Race 39% Black 15% Other including Hispanic 46% White CRC screening Age 63% aged 50-59 years 37% 60+ 54% female Race 35% Black 14% Other including Hispanic 51% White	Urban academic internal medicine safety-net practice Rochester, New York	A. Bilingual letter with scheduling information, contact for outreach worker and information on free screening, personal call from outreach worker with motivational interviewing and navigation (appointment scheduling, logistic assistance) (breast cancer: 153, CRC: 158) B. Bilingual letter with scheduling information, contact for outreach worker and information on free screening, automated message to call outreach worker, paper prompts for physician during patient's point of care (breast cancer: 156, CRC: 158) C. Bilingual letter with scheduling information, contact for outreach worker and information on free screening, automated message to call outreach worker (breast cancer: 158, CRC: 157)	D. Bilingual letter with scheduling information, contact for outreach worker, and information on free screening (breast cancer: 157, CRC: 156)	12 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Friedman & Borum, 2007	Colorectal cancer screening	African American	Before-after study (248)	NR, but African Americans 50 years or older were recruited	Resident clinic; Washington, D.C.	Educational intervention for internal medicine residence: didactic seminars, observation of screening modalities, exam, charting A. Post-intervention (132)	B. Preintervention (116)	Followup of screening rates during 6 months post intervention
Friedman et al., 2001	Colorectal cancer screening	Low-income African American	RCT (160)	Age, mean years (SD): 61 (7.24) Female: 84.4% Race African American: 87.5% Caucasian: 5% Hispanic: 5% Other: 2.5%	Medical outpatient community clinic Houston, TX	A. Educational video and questionnaire; ACS brochure and order for FOBT kit to give to physician; FOBT kit, instructions from nurse, appointments for FOBT return to lab and followup visit (110)	B. Questionnaire only; ACS brochure and order for FOBT kit to give to physician; FOBT kit, instructions from nurse, appointments for FOBT return to lab and followup visit (50)	3 months
Glasgow et al., 2000	Tobacco smoking cessation	Low socio-economic status females	RCT (1,154)	A vs. B Age, mean years (SD): 24 (5) vs. 24 (5) Caucasian: 90% vs. 88%	Four Planned Parenthood clinics Portland, OR	A. Nine-minute video, 12 to 15 min behavioral counseling with staff, 20-second quit message from physician, supportive phone calls in following month (578)	B. Generic stop smoking brochure (Smart Moves) and 20-second quit smoking message from physician. (576)	Duration: Brief intervention Followup: 6 weeks and 6 months
Goldberg et al., 2004	Colorectal cancer screening	Low-income African American	Nonrandomized controlled trial (119)	A vs. B Age, mean years: 64.2 vs. 64.0 Female: 71.2% vs. 76.7% Race African American: 83.1% vs. 81.7% Caucasian: 6.8% vs. 11.7% Hispanic: 5.1% vs. 1.7% Other: 5.1% vs. 5.0%	Comprehensive general medicine clinic Chicago, IL	A. Personalized and signed letter with reminders and instructions 2 weeks prior to appointment, mailed 3 FOBT cards (59)	B. Usual care (60)	12 months

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Goldman et al., 2015	Colorectal cancer screening	Underserved	RCT (420)	Age: 57.3 (6.2) Female: 66% Latino: 62.1% White: 15.7% Black: 16.4%	Federally Qualified Community Health Center; Chicago, IL	A. Fecal immunochemical tests (FIT) outreach: mailed to home, followed by calls, texts. 3 months later call from patient navigator. Patient navigator help with appointments for positive FIT (210)	B. Usual care (210)	12 months
Gordon et al., 2010	Tobacco smoking cessation	Low-income Racial/ethnic minority	RCT (2,637)	Age, mean years (SD): 40.5 (12.6) Female: 57.2% NH African American: 45.8% NH White: 32.2% Hispanic: 15.8%	14 federally funded community health center dental clinics NY, MS, OR	A. Brief office-based counseling using 5 As model, NRT, tailored print materials, local tobacco quit line number (1,434)	B. Usual care (1,203)	7.5 months (6 months plus 6 week grace period)
Guillaume et al., 2017b De Mil, 2018	Colorectal cancer screening	Low socio-economic	Cluster RCT (16,267) *Navigable population only	A vs. B Age, mean (SD): 58.6 years (6.9) vs. 58.8 years (7) Female: 51.5% vs. 51.3% Race: NR	Urban and rural strata of deprivation and affluence; France	A. Introductory letter, telephone calls to address barriers, FOBT kit, potential for home visit (8121)	B. Usual care; FOBT kit (8146)	9 months
Gupta et al., 2013	Colorectal cancer screening	Underserved	RCT (5,994)	Age, mean: 59 years Female: 64% White: 41% Black: 24% Hispanic: 29% Other: 7%	Safety-net system; Texas	A1. Colonoscopy: mailed invitation, 2 automated reminder phone calls, 2 'live' reminder phone calls, assistance with scheduling and prep (480) A2. FIT: same as (A1), plus mailed FIT kit (1,600)	B. Usual care - gFOBT, colonoscopy, barium enema, or sigmoidoscopy (3,914)	1 year

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Hendren et al., 2014	Breast cancer, colorectal cancer screening	Low-income	RCT (366; CRC screening n=240; mammography n=191)	A vs. B CRC Screening Age 50 to 59: 62.3% vs. 61.1% 60+: 37.7% vs. 38.9% Race Black: 43.0% vs. 36.3% White: 52.0% vs. 54.9% Other: 5.0% vs. 8.8% Female: NR Mammography Age 40 to 49: 59.4% vs. 45.6% 50 to 59: 25.7% vs. 23.3% 60+: 14.9% vs. 31.1% Race Black: 41.1% vs. 45.8% White: 47.8% vs. 47.0% Other: 11.1% vs. 7.2% Female: NR	Large safety net primary care practice; Rochester, New York	A. Multi-modal intervention including: 1) letters; 2) automated telephone calls; 3) point-of-care prompts reminding clinicians and patients the patient was past due for the service; 4) mailing of home test kit for CRC screening patients (185) Type of CRC screening: colonoscopy, FIT, FOBT	B. Control group (181)	Duration: 6 months Followup: 1 year
Hirst et al., 2018	Colorectal cancer screening	Low socio-economic status Racial/ethnic minority	Post-intervention multiple time series (4,423,734)	Age of participants restricted to 60 to 64 years; no other information reported	Population-based screening via local NHS bowel cancer screening programme hub England	Biennial invitations, gFOBT kit and instructions, prepaid envelope; reminder letter after 4 weeks non-response	Quintiles of deprivation (Q5 most deprived) and area-based ethnic diversity (Q5 most diverse) (n NR)	Duration: 5 years biennial invitations
Hoffman et al., 2017	Colorectal cancer screening	African American	RCT (89)	A vs. B Age, mean years (range, SD): 57.7 (49-73, 7.4) vs. 57.4 (49-71, 5.9) Female: 66% vs. 72%	Internal/family medicine outpatient clinics at 3 tertiary care centers Houston, TX	A. Tailored, entertainment-education decision aid video (30 minutes) (59)	B. Generic hypertension education video (11 minutes) (30)	3 months

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Honeycutt et al., 2013	Colorectal cancer screening	Underserved	Prospective cohort (809)	Age, mean: 55.8 years Female: 67.1% White: 37.1% Black: 62.9%	13 FQHCs; Georgia	A. Four clinics with Community Cancer Screening Program: health navigators conduct chart audits, manage provider reminder systems, coordinate screening and followup, provide patient education and appointment reminders, assist in overcoming barriers to screening, coordinate provider feedback on referral patterns (289)	B. Nine comparison clinics - no Community Cancer Screening Program (520)	18 months
Horne et al., 2015	Colorectal cancer screening	African Americans	RCT (1,691)	A vs. B Age 65-69: 49.8% vs. 50.3% 70-75: 50.2% vs. 49.7% Female: 72.8% vs. 72.3%	Unclear; CMS-funded multisite trial, with this site in Baltimore associated with Johns Hopkins	A. Patient navigation to identify and overcome barriers to screening, plus printed education materials (578) Type of CRC screening: FOBT or colonoscopy / flexible sigmoidoscopy	B. Printed educational materials from CMS and ACS on general cancer information and Medicare services (642)	Duration: 4 years Followup: 1 year (FOBT), any point within prior 10 years (C/FS)
Inadomi et al., 2012	Colorectal cancer screening	Low socio-economic status Racial/ethnic minority	Cluster RCT (997)	Age, mean years (median, SD): 58.4 (57, 6.9) Female: 53% Race African American: 18% White: 15% Latino: 34% Asian: 30% Other: 4%	Community health network San Francisco, CA	Physician recommendation of either: A. Colonoscopy (332) B. FOBT (344) in patient's preferred language; if selected B, scheduled for procedure and offered ride home	C. Patient choice of FOBT or colonoscopy (PCP discussed options but no recommendation) (321)	12 months
Jandorf et al., 2005	Colorectal cancer screening	Underserved	RCT (78)	Age, mean (SD): 61.2 years (7.8) Female: 74.4% Hispanic: 82.1%	1 FQHC; New York City, New York	A. Telephone patient navigation by research assistant: patient education, assessment of barriers, followup (38)	B. Usual care- not navigated (40)	6 months

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Jandorf et al., 2014	Breast cancer, cervical cancer screening	Latinas	Cluster RCT (1,333)	Mean age NR Female: 100% Latino: 100%	Community based settings in Arkansas, Buffalo, and New York City	A. Faith-based intervention using of peer/lay health workers (LHA, promotors) (803)	B. Diabetes prevention education group vs. breast and cervical cancer education group (530)	Duration: 2007 to 2009 Followup: 2 months, 8 months
Jean-Jacques et al., 2012	Colorectal cancer screening	Low-income Racial/ethnic minority	RCT (202)	A vs. B Age, mean years (SD): 60 (7) vs. 60 (8) Female: 64% vs. 59% Race White: 29% vs. 24% Black: 27% vs. 28% Hispanic: 19% vs. 21% Asian: 15% vs. 12% Other: 8% vs. 14%	FQHC Chicago, IL	A. Personalized and signed letter encouraging screening, fact sheet, gFOBT kit and instructions; if no response after 2 weeks, up to 3 reminder calls from bilingual lay health educators; if no response after 6 weeks, another mailed letter and kit (104)	B. Usual care (98)	4 months (12 months post-hoc)
Jibaja-Weiss et al., 2003	Breast cancer, cervical cancer screening	Low income	RCT (1,574)	A vs. B vs. C Age, mean years (SD): 39.1 (12.9) vs. 40.8 (13.3) vs. 40.8 (13.6) Female: 100% AA/Black: 43.5% vs. 38% vs. 40.3% Mexican American: 39.7% vs. 44.8% vs. 40.9% Non-Hispanic White: 16.8% vs. 17.2% vs. 18.8%	Community Health Centers Houston, TX	A1. Personalized Tailored Letter - specific breast and cervical risk factor info from EMR (age, race/ethnicity, family history, parity, BMI, smoking status)… "you are at risk because…" (581) A2. Personalized Form Letter - risk factors, importance of screening, encouragement to schedule screening. (494)	B. Control - no communication regarding screening services (499)	12 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Katz et al., 2007	Cervical cancer screening	Rural, low income	RCT (897)	Age, mean (SD): 54.95 years (11.1) Female: 100% AA/Black: 32% AI/AN: 42% White: 25%	Community Health Centers Robeson County, NC	A. Mammogram intervention-Lay Health Advisors Individualized health education program that consisted of three home visits with educational materials, followup phone calls, and tailored mailings. Addressed barriers to completing mammography. Participants received small gifts (mugs, calendars). (453) Baseline and follow up surveys included questions about cervical cancer.	B: Physician letter/brochure focused on pap exams. (444)	Duration: 14 months Follwup: 6 months
Katz et al., 2012	Colorectal cancer screening	Low socio-economic status Racial/ethnic minority	RCT (270)	A vs. B Age, median years: 55.7 vs. 56.3 Female: 66.7% vs. 60.6% African American: 75.4% vs. 68.9%	FQHC Columbus, OH	A. Theory-based educational video (12 minutes) with communication training, CRC prevention brochure, communication tips brochure; if no response in 1 month, telephone barriers counseling to ask PCP for CRC screening (138)	B. Generic educational video (10 min) on CRC screening, CRC prevention brochure (132)	2 months
Kim & Sarna, 2004	Breast cancer screening	Korean Americans	Cluster RCT (141)	Mean age: 48 years Gender: 100% female Ethnicity: 100% Korean American	Churches in Los Angeles County, California	A1. Peer-group education about breast cancer screening and access to free or low-cost mobile mammography service (47) A2. Mobile mammography access only (48)	B. Cholesterol education with low-cost blood chemistry and osteoporosis screening (46)	2 months

Author, Year (See Appendix B for full citation)	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions (n)	Comparison (n)	Duration; Followup
Kumanyika et al., 2002	Obesity screening and manageme nt	African American	RCT (585)	Age, mean years (SD) Black women: 65.5 (4.8) Black men: 65.4 (4.4) White women: 65.8 (4.5) White men: 65.2 (4.3) Female: 52.3% Black: 28% White: 72%	Four academic medical centers MD, TN, NJ, NC	Group (60 minutes) and individual sessions at varying frequency throughout followup with counseling and education focused on: A. Weight loss (147) B. Sodium reduction (144) C. A+B (147)	D. Usual care; quarterly group educational sessions on unrelated health topics (147)	15 to 36 months
Kumanyika et al., 2005	Obesity screening and manageme nt	African American	RCT (237)	Phase 1, Phase 2 Age, mean years (SD): 43.4 (10.5), 45.4 (10.2) Female: 89.9%, 90.6% Weight (kg) mean (SD): 102.7 (17.2), 99.9 (16.9) BMI (kg/m2) mean (SD): 38.0 (5.3), 37.0 (5.5)	Family practice department in university health system Philadelphia, Pennsylvania	Culturally adapted Healthy Eating and Lifestyle Program beginning with 10 weekly weight loss classes (Phase 1), followed by randomization into Phase 2: A. Group counseling, with 1 hour classes and individualized help by request (43) B. Staff-facilitated self-help, with individual monthly calls to provide coaching, kit with local resources on diet and exercise, pedometer, ad hoc telephone support (43)	C. Usual care (42)	21 months (3 months after Phase 1, 18 months after randomizatio n into Phase 2)
Lasser et al., 2017	Tobacco smoking cessation	Low socio-economic status Racial/ethnic minority	RCT (352)	Age, mean years (SD): 50 (11) Female: 54.3% NH Black: 56% Hispanic: 11% NH White: 22% Other: 10%	Safety net hospital Boston, MA	A. Patient navigation (up to 4 hours over 6 months) to assess contextual factors in cessation, connection to cessation resources (quit line, support group), connection with physicians for prescriptions, counseling, financial incentives for biochemical confirmation of cessation (177)	B. Enhanced usual care (low-literacy smoking cessation brochure, list of hospital and community resources for cessation) (175)	12 months
Lee-Lin et al., 2015	Breast cancer screening	Low-income, Chinese American	RCT (300)	Age 58.8 (40 to 85) 100% Female 100% Chinese	Asian health clinic in Portland, Oregon metro area	A. Culturally responsive targeted breast health educational program (147)	B. Brochure control (153)	Duration: NR Followup: 3, 6, 12 months

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Leone et al., 2013	Colorectal cancer screening	Medicaid	Cluster nonrandomized trial (416)	Age, mean years (SE) A. 56.5 (0.34) B. 56.2 (0.26) Female A. 57% B. 57.5% Black A. 62% B. 40.8% White A. 31% B. 52.9% p<0.001 for race Mean clinics baseline CRC screening (range) A. 35.6% (30 to 52%) B. 46% (25.9 to 52.1%)	12 managed care network-affiliated primary care practices North Carolina	A. Six intervention clinics: mailed packet with study invitation from physician or navigator, survey, and CHOICE decision aid (11-min educational DVD); after one month, follow up telephone call from PN to address barriers, assist with appointment scheduling and (242)	B. Six control clinics (174)	Duration: 6 months Followup: 12 months
Levy et al., 2013	Colorectal cancer screening	Rural	RCT (743)	Mean age: 61.1 years Female: 52% Race: 98.7% White, 0.5% Black, 0.8% unknown	Rural family medicine clinics (n=16); Iowa	A. All materials in (A2) and (A3), plus structured telephone call providing education, assessment and addressing of barriers (187) B. Chart reminder, plus educational materials, fridge magnet, FIT with SASE (186) C. Chart reminder - paper or electronic, depending on clinic system (185)	D. Usual care (185)	15 months
Ma et al., 2009	Colorectal cancer screening	Korean Americans	Non-randomized trial (167)	Mean age: 63 years Gender: 59% female Ethnicity: 100% Korean American	Churches; Los Angeles, CA	A. Small group colorectal cancer screening education and patient navigation (84)	B. Small group general health and primary prevention education, without navigation (83)	12 months

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Marshall et al., 2016	Breast cancer screening	African American older adults	RCT (1,358)	>75: 29.3% ≤ 75: 70.7% Female: 100% AA/Black: 100%	Community settings (senior centers, health fairs); Baltimore City, MD	A. CMS developed Patient Education Materials plus Navigation -phone call to address screening status, materials, perceptions/beliefs, barriers; helped arrange appointments and accompanied when necessary. Coached patients on questions to ask providers, Navigators also worked to enhance the patient-provider interaction by coaching patients on potential questions to ask their providers. Phone and in-person contact, minimum quarterly. (638)	B. CMS developed patient education materials (720)	Duration: NR Followup, mean: 17.8 months

Mehta et al., 2016	Colorectal cancer screening	Racial and ethnic minority	Before-after study (868,934)	A1. Post-program 2010 to 2013 Age 50 to 55: 34.8% 56 to 60: 24.6% 61 to 65: 17.5% 66 to 70: 12.9% 71 to 75: 10.1% Female: 54.6% Race NH white: 59.4% NH black: 8.2% Hispanic: 13.3% API: 14.4% Native American: 0.5% Multiple: 4.1% A2: Post-program 2007-2009 Age 50 to 55: 35.7% 56 to 60: 25.8% 61 to 65: 16.1% 66 to 70: 12.2% 71 to 75: 10.3% Female: 54.1% Race NH white: 60.9% NH black: 8.1% Hispanic: 12.5% API: 13.7% Native American: 0.5% Multiple: 4.3% B. Pre-program 2004 to 2006 Age 50 to 55: 54.8% 56 to 60: 15.6% 61 to 65: 12.2% 66 to 70: 10.6% 71 to 75: 6.8% Female: 54.1% Race NH white: 63.1% NH black: 7.9% Hispanic: 11.5% API: 12.6%	Mail, community-based healthcare system; Kaiser Permanente Northern California	Mailed FIT kits to overdue patients (outreach), EMR prompts during clinic visits (in-reach) A1. After program: 2010 to 2013 (665,268) A2. After program: 2007 to 2009 (654,633) Note: cohorts overlap	Screening status pre-program implementation, screening status immediately after program implementation B. Before program: 2004 to 2006 (662,872) Note: cohorts overlap	Duration: 10 years Followup: between 1-10 years

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				Native American: 0.5% Multiple: 4.5%				
Miller et al., 2013	Cervical cancer screening	Low-income, racial and ethnic minority women	RCT (211)	A1. Tailored telephone Age, mean (SD): 28.5 years (8.5) Race White: 5.2% Black: 86.2% Hispanic: 8.6% Other: 0% A2. Tailored print Age, mean (SD): 30.7 years (12.0) Race White: 1.4% Black: 84.7% Hispanic: 12.5% Other: 1.4% B. Enhanced standard Age, mean (SD): 30.6 years (11.0) Race White: 6.9% Black: 76.4% Hispanic: 15.3% Other: 1.4%	University-affiliated clinic serving low-income minority women in Philadelphia, Pennsylvania	A1. Tailored telephone (61) A2. Tailored printed messaging (76) Interventions based on identified cognitive-affective barriers	B. Enhanced standard care-baseline surveys, barriers assessment, mail and telephone appointment reminder (73)	Screening to 6- and 12-month followup appointments; followed up to 15 months

