



Achieving Health Equity in Preventive Services

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.

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.



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
	Obesity in adults: screening and management ^b	All adults (screening); adults who are overweight or obese (management)

Abbreviations: CVD = cardiovascular disease

^aBreast 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.

^bAlso relevant to cardiovascular disease prevention.

Methods

This review follows standard methods for systematic reviews⁵ 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.

^a50 studies in 54 publications, ^b26 studies in 27 publications, ^c13 studies in 14 publications, ^d1 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

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

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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
	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

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

Preventive Service	Impediments and Barriers	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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
	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.

^aSecondary data analysis of participants who did not undergo screening.

^bSecondary analysis of RCT data.

^cMediation 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
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 <i>promotora</i>	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

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

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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

^aIncludes 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

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

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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

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

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
Colorectal cancer screening	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

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

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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
	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

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

Preventive Service	Intervention	Number of Studies; Study Design; Participants (n)	Overall Effect	Strength of Evidence; Applicability
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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Full Report

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