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Behavioral health promotion interventions to increase cervical cancer screening uptake: A systematic review

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Abstract

Background: Cervical cancer is the fourth most common cancer in women worldwide, disproportionately affecting those in low- and middle-income countries (LMICs). Despite the availability of effective screening tools such as Pap test and HPV testing, participation rates remain suboptimal due to complex behavioral barriers including low awareness, cultural stigma, and limited access to healthcare services.
Purpose: To synthesize evidence on behavioral-based health promotion interventions designed to increase cervical cancer screening uptake, examining their theoretical frameworks, delivery modalities, and effectiveness.
Method: A systematic search was conducted in three electronic databases—PubMed/MEDLINE, Scopus, and ScienceDirect—for studies published between January 2015 and March 2026. The PRISMA 2020 framework guided the review process. Studies evaluating behavioral interventions targeting cervical cancer screening in women eligible for or targeted by cervical screening were included.
Results: A total of 760 records were identified from three databases (PubMed: n=32; Scopus: n=463; ScienceDirect: n=265). After removing 38 duplicates, 722 records were screened; 159 proceeded to full-text assessment, and 54 studies from 25 countries were ultimately included. Interventions were categorized as: face-to-face health education (n=18), digital/mHealth (n=11), reminder-based systems (n=7), motivational interviewing (n=4), peer-led education (n=4), culturally tailored programs (n=7), and multicomponent strategies (n=3). Theoretical frameworks used included the Health Belief Model, Protection Motivation Theory, and Social Cognitive Theory. Of 54 studies, 47 (87.0%) reported statistically significant improvement in at least one outcome in screening uptake or related behavioral outcomes.
Conclusion: Behavioral-based health promotion interventions effectively increase cervical cancer screening uptake. Theory-driven, culturally tailored, and multicomponent approaches demonstrate the most consistently favorable findings and should be prioritized in public health programs.

Keywords: Behavioral Intervention; Cervical Cancer Screening; Health Behavior Theory; Health Promotion; Systematic Review.

INTRODUCTION

Cervical cancer is the fourth most common cancer affecting women worldwide, with approximately 660,000 new cases and 350,000 deaths reported annually (World Health Organization, 2022). The global burden of cervical cancer falls disproportionately on women in low- and middle-income countries (LMICs), where more than 85% of cases and deaths occur due to limited access to preventive services, organized screening programs, and treatment infrastructure (Tin, Ngamjarus, Rattanakanokchai, Sothornwit, Aue-Aungkul, Paing, & Lumbiganon, 2023). In high-income countries, the introduction of organized Papanicolaou (Pap) smear screening has led to substantial reductions in cervical cancer incidence and mortality over recent decades (Lott, Trejo, Baum, McClelland, Adsul, Madhivanan, & Ehiri, 2020).

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Cervical cancer is largely preventable through early detection via screening techniques such as Pap test cytology, liquid-based cytology, and high-risk HPV DNA testing. When detected at precancerous or early invasive stages, treatment success rates exceed 90% (World Health Organization, 2022). Despite this, participation in cervical cancer screening remains critically low in many regions, particularly in LMICs, sub-Saharan Africa, South and Southeast Asia, and among immigrant populations in high-income countries. Barriers to screening are multifaceted and encompass low awareness, cultural and religious stigma, fear of procedures and results, low perceived susceptibility, fatalistic beliefs, financial constraints, healthcare inaccessibility, and inadequate provider recommendation (Lott et al., 2020; Qureshi, Igland, Møen, Gele, Kumar, & Diaz, 2021).

Health promotion, as conceptualized by the Ottawa Charter, encompasses a broad range of strategies designed to enable individuals to exert control over and improve their health (World Health Organization, 1986). Behavioral-based health promotion interventions draw systematically upon established psychological and behavioral theories to address the cognitive, motivational, and social determinants of health behavior (Glanz, Rimer, & Viswanath, 2015). Frameworks such as the Health Belief Model (HBM), Protection Motivation Theory (PMT), Social Cognitive Theory (SCT), Motivational Interviewing (MI), and the Integrated Behavioral Model (IBM) have been widely applied to design and evaluate cervical cancer screening interventions across diverse populations and settings (Interis, Anakwenze, Aung, & Jolly, 2016; Ghahremani, Harami, Kaveh, & Keshavarzi, 2016; Altinel & Akin, 2022).