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Mitchell, Andrews, & Schenker, 2015	Obesity screening and manageme nt	Latino, low-income, immigrant	RCT (254; analyzed 178)	A. Intervention Age, mean (SD): 32.3 y (7.6) BMI: 29.1 kg/m^2 (0.3) B. Control Age, mean (SD): 32.5 y (7.9) BMI: 27.7 kg/m^2 (0.4) Female, entire population: 72.0%	Worksite-sponsored clinic on berry farms in California	Nine 90-minute educational sessions and one final review on PA, healthy weight, healthy diet, lifestyle, plus 15-20 min per session for guided PA (112 analyzed) A1. Intervention high attendance-8 to 10 sessions (86) A2. Intervention low attendance-3 to 7 sessions (26)	B. Control group-no information, contacted only once to maintain communication (66 analyzed)	12 to 14 weeks
Murphy et al., 2005	Tobacco smoking cessation	Medicaid (low-income)	RCT (608)	Age, mean years (SD), median (range): 35.8 (9.8), 36 (18-62) (p=0.01 across arms) Female: 72.9% White: 42.9% Black: 42.4% Hispanic: 7.6% Other: 7.1%	Department of Social Services Eric County, NY	A. Case management, including verbal information on Medicaid pharmacotherapy benefit, self-help materials, and patient navigation (schedule appointments for prescription, followup reminder calls, vouchers for childcare or transportation) (206) B. Self-help, including verbal information on Medicaid pharmacotherapy benefit, plus self-help materials (205)	C. Minimal intervention, including verbal information on Medicaid pharmacotherapy benefit (197)	3 months
Murray et al., 2001	Tobacco smoking cessation	African American	RCT (3,068)	Black vs. White Age, mean years (SD): 48.7 (7.3) vs. 48.6 (6.8) Female: 46% (0.5) vs. 37% (0.48) (p=0.01) Black: 6.5% White: 93.5%	6 Lung Health Study participating clinical centers MD, AL, OH, MI, CA, PA	A. Group program, including physician quit message focused on pulmonary function, 12 week group program, NRT (2,047)	B. Usual care (1,021)	Yearly for 5 years

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Myers et al., 2014	Colorectal cancer screening	African American	RCT (764)	A. Tailored intervention Age 50 to 59: 75.1% 60+: 24.9% Female: 72.7% B. Comparison Age 50 to 59: 67.3% 60+: 32.7% Female: 64.1%	University and network affiliated primary care clinics; Philadelphia, Pennsylvania	A. Tailored intervention - mailed CRC screening booklet, personalized message based on identified barriers, colonoscopy contact number or SBT kit, patient navigation (384; analyzed: 382; navigated: 293)	B. Standard - mailed CRC screening booklet, personalized letter, colonoscopy number, SBT kit, no patient navigation (380; analyzed: 379)	Duration: 45 days Followup: 6 and 12 months
Myers et al., 2019	Colorectal cancer screening	Hispanic	RCT (400)	A vs. B Age, mean years (SD): 57.2 (6.4) vs. 57.5 (6.5) Female: 59.4% vs. 58.1%	Five primary care practices in large health system PA	A. Decision Support and Navigation, including mailed bilingual information on and instructions for SBT and colonoscopy, SBT kit, and telephone navigation (identify preferred test, develop plan, scheduled prescreen visit for colonoscopy or review for kit return, added plan to EHR) (197)	B. Standard Intervention, including bilingual information on and instructions for SBT and colonoscopy, SBT kit (203)	12 months

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Nash et al., 2006	Colorectal cancer screening	Low income racial and ethnic minority	Before-after study (1767)	Age <50 A: 12% B: 15% 50 to 54 A: 17% B: 16% 55 to 59 A: 21% B: 17% 60 to 64 A: 20% B: 15% 65 to 69 A: 15% B: 16% 70 to 74 A: 9% B: 11% >75 A: 6% B: 9% Female A. 61% B. 59% Race/ethnicity NH Black A. 6% B. 17% Hispanic A. 69% B. 79% Other/unknown A. 25% B. 5%	Public hospital; New York City, NY	A. After intervention- August 2003 to February 2004 Patient navigator, direct endoscopic referral system, GI suite enhancements (1297)	B. Before intervention - April to July 2003 (470)	Duration: March 2003 to February 2004 Followup: same time period (11 months)

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Navarro et al., 1998	Breast cancer, cervical cancer screening	Low income Hispanic	RCT (512)	Age: 34 (18 to 72) Female: 100% Hispanic: 100%	Community Settings in San Diego County, California	A. Lay Health Worker: identified "consejeras" or "natural helpers" in the community. Consejeras led weekly education sessions to women in their social networks. Culturally appropriate educational materials. (274)	B. Control - Consejeras led weekly "Community Living Skills" education. (238)	12 weeks
Nguyen et al., 2015	Colorectal cancer screening	Vietnamese American	RCT (640)	Age 50 to 64: 67.8% vs 75% 65 to 74: 32.2% vs 25% Female: 50% Vietnamese: 100%	Community-based organizations; Santa Clara County, California	A. Navigation- lay health workers provided CRC education using a flip chart created for the intervention in Vietnamese. Followup calls, in person visits, referrals to low cost screening, assistance with making appointments, accompanying subject to appointment at times. (320)	B. Lay health worker education about healthy eating, physical activity, followup calls/visits to remind them to exercise and eat healthy. (320)	6 months
Paskett et al., 2011	Cervical cancer screening	Rural	RCT (286)	Age, mean years: 47.3 Female: 100% White: 95.4%	Community health clinic Appalachia Ohio	A. Lay Health Worker: two in-person visits, two telephone calls, and four postcards from an LHA over 10 months (145)	B. Letter from their physician and a National Cancer Institute brochure that encouraged them to have a Pap test (141)	10 months

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Paskett et al., 2006	Breast cancer screening	Low-income Racial/ethnic minority	Block RCT (851)	Age, mean years (95% CI) A. 54.5 (53.5 to 55.5) B. 55.7 (54.6 to 56.8) African American A. 33% B. 33% Native American A. 42% B. 42% White A. 24% B. 25% Low SES A. 80% B. 84%	Community health center Robeson County, NC	A. Lay health advisor: trained community members delivered individualized intensive education program through three home visits (45-60 minute first visit, 30-45 minute otherwise), two phone calls, two postcard mailings to educate, assess and manage barriers to screening, and assist with scheduling (453)	B. Letter: Letter and NCI brochure on importance of cervical cancer screening; after study completion, invitation to mammography screening and NCI brochure (444)	12 months
Percac-Lima et al., 2009	Colorectal cancer screening	Low income minority	RCT (1,223)	Age, mean: 63 years Female: 60% White: 47% Latino: 40% Black: 5% Asian: 2%	Hospital-affiliated primary care clinic; Chelsea, Massachusetts	A. Patient navigation: introductory letter, educational materials, assessment and addressing of barriers to screening, appointment scheduling and reminders, bowel prep assistance, transportation and appointment attendance as needed (409)	B. Usual care; patients given access to (A) after study completion (814)	9 months
Percac-Lima et al., 2012	Breast cancer screening	Serbo-Croatian (Bosnian) speaking self-identified	Before-after study (91)	Age, mean (range): 54 years (40-78) Female: 100% Race: NR Serbo-Croatian speaking: 100%	Hospital-affiliated Community Health Center, Chelsea, MA	Culturally tailored patient navigation. In person, phone, organized educational group sessions in community setting. Explored barriers, talked about preventive care. Arranged transportation, reminder calls, scheduling appointments, resolving insurance issues, accompanying patients to appointments when needed. A. After intervention (91)	B. Before intervention (91)	1 year

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Percac-Lima et al., 2014	Colorectal cancer screening	Latino Non-English speakers, non-Latino	Before-after study (3,115)	Age, mean (SD): 61.4 years (6.7) Female: 57.1% Race/ethnicity Asian: 1.8% Black: 5.2% Latino: 39.5% White: 49.6% Other: 4.0%	Hospital-affiliated community health center; Philadelphia, Pennsylvania	Culturally tailored patient navigation, including assessment/ management of barriers A. After intervention (NR)	B. Before intervention (NR)	Duration:5 years Followup: 12 months
Percac-Lima et al., 2018	Lung cancer screening	Low-income	RCT (1,200)	Age, mean: 62.2 Female: 52.5% Race Asian: 3.3% Black: 3.6% Hispanic: 5.6% White: 81.4% Other: 6.1%	Five community health centers in Massachusetts	A. Patient navigation consisting of helping with identifying and overcoming barriers to screening, introduction of shared decision making, improving patient-provider communication, communicating abnormal CT results to ordering provider, and arranging appropriate followup (400)	B. Usual care, consisting of provider initiated shared decision making and ordering of CTs without the use of a patient navigator (800)	Duration: 11 months Followup: 11 months
Phillips et al., 2011	Breast cancer screening	Low-income, racial and ethnic minority women	RCT (3,895) Note: randomized at the provider level	A vs. B Age, mean (SD): 60 years (5) vs. 60 years (5) Race White: 28% vs. 30% Black: 51% vs. 45% Hispanic: 7% vs. 14% Other: 14% vs. 12%	Safety-net hospital-affiliated internal medicine clinics in Boston, Massachusetts	A. Patient navigation as part of the primary care team, including assessment of/ addressing individual barriers to care (1,817)	Concurrent comparison group- received intervention at end of study (2,078)	9 months, followed until receipt of mammogram or end of protocol

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Potter et al., 2011	Colorectal cancer screening	Low-income Racial/ethnic minority	Group RCT (1,372)	A vs. B Age, mean years (SD): 59.9 (6.4) vs. 60.1 (6.6) Female: 43.7% vs. 46.6% African American: 37.7% vs. 36.5% Asian American: 11.5% vs. 10.6% Latino: 19.7% vs. 21.1% White: 28.9% vs. 30.1%	Six community-based primary care clinics San Francisco, CA	A. Nurse reminder sheet, visual aids explaining FOBT test and prep, simple multilingual written instructions, video instructions, and stamped envelopes to return kits (695)	B. Usual care (677)	18 weeks
Powell et al., 2005	Breast cancer screening	Rural African Americans	Cluster RCT (192)	Mean age: NR (75% were younger than 65 years and 25% were 65 years or older) Gender: 100% female Ethnicity: 100% African American	Churches, Greene County, AL	A1. Full program - educational intervention, including videos, group discussion (partial and full intervention groups), and a home visit by a home health educator (full intervention group only) (75) A2. Partial program - educational intervention, including videos and group discussion (partial and full intervention groups) only (71)	B. Delayed intervention (44)	3 months

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Racette et al., 2001	Obesity screening and manageme nt	African American	Prospective cohort (69)	A vs. B Age, mean year (SD): 47 (1) vs. 48 (1) Female: 84% vs. 88% Weight, mean kg (SD): 105 (3) vs. 110 (5) BMI, mean kg/m2 (SD): 39 (1) vs. 41 (2)	University medical center St. Louis, MO	A. Provided meals (energy restricted diet) for 1 week; lifestyle modification program to reduce fat intake (educational materials, utensils, personalized guidance, monthly telephone calls, newsletters, optional bimonthly group meetings and individual meetings, food diaries) and recommendation to increase physical activity (handouts, access to cardio equipment at hospital, exercise prescriptions, individual exercise orientation sessions, logbooks) (45)	B. Matched control (24)	Duration: 12 months Assessments at 4 and 12 months
Reuland et al., 2017	Colorectal cancer screening	Low-income, racial and ethnic minority	RCT (265)	Mean age: 58 years (50-75) Female: 65% Race Latino: 62% Non-Latino White: 15% Non-Latino Black/Mixed: 23%	2 community health centers, one each in Albuquerque, New Mexico and Charlotte, North Carolina	A. Tailored patient navigation using CRC screening decision aid videos regarding FOBT/FIT or colonoscopy, distribution of FOBT/FIT kits (133)	B. Food safety videos (attention control), usual care (132)	6 months
Rodriguez-Torre, 2019	Breast cancer screening	Refugees	Post-intervention multiple time series (1,664)	Age, mean years (SD) A. 53.62 (9.2) B. 54.9 (9.1) Language (among n=126 refugees) Arabic: 23% Serbo-Croatian (Bosnian): 59.5% Somali: 17.6% Baseline screening prior to PN program: 64%	Hospital-affiliated primary care clinic Chelsea, MA	A. Refugees provided culturally tailored patient navigation in person, phone, group session with education, barrier assessment and management; program ended 2012, study ended 2016 (126)	B. English-speaking patients over same period (1,538)	5 years

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Roetzheim et al., 2004 and 2005	Breast cancer, cervical cancer, colorectal cancer screening	Low income	Cluster RCT (1,196) 8 Practices	Age 50 to 56: 37.1% 57 to 63: 33% 64 to 75: 29.8% Female: 78.2% Race AA/Black: 29.1% White: 48.4% Hispanic: 22.5%	8 clinics; Hillsborough County, Florida	A. Cancer screening checklist completed by patients, stickers to designate whether screening was ordered/completed. (600) Type of CRC screening: FOBT	B. Usual care (596)	12 months and 24 months
Rosas et al., 2015	Obesity screening and management	Low income, Latino	RCT (207)	Age, mean (SD): 47.1 years (11.1) Female: 76.8% Race: 100% Latino	1 health system-affiliated community health center; Fair Oaks, California	A1. Case management plus community health worker: (A2) plus fostering family support, building skills for navigating obesogenic environment, mapping neighborhood walking routes, modified photo voice activities to track and manage food and physical activity and goals. (A2) group and individual sessions, plus five home visits first year, two home visits second year. (82) A2. Case management: motivational interviewing, goal setting, cooking and PA demonstrations, fostering self-efficacy, identifying community resources, coordinating with primary care. First year 12 (2-hr) group and 4 (30-min) individual sessions; second year 3 group and 1 individual session. (84)	B. Usual care, with potential for referral to lifestyle counseling in specialized diabetes clinic; access to modified (A2) at study completion. (41)	2 years

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Russell et al., 2010	Breast cancer screening	Low-income, African-American Women	RCT (179)	Age, mean: 51.2 Female: 100% Black: 100% Insured: 55.4%	FQHC in Indianapolis, Indiana	A. Interactive computer program providing algorithm of tailored messages to identify views of breast cancer; to assess health beliefs, self-efficacy, and barriers to screening; and to assess stage of readiness for breast cancer screening; and 2) lay health advisor assisting in patient navigation services including barriers counseling, referrals to low or no-cost mammograms, assistance scheduling appointments, and assistance with transportation (89)	B. Low-dose group receiving culturally appropriate pamphlet about breast cancer and screening coupled with a lay health advisor recommendation to schedule a mammography. Also, received mailed postcards with general nutrition information periodically (90)	Duration: Unclear, appears to be 18 weeks Followup: 6 months
Singal et al., 2016 Singal et al., 2017	Colorectal cancer screening	Underserved	RCT (5,999)	Mean age: 56 years Female: 62% White: 22% Hispanic: 49% Black: 24%	Safety-net hospital system; Dallas County, Texas	A. Mailed letter with invitation, telephone call reminder for nonresponders, phone number to call for scheduling, mailed bowel prep, appointment reminder phone call for colonoscopy (2,400) B. Mailed letter with invitation, telephone call reminder for nonresponders, FIT kit and SASE, instructions (2,400)	C. Usual care for colonoscopy or FIT (1,199)	3 years; 1 year
Soltero et al., 2019	Obesity screening and manageme nt	Latino Underserved	Before-after (59)	Age, mean years (SD): 37.3 (6.5) Female: 92.2%	FQHC, YMCA, diabetes program, academic research center Phoenix, AZ	A. 12 week lifestyle intervention including nutritional education and behavioral skills training (60 minute 1x/week), physical activity classes (60 minute, 3x/week) (59)	B. Post-intervention (NA)	12 weeks

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Staten et al., 2004 Arizona WISEWOMAN	Obesity screening and management	Hispanic, underserved	RCT (217)	Mean age (SD): 57.2 years (4.8) Female: 100% Race White: 25% Hispanic: 74% AA/Black: 1%	2 national Breast and Cervical Cancer Early Detection Program clinics; Tucson, Arizona	A1. PC+HE+CHW (67): (A2) and (B), plus semiweekly to monthly communication with a community health worker providing advice on healthy diet and exercise, behavior change, and invitations to bimonthly walks in community. A2. PC+HE (73): (B), plus two health education classes (one on nutrition, one on physical activity), monthly health newsletter for 12 months, reminder calls at 6 months.	B. PC (77): provider counseling (active control), including brochures, benefits of physical activity and healthy diet, behavior change prescription tailored to individual	12 months
Stoddard et al., 2004 Massa-chusetts WISE-WOMAN	High blood pressure screening	Underserved	RCT (1,443)	Age, years (50-64): 82.9% Age, years (≥65): 17.1% Female: 100% Race White: 79.4% AA/Black: 2.7% Hispanic: 11.7% Other: 6.2%	10 Massachusetts Breast and Cervical Cancer Initiative project sites; Massachusetts	A. Enhanced intervention including (B) plus lifestyle interventions focused on nutrition and physical activity to reduce CVD risk through one-to-one assessment and counseling, individual and group education, activities in the community (n=NR)	B. Minimal intervention including screening for breast and cervical cancer, CVD risk factors, multiple risk factors, counseling and education, referrals, and follow up; low-literacy fact sheets on preventive services	12 months

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Taplin et al., 2008	Breast cancer, cervical cancer, colorectal screening	Underserved	Before-after study (97,433) 4 Sites	Female: 49.5% Race Asian: 1.6% AA/Black: 14.6% AI/AN: 0.3% White: 21.2% Hispanic: 58.9%	4 FQHCs; U.S. nationwide	"Care process leaders," worked with primary care teams to plan and implement practice changes. FQHCs monitored progress: self-management goal setting; number and percent screened for breast, cervical, and colorectal cancer; percent timely results notification; and percent abnormal screens evaluated within 90 days. Create local communities of practice (LCOP) involving community resources to support cancer screening. Type of CRC screening: colonoscopy, sigmoidoscopy, FOBT A. After intervention (NR)	B. Before intervention (NR)	15 months
Tu et al., 2006	Colorectal cancer screening	Chinese Americans	RCT (210)	A vs. B Age 50-64: 59.1% vs. 49.5% 65+: 40.9% vs. 50.5% Female: 63.8% vs. 61.9% Race: 100% Chinese American	1 community clinic serving primarily Asians; Seattle, Washington	A. CRC screening education from health educator, video, and pamphlet, FOBT kit with instructions, plus SASE (105)	B. Usual care (105)	6 months
Tu et al., 2014	Colorectal cancer screening	Limited English Vietnamese	Before-after 1,016 baseline 1,260 post	Baseline vs. followup Age, 50-64 years, Intervention: 75% vs. 78% Age, 50-64 years, Control: 75% vs. 75% Female, Intervention: 67% vs. 65% Female, Control: 68% vs. 69%	Two primary care community health centers Seattle, WA	A. Educational DVD and pamphlet promoting CRC translated into Vietnamese, given to eligible patients by medical assistant (604 baseline, 746 post)	B. Control clinic (412 baseline, 514 post)	2 years

Author, Year (See Appendix B for full citation)	**Preventive Service**	**Disparity Population**	**Study Design (N)**	**Population; Age (mean; range); Gender; Race**	**Setting**	**Interventions (n)**	**Comparison (n)**	**Duration; Followup**
Weber & Reilly, 1997	Breast cancer screening	Low-income, racial and ethnic minority	RCT (376)	A vs. B Age, mean: 63 years vs. 63 years Race White: 39.8% vs. 43.7% Black: 39.2% vs. 33.2% Hispanic: 4.3% vs. 9.5% Asian: 3.8% vs. 4.2%	6 hospital-affiliated primary care practices; Rochester, New York	A. Mailed personalized letter from PCP, mailed personalized letter from community health worker 2 weeks later, CHW navigation (telephone, home visit, mail, office visits; education, appointment reminders, assessment and management of barriers, appointment scheduling / transport, financial assistance, dependent care) (186)	B. Mailed personalized letter from PCP, usual care (190)	16 weeks
West et al., 2004	Breast cancer screening	Low-income, African-American women	Multi-stage RCT: randomized first to stage 1, then independent of stage 1 group, if not screened they were randomized to stage 2 Stage 1 (320) Stage 2 (237)	Age, mean: 65 years Black: 91%	FQHC in rural Alabama locations	Stepped-care intervention (personalized letter in Stage 1, personalized phone counseling in Stage 2) A1. Stage 1 - letter (159) A2. Stage 2 - counseling call (119)	B1. Stage 1 - usual care (161) B2. Stage 2 - letter (118)	1 year; 6 month followup for each stage
Wu & Lin, 2015	Breast cancer screening	Chinese women	RCT (193)	Age: 54.6 (9.6) Female: 100% Chinese: 100%	Community Settings in Michigan	A. Tailored Intervention: telephone intervention tailored to the results of a baseline survey about barriers, misconceptions, risks. (96)	B. NCI mammography brochure (97)	4 months

Abbreviations: AA = African American; ACA = Affordable Care Act; ACS = American Cancer Society; AI = American Indian; AN = American Native; aOR = adjusted odds ratio; API = Asian Pacific Islander; BMI = body mass index; CMS = Centers for Medicare & Medicaid Services; COL/FS = colonoscopy/flexible sigmoidoscopy; CRC = colorectal cancer; CT = computerized tomography; DVD = digital versatile disc; EMR = electronic medical record; FIT = fecal immunochemical test; FOBT = fecal occult blood test; FQHC = federally qualified health center; FS = flexible sigmoidoscopy; gFOBT = Guaiac Fecal Occult Blood Test; HR = heart rate; ITT = intention to treat; LCOP = local communities of practice; LHA = lay health advisors; NA = not applicable; NCI = National Cancer Institute; NH = Non Hispanic; NHS = National Health Service; NNT = number needed to treat; NR = not reported; NRT = nicotine replacement therapy; NS = not significant; OR = odds ratio; PCP = primary care provider; PN = patient navigation; QoL = Quality of Life; RCT = randomized controlled trial; SASE = self-addressed stamped envelope; SBT = stool blood test; SD = standard deviation; SE = standard error; SES = socioeconomic status; TBHEP = Targeted Breast Health Education Program; YMCA = Young Men's Christian Association

Table F-8. Key Question 5 outcomes

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Abood et al., 2005	Mammogram completion in 6 months (adjusted for race and breast cancer symptoms): AOR 1.914 (95% CI, 1.2 to 3.05), p=0.0063	Poor 1. Randomization not sufficient 2. Not comparable groups at baseline 3. Maintenance of comparable groups unclear 4. No reporting of attrition/Loss to followup unclear 5. ITT unclear 6. Post randomization exclusions unclear	Poor 1. This is a pre ACA study examining participants uninsured for breast cancer screening.
Allen & Bazargan-Hejazi, 2005	Mean screening utilization rate A. 36.8% B. 29.0%, p=NS	Fair 1. Unclear as to whether outcome assessors were masked	Fair 1. Study population (demographics) 2. Study setting (health care system, centers, time, effort)
Arnold et al., 2016a Arnold et al., 2016b	Completion of three FOBT kits A1. 13.6% A2. 11.4% B. 4.7% p=0.005 Screening ratio, A1 vs. A2: 1.11 (95% CI, 0.76 to 1.62), p>0.05 Screening ratio, A1 vs. B: 2.65 (95% CI, 1.47 to 4.77), p=0.001 Screening ratio, A2 vs. B: 2.39 (95% CI, 1.21 to 4.72), p=0.01	Poor 1. Groups not comparable at baseline 2. Unclear whether outcome assessors were masked 3. Unclear whether attrition or loss to followup occurred	Poor 1. Study population (inclusion/exclusion, demographics, adherence) 2. Study setting (system, effort, center) 3. Study providers (training)
Baker et al., 2014	Completion of FOBT within 6 months (2014) A. 82.2% B. 37.3%, p<0.001 NNT: 2.2 Note: in 2015 followup, 88.7% of those in Group A kept up to date on CRC testing	Fair 1. Unclear allocation concealment 2. Unclear masking	Fair 1. Study setting (center, effort) 2. Study providers (ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Battaglia et al., 2012	Baseline period (2004-2005) vs. intervention period (2007-2008) Rate of diagnostic resolution of cervical abnormalities A. 79.1% vs. 87.9%, p=0.0008 B. 80.0% vs. 78.6%, p=0.64 Median days to resolution A. 110 vs. 76, p=NR B. 84 vs. 90, p=NR Adjusted HR for time to resolution during intervention time period compared with baseline time period A. 1.45 (95% CI, 1.14 to 1.88), p=0.003 B. reference	Fair 1. Groups not similar at baseline 2. Unclear masking	Fair 1. Specialized skills of patient navigator 2. Language concordance
Berkowitz et al., 2015	Baseline receipt of any CRC screening (colonoscopy, sigmoidoscopy, barium enema, CT colonography): A. 65.7% B. 74.5%, p<0.001 Post-intervention receipt: A. 69.4% B. 76.7%, p<0.001 Increase in CRC screening over time A. 3.7% B. 2.2%, p<0.001 (2.7% overall, p<0.001) Decline in CRC screening disparities over time: 0.68%, p<0.001 (gain of 26 life years, or an additional 99 out of 174,693 disadvantaged patients being screened)	NA	Good
Blumenthal et al., 2010	Any type of CRC screening by 6 months (ITT) A1. 16.7% A2. 17.4% A3. 22.2% B. 12.5% *No groups significant vs. control Screening by 6 months, contacted, n=257 A1. 22.2% A2. 25.4% A3. 33.9% B. 17.7% *A3 vs. B, p=0.04	Poor 1. Unclear whether randomization was adequate 2. Unclear whether allocation concealment was adequate 3. Unclear outcome assessors or care providers were masked 4. Groups not comparable with insurance status at baseline 5. High attrition	Poor 1. Study population (inclusion/exclusion, demographics, adherence, recruitment, refusal) 2. Study setting (system, time, cost, effort, center) 3. Study providers (training, expertise)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Braun et al., 2015	FOBT within past 1 year A. 20.7% B. 12.6%, p=0.02 Endoscopy within past 5 years A. 43.0% B. 27.2%, p<0.001 Pap smear within past 2 years A. 57.0% B. 36.4%, p=0.001 Mammogram within past 1 year A. 61.7% B. 42.4%, p=0.003	Poor 1. Unclear whether allocation concealment was adequate 2. Outcome assessors were not masked 3. No reporting of attrition and loss to followup unclear	Poor 1. Study population (demographics) 2. Study setting (center) 3. Study providers (training, skill, ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Byrd et al., 2013	ITT analysis, n=613 Pap test at 6 months followup, self-report A1. 52.3% A2. 45.5% A3. 41.3% B. 24.8% p<0.001 between intervention groups and control group p>0.05 among intervention groups Pap test at 6 months followup, validated by medical records A1. 17.9% A2. 22.7% A3. 19.4% B. 7.2% p=0.008 between intervention groups and control group p>0.05 among intervention groups Pap test at 6 months, El Paso, validated A1. 0% A2. 4.0% A3. 10.0% B. 8.0% p>0.05 for all comparisons Pap test at 6 months, Houston, validated A1. 23.5% A2. 24.1% A3. 12.3% B. 7.2% p=0.03 between intervention groups and control group p>0.05 among intervention groups Pap test at 6 months, Yakima, validated A1. 30.0% A2. 40.0% A3. 37.5% B. 6.4% p<0.001 between intervention groups and control group p>0.05 among intervention groups	Poor 1. Unclear allocation concealment 2. No reporting of baseline characteristics, and unclear whether groups were maintained 3. Unclear masking of outcome assessors, care providers, or patients	Poor 1. Study population (demographics, inclusion/exclusion criteria, recruitment) 2. Study setting (system, centers, time, effort) 3. Study providers (training, expertise, ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Cole et al., 2017	Any type of CRC screening at 6 months A1. 17.5% A2. 17.8% B. 8.4% Receipt of screening A1. AOR 2.28 (95% CI, 1.28 to 4.06) A2. AOR 2.44 (95% CI, 1.38 to 4.34) B: Reference Per protocol analysis, likelihood of CRC screening among those completing patient navigation aOR 16.04 (95% CI, 8.32 to 30.93)	Poor 1. Unclear whether allocation concealment was adequate 2. Outcome assessors were not masked 3. High attrition	Fair 1. Study population (inclusion/exclusion criteria, refusal rate, attrition, recruitment) 2. Study setting (time, effort) 3. Study providers (ancillary providers)
Coronado et al., 2011	FOBT screening: A1. 31% A2. 26% B. 2% A1 vs. B: p<0.001 A2 vs. B: p<0.001 A1 vs. A2: p=0.28	Fair 1. Unclear allocation concealment 2. Unclear masking of outcome assessors, providers, patients	Fair 1. Study providers (training, ancillary providers) 2. Study setting (time, effort)
Coronado et al., 2016	Percent of women who received a mammogram in the 12 months after randomization: A. 19.6% B. 11%, p<0.01	Fair 1. Unequal demographic groups at baseline 2. ITT- comparable groups not assessed.	Fair 1. Study providers (training, ancillary providers) 2. Intervention (resources)
Coronado et al., 2018	FIT completion in 12 months: A. 13.9% B. 10.4% Adjusted MD: 3.4 (95% CI, 0.1 to 6.8), p=0.05 Any CRC screening (FIT, COL/FS) in 18 months: A. 18.3% B. 14.5% Adjusted mean difference: 3.8 (95% CI, 0.6 to 7.0), p=0.02	Poor 1. Randomization not reported. 2. Allocation concealment unclear. 3. Unclear whether study maintained comparable groups. 4. Unclear whether ITT analysis performed.	Fair 1. Intervention is resource intensive - may not be plausible in all systems.

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Davis et al., 2013	FOBT completion in 12 months: A1. 60.6% A2. 57.1% B. 38.6%, p<0.0001 Adjusted screening ratio A1 vs. B: 1.60 (95% CI, 1.06 to 2.42), p=0.02 A1 vs. A2: 1.18 (95% CI, 0.97 to 1.42), p=0.09 A2 vs. B: 1.36 (95% CI, 0.85 to 2.18), p=0.20	Poor 1. Groups not comparable at baseline 2. Unclear blinding	Good
DeGroff et al., 2017	Receipt of colonoscopy within 6 months A. 61.1% B. 53.2% p=0.021 OR 1.51 (95% CI, 1.12 to 2.03), p=0.007 Hispanics vs. Whites, receipt of screening: OR 2.60 (95% CI, 1.64 to 4.13), p<0.001	Fair 1. Unclear allocation concealment 2. Unclear whether outcome assessors were masked	Fair 1. Study setting (serving low-income population) 2. Study providers (training, expertise, ancillary providers)
Dietrich et al., 2006	A. vs. B. Mammogram (% change from baseline): 10% vs. -2% Papanicolaou test (% change from baseline): 7% vs. 0% Any colorectal screening (% change from baseline): 24% vs. 11% Up to date 1+ screening (% change from baseline): 5% vs. 1% Up to date 2+ screening (% change from baseline): 14% vs. 1% Up to date 3+ screening (% change from baseline): 22% vs. 8%	Fair 1. Unclear whether clinicians were masked. 2. Subjects not blinded	Fair 1. Population: Multi-site study, but in a single state w/similar population 2. Intervention: Specific training/resources required.
Dietrich et al., 2013	A vs. B Any CRC screening at 18 months (FOBT, COL/FS, barium enema) A. 36.7% B. 30.6% AOR 1.32 (95% CI, 1.08 to 1.62), p<0.01	Fair 1. Allocation concealment unclear 2. Post-randomization exclusions	Good

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Dignan et al., 2014	Change in screening rates from baseline to 6 months FOBT results documented A. 1.0% B. 2.9%, p=0.463 Colonoscopy results documented A. 5.0% B. 0.5%, p=0.097 Any screening results documented A. 2.2% B. 0.2%, p=0.744 When limited to those with documented recommendation, changes in screening rates from baseline to 6 months Change in colonoscopy A. 15.7% B. 2.4%, p=0.01 Change in FOBT A. 41.3% B. 46.2%, p=0.82 Any screening completed A. 16.7% B. 9.5%, p=0.06	NA	Fair 1. Intervention may require additional resources/training

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Doorenbos et al., 2011	Smoking cessation Nicotine Patch A. 0.6% B. 0.8%, p=0.48 Cessation Counseling A. 4.5% B. 4.5%, p=0.99 Cessation Counseling Referral A. 0% B. 0.9%, p=0.51 Colorectal cancer screening Stool Occult Blood A. 2.9% B. 3.1%, p=0.81 Colonoscopy A. 0.3% B. 0.7%, p=0.20 Mammogram receipt A. 13.6% B. 14.8%, p=0.50	Poor 1. Unclear allocation 2. Unclear masking 3. No reporting of attrition 4. No ITT analysis 5. Post-randomization exclusions	Poor 1. Intervention requires additional resources / training
Enard et al., 2015	Colonoscopy, flexible sigmoidoscopy, or FOBT screening rates: A. 43.7% B. 32.1%, p=0.04 aOR: 1.82, p=002 Individually, significant difference only for colonoscopy/flexible sigmoidoscopy, but not FOBT.	Poor 1. Randomization and allocation concealment NR 2. Assessor and clinician masking unclear 3. Differential loss to followup 4. ITT not used. Post randomization exclusions.	Good

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Fang et al., 2017	Rate of screening at 12 months after intervention, % (n) A. 72.1% (209) B. 10.1% (30) Among uninsured women A. 77.8% (144) B. 6.7% (8) Rate difference between intervention and control groups, among all women: 62% Rate difference between intervention and control groups, among uninsured women: 71.1% Intervention led to significantly higher screening rates OR 25.9 (95% CI, 10.1 to 66.1); p<0.001 In the covariate adjusted model (age, marital status, prior pap receipt, insurance coverage, usual source of care): AOR 35.8 (95% CI, 11.1 to 114.9), p<0.001 Sensitivity analysis: OR 16.7 (95% CI, 8.1 to 34.4), p<0.001 covariate-adjusted analyses: AOR 21.6 (95% CI, 9.6 to 49), p<0.001 Post-hoc analyses to account for update in screening guidelines, n=340. Obtained screening by followup assessment: A. 65.5% (110/168) B. 4.7% (8/172) OR, (95% CI): 546; (73.9 to 4031.5), p<0.001	Fair 1. Differences in groups at baseline	Fair 1. Exclusive population consisting of only Korean American women
Fiscella et al., 2011	<u>CRC screening</u> Unadjusted rates A. 28.8% 10.0% B. 10.0%, p=NR AOR 3.69 (95% CI, 1.93 to 7.08) <u>Mammography</u> Unadjusted rates A. 41.0% B. 16.8%, p=NR AOR 3.44 (95% CI, 1.91 to 6.19)	Fair 1. Inadequate randomization 2. Allocation concealment not reported 3. Patient masking, attrition, and contamination not reported	Good

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Ford et al., 2006	Adherence to flexible sigmoidoscopy over 3 years Low income (≤1.5x federal poverty level A. 68.9% (31/45) B. 51.3% (20/39), p=0.10 Moderate to high Income A. 53.8% (50/93) B. 62.5% (60/96), p=0.22	Poor 1. Randomization and allocation techniques not reported 2. Masking unclear 3. Attrition not reported 4. ITT analysis unclear 5. Unclear post-randomization exclusions	Poor 1. Study population within a pre-existing trial 2. Study setting in single location 3. Study providers (training, ancillary providers)
Fortuna et al., 2014	Mammography screening rates A. 27.5%; aOR 2.2 (95% CI, 1.2 to 4.0) B. 28.2%; aOR 2.1 (95% CI, 1.1 to 3.7) C. 22.8%; aOR 1.3 (95% CI, 0.7 to 2.4) D. 17.8%; reference CRC screening rates A. 21.5%; aOR 2.0 (95% CI, 1.1 to 3.9) B. 19.6%; aOR 1.9 (95% CI, 1.0 to 3.7) C. 15.3%; aOR 1.2 (95% CI, 0.6 to 2.4) D. 12.2%; reference *only one variable appeared significant in CRC screening: Other, including Hispanic vs. White, 25.7% vs. 17.4%, aOR 1.9, (95% CI, 1.0 to 3.7)	Good	Fair 1. Study population 2. Study setting
Friedman & Borum, 2007	Endoscopic procedure A. 59.1% B. 26.7%, p<0.001 Rectal exam A. 38.6% B. 41.4%, p=0.6605 FOBT A. 37.9% B. 37.7%, p=0.7748	NA	Fair 1. Study setting (Demographics) 2. Study setting (time, effort) 3. Study providers (training)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Friedman et al., 2001	Compliance with FOBT screening, intercorrelation with treatment group: 0.07, p>0.05	Poor 1. Inadequate randomization 2. Unclear allocation 3. Groups not comparable at baseline 4. Unclear ITT analysis 5. Unclear post-randomization exclusions	Poor 1. Population 2. Setting
Glasgow et al., 2000	7-day abstinence, 6 weeks A. 10.2% B. 6.9 OR 1.52 (95% CI, 1.01 to 2.32), p<0.05 7-day abstinence, 6 months A. 18.3% B. 14.9% OR NR, p>0.05 30-day abstinence, 6 months A. 10.2% B. 7.8%, OR NR, p=0.15	Fair 1. Unclear allocation 2. Unclear masking	Fair 1. Population 2. Setting
Goldberg et al., 2004	Rate of return of FOBT card at index appointment A. 35.6% B. 3.3% OR 16.0 (95% CI, 3.5 to 71.4), p<0.001 Rate of return of FOBT card after index appointment A. 5.1% B. 1.7% OR 3.2 (95% CI, 0.3 to 31.3), p=0.36 Rate of return of FOBT card within 12 months of index appointment A. 40.7% B. 5.0% OR 13.0 (95% CI, 3.6 to 45.5), p<0.001	Fair 1. Outcome assessors and analysts were not masked	Good

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Goldman et al., 2015	<u>FOBT completed by week</u> 0 to 2 weeks A. 13.8% B. 2.9%, p≤0.001 >2 to 13 weeks A. 13.8% B. 4.8%, p=0.001 <u>FOBT completed month</u> 6 months A. 36.7% B. 14.8%, p<0.001 12 months A. 40% B. 22.4, p<0.001 <u>Total CRC screening</u> 6 months A. 36.7% B. 15.2%, p<0.001 12 months A. 40% B. 23.3%, p<0.001	Fair 1. method of randomization and allocation concealment NR	Good

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Gordon et al., 2010	No tobacco use (prolonged abstinence) A. 5.3% B. 1.9%, p<0.01 No tobacco use in past 7 days A. 11.3% B. 6.8%, p<0.05 No tobacco use, African American A. 6.5% B. 2.0%, p<0.001 No tobacco use, NH White A. 4.6% B. 2.3%, p<0.05 No tobacco use, Hispanic A. 3.2% B. 1.1%, p=NS No tobacco use, MS A. 6.3% B. 2.1%, p<0.01 No tobacco use, NY A. 4.9% B. 2.1%, p<0.05 No tobacco use, OR A. 4.9% B. 1.4%. p<0.05	Poor 1. Unclear randomization 2. Unclear allocation 3. Groups not comparable at baseline 4. Unclear masking 5. No ITT analysis 6. Post-randomization exclusions	Fair 1. Population 2. Setting 3. Providers
Guillaume et al., 2017b De Mil, 2018	FOBT within 9 months, overall navigable population A. 24.3% B. 21.1%, p=0.003 OR 1.19, (95% CI, 1.10 to 1.29), p<0.001 FOBT within 9 months, deprived strata A. 22.8% B. 20.2%, p=0.07 FOBT within 9 months, affluent strata A. 26% B. 21.9%, p=0.001	Fair 1. Unclear allocation concealment 2. Groups not comparable at baseline	Fair 1. Study system (background of universal screening and access in France) 2. Study setting (by geographic strata)