Over the past decade, there has been a significant proliferation of studies evaluating diverse behavioral interventions to promote cervical cancer screening, including face-to-face health education, community health worker (CHW)-led programs, digital and mobile health (mHealth) platforms, short message service (SMS) reminders, peer-led education, motivational interviewing, decision aids, and culturally tailored programs. However, a comprehensive synthesis examining behavioral theory as the unifying thread across intervention types, populations, and delivery settings is lacking. This systematic review aims to synthesize evidence on behavioral-based health promotion interventions for increasing cervical cancer screening uptake published between 2015 and 2026. Specifically, this review aims to: (1) identify types of behavioral interventions evaluated; (2) examine theoretical frameworks applied; (3) assess intervention effectiveness on screening uptake and related behavioral outcomes; and (4) identify contextual factors associated with effectiveness.

RESEARCH METHOD

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. Studies published between January 2015 and March 2026 were eligible if they: (1) evaluated a behavioral-based health promotion intervention targeting cervical cancer screening; (2) reported quantitative or mixed-methods outcomes related to screening uptake, knowledge, attitudes, self-efficacy, or behavioral intention; (3) included women eligible for or targeted by cervical screening as the primary target population; and (4) were published in English in peer-reviewed journals. Studies were excluded if they focused exclusively on HPV vaccination, lacked a clearly defined behavioral component, or consisted of conference abstracts, editorials, or opinion pieces without primary data. This review was not registered prospectively in PROSPERO or any other systematic review registry; this is acknowledged as a limitation in accordance with PRISMA 2020 reporting guidance.

A comprehensive and systematic literature search was conducted in three major electronic databases: PubMed, Scopus, and ScienceDirect. The search was performed independently by two researchers to minimize selection bias and ensure completeness of retrieval. Search terms were constructed by combining controlled vocabulary (Medical Subject Headings [MeSH] for PubMed; TITLE-ABS-KEY field tags for Scopus) with free-text keywords, organized into four conceptual blocks: (1) the condition: cervical cancer and cervical neoplasms; (2) the screening modality: cervical cancer screening, Pap test, VIA screening, and HPV testing; (3) the intervention: behavioral-based health promotion strategies including health education, health promotion, behavioral intervention, behavior change communication, counseling, peer education, motivational interviewing, mHealth, mobile health,

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reminder systems, and community-based intervention; and (4) the outcome: participation, uptake, adherence, compliance, and utilization. All conceptual blocks were connected using the Boolean operator AND, while synonymous terms within each block were connected using OR. An additional population filter (women; women of reproductive age; female) was applied across all database searches. Reference lists of all included studies and relevant systematic reviews were manually screened to identify additional eligible records not retrieved from the electronic database searches. The complete search strings applied in each database are presented below.

Search string for PubMed/MEDLINE:

("Cervical Cancer"[Mesh] OR "Uterine Cervical Neoplasms"[Mesh] OR "cervical cancer")
AND
("Mass Screening"[Mesh] OR "cervical cancer screening" OR "Pap test" OR "VIA screening" OR "HPV testing")
AND
("Health Promotion"[Mesh] OR "Health Education"[Mesh] OR "behavioral intervention" OR "behavior change communication" OR counseling OR "peer education" OR mHealth OR "motivational interviewing")
AND
(participation OR uptake OR adherence OR compliance)
AND
(women OR "women of reproductive age")

Search string for Scopus:

TITLE-ABS-KEY
("cervical cancer screening" OR "Pap test" OR "HPV testing" OR "VIA screening" OR "cervical screening")
AND
("behavioral intervention" OR "behavior change communication" OR "health promotion" OR "health education" OR counseling OR "peer education" OR "motivational interviewing" OR mHealth OR "mobile health" OR "reminder system" OR "community-based intervention")
AND
(participation OR uptake OR adherence OR compliance OR utilization)
AND
(women OR "women of reproductive age" OR female)

Search string for ScienceDirect:

("cervical cancer screening" OR "Pap test" OR "HPV screening")
AND
("behavioral intervention" OR "health promotion" OR "health education")
AND
(participation OR uptake OR adherence)
AND
(women)

After the database search, all retrieved records were imported into Covidence systematic review software for deduplication and screening management. Duplicate records were removed both automatically by Covidence (n=37) and manually (n=1), yielding a deduplicated pool of 722 records for title and abstract screening. Two independent reviewers screened all titles and abstracts against the eligibility criteria. Full texts of potentially eligible studies were retrieved and assessed independently. Discrepancies between reviewers were resolved through discussion and, when necessary, consultation with a third reviewer. Data were extracted using a standardized form covering: first author, year, country, study design, sample size, intervention type, theoretical framework, outcome measures, follow-up duration, and key findings. Reference lists of all included studies and relevant systematic reviews were manually screened for additional eligible records not retrieved from the electronic database searches.