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Gupta et al., 2013	CRC screening at 1 year: A1. 24.6% A2. 40.7% B. 12.1% Difference across all groups and between groups: p<0.001 Number needed to invite (NNI): number of patients needed to be invited to accomplish 1 additional screening A1. 8 A2. 3.5	Fair 1. Unclear allocation concealment 2. Unclear loss to followup	Good
Hendren et al., 2014	CRC screening, unadjusted rates A. 37.7% B. 16.7%, p=0.0002 aOR 3.22 (95% CI, 1.65 to 6.30) Mammography, unadjusted rates A. 29.7% B. 16.7%, p=0.034 aOR 1.96 (95% CI, 0.87 to 4.39) Sub-analysis based on race Black vs. White vs. Other CRC Screening, unadjusted rates A. 44.19% vs. 34.62% vs. 20.00% B. 14.63% vs. 16.13% vs. 30.00% Mammography, unadjusted rates A. 27.03% vs. 25.58% vs. 60.00% B. 10.53% vs. 20.51% vs. 33.33%	Fair 1. Care providers not masked, unclear if patients masked, attrition and loss to followup not reported	Good
Hirst et al., 2018	Uptake among adequately screened Female: OR 1.48 (95% CI, 1.46 to 1.51), p<0.01 Deprivation: OR 0.99 (95% CI, 0.98 to 0.99), p<0.01 Ethnic diversity: OR 0.99 (95% CI, 0.99 to 0.99), p<0.01 Year (linear): OR 0.95 (95% CI, 0.95 to 0.95), p<0.01 For one unit increase in deprivation, probability of gFOBT kit return: -0.36% For one unit increase in area-based ethnic diversity, probability of gFOBT kit return: -0.21% For every successive year of program, probability of gFOBT kit return: -0.78%	NA	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Hoffman et al., 2017	Completed screening (type NR) at 3 months A. 21% B. 28%, p=0.45	Fair 1. Unclear allocation 2. Unclear masking 3. Post-randomization exclusion	Poor 1. Population 2. Setting 3. Providers
Honeycutt et al., 2013	Guideline compliant at study completion (COL in 10 years, FS in 5 years, FOBT in 1 year): A. 42.6% B. 10.8%, p<0.001, effect 5.9, p<0.001 Effect White vs. Black (reference): 1.23, p>0.05	Fair 1. Groups not comparable at baseline 2. Assessors not blinded	Poor 1. Study setting (time, effort) 2. Study provider (ancillary provider)
Horne et al., 2015	Any CRC screening by exit interview: A. 94% B. 91%, p=0.04 Any CRC screening: AOR 1.56 (95% CI, 1.08 to 2.25), p=0.02 FOBT: AOR 1.09 (95% CI, 0.72 to 1.64), p=0.68 Colonoscopy/sigmoidoscopy: AOR 1.54 (95% CI, 1.08 to 2.20), p=0.02	Fair 1. High attrition 2. Post-randomization exclusions	Fair 1. Unclear what navigation services were offered (or their intensity); trained and certified patient navigator
Inadomi et al., 2012	Completed screening colonoscopy: 38% (referent) Completed screening FOBT: 67%, AOR 3.50 (95% CI, 2.48 to 4.93), p<0.001 Completed screening of either FOBT or colonoscopy (choice): 69%, AOR 3.69 (95% CI, 2.63 to 5.16), p<0.001 (p=0.64, FOBT vs choice) Completed screening, African American: 48% (ref), p=NR for all White: 59%, AOR 1.34 (95% CI, 0.82 to 2.18) Latino: 63%, AOR 1.29, (95% CI, 0.70 to 2.39) Asian: 61%, AOR 1.08, (95% CI, 0.64 to 1.8) Other: 36%, AOR 0.55, (95% CI, 0.25 to 1.22) Among those offered choice, adherence white vs. non-white Colonoscopy: OR 3.2 (95% CI, 1.7 to 6.1) FOBT: OR 0.3 (95% CI, 0.1 to 0.6) Among those offered FOBT, adherence vs. whites Asians: OR 2.6 (95% CI, 1.2 to 5.3) Latinos: OR 2.1 (95% CI, 1.0 to 4.2)	Poor 1. Unclear randomization 2. Unclear allocation 3. Unclear masking of outcome assessor 4. High loss to followup 5. No ITT analysis	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Jandorf et al., 2005	FOBT completion at 3 months A. 42.1% B. 25%, p>0.05 Endoscopy completion at 6 months A. 23.7% B. 5%, p=0.02	Poor 1. No information on randomization or allocation 2. No information on masking 3. Unclear on attrition and whether ITT occurred	Good
Jandorf et al., 2014	<u>Mammography adherence</u> Baseline to 2-month assessment: OR 2.16 (95% CI, 1.69 to 2.76) Baseline to 8 months: OR 8.56 (95% CI, 5.85 to 12.53) 2 months to 8 months: OR 3.97 (95% CI, 2.70 to 5.82) Baseline, 2-month, and 8-month combined A: 56.7% B: 62.2%, p=0.043 <u>Pap adherence</u> Baseline to 2-month assessment: OR 2.14 (95% CI, 1.87 to 2.45) Baseline to 8 months: OR 2.35 (95% CI, 2.00 to 2.76) 2 months to 8 months: OR 1.78 (95% CI, 1.52 to 2.) Baseline, 2 month, 8 month combined A: 62.7% B: 64.6%, p=NS Participants of Puerto Rican ethnicity were significantly (OR 1.35; 95% CI, 1.09 to 1.67) more likely to be Pap adherent at 2 and 8 months compared to those born in other countries. Significant time by program type interaction (Wald chi-square=6.10; p=0.0472). Baseline: no significant difference in adherence between groups 2-month assessment- women in cancer group were less likely to be adherent: OR 0.74 (95% CI, 0.59 to 0.94) 8-month assessment- no adherence differences	Fair 1. Allocation concealment not reported. 2. Unclear whether groups were similar at baseline.	Fair 1. Study population (inclusion/exclusion criteria, demographics)
Jean-Jacques et al., 2012	Completed any screening (FOBT, sigmoidoscopy, colonoscopy) A. 30% B. 5%, p<0.001 Post-hoc analysis, any screening at 12 months A. 38% B. 15%, p=0.002	Fair 1. Unclear allocation 2. Unclear masking 3. Unclear ITT analysis	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Jibaja-Weiss et al., 2003	12-month cervical cancer screening A1. 23.7% A2. 43.9% B. 39.9%, p<0.001 12 month Breast Cancer Screening A1. 13% A2. 30.5% B. 20.7%, p<0.001	Fair 1. No ITT 2. Unclear patient masking 3. Unclear allocation concealment	Fair 1. Intervention set up
Katz et al., 2007	Baseline vs. followup, within pap guidelines A. 51.6% vs. 66.6%, p<0.001 B. 52.9% vs. 63.2%, p<0.001 OR 1.03, 95% CI, 0.80 to 1.32, p=0.81 Followup within pap guidelines, A vs. B African American: 70% vs. 64% Native American: 64% vs. 62% White: 67% vs. 65% High SES: 76% vs. 79% Low SES: 65% vs. 61%	Poor 1. Unclear randomization 2. Unclear allocation 3. No masking of patients, unclear masking of providers 4. No ITT analysis 5. Post-randomization exclusions 6. Unclear attrition	Poor 1. Population 2. Setting (cost)
Katz et al., 2012	CRC screening (FOBT or colonoscopy) at 2 months: A.19.6% B. 9.9%, aOR 2.35 (95% CI, 1.14 to 5.56), p=0.02	Fair 1. Unclear allocation 2. Unclear masking	Fair 1. Population 2. Setting
Kim & Sarna, 2004	Screening rate: A1. 87% (41/47) A2. 72% (35/48) A3. 47% (22/46) A1 vs. B, OR 1.82 (95% CI, 1.32 to 2.51) A2 vs. B, OR 1.52 (95% CI, 1.08 to 2.16)	Fair 1. Unclear as to whether outcome assessors were masked 2. Unclear as to whether attrition or loss to followup occurred	Poor 1. Study population (inclusion/ exclusion criteria, demographics, recruitment) 2. Study setting (health care system and centers, time) 3. Study providers (training, expertise or skill, ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Kumanyika et al., 2002	Mean weight change (SE), in kg at 6 months Black, A vs. D: -2.9 (0.4) vs. -0.2 (0.4), p<0.001 White, A vs. D: -6.2 (0.4) vs. -0.2 (0.4), p<0.001 Black vs. White, p<0.001 Mean weight (kg) change (SE) after 6 months Black, A vs. D: -0.3 (0.6) vs. -1.0 (0.5), p=NS White, A vs. D: 0.9 (0.4) vs. 0.0 (0.4), p<0.05 Black vs. White, p=0.90 Mean weight (kg) change (SE) at last study measurement Black, A vs. D: -3.2 (0.7) vs. -1.2 (0.9), p<0.05 White, A vs. D: -5.2 (0.4) vs. -0.3 (0.5), p<0.001 Black vs. White, p=0.007 Mean weight change (SE) at 6 months, A+C vs. B+D Black: -3.2 (0.4) vs. -0.9 (0.3), p<0.001 White: -5.6 (0.3) vs. -1.2 (0.3), p<0.001 Black vs. White, p=0.004 Mean weight (kg) change (SE) at last study measurement, A+C vs. B+D Black: -3.3 (0.5) vs. -1.4 (0.4), p<0.01 White: -4.2 (0.4) vs. -0.9 (0.4), p<0.001 Black vs. White, p=0.12 Average net weight loss across followup, A+C vs. B+D, Black vs. White: -2.3 vs. -3.9, p=0.03	Fair 1. Unclear allocation 2. Unclear masking	Poor 1. Setting 2. Providers
Kumanyika et al., 2005	Mean weight change, kg, final visit minus baseline A. -0.8 (95% CI, -2.5 to 0.9) B. -1.3 (95% CI, -3.4 to 0.9) C. -1.4 (95% CI, -3.5 to 0.7), p=0.90	Fair 1. No masking 2. High loss to followup 3. No ITT	Poor 1. Setting 2. Providers

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Lasser et al., 2017	Biochemically confirmed cessation, 6 months A. 9.6% B. 0.6%, p<0.001 Biochemically confirmed cessation, 12 months A. 11.9% B. 2.3% AOR 4.89 (95% CI, 1.59 to 15.03), p<0.001 Biochemically confirmed cessation at both points A. 7% B. 0%, p<0.001 Biochemically confirmed cessation, 12 months, non-White A. 15% B. 3%, p<0.001	Good	Fair 1. Setting 2. Providers
Lee-Lin et al., 2015	Mammogram completion 3 month aOR: 8.81 (95% CI, 4.83 to 1605), p<0.001 6 month aOR: 9.10 (95% CI, 3.5 to 23.62), p<0.001 12 month aOR: 4.61 (95% CI, 1.59 to 13.37), p<0.001	Fair 1. Poor reporting re: allocation concealment, randomization 2. Unclear whether ITT was used or post randomization exclusions to synthesis.	Fair 1. Study providers (training, ancillary providers) 2. Intervention (resources)
Leone et al., 2013	CRC screening, 6 months A. 9.2% B. 7.5%, AOR 1.44 (95% CI, 0.68 to 3.06) CRC screening, 12 months A. 16.3% B. 10.3%, unadjusted OR 1.68 (95% CI, 0.80 to 3.56) In A, reached by PN (n=44, 27.6%) CRC screening in A, reached vs. not reached: OR 3.5 (95% 1.7 to 7.1)	NA	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Levy et al., 2013	A vs. B vs. C vs. D Any CRC completion: 57.2% vs. 56.5% vs. 20.5% vs. 17.8%, p<0.0001 A: AOR 6.38 (95% CI, 3.9 to 10.5), p<0.0001 B. AOR 6.29 (95% CI, 3.8 to 10.4), p<0.0001 C. AOR 1.23 (95% CI, 0.7 to 2.1), p=0.46 D. Reference Colonoscopy: 19.3% vs. 22% vs. 17.8% vs. 11.9%, p=0.07 A. OR 1.8 (95% CI, 1.0 to 3.1) B. OR 2.1 (95% CI, 1.2 to 3.7) C. OR 1.6 (95% CI, 0.9 to 2.9) D. Reference FOBT: 1.6% vs. 2.2% vs. 2.7% vs. 2.7%, p=0.875 Flexible sigmoidoscopy: 0% vs. 0% vs. 0% vs. 0.5%, p=0.389 Barium enema: 0% for all	Fair 1. Unclear allocation concealment 2. Unclear as to whether outcome assessors, providers, patients were masked	Good
Ma et al., 2009	Baseline colonoscopy, flexible sigmoidoscopy, or FOBT screening rates A.13.1% B. 9.6% Colonoscopy, flexible sigmoidoscopy, or FOBT screening rates in 12 months following intervention: A. 77.4% B. 10.8% RR 7.14 (95% CI, 3.81 to 13.37) Screening rate following intervention among those who had not had a previous screening within the past year A. 76.7% (56/73) B. 12% (9/75) RR 6.39 (95% CI, 3.42 to 11.95)	Poor 1. Inadequate randomization. 2. Allocation concealment not reported. 3. Groups dissimilar at baseline.	Poor 1. Specific population 2. Setting - church based 3. Resource intensive intervention
Marshall et al., 2016	Self-reported mammogram status at exit screening: A. 93.3% B. 87.5%, p<0.001 AOR 2.26 (95 % CI, 1.59 to 3.42; control is reference)	Poor 1. Randomization and concealment not reported. 2. Did not report attrition, crossover, adherence, and contamination.	Fair 1. Specific population 2. Resource intensive intervention

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Mehta et al., 2016	Race/ethnicity and up to date screening, any CRC test, post vs. preprogram A1. RR 2.05 (95% CI, 2.04 to 2.05) A2. RR 1.60 (95% CI, 1.59 to 1.60) B. Reference By race/ethnicity, NH White reference NH Black A1. RR 0.97 (95% CI, 0.96 to 0.97) A2. RR 0.94 (95% CI, 0.93 to 0.95) B. RR 1.04 (95% CI, 1.02 to 1.05) Hispanic A1. RR 0.95 (95% CI, 0.95 to 0.96)* A2. RR 0.92 (95% CI, 0.92 to 0.93) B. RR 0.94 (95% CI, 0.93 to 0.96) API A1. RR 1.02 (95% CI, 1.02 to 1.02) A2. RR 1.03 (95% CI, 1.02 to 1.03) B. RR 1.05 (95% CI, 1.04 to 1.06) Native American A1. RR 0.91 (95% CI, 0.89 to 0.93)* A2. RR 0.87 (95% CI, 0.84 to 0.90)* B. RR 0.88 (95% CI, 0.83 to 0.93) Multiple race A1. RR 1.05 (95% CI, 1.05 to 1.06) A2. RR 1.07 (95% CI, 1.06 to 1.08) B. RR 1.11 (95% CI, 1.09 to 1.13) *RR vs. NH Whites in period C not statistically significant at p=0.01	NA	Good

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Mehta et al., 2016 (continued)	Overall, any CRC screening test (age/sex adjusted rates) 2004: 35.3% 2013: 80.9% NH White, any CRC test 2004: 35.2% 2013: 81.1% NH Black, any CRC test 2004: 35.6% 2013: 78.0% Hispanic, any CRC test 2004: 33.1% 2013: 78.3% API, any CRC test 2004: 36.3% 2013: 83.0% Native American, any CRC test 2004: 29.4% 2013: 74.5% Multiple race, any CRC test 2004: 39.0% 2013: 84.9%	(continued)	(continued)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Miller et al., 2013	Adherence, initial screening A1. 75.4% A2. 61.8% B. 65.6% Adherence, 6 months A1. 70.0% A2. 50.0% B. 61.0% Adherence, 12 months A1. 63.0% A2. 58.6% B. 53.9% *Note A2 and B combined for analysis below for statistical reasons Adherence, initial screening A1. 75.4% A2+B. 63.8% p=0.1027 Adherence, 6 months A1. 70.0% A2+B.: 55.6% p=0.1687 Adherence, 12 months A1: 63.0% A2+B: 56.4% p=0.586 Total adherence: all three measures favors telephone, p=0.475	Poor 1. Allocation concealment unclear 2. Did not maintain comparable groups 3. Unclear outcome, provider, patient-masking 4. No ITT analysis 5. High attrition	Fair 1. Study population (inclusion/ exclusion criteria, adherence) 2. Study setting (health care system and center) 3. Study providers (special training)
Mitchell, Andrews, & Schenker, 2015	BMI, mean kg/m2 A1. 27.9 (95% CI, 27.1 to 28.1) A2. 28.3 (95% CI, 27.9 to 28.8) B. 28.6 (95% CI, 28.3 to 28.9), p<0.001 Fruits and veg servings per day, mean A1. 6.1 (95% CI, 5.7 to 6.4) A2. 5.6 (95% CI, 5.0 to 6.3) B. 5.4 (95% CI, 5.0 to 5.8), p=0.041 Nonwork PA for 30 min, days per week, mean A1. 3.2 (95% CI, 2.8 to 3.7) A2. 2.5 (95% CI, 1.7 to 3.3) B. 2.1 (95% CI, 1.6 to 2.6), p=0.004	Poor 1. Groups not comparable at baseline 2. High attrition 3. No ITT analysis	Poor 1. Study population (demographics, inclusion/exclusion criteria, adherence, recruitment) 2. Study setting (health care system and center, time, effort) 3. Study providers (training, expertise, ancillary providers)

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Murphy et al., 2005	Biochemically confirmed cessation at 3 months A. 2.4%, OR 2.43, (95% CI, 0.47 to 12.65) B. 2.0%, OR 1.94, (95% CI, 0.35 to 10.71) C. 1.0% (reference) Biochemically confirmed cessation at 3 months overall: 1.8%	Poor 1. Inadequate randomization 2. Unclear allocation 3. Groups not comparable at baseline 4. No masking 5. No ITT analysis	Fair 1. Population 2. Setting
Murray et al., 2001	A vs. B Validated quitting at 1 year, Black: AOR 1.18 (95% CI, 0.66 to 3.32), p=NS Validated quitting at 1 year, White: AOR 5.99 (95% CI, 4.65 to 7.71), p<0.001 Race x group interaction, quit status: p=0.002 Validated quitting during years 1-5, Black: AOR 1.87 (95% CI, 1.02 to 3.43), p=0.04 Validated quitting during years 1-5, White: AOR 3.34, (95% CI, 2.82 to 3.95), p<0.001 Race x group interaction, quit status: p=0.06 A, Black vs. White Still smoking at 12 months: 23% (0.42) vs. 34% (0.47), p<0.01 Still smoking at 5 years: 30% (0.46) vs. 35% (0.48), p=NS B, Black vs. White Still smoking at 12 months: 15% (0.36) vs. 8% (0.27), p=NS Still smoking at 5 years: 17% (0.38) vs. 20% (0.40), p=NS Percent reduction of cigarettes per day after 1 year, A vs. B Black: 50.9% vs. 25.5% White: 61.2% vs. 22.3% After 5 years Black: 57.9% vs. 42.9% White: 61% vs. 39.8%	Poor 1. Unclear randomization 2. Allocation NR 3.Groups not comparable at baseline 4. Unclear masking 5. High loss to followup 6. No ITT analysis 7. Unclear post-randomization exclusions	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Myers et al., 2014	Any screening, 6 months A. 38.0% B. 23.7% AOR 2.1 (95% CI, 1.5 to 2.9), p=0.001 Any screening, 12 months A. 43.4% B. 32.2% AOR 1.7 (95% CI, 1.2 to 2.3), p=0.001 Group A, as treated analysis, adherence at 6 months Navigated: 45.7% Not navigated: 12.4% Group A, as treated analysis, adherence at 12 months Navigated: 50.9% Not navigated: 19.1%	Fair 1. Unclear if baseline differences exist 2. Missing data	Fair 1. Study population (demographics) 2. Study setting (time, effort) 3. Study providers (training, ancillary providers)
Myers et al., 2019	Screening adherence, 12 months: A. 77.7% B. 43.3% AOR 4.8 (95% CI, 3.1 to 7.6), p=0.001 SBT screening, 12 months: A. 57.4% B. 37.4% AOR 4.2 (95% CI, 2.6 to 6.7), p=0.001 Colonoscopy screening, 12 months A. 20.3% B. 5.9% AOR 8.79 (95% CI, 4.1 to 18.7), p=0.001	Good	Fair 1. Population 2. Providers

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Nash et al., 2006	Estimated coverage of screening colonoscopies by hospital among eligible population in local area (average per month, %) A. 65.1 (15.6%) B. 21.8 (5.2%) By race/ethnicity NH Black A. 3.9 (2.4%) B. 2.8 (1.7%) Hispanic A. 47.1 (20.1%) B. 17.5 (7.5%) Other/unknown A. 14.1 (104.5%) B. 1.5 (11.1%) Likelihood of screening colonoscopy at center, RR 3.0 (95% CI, 1.9 to 4.7) Average number of persons screened per month increased from 75.7 to 119.0. Individuals screened on Medicaid 48.4% vs. 17%; p<0.001 Estimated coverage of screening colonoscopies by hospital among eligible population in local area (average per month, %) A. 65.1 (15.6%) B. 21.8 (5.2%) By race/ethnicity NH Black A. 3.9 (2.4%) B. 2.8 (1.7%) Hispanic A. 47.1 (20.1%) B. 17.5 (7.5%) Other/unknown A. 14.1 (104.5%) B. 1.5 (11.1%) Likelihood of screening colonoscopy at center: RR 3.0 (95% CI, 1.9 to 4.7) Average number of persons screened per month increased from 75.7 to 119.0. Individuals screened on Medicaid 48.4% vs. 17% p<0.001	NA	Fair 1. Study population (inclusion/exclusion criteria) 2. Study setting (Selection of centers, cost of service) 3. Study providers (training, skill, ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Navarro et al., 1998	Increase in screening Mammography A. 21.4% B. 7%, p=0.29 Cervical A. 23.1% B. 16.2%, p=0.96	Poor 1. Randomization and allocation concealment unclear 2. Unclear whether comparable groups were maintained 3. Outcome assessor, care provider, and patient masking unclear 4. No ITT analysis 5. Unclear whether post-randomization exclusions occurred	Fair 1. Study population (inclusion/exclusion criteria, demographics, recruitment) 2. Study providers (training, expertise)
Nguyen et al., 2015	Report of colonoscopy, flexible sigmoidoscopy, or FOBT screening at 6 months A. 56% B. 19%, p<0.001 AOR 5.45 (95% CI, 3.02 to 9.82) Intervention was effective in both men and women; no difference by gender.	Poor 1. Randomization and allocation concealment unclear 2. Outcome assessor and patient not masked 3. No ITT analysis 4. Unclear whether post-randomization exclusions occurred 5. Potential for contamination / cross-over	Poor 1. Population - single city, specific racial and ethnic group 2. Special skills - language 3. Effort - training time, special materials
Paskett et al., 2011	Medical record 12 month pap: OR 1.44 (95% CI, 0.89 to 2.33); p=0.14 Self-reported 12 month pap: OR 2.10 (95% CI, 1.22 to 3.61); p=0.008	Good	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Paskett et al., 2006	Receipt of mammography in past 12 months A.42.5% B. 27.3% RR 1.56 (95% CI, 1.29 to 1.87), p<0.001 Receipt of mammography by race-ethnicity African Americans: RR 1.54 (95% CI, 0.11 to 2.14), p=0.008 Native Americans: RR 1.58 (95% CI, 1.18 to 2.13), p=0.002 White: RR 1.54 (95% CI, 1.05 to 2.25), p=0.024 Change in barriers, intervention vs. control: b=-0.77 (95% CI, -1.02 to -0.53), p<0.001 Change in beliefs, intervention vs. control: b=0.46 (95% CI, 0.15 to 0.77), p=0.004 Change in knowledge, intervention vs. control: b=-0.02 (95% CI, -0.21 to 0.17) p=NS Association of baseline barriers with mammography Barrier scale: OR 0.93 (95% CI, 0.87 to 1.00) p=0.051 (one unit increase on barrier scale means slightly lower odds of screening) Intervention group vs. control: AOR 1.57 (95% CI, 1.31 to 1.84) Never smoked, vs. current/former smokers: AOR 1.25 (95% CI, 1.03 to 1.52)	Fair 1. Unclear randomization technique and allocation 2. Unclear masking of patients	Poor 1. Population composition unique to setting 2. Potentially time-intensive intervention
Percac-Lima et al., 2009	CRC screening completion (COL/FS, barium enema, FOBT) A. 27.4% B. 11.9%, p<0.001 Colonoscopy A. 20.8% B. 9.6%, p<0.001	Poor 1. Randomization and allocation concealment unclear 2. Unclear whether outcome assessor or patients were masked	Fair 1. Study providers (training, ancillary provider) 2. Study setting (time, effort)
Percac-Lima et al., 2012	Up to date with mammography A. 67.0% (61/91) B. 44.0% (40/91), p=0.001	NA	Poor 1. Study population is very specific 2. Study setting is in a single clinic
Percac-Lima et al., 2014	Up to date on screening (colonoscopy, sigmoidoscopy, colonography, or barium enema) Before intervention Latinos: 47.5% Non-Latino: 50.4%, p>0.05 Up to date on CRC screening after intervention Latinos: 73.5% Non-Latino: 66%, p<0.001 Non-English speaker: 70.6% English speaker: 68%, p=0.09	NA	Fair 1. Study population (demographics) 2. Study setting (health care system, center, time) 3. Study providers (training, skill, ancillary providers)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Percac-Lima et al., 2018	Receipt of CT lung cancer screening A. 23.5% (94/400) B. 8.6% (69/800), p<0.001	Poor 1. Randomization and allocation concealment method NR 2. Unclear masking 3. Large loss to followup	Fair 1. Study population in a single geographic location 2. Study setting in a single healthcare system 3. Expertise and training needed to complete intervention
Phillips et al., 2011	Adherence, post intervention A. 87% B. 76% AOR 2.5 (95% CI, 1.9 to 3.2) Likelihood of adherence by time since last mammogram >24 months: AOR 5.6 (95% CI, 3.9 to 8.2) 18 to 24 months: AOR 6.0 (95% CI, 2.8 to 12.7) 12 to 18 months: AOR 3.5 (95% CI, 1.8 to 6.5) Likelihood of adherence by race White: OR 2.4 (95% CI, 1.5 to 4.0) Black: OR 1.9 (95% CI, 1.4 to 2.6) Hispanic: OR 1.2 (95% CI, 0.8 to 1.8)	Fair 1. Groups not similar at baseline 2. Unclear masking of outcome assessors or analysts 3. High attrition/ loss to followup	Fair 1. Study population (inclusion/ exclusion criteria, adherence) 2. Study setting (health care system and centers, time) 3. Study providers (training, expertise or skill, ancillary providers)
Potter et al., 2011	Any CRC screening (colonoscopy, FS, FOBT) completed during study A. 24.2% B. 13.4%, p<0.001 OR 2.22 (95% CI, 1.24 to 3.95) Any CRC screening completed during last 12 months A. 45.5% B 35.6%, p<0.001 FOBT completed during study A. 21.6% B. 11.8%, p<0.001 OR 2.25 (95% CI, 1.56 to 3.24), p=NR FOBT completed during last 12 months A. 33.8% B. 21.7%, p<0.001	Poor 1. Unclear randomization 2. Allocation NR 3. Unclear masking 4. No ITT analysis	Fair 1. Population 2. Setting

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Powell et al., 2005	Mammography at baseline vs. 3 months A1. 45% vs. 63%, % Change = 38.4% A2. 65% Vs. 70%, % Change = 8.6% B. 57% Vs. 61%, % Change = 8.1% A1 vs. B: p<0.001 A1 vs. A2: p<0.001 A2 vs. B: NS	Fair 1. Unclear as to whether outcome assessors were masked 2. Unclear as to whether attrition or loss to followup occurred	Poor 1. Study population (inclusion/ exclusion criteria, demographics, recruitment) 2. Study setting (health care system and centers, time) 3. Study providers (training, expertise or skill, ancillary providers)
Racette et al., 2001	Mean change in weight, kg (SD), 4 months A. -4.8 (0.7) B. -0.8 (0.6), p<0.001 Mean change in weight, kg (SD), 12 months A. -4.6 (1.0) B. 0.3 (0.8), p<0.001 Note: Group A, p<0.001 vs. baseline at 4 and 12 months	Poor 1. Unclear ascertainment of exposures, potential confounders, and outcomes 2. High loss to followup 3. Study did not perform appropriate analysis on potential confounders	Poor 1. Population 2. Setting 3. Providers
Reuland et al., 2017	Any CRC screening at 6 months A. 68% B. 27%, p=NR Adjusted difference 40 percentage points (95% CI, 29 to 51) Number needed to offer intervention to screen 1 additional patient: 3 FOBT/FIT screening at 6 months A. 54% B. 21%, p=NR Colonoscopy screening at 6 months A. 14% B. 6%, p=NR	Good	Good
Rodriguez-Torre et al., 2019	A vs. B, adjusted screening rates over time 2012: 90.5% vs. 81.9%, p=0.006 2013: 88.7% vs. 82.1%, p=0.31 2014: 77.9% vs. 81.5%, p=0.66 2015: 81.9% vs. 84.6%, p=0.71 2016: 76.5% vs. 80.5%, p=0.46 Trend in screening rates over time, A vs. B: p=0.02	NA	Poor 1. Population 2. Setting 3. Providers

Author, Year (See Appendix B for full citation)	Outcomes	Quality Rating	Applicability Rating
Roetzheim et al., 2004 and 2005	12 months Intervention increased all screenings: Cervical: OR 1.57 (95% CI, (0.92 to 2.64), p=0.96 Breast: OR 1.62 (95% CI, 1.07 to 9.78), p=0.23 CRC (FOBT): OR 2.56 (95% CI, 1.65 to 4.01), p<0.001 24 months Breast: OR 1.26 (95% CI, 1.02 to 1.55), p=0.03 Cervical: OR 0.88 (95% CI, 0.68 to 1.15), p=0.34 FOBT: OR 1.17 (95% CI, 0.92 to 1.48), p=0.19 24 months post hoc patient level analysis Breast: OR 1.42 (95% CI, 0.98 to 2.07), p=0.06 Cervical: OR = 2.03 (95% CI, 1.14 to 3.61), p=0.014 FBOT: OR=3.8 (95% CI, 2.05 to 5.23), p<0.001 CRC (FOBT): OR 2.56 (95% CI, 1.65 to 4.01), p<0.001	Fair 1. No information regarding randomization/allocation	Fair 1. Study population (inclusion/exclusion criteria) 2. Study setting (system, effort)
Rosas et al., 2015	A1 vs. A2 vs. B Mean change in BMI at 6 months, kg/m2 -0.8 (95% CI, -1.1 to -0.5) vs. -0.6 (95% CI, -1.0 to -0.3) vs. -0.4 (95% CI, -0.7 to 0), p>0.05 for all comparisons Mean change in BMI at 12 months, kg/m2 -0.7 (95% CI, -1.1 to -0.3) vs. -0.6 (95% CI, -1.0 to -0.1) vs. -0.3 (95% CI, -0.8 to 0.3), p>0.05 for all comparisons Mean change in BMI at 24 months, kg/m2 -0.4 (95% CI, -0.9 to 0.2) vs. -0.4 (95% CI, -1.0 to 0.2) vs. -0.2 (95% CI, -1.1 to 0.7), p>0.05 for all comparisons Mean change in weight at 6 months -2.1 kg (95% CI, -2.8 to -1.3) vs. -1.6 kg (95% CI, -2.4 to -0.7) vs. -0.9 kg (95% CI, -1.9 to 1.1), p=0.05 (A), p>0.05 (B) vs. C; p>0.05 A vs. B Mean change in weight at 12 months -1.9 kg (95% CI, -2.9 to -0.9) vs. -1.4 kg (95% CI, -2.4 to 0.3) vs. -0.7 kg (95% CI, -2.2 to 0.8), p>0.05 for all comparisons Mean change in weight at 24 months -1.0 kg (95% CI, -2.4 to 0.4) vs. -1.0 kg (95% CI, -2.4 to 1.0) vs. -0.6 kg (95% CI, -2.8 to 1.5), p>0.05 for all comparisons	Good	Poor 1. Study population (inclusion/exclusion, demographics, absolute risk) 2. Study setting (center, time, effort) 3. Study provider (training, expertise/skill, ancillary provider)

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Russell et al., 2010	Mammography adherence A. 50.6% (45/89) B. 17.8% (16/90) adjusted RR: 2.7 (95% CI, 1.8 to 3.7), p<0.0001 AOR: 4.3 (95% CI, 2.1 to 9.0), p<0.0001 Forward movement in stage of screening adoption A. 76.3% (61/89) B. 38.5% (25/90) adjusted RR: 2.0 (95% CI, 1.5 to 2.3), p<0.0001 AOR: 4.9 (95% CI, 2.3 to 10.4, p<0.0001	Fair 1. Allocation not concealed 2. Patients and interventionists not masked	Fair 1. Specific population 2. Patients recruited from a single clinic 3. Expertise needed for implementation of intervention
Singal et al., 2016 Singal et al., 2017	2016 data Completion within 12 months of any test A: 42.4%; AOR 1.83 (95% CI, 1.57 to 2.14) B: 58.8%; AOR 3.84 (95% CI, 3.28 to 4.5) C: 29.6%; reference A vs. C: p<0.0001 B vs. C: p<0.0001 B vs. A: p<0.001 2017 data Screening process completion rates (composite endpoint, including abnormalities) A. 38.4%; 56% (1344/2400) received screening; 68.6% of those screened (922/1344) completed B. 28%; 69.8% (1676/2400) received screening; 40% of those screened (671/1676) completed C. 10.7%; 41.9% (502/1199) received screening; 25.5% of those screened (128/502) complete p<0.001	Good	Good
Soltero et al., 2019	Mean weight, kg (SD), baseline to study end: 82.1 (17.8) to 80.6 (17.8), p=0.12 Mean BMI, kg/m2 (SD), baseline to study end: 32.1 (5.9) to 31.6 (6.0), p=0.12 Mean HbA1C, baseline to study end: 5.6 (0.4) to 5.5 (0.3), p=0.03 Change in weight-specific QoL (0-100, 100 high), baseline to study end: 64.6 (15.8) to 71 (13.7), p=0.001	NA	Poor 1. Population 2. Setting 3. Providers

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Staten et al., 2004 Arizona WISEWOMAN	Change in BMI from baseline to 12 months A1. 0.1 (95% CI, -0.3 to 0.6) A2. 0.7 (95% CI, -0.1 to 1.4) B. -0.1 (95% CI, -0.6 to 0.5), p=NR Change in % of study arm at BMI ≥25 from baseline to 12 months: A1. -4.6% A2. 4.2% B. 0% Adjusted effect of intervention at 12 months (β, SE, p) A1 vs. B: 0.28, 0.45, p=0.53 A2 vs. B: 0.77, 0.44, p=0.08 A1 vs. A2: -0.49, 0.46, p=0.28	Poor 1. Unclear randomization and allocation concealment 2. Unclear whether maintained comparable groups 3. Unclear masking of outcome assessor, provider, patient 4. No ITT 5. Post-randomization exclusions	Fair 1. Time, effort required for intervention 2. Ancillary providers
Stoddard et al., 2004 Massachusetts WISEWOMAN	High blood pressure, excluding women on medication at baseline, adjusted difference (baseline to 12 months): A. -6.8 (33.8 to 27, p=0.02) B. -8.6 (31.5 to 22.9, p<0.01) p=0.51	Poor 1. Unclear randomization and allocation concealment 2. Unclear whether maintained comparable groups 3. Unclear masking of outcome assessor, provider, patient 4. No ITT 5. Unclear whether one site was excluded pre- or post-randomization	Fair 1. Time, effort required for intervention 2. Ancillary providers
Taplin et al., 2008	Breast cancer screening A. 39% B. 23.2%, p<0.001 Cervical cancer screening A. 37.2% B. 25.2% p<0.001 CRC screening A. 21.2% B. 8.6%, p<0.001	NA	Poor 1. Intervention - intervention that includes the community and many others that provide barriers to implementation.

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Tu et al., 2006	FOBT completion at 6 months A. 69.5% B. 27.6% AOR 6.38 (95% CI, 3.44 to 11.85), p=NR	Poor 1. Unclear allocation concealment 2. Unclear maintaining comparable groups 3. Unclear masking of outcome assessor, provider, patient 4. No ITT	Fair 1. Training of health educator very specialized 2. single clinic location
Tu et al., 2014	Baseline vs. followup Any CRC screening A. 42% vs. 45% B. 38% vs. 38% AOR 1.42 (95% CI, 0.95 to 2.15), p=0.06 FOBT A. 25% vs. 16% B. 17% vs. 9% A vs. B, AOR 1.42 (95% CI, 0.84 to 2.39), p=0.19 Sigmoidoscopy A. 3% vs. 1% B. 1% vs. 1% AOR 0.60 (95% CI, 0.10 to 3.72), p=0.58 Colonoscopy A. 22% vs. 34% B. 24% vs. 30% AOR 1.38 (95% CI, 0.89 to 2.13), p=0.15	NA	Fair 1. Population 2. Providers

Author, Year (See Appendix B for full citation)	**Outcomes**	**Quality Rating**	**Applicability Rating**
Weber & Reilly, 1997	A vs. B Mammogram (ITT) A. 25% B. 9.8% RR 2.57 (95% CI, 1.53 to 4.35), p<0.001 Mammogram (per protocol) A. 29% B. 11% RR 2.67 (95% CI, 1.59 to 4.48), p<0.001 Mammogram ("truly eligible") A. 41% B. 14% RR 2.87 (95% CI, 1.75 to 4.73), p<0.001	Poor 1. Randomization and allocation concealment techniques not reported 2. Unclear allocation and masking	Fair 1. Multiple sites 2. Recruitment, training and pay not reported 3. Single city in NY
West et al., 2004	Receipt of mammogram, Stage 1 A1. 14% B1. 14% Receipt of mammogram, Stage 2 A2. 15% B2. 13% Receipt of mammogram among women with no prior mammography, Stage 2 A2. 16% B2. 7%, p=0.05	Fair 1. Unclear masking outcome or analysts 2. High differential loss to followup (12.2%) in Stage 1 but not Stage 2 or overall	Fair 1. Study population (demographics) 2. Study setting (health care system, centers, time, effort)
Wu & Lin, 2015	Obtained screening at followup Total A. 40% B. 33%, p=NS Women with insurance A. 56% B. 34%, p=0.03 Women >65 years A. 51% B. 25%, p=NS	Poor 1. Randomization and allocation concealment unclear 2. Unclear whether outcome, provider, patient were masked 3. Differential and overall loss to followup 4. Post-randomization exclusions 5. No ITT analysis	Fair 1. Study population (demographics, recruitment) 2. Study setting (time, effort) 3. Study providers (expertise

Abbreviations: AA = African American; ACA = Affordable Care Act; ACS = American Cancer Society; AI = American Indian; AN = American Native; aOR = adjusted odds ratio; API = Asian Pacific Islander; BMI = body mass index; CMS = Centers for Medicare & Medicaid Services; COL/FS = colonoscopy/flexible sigmoidoscopy; CRC = colorectal cancer; CT = computerized tomography; DVD = digital versatile disc; EMR = electronic medical record; FIT = fecal immunochemical test; FOBT = fecal occult blood test; FQHC = federally qualified health center; FS = flexible sigmoidoscopy; gFOBT = Guaiac Fecal Occult Blood Test; HR = heart rate; ITT = intention to treat; LCOP = local communities of practice; LHA = lay health advisors; NA = not applicable; NCI = National Cancer Institute; NH = Non Hispanic; NHS = National Health Service; NNT = number needed to treat; NR = not reported; NRT = nicotine replacement therapy; NS = not significant;

OR = odds ratio; PCP = primary care provider; PN = patient navigation; QoL = Quality of Life; RCT = randomized controlled trial; SASE = self-addressed stamped envelope; SBT = stool blood test; SD = standard deviation; SE = standard error; SES = socioeconomic status; TBHEP = Targeted Breast Health Education Program; YMCA = Young Men's Christian Association

Appendix G. Quality Assessment

Table G-1, P. Quality assessment of randomized controlled trials, Part A

Author, Year (See Appendix B for full citation)	**Randomization adequate?**	**Allocation concealment adequate?**	**Groups similar at baseline?**	**Maintain comparable groups?**	**Eligibility criteria specified?**	**Outcome assessors masked?**	**Care provider masked?**	**Patient masked?**	**Reporting of attrition, crossovers, adherence, and contamination?**
Abood, 2005	No	NA	No	No	Yes	Unclear	Yes	Yes	No
Ahmed, 2010	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Allen, 2005	Yes	NR	Unclear	Unclear	Yes	Unclear	No	No	Yes
Aragones, 2010	Yes	NR	Yes	Yes	Yes	Yes	Unclear	Yes	Yes
Arnold, 2016a Arnold, 2016b	Yes	NR	No	No	Yes	Unclear	No	No	Yes
Baker, 2014	Yes	Unclear	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes
Bastani, 2015	Unclear	Unclear	Unclear	Yes	Yes	Unclear	No	No	Yes
Bennett, 2012	Yes	No	Unclear	Unclear	Yes	No	No	No	Yes
Beach, 2007	Yes	Yes	No	Yes	Yes	Yes	Unclear	No	Yes
Bennett, 2013	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Blumenthal, 2010	Unclear	No	No	Yes	Yes	Unclear	unclear	Yes	Yes
Braun, 2015	Yes	Unclear	Yes	Unclear	Yes	No	No	Unclear	No
Byrd, 2013	Yes	Unclear	Unclear	Yes	Yes	Unclear	Unclear	Unclear	No
Christie, 2008	NR	Unclear	Yes	Yes	Yes	No	No	No	Yes
Cole, 2017	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Coronado, 2011	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Coronado, 2016	Yes	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes
Coronado, 2018	NR	Unclear	Yes	Unclear	Yes	No	No	Yes	Yes
Curry, 2003	Yes	Yes	Yes	Unclear	Yes	Unclear	No	Unclear	Yes
DeGroff, 2017	Yes	Unclear	Yes	Yes	Yes	Unclear	No	Unclear	Yes
Dietrich, 2006	Yes	Yes	No	Yes	Yes	Yes	Unclear	No	Yes
Dietrich, 2013	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
Doorenbos, 2011	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	No
Enard, 2015	Unclear	Unclear	Yes	Unclear	Yes	No	Unclear	No	Yes
Fang, 2017	Yes	NR	No	Yes	Yes	Unclear	No	No	Yes
Fiscella, 2011	No	NR	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear
Ford, 2006	NR	NR	Yes	Yes	Yes	Unclear	Unclear	Unclear	No
Fortuna, 2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
Friedman, 2001	No	NR	No	NA	Yes	Unclear	Yes	Unclear	Yes
Glasgow, 2000	Yes	NR	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Goldman, 2015	Unclear	Unclear	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes
Gordon, 2010	Unclear	NR	No	NA	Yes	Unclear	Unclear	Unclear	Yes