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Methodological quality was assessed using appropriate tools based on study design: the Cochrane Risk of Bias Tool (RoB 2.0) for randomized controlled trials (RCTs); the Newcastle-Ottawa Scale (NOS) for quasi-experimental and observational studies; and the AMSTAR-2 checklist for included systematic reviews. Two reviewers conducted quality assessments independently, with discrepancies resolved by consensus. Due to considerable heterogeneity in intervention types, theoretical frameworks, populations, study designs, and outcome measures, a narrative synthesis approach was adopted. Studies were grouped by intervention type and theoretical framework, and patterns of effectiveness across diverse contexts were systematically described.

RESEARCH RESULTS

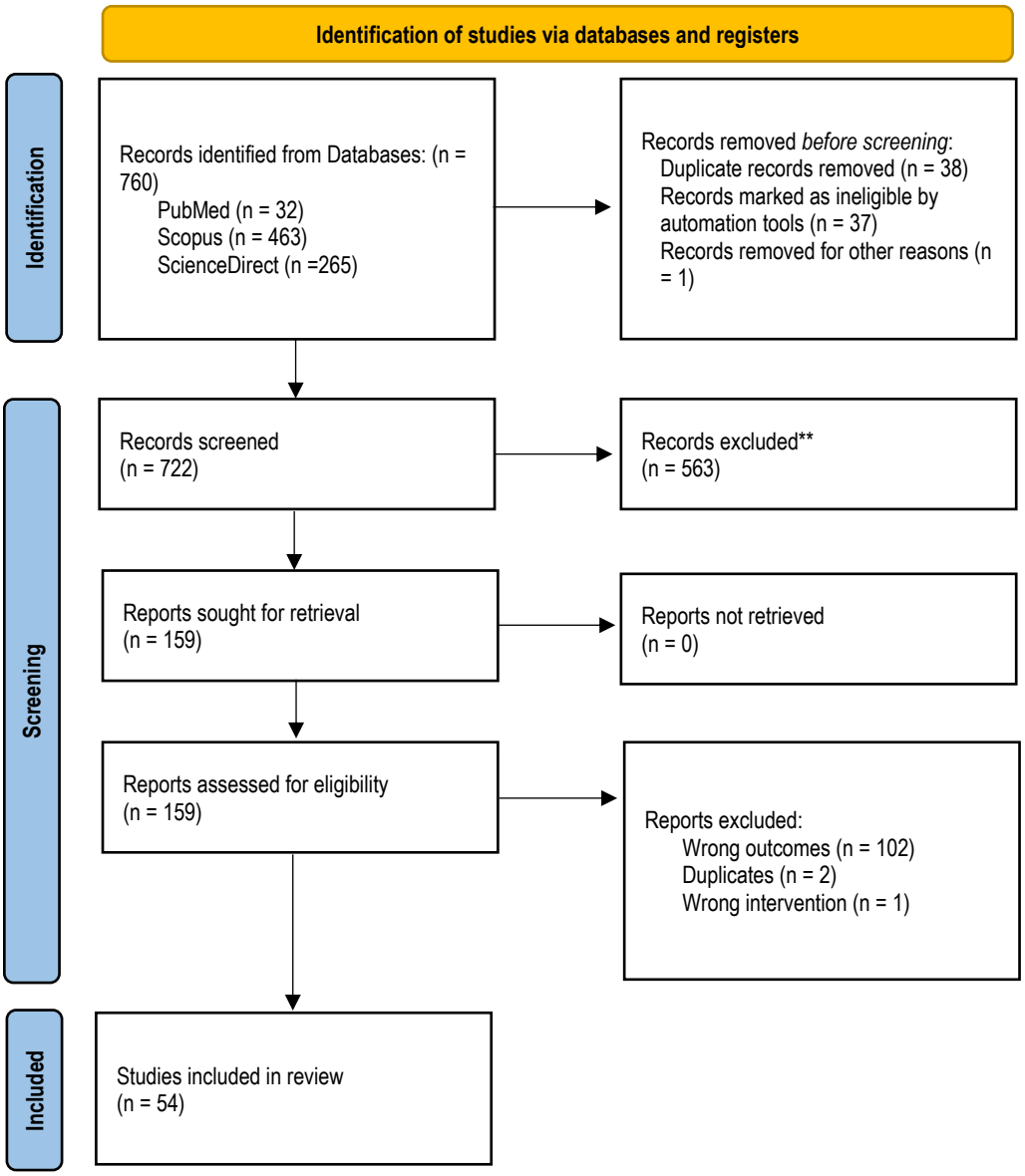


Figure 1. PRISMA Flow Diagram

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Table 1. Distribution of Behavioral Interventions Across Included Studies (N=54)