Author, Year (See Appendix B for full citation)	**Randomization adequate?**	**Allocation concealment adequate?**	**Groups similar at baseline?**	**Maintain comparable groups?**	**Eligibility criteria specified?**	**Outcome assessors masked?**	**Care provider masked?**	**Patient masked?**	**Reporting of attrition, crossovers, adherence, and contamination?**
Guillaume, 2017b De Mil, 2018	Yes	Unclear	No	Unclear	Yes	Unclear	Yes	Unclear	Yes
Gupta, 2013	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes
Hass, 2015	Yes	NR	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Hendren, 2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear
Hoffman, 2017	Yes	NR	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Horne, 2015	Yes	NR	Yes	No	Yes	Unclear	Unclear	Unclear	Yes
Inadomi, 2012	Unclear	Unclear	Yes	Yes	Yes	Unclear	Yes	Unclear	Yes
Jandorf, 2005	Unclear	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	Unclear
Jandorf, 2014	Yes	NR	Unclear	Yes	Yes	Unclear	No	No	Yes
Jean-Jacques, 2012	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Jibaja-Weiss, 2003	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	No
Katz, 2007	Unclear	Unclear	Yes	Unclear	Yes	Yes	Unclear	No	Yes
Katz, 2012	Yes	NR	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Kim, 2004	Yes	Yes	Yes	Unclear	Yes	Unclear	No	No	No
Kumanyika, 2002	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Kumanyika, 2005	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Lasser, 2011	Yes	Unclear	Yes	Yes	Yes	Yes	No	No	Yes
Lasser, 2017	Yes	Yes	Yes	Yes	Yes	No	Unclear	Unclear	Yes
Lee-Lin, 2015	Unclear	NR	Yes	Yes	Yes	Unclear	Yes	Yes	Yes
Levy, 2013	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes
Ma, 2009	No	NR	No	No	Yes	Unclear	No	No	Yes
Margolis, 1998	No	Unclear	Yes	Yes	Yes	No	No	No	Yes
Marshall, 2016	NR	NR	Yes	Yes	Yes	NR	No	Unclear	No
Martin, 2006 Martin, 2008	Yes	Unclear	Yes	Yes	Yes	No	No	No	Yes
Miller, 2013	Yes	Unclear	Yes	No	Yes	Unclear	Unclear	Unclear	Yes
Miller, Jr., 2011	Method NR	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Miller, Jr., 2018	Yes	Yes	Unclear	Unclear	Yes	Yes	Unclear	Yes	No
Mitchell, 2015	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Muller, 2017	Yes	NA	Yes	Yes	Yes	Yes	Unclear	Yes	Yes
Murphy, 2005	No	NR	No	NA	Yes	No	Unclear	Unclear	Yes
Murray, 2001	Unclear	NR	No	NA	Yes	Unclear	Unclear	Unclear	Yes
Myers, 2014	Yes	Yes	Unclear	Unclear	Yes	Yes	No	No	Yes
Myers, 2019	Yes	No	Yes	Yes	Yes	Yes	No	Unclear	No
Navarro, 1998	Unclear	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes

Author, Year (See Appendix B for full citation)	**Randomization adequate?**	**Allocation concealment adequate?**	**Groups similar at baseline?**	**Maintain comparable groups?**	**Eligibility criteria specified?**	**Outcome assessors masked?**	**Care provider masked?**	**Patient masked?**	**Reporting of attrition, crossovers, adherence, and contamination?**
Nguyen, 2015	Unclear	Unclear	Yes	Yes	Yes	No	Unclear	No	Yes
Paskett, 2006	Method NR	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
Paskett, 2011	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Percac-Lima, 2009	Unclear	Unclear	Yes	Yes	Yes	Unclear	No	Unclear	Yes
Percac-Lima, 2018	Method NR	NR	Yes	Unclear	Yes	Unclear	No	Unclear	Yes
Phillips, 2011	NR	Unclear	No	Unclear	Yes	Yes	Unclear	Unclear	Yes
Potter, 2011	Unclear	NR	Yes	Yes	Yes	Unclear	No	Unclear	Yes
Powell, 2005	NR	NR	Yes	Unclear	Yes	Unclear	No	No	Yes
Reuland, 2017	Yes	Yes	Unclear	Unclear	Yes	Yes	No	No	Yes
Richter, 2015	Yes	Yes	Yes	Yes	Yes	Unclear	No	No	Yes
Roetzheim, 2004 Roetzheim, 2005	NR	NR	No	Yes	Yes	Unclear	Unclear	Yes	Yes
Rosas, 2015	Yes	Unclear	Yes	Yes	Yes	Yes	Partial	No	Yes
Russell, 2010	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes
Schroy, 2012	Method NR	NR	Yes	Yes	Yes	No	No	No	Yes
Siddiqui, 2011	Unclear	Unclear	Unclear	Unclear	Yes	Unclear	No	No	No
Simon, 2001	Method NR	NR	Unclear	Unclear	Yes	Unclear	Unclear	Unclear	Unclear
Singal, 2016	Yes	Yes	Yes	No	Yes	Unclear	Yes	Yes	Yes
Staten, 2004	Unclear	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes
Stoddard, 2004	Unclear	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes
Studts, 2012	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Thompson, 2017	Unclear	Unclear	Yes	Yes	Yes	Yes	No	No	Yes
Tu, 2006	Yes	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes
Valdez, 2018	Yes	NA	Yes	Unclear	Yes	Unclear	Yes	Unclear	No
Weber, 1997	NR	NR	Unclear	NR	Yes	NR	NR	NR	Yes
West 2004	NR	Unclear	Unclear	Unclear	Yes	Unclear	No	No	Yes
Wu, 2015	Unclear	Unclear	Yes	Unclear	Yes	Unclear	Unclear	Unclear	Yes

Abbreviations: NA = not applicable; NR = not reported

Table G-2. Quality assessment of randomized controlled trials, Part B

Author, Year (See Appendix B for full citation)	Loss to followup: differential/ high?	Intention-to-treat analysis?	Postrandomization exclusions?	Outcomes Prespecified?	Funding Source	Applicability	Quality Rating
Abood, 2005	Unclear	Unclear	Unclear	Yes	American Cancer Society, Florida Division	Poor	Poor
Ahmed, 2010	No	Yes	No	Yes	US Army Medical Research and Materiel Command Grant	Good	Good
Allen, 2005	No	Yes	No	Yes	Grant from University of California Breast Cancer Research Program	Fair	Fair
Aragones, 2010	No	Yes	No	Yes	Centers for Disease Control and Prevention	Poor	Fair
Arnold, 2016a Arnold, 2016b	Unclear	Yes	Yes	Yes	National Cancer Institute & National Institute of General Medical Sciences of the National Institutes of Health	Poor	Poor
Baker, 2014	NA	Yes	No	Yes	Agency for Healthcare Research and Quality	Fair	Fair
Bastani, 2015	No	Yes	No	Yes	National Cancer Institute, National Institutes of Health	Fair	Fair
Beach, 2007	Yes	Yes	Yes	Yes	National Cancer Institute	Fair	Fair
Bennett, 2012	No	Yes	No	Yes	National Cancer Institute; National Heart, Lung, and Blood Institute	Fair	Fair
Bennett, 2013	No	Yes	Yes	Yes	National Institute for Diabetes and Digestive and Kidney Diseases; National Cancer Institute	Fair	Fair
Blumenthal, 2010	Yes	Yes	No	Yes	Centers for Disease Control and Prevention, National Cancer Institute, National Center for Research Resources	Poor	Poor
Braun, 2015	Unclear	Yes	No	Yes	National Cancer Institute and Centers for Medicare and Medicaid Services	Poor	Poor
Byrd, 2013	No	Yes	No	Yes	Centers for Disease Control and Prevention cooperative agreement to the University of Texas School of Public Health at El Paso	Poor	Poor
Christie, 2008	No	Yes	No	Yes	National Cancer Institute	Poor	Poor
Cole, 2017	Yes	Yes	Yes	Yes	National Institute on Minority Health and Health Disparities, National Institutes of Health and the Centers for Disease Control and Prevention	Fair	Poor
Coronado, 2011	No	Yes	No	Yes	Fred Hutchinson Cancer Research Center	Fair	Fair
Coronado, 2016	No	Yes	No	Yes	National Cancer Institute	Fair	Fair
Coronado, 2018	No	Unclear	No	Yes	National Institutes of Health	Fair	Poor
Curry, 2003	Yes	Yes	Unclear	Yes	National Heart, Lung, and Blood Institute	Fair	Fair
DeGroff, 2017	No	Yes	Yes	Yes	Centers for Disease Control and Prevention	Fair	Fair
Dietrich, 2006	Yes	Yes	Yes	Yes	National Cancer Institute	Fair	Fair

Author, Year (See Appendix B for full citation)	**Loss to followup: differential/ high?**	**Intention-to-treat analysis?**	**Postrandomization exclusions?**	**Outcomes Prespecified?**	**Funding Source**	**Applicability**	**Quality Rating**
Dietrich, 2013	No	Yes	Yes	Yes	National Cancer Institute	Good	Fair
Doorenbos, 2011	No	No	Yes	Yes	National Institute for Aging, Agency for Healthcare Research and Quality, National Center for Minority Health and Health Disparities, Native People for Cancer Control	Poor	Poor
Enard, 2015	Yes	No	Yes	Yes	Centers for Medicare and Medicaid Services	Good	Poor
Fang, 2017	No	Yes	Yes	Yes	Grants from the American Cancer Society Research Scholar Grant; National Cancer Institute; Fox Chase Cancer Center	Fair	Fair
Fiscella, 2011	No	Yes	No	Yes	American Cancer Society	Good	Fair
Ford, 2006	Unclear	Unclear	Unclear	Yes	Centers for Disease Control and Prevention / National Cancer Institute; Department of Defense; Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development Service Project, National Institutes of Health	Poor	Poor
Fortuna, 2014	No	Yes	Yes	Yes	American Cancer Society	Fair	Good
Friedman, 2001	No	Unclear	Unclear	Yes	NR	Poor	Poor
Glasgow, 2000	No	Yes	No	Yes	National Heart, Lung, and Blood Institute	Fair	Fair
Goldman, 2015	No	Yes	No	Yes	Agency for Healthcare Research and Quality	Good	Fair
Gordon, 2010	Yes	No	Yes	Yes	National Institutes of Health, National Cancer Institute	Fair	Poor
Guillaume, 2017b De Mil, 2018	No	Unclear	Yes	Yes	French National Cancer Institute, Cancéropole Nord-Oues	Fair	Fair
Gupta, 2013	Unclear	Yes	Yes	Yes	National Institutes of Health, Cancer Prevention and Research Institute of Texas	Good	Fair
Hass, 2015	Yes	Yes	Yes	Yes	Lung Cancer disparities Center at Harvard School of Public Health; Harvard Catalyst; Harvard Clinical and Translational Science Center	Good	Fair
Hendren, 2014	Unclear	Yes	No	Yes	American Cancer Society	Good	Fair
Hoffman, 2017	No	No	Yes	Yes	National Cancer Institute, University of Texas / MD Anderson	Poor	Fair
Horne, 2015	Yes	No	Yes	Yes	Centers for Medicare and Medicaid Services; National Cancer Institute; Maryland Cigarette Restitution Fund	Fair	Fair
Inadomi, 2012	Yes	No	No	Yes	National Cancer Institute, National Institutes of Diabetes and Digestive and Kidney Diseases, National Center for Research Resources	Fair	Poor

Author, Year (See Appendix B for full citation)	Loss to followup: differential/ high?	Intention-to-treat analysis?	Postrandomization exclusions?	Outcomes Prespecified?	Funding Source	Applicability	Quality Rating
Jandorf, 2005	No	Unclear	No	Yes	National Cancer Institute	Good	Poor
Jandorf, 2014	Yes	Unclear	No	Yes	Grants from the American Cancer Society; John R. Oishei Foundation of Western New York; & Western New York Affiliate of Susan G. Komen for the Cure	Fair	Fair
Jean-Jacques, 2012	No	Unclear	No	Yes	Northwestern University Clinical and Translational Sciences Institute, Clinical and Translational Science Awards Program	Fair	Fair
Jibaja-Weiss, 2003	Yes	No	Yes	Yes	Agency for Healthcare Research and Quality	Fair	Fair
Katz, 2007	No	No	Yes	Yes	National Cancer Institute	Poor	Poor
Katz, 2012	No	Yes	Yes	Yes	The Ohio State University	Fair	Fair
Kim, 2004	Unclear	Yes	No	Yes	NR	Poor	Fair
Kumanyika, 2002	No	Yes	No	Yes	National Institute of Aging, National Heart, Lung, and Blood Institute	Poor	Fair
Kumanyika, 2005	Yes	No	No	Yes	American Heart Association, National Institutes of Health	Poor	Fair
Lasser, 2011	No	Yes	No	Yes	American Cancer Society	Fair	Fair
Lasser, 2017	Yes	Yes	No	Yes	American Cancer Society	Fair	Good
Lee-Lin, 2015	No	Unclear	Unclear	Yes	American Cancer Society	Fair	Fair
Levy, 2013	No	Yes	No	Yes	American Cancer Society, University of IA	Good	Fair
Ma, 2009	No	Yes	No	Yes	Grant from National Cancer Institute-National Institutes of Health grant & Center to Reduce Cancer Health Disparities	Poor	Poor
Margolis, 1998	No	Unclear	No	Yes	National Institutes of Health, National Cancer Institute	Fair	Fair
Marshall, 2016	Yes	No	Yes	Yes	Centers for Medicare and Medicaid Services; National Cancer Institute	Fair	Poor
Martin, 2006 Martin, 2008	Yes	Yes	No	Yes	National Institute of Diabetes and Digestive and Kidney Diseases, Centers for Disease Control and Prevention	Fair	Fair
Miller, 2013	Yes	No	No	Yes	National Institutes of Health, American Recovery and Reinvestment Act, American Cancer Society	Fair	Poor
Miller, Jr., 2011	No	Yes	No	Yes	American Cancer Society	Fair	Fair
Miller, Jr., 2018	No	Unclear	No	Yes	National Cancer Institute; Wake Forest Clinical and Translational Science Institute; Wake Forest Comprehensive Cancer Center	Good	Fair
Mitchell, 2015	Yes	No	No	Yes	Reiter Affiliated Companies; Oxnard, California; Western Center for Agricultural Health and Safety	Poor	Poor

Author, Year (See Appendix B for full citation)	Loss to followup: differential/ high?	Intention-to-treat analysis?	Postrandomization exclusions?	Outcomes Prespecified?	Funding Source	Applicability	Quality Rating
Muller, 2017	No	Yes	No	Yes	National Cancer Institute	Fair	Good
Murphy, 2005	No	No	No	Yes	American Legacy Foundation, Eric-Niagara Tobacco Free Coalition	Fair	Poor
Murray, 2001	Yes	No	Unclear	Yes	National Heart, Lung, and Blood Institute	Fair	Poor
Myers, 2014	No	Yes	No	Yes	American Cancer Society	Fair	Fair
Myers, 2019	No	Yes	No	Yes	Patient Centered Outcomes Research Institute; Pennsylvania Department of Health	Good	Fair
Navarro, 1998	Yes	No	Unclear	Yes	National Cancer Institute	Fair	Poor
Nguyen, 2015	No	No	Unclear	Yes	National Cancer Institute	Poor	Poor
Paskett, 2006	No	Yes	Yes	Yes	National Cancer Institute; National Institutes of Health	Poor	Fair
Paskett, 2011	No	No	Yes	Yes	National Institutes of Health	Fair	Good
Percac-Lima, 2009	No	Yes	No	Yes	Massachusetts General primary Care Practice-Based Research network, Massachusetts Cancer Prevention Community Research Network, multiple local grants and awards	Fair	Poor
Percac-Lima, 2018	Yes	Yes	Yes	Yes	American Cancer Society	Fair	Poor
Phillips, 2011	Unclear	Yes	No	Yes	Avon Foundation Safety Net Grant	Fair	Fair
Potter, 2011	No	No	No	Yes	Centers for Disease Control and Prevention	Fair	Poor
Powell, 2005	No	Yes	No	Yes	Grants from Centers for Medicare and Medicaid	Poor	Fair
Reuland, 2017	No	Yes	Yes	Yes	America Cancer Society; Agency for Healthcare Research and Quality; National Institutes of Health	Good	Good
Richter, 2015	No	Yes	No	Yes	National Heart, Lung, and Blood Institute	Fair	Fair
Roetzheim, 2004 Roetzheim, 2005	NA	Yes	No	Yes	National Cancer Institute	Fair	Fair
Rosas, 2015	No	Yes	No	Yes	National Heart, Lung, and Blood Institute	Poor	Good
Russell, 2010	No	yes	Yes	Yes	National Institutes of Health; National Cancer Institute; Indiana University School of Nursing/Center for Enhancing Quality of Life in Chronic Illness	Fair	Fair
Schroy, 2012	No	Yes	No	Yes	Agency for Healthcare Research and Quality; National Cancer Institute; National Science Foundation	Fair	Poor
Siddiqui, 2011	Unclear	No	Unclear	Yes	NIH National Cancer Institute	Poor	Poor
Simon, 2001	No	Yes	Unclear	Yes	National Cancer Institute	Fair	Poor

Author, Year (See Appendix B for full citation)	**Loss to followup: differential/ high?**	**Intention-to-treat analysis?**	**Postrandomization exclusions?**	**Outcomes Prespecified?**	**Funding Source**	**Applicability**	**Quality Rating**
Singal, 2016	No	Yes	No	Yes	National Cancer Institute, National Institutes of Health, Agency for Healthcare Research and Quality	Good	Good
Staten, 2004	Unclear	No	Yes	Yes	Centers for Disease Control and Prevention	Fair	Poor
Stoddard, 2004	No	No	Unclear	Yes	Centers for Disease Control and Prevention	Fair	Poor
Studts, 2012	No	Yes	No	Yes	National Cancer Institute	Fair	Good
Thompson, 2017	No	Yes	No	Yes	National Institutes of Health to the Fred Hutchinson Cancer Research Center; National Center for Research Resources/National Institute of Health	Fair	Fair
Tu, 2006	No	No	No	Yes	National Cancer Institute	Fair	Poor
Valdez, 2018	Yes	Yes	Unclear	Yes	National Cancer Institute	Fair	Fair
Weber, 1997	No	Yes	No	Yes	New York State Department of Public Health Primary Care Initiative	Fair	Poor
West 2004	No	Yes	Yes	Yes	Grants from National Cancer Institute-National Institutes of Health & University of Alabama at Birmingham Center for Health Promotion	Fair	Fair
Wu, 2015	No	No	Yes	Yes	National Cancer Institute, National Institutes of Health	Fair	Poor

Abbreviations: NA = not applicable; NR = not reported

Table G-3. Quality assessment of cohort studies

Author, Year (See Appendix B for full citation)	**Did the study attempt to enroll a random sample or consecutive patients meeting inclusion criteria (inception cohort)?**	**Were the groups comparable at baseline?**	**Did the study use accurate methods for ascertaining exposures, potential confounders, and outcomes?**	**Were outcome assessors and/or data analysts blinded to treatment?**	**Did the article report attrition?**	**Did the study perform appropriate statistical analyses on potential confounders?**	**Is there important differential loss to followup or overall high loss to followup?**	**Were outcomes prespecified and defined, and ascertained using accurate methods?**	**Funding Source**	**Applicability**	**Quality**
Battaglia, 2012	Yes	No	Yes	Unclear	Yes	Yes	No	Yes	National Cancer Institute	Fair	Fair
Davis, 2013	Yes	No	Yes	Unclear	NA	Yes	No	Yes	National Institutes of Health; National Cancer Institute	Good	Poor
Goldberg, 2004	Yes	Yes	Yes	Partial	Yes	Yes	No	Yes	Cook County Bureau of Health Services; Department of Medicine of Cook County Hospital; General Medicine Clinic of Cook County Hospital	Good	Fair
Guillaume, 2017a	Yes	No	Yes	Unclear	Unclear	Yes	Unclear	Yes	French National Cancer Institute; Canceropole Nord-Ouest	Fair	Fair
Honeycutt, 2013	Yes	No	Yes	Unclear	No	Yes	No	Yes	Centers for Disease Control and Prevention; National Cancer Institute	Poor	Fair
Racette, 2001	Yes	Yes	Unclear	Unclear	Yes	No	Yes	Yes	National Institutes of Health; Diabetes Research and Training Grant; Institutional National Research Service Award	Poor	Poor

Author, Year (See Appendix B for full citation)	**Did the study attempt to enroll a random sample or consecutive patients meeting inclusion criteria (inception cohort)?**	**Were the groups comparable at baseline?**	**Did the study use accurate methods for ascertaining exposures, potential confounders, and outcomes?**	**Were outcome assessors and/or data analysts blinded to treatment?**	**Did the article report attrition?**	**Did the study perform appropriate statistical analyses on potential confounders?**	**Is there important differential loss to followup or overall high loss to followup?**	**Were outcomes prespecified and defined, and ascertained using accurate methods?**	**Funding Source**	**Applicability**	**Quality**
Wang, 2010	No	No	Unclear	Unclear	Yes	Yes	Yes	Yes	National Cancer Institute	Good	Poor

Table G-4. Design, funding, and applicability of included studies not assessed for quality

Author, Year (See Appendix B for full citation)	**Study Design**	**Funding Source**	**Applicability**
Ahluwalia, 2002	Secondary data analysis of intervention at posttest time point	Robert Wood Johnson Foundation; National Cancer Institute	Fair
Bacio, 2014	Mediation analysis of larger RCT	California Tobacco Related Disease Research Program; UCLA Clinical and Translational Science Institute	Fair
Berkowitz, 2015	Before-after	Agency for Healthcare Research and Quality; Controlled Risk Insurance Company/Risk Management Foundation; Massachusetts General Hospital; Massachusetts General Physicians Organization	Good
Bock, 2005	Before-after	NR	Fair
Clark, 2009	Before-after	Centers for Disease Control and Prevention	Fair
Clark, 2011	Before-after	Centers for Disease Control and Prevention	Fair
Dignan, 2014	Before-after	National Cancer Institute	Fair
Friedman, 2007	Before-after	NR	Fair
Hirst, 2018	Post-intervention multiple time series	Cancer Research UK	Fair
Leone, 2013	Cluster nonrandomized trial	University Cancer Research Fund at the University of North Carolina at Chapel Hill	Fair
Mehta, 2016	Before-after	National Cancer Institute	Good
Nash, 2006	Before-after	Fund for the City of New York; City Council of New York	Fair
Percac-Lima, 2012	Before-after	Susan G. Komen MA Affiliate	Poor
Percac-Lima, 2014	Before-after	Massachusetts General Hospital; Massachusetts Cancer Prevention Community Research Network; Trefler Foundation	Fair
Rodriguez-Torre, 2019	Post-intervention multiple time series	Susan G. Komen MA Affiliate; Lazarex Cancer Foundation	Poor
Smith, 2017	Secondary analysis of participants in RCT	National Cancer Institute; Centers for Disease Control and Prevention	Fair
Soltero, 2019	Before-after	Arizona Department of Health Services	Poor
Taplin, 2008	Before-after	Health Resources and Services Administration; Centers for Disease Control and Prevention	Poor
Tu, 2014	Before-after	National Cancer Institute; College of Public Health at the University of Nebraska Medical Center	Fair
Wang, 2018	Retrospective chart review	National Institutes of Health	Fair
White, 2012	Before-after	Susan G. Komen for the Cure, North Alabama affiliate; National Cancer Institute	Poor

Abbreviations: NR = not reported; RCT = randomized controlled trial

Appendix H. Community-Based Studies

Table H-1. Community-based studies: study characteristics

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
Carlini et al., 2012[1]	Tobacco cessation	Low-income (Medicaid and uninsured)	RCT (521)	Age, mean: 42.6 years Female: 64.1% Race White: 81.6% African American: 5.8 % Latino/Hispanic: 3.9% Native American/Pacific Islander: 3.3% Asian: 0.9% Other: 4.6% Insurance status Medicaid: 56.2% No Insurance: 43.8%	General community (Medicaid recipients enrolled in quitlines in Indiana and Washington between June and September 2009), Indiana and Washington	Interactive voice response (IVR) system to recycle smokers who used a quitline in the past back into quitline support for a new quit attempt	A: Control group (n=276) B: IVR intervention group (n=245)	Duration: 6 weeks Followup: up to 1 month after last attempt of reaching participants (10 weeks total)
Dunlop et al., 2016[2]	Cervical cancer screening	Low income	Before-After Georgia Title X and Medicare data (172,525)	Age: NR 18 to 44 eligible Female: 100% Race: NR	Georgia	CMS Georgia Planning for Healthy Babies (P4HB) Program. Expanded family planning services to uninsured women 18 to 44 at or below 200% Federal Poverty Line. Included a cervical cytology testing.	Pre-post: 2 years pre, 3 years post.	3 years post
Harrison et al., 2003[3]	Breast cancer screening	Older Women, African American, Rural/Urban	RCT (2,458)	Age: 78.9 Female: 100% Race Black: 22%	Michigan	A. The intervention consisted of a letter, brochure, and information sheet. Education, addressing barriers.	B. Matched-control (matched on zip code and race)	5 years

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
Kandula et al., 2015[4]	Health behaviors for CVD (PA, nutrition, tobacco cessation)	Race - South Asians	RCT (63)	Medically underserved South Asian immigrants at risk for ASCVD Age, year (SD) A: 50 (8) B: 50 (7) Male, % A: 35% B: 38%	Metropolitan Asian Family Services - not-for-profit community-based organization that provides social services in Illinois	A. South Asian Heart Lifestyle Intervention - integrates evidence-based behavior change strategies with South Asians' sociocultural context and beliefs (31)	B. Given preexisting print education materials about ASCVD, diet, exercise, and weight loss (32)	October 2012 to July 2013; 3 and 6 months
Kelaher & Stellman, 2000[5]	Breast cancer screening	Older women 65 to 69, Medicare eligible	Retrospective cohort: National Health Interview Survey Data (4,291; 2,419 Medicare eligible, 1,872 noneligible)	Age: 65 to 69 Female 100% Race (Among Medicare Eligible): Black 53.4% , Non-Black 53.4% ; Hispanic 47.6%, Non-Hispanic 55%	NR NHIS data	Biennial mammography coverage with Medicare Part B. Change in 1991	Noneligible (aged 60 to 64), Pre-intervention	Compared 1990, 1993
Marino et al., 2016[6]	Breast, cervical, and colorectal cancer screening; Diabetes; Hypertension; Obesity; Smoking	Medicaid	RCT (10,643) A:Intervention: 4,049 B: Control: 6,594	Age: 39 (11.8) years Female: 55% Race: 60% white, 20% non-Hispanic other, 13% Hispanic, 6% unknown	Oregon community health clinics	Oregon Experiment: a randomized natural experiment of the effect of Medicaid coverage on screening rates	Not assigned to Medicaid	36 months
Miller & Sedivy, 2009[7]	Tobacco cessation	Low-income	Observational study (1,377) A: Intervention: 1,000 B: Comparison: 377 3-month followup: 1,192 6-month: 1,137 12-month: 929	*Note: significantly different by smoking behavior at baseline A: Intervention Age, mean: 48.3 years Female: 65.3% Indigenous: 1.1% B: Comparison Age, mean: 49.7 years Female: 62.1% Indigenous: 2.4%	National quitline in Australia	Standard multi-session quitline counseling, mailed vouchers for subsidized NRT	Standard multi-session quitline counseling	No more than 12 weeks of counseling sessions; followup at 3, 6, and 12 months

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
O'Brien et al., 2010[8]	Cervical cancer screening	Race- Hispanic women	RCT (120)	Hispanic women Age (SD) A. 32 (11) B. 31 (12), p=0.49	Community, Pennsylvania	A. Promatora-led cervical cancer intervention: two 3-hour workshops (60)	B. Usual care (60)	4 months; 6 months
Plescia et al., 2008[9]	Health behaviors for CVD (PA, nutrition, tobacco cessation)	African American	Quasi-experimental A: Intervention: 4,730 B: Comparison: 9,814	A: Intervention Age 18 to 34: 20.2% 35 to 44: 17.3% 45 to 54: 19.6% 55 to 64: 16.2% 65+: 26.0% Female: 63.4% B: Comparison Age 18 to 34: 33.1% 35 to 44: 20.9% 45 to 54: 19.0% 55 to 64: 11.8% 65+: 14.4% Female: 55.8%	Community (NW corridor of Charlotte, NC), including health center	Community coalition, lay health advisors, policy and community change	African-American respondents to BRFSS in North Carolina during study period	5 years; annual telephone surveys
Richards et al., 2011[10]	Colorectal cancer screening	Age, SES	Before-After/Cross-sectional N 2003: 826,163 2007: 1,252,313	NR	City-wide campaign New York	Multihealth marketing campaign targeting low SES areas and "ethnic radio stations." Patient navigation programs, improved referral processes, etc.	Pre-post/Cross-sectional	4 years
Sung et al., 1997[11]	Cervical and breast cancer screening	Low-income, African-American women	RCT (321)	Low-income, inner-city African-American women Mean age (range): NR Age % (n) >35: 13.4 (43) 35 to 44: 45.2 (145) 45 to 59: 23.3 (75) 60 and older: 18.1 (58) Female: 100% African American: 100%	In-home Georgia	A. In-home culturally sensitive educational program with lay health workers. Consists of two educational sessions and a third review session. Materials included videotape and culturally appropriate printed materials (n=163)	B. Control (n=158) Interviewed at the end of the study, received educational materials on cancer screening after the intervention period (at followup)	Duration: 11 months Followup: 6 months

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
Sung et al., 1997 (continued)[11]	Cervical and breast cancer screening	(continued)	(continued)	(continued)	(continued)	(continued)	(continued)	(continued)
Van Der Wees et al., 2013[12]	Breast, cervical, colorectal cancer screening	SES	Before-After (345, 211)	NR	State-wide Massachusetts	Subsidized health insurance in MA (2006 Health Reform)	Pre-post/other NE states	10 years
Williams et al., 2016[13]	Health behaviors for CVD (PA, nutrition, tobacco cessation)	African American	Before-After (201)	Age, mean (SD): 51.9 years (12.8) Age, median (IQR): 54 years (17) Female: 73.6	Baptist churches Alabama	NHLBI-based curriculum tailored for delivery by CHWs to African Americans; six 2-hour education sessions on CVD risk reduction including handouts, individual goal setting	Baseline	3 months; followup within 1 week of study completion

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
Zhou et al., 2014[14]	Tobacco cessation	Asian American	Community change (14,540) Average Vietnamese men per year: 904 Average Cambodian men per year: 334	A: Intervention Vietnamese men Age 18 to 34: 28.3% 35 to 44: 26.6% 45 to 54: 19.6% 55 to 64: 12.7% 65+: 12.8% B: Control Vietnamese men California Age 18 to 34: 36.4% 35 to 44: 22.1% 45 to 54: 18.1% 55 to 64: 11.1% 65+: 12.3% C: Intervention Cambodian men Age 18 to 34: 39.9% 35 to 44: 32.1% 45 to 54: 16.1% 55 to 64: 4.6% 65+: 7.3% D: Control Cambodian men Massachusetts Age 18 to 34: 32.2% 35 to 44: 22.1% 45 to 54: 18.7% 55 to 64: 12.3% 65+: 14.8%	Community and systems changes California and Massachusetts	Cultural- and language-appropriate health communications via radio, cable TV, printed materials; community and systems change; education and promotion via trained lay health workers	State population (men)	Followup annually 2002 to 2006

Author, Year	Preventive Service	Disparity Population	Study Design (N)	Population; Age (mean; range); Gender; Race	Setting	Interventions/Study Objective	Comparison	Duration; Followup
Zhu et al., 2012[15]	Tobacco cessation	Asian American	RCT (2,277) A: Intervention: 1,124 B: Control 1,153	A: Intervention Age 18 to 24: 3.3% 25 to 44: 45.8% 45 to 64: 45.1% 65+: 5.8% Female: 10% Language Chinese: 31.9% Korean: 37.6% Vietnamese: 30.5% B: Control Age 18 to 24: 3.0% 25 to 44: 44.0% 45 to 64: 44.9% 65+: 8.1% Female: 10% Language Chinese: 32.1% Korean: 36.9% Vietnamese: 31.0%	Telephone quitline California	A. Toll-free Asian-language tobacco quitline promoted in CA, CO, HI, NY, TX, WA from January 2010 to July 2012, offering six telephone counseling sessions and self-help materials, plus free nicotine patches where available	B. Self-help materials	Up to six calls over one month (pre-quit, 3, 7, 14, 30 days post quitting), evaluation 4 and 7 months postintake

Table H-2. Community-based studies: outcomes

Author, Year	Outcomes	Quality Rating	Applicability Rating
Carlini et al., 2012[1]	Quitline re-enrollment rate A: 3.3% (9/276) B: 28.2% (69/245) OR 11.2 (95% CI 5.4 to 23.3), p<0.001	Poor 1. Randomization, allocation concealment, masking of outcome assessors not described, 2. ITT analysis unclear 3. Llarge proportion of attrition	Good
Dunlop et al., 2016[2]	Significantly more women screened during visit (p<0.001) in postintervention years.	NA	Good
Harrison et al., 2003[3]	Mammography rates during 14 month postintervention period, A vs. B Total sample: 5.2% vs. 8.1% OR 1.6, 95% CI 1.15 to 2.21, p≤0.01 Urban Black: 4.9% vs. 9.2%, OR 2.09, 95% CI 1.04 to 4.22, p≤0.05 Rural Non-Black: 6.7% vs. 9.2%, OR 1.44, 95% CI 0.76 to 2.52, NS Age 70 to 79: 6.5% vs. 10.6, OR 1.71, 95% CI 1.16 to 2.52, p≤0.01 Age 80+: 3.6% vs. 4.6%, OR 1.29, 95% CI 0.69 to 2.39, NS	Good	Good

Author, Year	Outcomes	Quality Rating	Applicability Rating
Kandula et al., 2015[4]	Mean (95% CI) Change in bout-corrected moderate-vigorous physical activity, min/week 3 months A. 15.5 (−13.06 to 44.07) B. 7.3 (−19.00 to 33.56) Adjusted mean difference: 8.2 (−29.23 to 45.68) 6 months A. 9.5 (−19.49 to 38.53) B. 4.4 (−23.08 to 31.83) Adjusted mean difference: 5.1 (−32.98 to 43.26) Change in percent kilocalories from saturated fat intake, % 3 months A. −0.24 (−1.15 to 0.68) B. 0.12 (−0.76 to 1.01) Adjusted mean difference: −0.36 (−1.60 to 0.88) 6 months A. 0.37 (−0.64 to 1.39) B. 0.58 (−0.42 to 1.59) Adjusted mean difference: −0.21 (−1.59 to 1.17) Change in energy intake, kcalories/day 3 months A. −182 (303.61 to −59.67) B. −52 (−170.92 to 66.60) Adjusted mean difference: −129 (−293.40 to 34.44) 6 months A. −173 (−290.33 to −55.75) B. −99 (−214.72 to 16.84) Adjusted mean difference: −74 (−223.03 to 74.84) Change in fruit and vegetable intake, servings/day 3 months A. 0.5 (−0.01 to 1.09) B. 0.1 (−0.45 to 0.62) Adjusted mean difference: 0.5 (−0.23 to 1.14) 6 months A. 0.04 (−.52 to 0.60) B. 0.5 (−0.07 to 1.03) Adjusted mean difference: −0.4 (−1.15 to 0.26)	Good	Fair 1,Only occurred in one community center, unclear whether it is applicable in other communities. 2. Seems resource heavy.

Author, Year	Outcomes	Quality Rating	Applicability Rating
Kelaher & Stellman, 2000[5]	Predictors of mammogram in last 2 years, by year 1993 vs. 1990 57.3% vs. 50.3%, OR 1.2, 95% CI 0.9 to 1.4, NS Predictors of mammogram in last 2 years, by Medicare-eligible status 51.9% vs. 54.0%, OR 0.8, 95% CI 0.7 to 1.0, p<0.05 (favors control) Mammogram in last 2 years, by year of interview 1990 vs. 1993: Medicare eligible: 47.7% vs. 63.3% Medicare ineligible: 53.3% vs. 60.8% no statistics provided.	Poor 1. No statistical analysis of pre-post Medicare eligible population 2. Self-report data based on national survey	Good
Marino et al., 2016[6]	Change, Medicaid coverage vs. unselected BMI: 12.5% (95% CI 10.6 to 14.4) Blood pressure: 10.1% (95% CI 7.0 to 13.3) Smoking: 6.2% (95% CI 5.3 to 7.1) Pap test: 10.3% (95% CI 8.8 to 11.7) Mammography: 14.5% (95% CI 10.1 to 18.8) FOBT: -0.2% (95% CI -5.1 to 4.7) Colonoscopy: 2.7% (95% CI -1.7 to 7.1) Glucose: 4.8% (95% CI -3.0 to 12.7) HbA1c: 0.8% (95% CI -4.0 to 5.7)	Fair 1. Unclear whether assessors were blinded. 2. Unclear whether attrition occurred	Fair 1. Study population (demographics, inclusion/exclusion criteria) 2. Study setting (system)

Author, Year	Outcomes	Quality Rating	Applicability Rating
Miller & Sedivy, 2009[7]	Responder estimates Attempted to quit A: 83.8% B: 74.8% p<0.001 Quit at 3 months A: 46.0% B: 29.5% p<0.001 Quit at 6 months A: 37.1% B: 26.2% p<0.001 Quit at 12 months A: 33.2% B: 28.0% Sustained abstinence from 3 to 6 months followup A: 20.7% B: 13.1% p<0.01 Sustained abstinence, 3 to 12 months followup A: 2.7% B: 2.0% Self-reported NRT use A: 57.9% B: 22.3% p<0.05 Mean days NRT use (SD) A: 38.8 days (26.0) B: 22.2 days (22.0) p<0.05 Number of calls from quitline, mean (SD) A: 6.6 calls (3.7) B: 5.8 calls (3.9) p<0.001	Poor 1. Groups not comparable at baseline, and participants allowed in outside of original purposeful sampling 2. High attrition / loss to followup	Fair 1. Study population (inclusion/ exclusion criteria, refusal rate, adherence, recruitment)
O'Brien et al., 2010[8]	Receipt of Pap smear, % (n) A. 65% (22)* B. 36% (13)* *A. n=34 at followup *B. n=36 at followup	Fair	Fair 1. Difficult to understand the setting in which the intervention occurs. Not sure if it would work in all communities

Author, Year	Outcomes	Quality Rating	Applicability Rating
Plescia et al., 2008[9]	Does not meet any PA recommendation, 2001 A: 31.9% (28.3 to 35.7) B: 23.1% (19.3 to 27.5) p<0.001 Does not meet any PA recommendation, 2005 A: 27.4% (24.1 to 30.9) B: 25.5% (23.4 to 27.8) Consumes 5+ veg/fruits daily, 2001 A: 23.1% (20.1 to 26.5) B: 21.7% (16.4 to 28.1) Consumes 5+ veg/fruits daily, 2005 A: 25.3% (22.2 to 28.7) B: 17.5% (15.7 to 19.4) p<0.001 Currently smokes, 2001 A: 27.3% (24.0 to 30.8) B: 21.1% (17.6 to 25.1) p=0.02 Currently smokes, 2005 A: 26.6% (23.3 to 30.2) B: 22.3% (20.2 to 24.7) p=0.04	Fair 1. No real baseline, so hard to compare groups 2. Unclear masking of outcome assessors or analysts 3. Survey data, so unclear or N/A on attrition	Poor 1. Study population (demographic characteristics) 2. Study setting (health care system, centers, time, effort, system cost) 3. Study providers (training, expertise or skill, ancillary providers)
Richards et al., 2011[10]	These figures show the elimination of racial/ethnic disparities by 2007 among non-Hispanic Whites, non-Hispanic Blacks, and Hispanics, and highlight persistently lower screening levels among Asians, despite a significant improvement over time, a 29-percentage-point increase. Disparities between the sexes were lessened over time as well: while men had a higher prevalence of screening in 2003, women had a greater percentage-point increase than men (22.3% vs. 16.7%), effectively eliminating the sex disparity. Similarly, disparities between adults with private, Medicaid, and Medicare insurance also disappeared over time, yet those with no insurance continued to lag behind in 2007. In addition, disparities between income levels and education levels persisted. Adults with high household incomes—600% of the federal poverty level or more—continued to have a much higher prevalence of timely colonoscopy screening than all other income groups. Those with at least some college education were more likely to be screened throughout 2003 to 2007 than those with a high school degree or less. In 2003, those aged 50 to 64 were less likely to have been screened than those 65 and older, and this difference by age group persisted into 2007.	NA	Fair 1. Population: NY urban population, not applicable to other locations 2. Intervention: city-wide intervention

Author, Year	Outcomes	Quality Rating	Applicability Rating
Sung et al., 1997[11]	Obtained cancer screening exam on recommended schedule, whole sample size Pap smear, % (n) Baseline A: 50.3 (81) B: 51.9 (82) % Difference between groups (95% CI): -1.6 (-12.5 to 9.3) Postintervention A: 58.7 (91) B: 62.1 (95) % Difference between groups (95% CI): -3.4 (-14.1 to 7.3) Change from baseline to postintervention %, (95% CI) A: 8.4 (-2.6 to 19.4) B: 10.2 (-2.6 to 19.0) % Difference between groups (95% CI): -1.8 (-8.0 to 4.4) Mammography (age ≥35) [A. N=141; B. N=137], % (n) Baseline A: 35.5 (50) B: 34.3 (47) % Difference between groups (95% CI): -1.2 (-9.2 to 11.6) Intervention A: 50.4 (71) B: 39.4 (54) % Difference between groups (95% CI): 11.0 (0.1 to 21.9) Change from baseline to postintervention %, (95% CI) A: 14.9 (3.5 to 26.3) B: 5.1 (-6.3 to 16.5) % Difference between groups (95% CI): 9.8 (2.9 to 16.7)	Fair 1. Could not recruit a random sample but did randomize to intervention/control. 2. High loss to followup but did do two different analyses to try to account for this.	Fair 1. Attempted to enroll a random sample from community health centers but were unsuccessful in contacting participants and had high refusal. Instead used a CBPR approach and went door-to-door in public housing, churches, businesses, and referrals from women's self-help organization. 2. Did not occur within a health system but could be easily adopted with home-based educational visits.