Intervention Type	Studies (n=54)	Countries Represented
Face-to-face health education	18 (33.3%)	Ethiopia, India, Kenya, Nigeria, Malaysia, Ghana, Jamaica
Digital / mHealth interventions	11 (20.4%)	Iran, Nigeria, Australia, USA, United Kingdom
Reminder-based systems (SMS / letters / calls)	7 (13.0%)	Portugal, Norway, USA, United Kingdom, Iran
Motivational interviewing (MI)	4 (7.4%)	Iran, Canada
Peer-led education	4 (7.4%)	Nigeria, Tanzania
Culturally tailored programs	7 (13.0%)	USA, Netherlands, Canada, Australia, Tanzania
Multicomponent / mixed strategies	3 (5.5%)	Canada, USA, India

Table 1 presents the 54 included studies which were published between 2015 and 2026 and conducted across 25 countries spanning five continents. The highest representation was from Asia (Iran: n=10, India: n=7, Malaysia: n=4), Africa (Ethiopia: n=4, Nigeria: n=3, Kenya: n=3, Ghana: n=2, Tanzania: n=2), the Americas (USA: n=6, Canada: n=2), Europe (Norway: n=3, Portugal: n=2, United Kingdom: n=2, Netherlands: n=1, Turkey: n=1), and Oceania (Australia: n=2), with two multi-country systematic reviews in LMICs. Study designs comprised RCTs (n=29, 53.7%), quasi-experimental studies (n=8, 14.8%), community-based interventional studies (n=9, 16.7%), mixed-methods studies (n=3, 5.6%), and service evaluations (n=2, 3.7%).

Behavioral interventions were classified into seven primary categories. Face-to-face health education was the most prevalent intervention type (n=18, 33.3%), followed by digital/mHealth interventions (n=11, 20.4%), culturally tailored programs (n=7, 13.0%), reminder-based systems (n=7, 13.0%), motivational interviewing (n=4, 7.4%), peer-led education (n=4, 7.4%), and multicomponent strategies (n=3, 5.5%). The distribution of intervention types, study counts, and countries represented is presented in Table 1.

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Table 2. Summary Characteristics and Key Findings of the 54 Included Studies (N=54)

(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Hamdiui et al., 2022) (Netherlands)	To evaluate the added effect of the CSEV on IDM regarding CC screening uptake among Turkish and Moroccan women aged 30 to 60 years in the Netherlands through a randomized intervention study.	Randomized Controlled Trial (RCT)	Web-based culturally sensitive educational video	Not specified	Informed cervical cancer screening decisions	Educational video significantly improved informed decision-making among Turkish- and Moroccan-Dutch women aged 30–60
(Bahrami et al., 2025) (Iran)	To evaluate the effectiveness of face-to-face and mobile-based educational interventions, grounded in the Health Belief Model (HBM), in promoting Pap est uptake.	3-arm RCT	Theory-based education: face-to-face vs. mobile-based vs. control	Theory-based education	Pap test uptake	Both face-to-face and mobile-based interventions significantly improved pap est uptake compared to control
(Thahirabanuibrahim et al., 2021) (India)	To explore the effective way of health communication towards the promotion of cervical cancer prevention and screening.	Community-based Interventional Study	Health education intervention	Not specified	Cervical cancer screening uptake among rural women	Health education significantly increased cervical cancer screening uptake among rural women in Chengalpattu district
(Mohammad et al., 2022) (Malaysia)	To determine the effects of a theory-based educational intervention and WhatsApp follow-up (Pap test uptake [PSU] intervention) in improving PSU among postnatal women.	Randomized Controlled Trial (RCT)	Theory-based educational intervention + WhatsApp follow-up	Theory-based (not specified)	Pap test uptake among postnatal women	Intervention significantly improved Pap test uptake; WhatsApp follow-up enhanced retention and compliance
(Vahabi et al., 2023) (India)	To examine the effectiveness of HPV-SS, supported by family-centred arts-based sexual health literacy on the uptake of cervical cancer screening among hard-to-reach women in rural and remote areas in India.	Community-based Mixed Methods Pilot Study (Protocol)	Family-centered sexual health intervention	Not specified	Cervical cancer screening uptake among low-income rural women	Protocol study; results pending; intervention designed to promote screening in hard-to-reach populations