Author, Year	Outcomes	Quality Rating	Applicability Rating
Sung et al., 1997 (continued)[11]	Obtained cancer screening exam on recommended schedule, only those who responded to postintervention survey Pap smear, % (n) [A. N=93; B. N=102] Baseline A: 52.7 (49) B: 50.0 (51) % Difference between groups (95% CI): 2.7 (-11.3 to 16.7) Postintervention A: 63.4 (59) B: 62.7 (64) % Difference between groups (95% CI): 0.7 (-12.9 to 16.7) Change from baseline to postintervention %, (95% CI) A: 10.7 (-3.4 to 24.8) B: 12.7 (-0.8 to 26.2) % Difference between groups (95% CI): -2.0 (-11.0 to 7.0) Mammography (age ≥35) [A. N=80; B. N=94], % (n) Baseline A: 32.5 (26) B: 34.0 (32) % Difference between groups (95% CI): -1.5 (-12.6 to 15.6) Postintervention A: 58.7 (47) B: 47.9 (45) % Difference between groups (95% CI): 10.9 (-3.4 to 25.1) Change from baseline to postintervention %, (95% CI) A: 26.3 (11.3 to 41.1) B: 13.9 (-2.0 to 25.8) % Difference between groups (95% CI): 12.4 (1.0 to 24.3)	(continued)	(continued)
Van Der Wees et al., 2013[12]	Breast: DiD -0.1, p=0.64 Cervical: DiD 2.3%, p=0.02 CRC: DiD 5.5%, p<0.01	NA	Fair 1. Intervention depends on state policy

Author, Year	Outcomes	Quality Rating	Applicability Rating
Williams et al., 2016[13]	A. Postintervention B. Baseline Hypertensive BP A: 34.8% B: 45.8% p<0.005 Weight, mean (SD) A: 205.2 lbs. (48.3) B: 205.9 lbs. (49.2) *Note, 20% lost 5+ lbs. QOL, physical (100 high) A: 47.4 (7.1) B: 45.1 (10.1) p<0.001 QOL, mental A: 52.7 (8.7) B: 52.5 (9.3)	NA	Poor 1. Study population (absolute risk, demographics, inclusion/exclusion criteria) 2. Study setting (system, centers, time, effort) 3. Study providers (training, ancillary providers)
Zhou et al., 2014[14]	A: Intervention Vietnamese B: Control Vietnamese C: Intervention Cambodia D: Control Cambodia Annual quit ratio, age-standardized 5-year trend A: 9.6%, p<0.001 B: 0.1%, p=0.609 C: 19.0%, p=0.002 D: -0.7%, p=0.386 *Note: increases in intervention groups significantly greater than control groups, p<0.01 Annual smoking prevalence, age-standardized 5 year trend A: -6.4%, p=0.005 B: -1.8%, p=0.364 C: 13.9%, p=0.001 D: -1.6%, p=0.300 *Note: declines in intervention groups significantly greater than control groups, p<0.05 Relative disparity decreased (lower smoking prevalence) among A with < high school vs. B and among C with > high school than D Relative disparity decreased (higher quit ratio) among A with < high school vs. B and among C with > high school than D	Poor 1. Groups not comparable at baseline, and no comparison of comparable racial/ethnic group in intervention and control groups 2. Low response rates 3. Self-report data 4. Survey respondents, so likely not same population from start to finish 5. Unclear whether outcome assessors were masked	Fair 1. Study population (inclusion/exclusion, demographics, recruitment) 2. Study setting (system) 3. Providers (expertise or skill)

Author, Year	Outcomes	Quality Rating	Applicability Rating
Zhu et al., 2012[15]	Six-month prolonged abstinence overall A: 16.4% B: 8.0% p<0.001 OR 2.26, 95% CI 1.73 to 2.94 Chinese A: 14.8% B: 6.0% p<0.001 Korean A: 14.9% B: 5.2% p<0.001 Vietnamese A: 19.8% B: 13.5% p=0.023	Good	Good

Abbreviations: ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; BP = blood pressure; BRFSS = Behavioral Risk Factor Surveillance System; CI = confidence interval; CRC = colorectal cancer; CVD = cardiovascular disease; DiD = difference-in-difference; FOBT = fecal occult blood test; HbA1c = hemoglobin A1c; IQR = interquartile range; ITT = intention-to-treat; NA = not applicable; NHLBI = National Heart Lung and Blood Institute; NR = not reported; NRT = nicotine replacement therapy; NS = not significant; OR = odds ratio; PA = physical activity; Pap = Papanicolaou test; QOL = quality of life; RCT = randomized control trial; SD = standard deviation; SES = socioeconomic status

Note: The studies in the above table are a sample of community-based interventions and do not reflect a comprehensive list of all community-based studies found in our search.

Appendix H References

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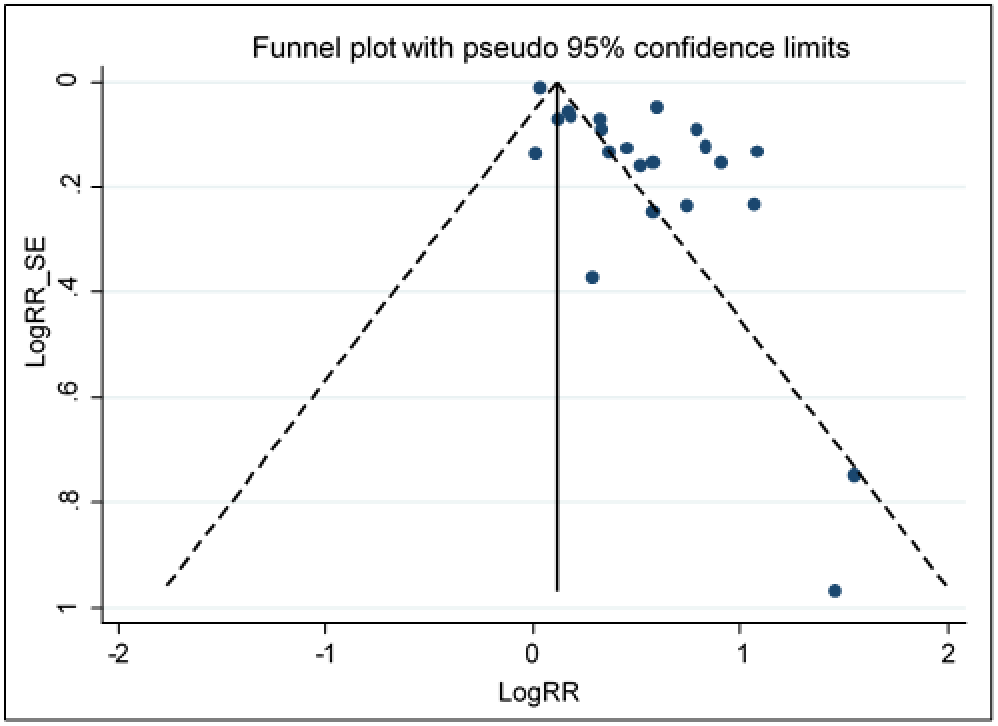
Appendix I. Funnel Plot of Colorectal Cancer Screening Studies in Meta-Analysis

Figure I-1. Funnel plot of 22 colorectal cancer screening studies



Abbreviations: RR = risk ratio; SE = standard error.

Appendix J. Strength of Evidence

Table J-1. Strength of evidence for Key Question 2: Effects of impediments and barriers of populations that contribute to disparities in preventive services

Preventive Service	Barrier	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Low income	1 RCT (240)	Medium	NA	Direct	Imprecise	Undetected	No effect among safety net clinics	Low; low
	Insurance status and type	2 RCTs (1,436)	Medium	Inconsistent	Direct	Imprecise	Undetected	Less screening with Medicare compared with county health plans in 1 RCT; no effect in another RCT	Low; low
	Screening attitudes	1 RCT[a] (257)	High	NA	Indirect	Imprecise	Undetected	Higher scores on attitudes scale associated with higher screening rates among African Americans	Insufficient; insufficient
	Language	1 RCT[b] (1,070)	Medium	NA	Direct	Imprecise	Undetected	No effect on screening with Spanish compared with English speakers	Low; low
	Health literacy	1 RCT (264)	Medium	NA	Direct	Imprecise	Undetected	No effect on screening among disadvantaged	Low; low
Breast cancer screening	Country of origin	1 RCT (1,333); 1 before-after study (437)	Medium	NA	Direct	Imprecise	Undetected	More screening among Puerto Rican vs. other non-U.S. born Latinas in 1 RCT, and African-American women born outside the U.S. in a before-after study	Insufficient; insufficient
	Older age at migration	1 RCT (300)	Medium	NA	Direct	Imprecise	Undetected	Less screening for older low-income Chinese immigrants	Low; low
	Low income	2 RCTs (491)	Medium	Inconsistent	Direct	Imprecise	Undetected	No effect in 2 RCTs	Low; low

Preventive Service	Barrier	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Insurance status and type	2 before-after studies (666); 5 RCTs (3,871); 1 retrospective chart review (8,347)	Medium	Inconsistent	Direct	Precise	Undetected	More screening with Medicare compared with no coverage in 1 RCT and with insurance in 2 studies; less with insurance in 1 before-after study; no effect in 3 studies; mixed results in chart review study (lower rates for Black, not Hispanic)	Low; low
	Rural access	1 cohort study (166)	Medium	NA	Direct	Precise	Undetected	Less screening with increasing distance from radiologist office and with living in economically-deprived areas	Low; low
	No provider	1 before-after study (437); 1 RCT (300)	Medium	Inconsistent	Direct	Precise	Undetected	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
	Language	2 RCTs (1,617); 1 before-after study (229)	Medium	NA	Direct	Imprecise	Undetected	No effect among low-income Chinese-American immigrants, Spanish speaking or limited-English speaking Hispanic women	Low; low
	Individual access-related barriers	1 RCT (851)	Medium	NA	Direct	Imprecise	Undetected	Some barriers decrease screening among rural, low-income women (not knowing where to get a mammogram, cost), while others had no effect (time, insurance status, difficulty getting to the facility)	Low; low

Preventive Service	Barrier	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Cervical cancer screening	Country of origin	2 RCTs (1,678)	Medium	Inconsistent	Direct	Imprecise	Undetected	More screening among Puerto Rican vs. other non U.S.-born Latinas in 1 RCT; no effect in RCT of low-income rural women	Insufficient; insufficient
	Older age	1 RCT (345)	Medium	NA	Direct	Precise	Undetected	Less screening for older low-income rural	Low; low
	Low income	1 RCT (345)	Medium	NA	Direct	Imprecise	Undetected	No effect among low-income rural patients	Low; low
	Insurance status and type	3 RCTs (2,246); 1 before-after study (782)	Medium	Inconsistent	Direct	Precise	Undetected	Less screening with Medicare compared with county health plans in 1 RCT and with any insurance in 2 studies; no effect in 1 RCT	Low; low
	Language	1 RCT[b] (967)	Medium	NA	Direct	Imprecise	Undetected	No effect on screening among Spanish speaking women	Low; low
	No provider	1 RCT (705); 1 before-after study (732)	Medium	Inconsistent	Direct	Imprecise	Undetected	Less screening with no regular provider in 1 study; no effect in 1 RCT	Low; low
Smoking cessation	Attitudes	1 RCT[c] (314)	Medium	NA	Indirect	Imprecise	Undetected	Motivations for smoking differed between African-American and White smokers, but did not explain lower quit rates for African Americans	Insufficient; insufficient
	No provider	1 before-after study (879)	Medium	NA	Indirect	Imprecise	Undetected	A regular source of healthcare was associated with planning to quit, ever receiving physician advice to quit, and smoking ≤10 cigarettes/day	Low; low

Preventive Service	Barrier	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Language	1 before-after moderation analysis (615)	Medium	NA	Indirect	Imprecise	Undetected	Latinos preferring Spanish are more likely to quit vs. those preferring English	Insufficient; insufficient

Abbreviations: NA = not applicable; RCT = randomized controlled trial.

[a] Secondary data analysis of participants who did not undergo screening.
[b] Secondary analysis of RCT data.
[c] Mediation analysis of baseline data.

Table J-2. Strength of evidence for Key Question 3: Effectiveness of approaches between providers and patients to reduce disparities in preventive services

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	2 RCTs (486)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates in 2 RCTs of Hispanic, African-American, and low-income patients	Low; low
	Printed materials and telephone counseling	1 RCT (1,280)	Low	NA	Direct	Precise	Undetected	Increased screening rates among first-degree relatives of colorectal cancer cases for Latinos, Asians, and Whites, but not African Americans	Low; low
	Mailed materials	1 RCT (1,430)	High	NA	Direct	Imprecise	Undetected	Higher screening rates in Whites than African Americans	Insufficient; insufficient
	Educational video and physician reminder	1 RCT (65)	Medium	NA	Direct	Imprecise	Undetected	Higher screening rates among Latinos	Insufficient; insufficient
	Decision aid with or without personalized risk assessment	1 RCT (825)	Medium	NA	Direct	Imprecise	Undetected	Increased screening completion rates with decision aid among low-income patients	Insufficient; insufficient
Breast cancer screening	Reminders with lay health workers	1 RCT[a] (2,357); 1 non-randomized trial (1,693)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates among low-income women in 2 trials	Moderate; moderate
Cervical cancer screening	Reminders with lay health workers	1 nonrandomized trial (1,693)	Medium	NA	Direct	Precise	Undetected	Increased screening rates among low-income women	Low; low

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Education video and *promotora*	1 RCT (443)	Medium	NA	Direct	Imprecise	Undetected	Increased screening rates among rural Latinas	Low; low
	Education with navigation	1 cohort (134)	High	NA	Direct	Imprecise	Undetected	Increased screening rates among low-income Chinese-American women	Insufficient; insufficient
Tobacco smoking cessation	Message from child's clinician, interview, telephone counseling	1 RCT (303)	Medium	NA	Direct	Imprecise	Undetected	Higher quit rates at 3 and 12 months among low-income women	Low; low
Obesity Screeening and Management	Tailored weight loss intervention from primary care physicians	1 RCT (137)	Medium	NA	Direct	Imprecise	Undetected	Improved weight loss in low-income African-American women at 9 months, but not at 12 or 18 months	Insufficient; insufficient

Abbreviations: NA = not applicable; RCT = randomized controlled trial.

Table J-3. Strength of evidence for Key Question 4: Effectiveness of health system information technologies to improve preventive services in settings that serve populations adversely affected by disparities

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Electronic decision aid with patient-ordered tests and followup messages	1 RCT (450)	Medium	NA	Direct	Imprecise	Undetected	Increased screening rates in low-income patients	Low; low
	Web-based electronic decision aid before healthcare visit	1 RCT (264)	Medium	NA	Direct	Imprecise	Undetected	No effect on screening rates in socioeconomically disadvantaged patients; increased patient readiness for screening	Insufficient; insufficient
	EHR-identified mailings and telephone calls	1 RCT (240)	Medium	NA	Direct	Imprecise	Undetected	Increased screening rates in low-income patient	Insufficient; insufficient
	Text messages added to usual telephone calls and mailings	1 RCT (808)	Low	NA	Direct	Imprecise	Undetected	No differences among Alaska Native and American Indian patients	Low; low
Breast cancer screening	EHR-identified mailings and telephone calls	1 RCT (191)	Medium	NA	Direct	Imprecise	Undetected	No effect among low-income patients	Insufficient; insufficient
	EHR-triggered reminder letters	1 RCT (1,717)	High	NA	Direct	Imprecise	Undetected	No effect among low-income patients	Insufficient; insufficient

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Interactive computer program and patient navigation	1 RCT (179)	Medium	NA	Direct	Imprecise	Undetected	Increased mammography adherence and readiness among low-income African-American women	Insufficient; insufficient
Cervical cancer screening	Electronic education modules	1 RCT (943)	Medium	NA	Direct	Imprecise	Undetected	No effect among low-income Latinas	Low; low
Smoking cessation	Counseling by telemedicine	1 RCT (566)	Medium	NA	Direct	Imprecise	Undetected	No difference in quit rates among low-income rural patients	Low; low
	EHR-identified smokers followed by counseling and NRT	1 RCT (707)	Medium	NA	Direct	Imprecise	Undetected	Increased quit rates among low socioeconomic status patients	Low; low
Obesity screening and management	Behavioral change counseling with web- or telephone-based patient self-monitoring	1 RCT (365)	Medium	NA	Direct	Imprecise	Undetected	Decreased BMI among patients of ethnic and racial minorities	Low; low

Abbreviations: BMI = body mass index; EHR = electronic health record; KQ = Key Question; NA = not applicable; NRT = nicotine replacement therapy; RCT = randomized controlled trial.

Table J-4. Strength of evidence for Key Question 5: Effectiveness of health system Interventions to reduce disparities in preventive services

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	Patient navigation	20 RCTs (30,736); 3 nonrandomized trials (1,392); 2 before-after studies (4,882)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates in all but 4 studies	High; high
	Telephone calls, prompts, and other outreach	10 RCTs (61,155); 2 nonrandomized trial (1,080); 2 before-after studies (918,667); 1 post intervention time series (4,423,734)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates for multiple types of outreach among several patient populations; no effect in 2 studies	High; high
	Educational videos	4 RCTs (1,823)	Medium	Inconsistent	Direct	Imprecise	Undetected	Increased screening for low-income patients in 2 RCTS; no effect in 2 others	Low; low
	Screening checklist	1 RCT (1,196)	Medium	NA	Direct	Precise	Undetected	Increased screening rates in low-income patients	Low; low
	Provider training	2 before-after studies (4,092)	Medium	Consistent	Indirect	Precise	Undetected	Increased colonoscopy rates and documentation; no increase in FOBT	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Medium	NA	Indirect	Precise	Undetected	Increased screening rates among underserved patients	Low; low

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
Breast cancer screening	Patient navigation	7 RCTs (8,622); 1 before-after study (91); 1 post-intervention time series (1,664)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates in all studies except 1 RCT	Moderate; moderate
	Telephone calls, prompts, and other outreach	5 RCTs (2,238)	Medium	Inconsistent	Direct	Imprecise	Undetected	Increased screening rate in 1 RCT; no increase others	Low; low
	Patient education	2 RCTs (341)	High	Consistent	Direct	Imprecise	Undetected	Increased screening rates in Chinese and Korean-American women	Low; low
	Lay health workers	4 RCTs (2,573)	Medium	Consistent	Direct	Precise	Undetected	Increased screening rates in 3 RCTs of Hispanic and African-American women; no increase in another RCT of Hispanic women	Moderate; moderate
	Screening checklist	1 RCT (1,196)	Medium	NA	Direct	Precise	Undetected	Increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Medium	NA	Indirect	Precise	Undetected	Increased screening rates among underserved patients	Low; low
Cervical cancer screening	Patient navigation	3 RCTs (2,378); 1 nonrandomized trial (1,763)	Medium	Consistent	Direct	Precise	Undetected	Increased screening and diagnostic resolution	Moderate; moderate

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Telephone calls, prompts, and other outreach	2 RCTs (1,784)	Medium	NA	Direct	Imprecise	Undetected	Increased screening and colposcopy followup	Low; low
	Lay health workers	5 RCTs (3,641)	Medium	Inconsistent	Direct	Imprecise	Undetected	Increased screening rates among Hispanic women in 1 RCT; no increases in others	Low; low
	Screening checklist	1 RCT (1,196)	Medium	NA	Direct	Imprecise	Undetected	No increased screening rates in low-income patients	Low; low
	Practice changes involving community engagement	1 before-after study (97,433)	Medium	NA	Indirect	Precise	Undetected	Increased screening rates among underserved patients	Low; low
Lung cancer screening	Patient navigation	1 RCT (1,200)	High	NA	Direct	Imprecise	Undetected	Increased screening rates among low-income smokers	Insufficient; insufficient
Smoking cessation	Patient navigation	2 RCTs (960)	Medium	Inconsistent	Direct	Imprecise	Undetected	Higher quit rates in 1 RCT, but not another	Insufficient; insufficient
	Nicotine replacement	2 RCTs (5,705)	High	Consistent	Direct	Imprecise	Undetected	Higher quit rates with counseling and nicotine replacement	Insufficient; insufficient
	Education and counseling	2 RCTs (6,219)	Medium	Inconsistent	Direct	Imprecise	Undetected	Higher short-term quit rates, but not long-term rates in 1 RCT; no differences in another	Insufficient; insufficient
High blood pressure screening	Education and counseling	1 RCT (1,443)	High	NA	Indirect	Imprecise	Undetected	No difference in rates of high blood pressure among underserved women	Insufficient; insufficient
Obesity screening; management	Education and counseling	4 RCTs (1,293); 1 cohort study (69); 1 before-after study (59)	High	NA	Indirect	Imprecise	Undetected	Lower BMI in 3 studies; no differences in 3 others	Insufficient; insufficient

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Study Limitations	Consistency	Directness	Precision	Reporting Bias	Overall Effect	Strength of Evidence; Applicability
	Case management and outreach	1 RCT (207)	Low	NA	Direct	Imprecise	Undetected	No differences in BMI among low-income Hispanic adults	Insufficient; insufficient

Abbreviations: BMI = body mass index; EHR = electronic health record; NA = not applicable; RCT = randomized controlled trial