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Rosser et al., 2015) (Kenya)	To evaluate a health talk's impact on cervical cancer knowledge, attitudes, and screening rates in rural Kenya.	Pre-post Educational Intervention	Educational intervention program	Not specified	Knowledge, attitudes, and behaviors regarding cervical cancer screening	Significant improvement in knowledge, attitudes, and screening behaviors among rural women post-intervention
(Calderon-Mora et al., 2020) (USA)	To determine whether group education is as effective as individual education in improving cervical cancer screening uptake along the US–Mexico border.	Cluster Randomized Trial	Group vs. individual culturally tailored and theory-based education	Social Cognitive Theory	Cervical cancer screening uptake among underserved Hispanics	Both group and individual formats improved screening; group format was more cost-effective
(Abera et al., 2022) (Ethiopia)	To evaluate the impact of health education intervention on women's demand for cervical cancer screening.	Cluster Randomized Controlled Trial	Health education intervention	Not specified	Demand for cervical cancer screening	Health education significantly increased women's demand for cervical cancer screening
(Interis et al., 2015) (Jamaica)	To evaluate the effectiveness of an educational intervention based on the Transtheoretical and Health Belief Models of behavior change in increasing cervical cancer knowledge and intention to screen; and to assess cervical cancer screening rates post-intervention among study participants in western Jamaica.	Theory-based Educational Intervention	Theory-based educational intervention	Health Belief Model (HBM)	Cervical cancer awareness and screening uptake	Intervention significantly increased cervical cancer awareness and screening uptake
(Wong et al., 2019) (Canada)	To investigate the feasibility and preliminary effects of a CHW-led multimedia intervention on cervical cancer screening uptake among this underprivileged group.	Pilot Randomized Controlled Trial	Community health worker (CHW)-led multimedia intervention	Not specified	Cervical cancer screening uptake among South Asian women	CHW-led multimedia intervention showed promising increase in screening uptake; feasibility confirmed
(Bonful et al., 2022) (Ghana)	To assess the effectiveness of a culturally tailored program to promote cervical cancer screening in Accra, Ghana.	Intervention Development Study	Culturally tailored SMS intervention	Not specified	Cervical cancer screening uptake in urban communities	Culturally tailored SMS was acceptable and feasible; positive feedback from target population

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Ghahremani et al., 2016) (Iran)	To examine the effect of educational interventions implemented by health volunteers based on protection motivation theory (PMT) on promoting Pap test use among women.	Quasi-experimental Study	Training health volunteers	Protection Motivation Theory (PMT)	Pap test use among women	Training health volunteers based on PMT significantly improved pap test uptake among Iranian women
(Devi & Dasila, 2020) (India)	To assess the participation of women for cervical screening before and after verbal, written, and video-based health education.	Quasi-experimental / Pre-post Study	Verbal, written, and video-based health education	Not specified	Prevention and early detection of cervical cancer	All three modalities improved knowledge; video-based education showed greatest improvement
(Lönnberg et al., 2016) (Norway)	To pilot scheduled appointments and assess their potential for increased participation.	Randomised Intervention	Scheduled appointment system	Not specified	Cervical screening uptake	Offering scheduled appointments significantly increased cervical screening uptake rates
(Lidofsky et al., 2019) (Tanzania)	To teach Maasai women about the natural history of cervical cancer and available screening and treatment.	Program Development and Implementation	Culturally appropriate education program	Not specified	Cervical cancer screening among Maasai women	Program successfully developed and implemented; increased awareness and acceptance of screening among Maasai women
(Malekzadeh et al., 2022) (Iran)	To determine the effect of decision-aid-based counseling on cervical cancer screening behavior among women.	Interventional Study	Decision-aid-based counseling	Decision Aid / Shared Decision Making	Cervical cancer screening behavior	Decision-aid counseling significantly improved screening behavior and informed decision-making
(Firmino-Machado et al., 2018) (Portugal)	To test the effectiveness of invitation to cervical cancer screening through a very low-cost strategy based on automated and customized text messages, phone calls and reminders.	Population-based Randomized Controlled Trial	Automated text messages, phone calls, and reminders	Not specified	Cervical cancer screening adherence	Stepwise strategy significantly improved cervical screening adherence in non-attendees

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Shrestha et al., 2021) (Nepal)	To determine the effect of a home-based health education intervention for increasing cervical cancer screening uptake delivered by trained female community health volunteers (FCHVs), a category of community health worker.	Protocol for Cluster RCT	Community-based multi-component intervention	Not specified	Cervical cancer screening uptake in semi-urban area	Protocol study; intervention includes health education and outreach; results awaited
(Bowles et al., 2016) (USA)	To test-specific reminder letters can improve cancer screening adherence.	Comparative Effectiveness Study	Two outreach strategies: patient navigation vs. provider referral	Not specified	Cervical cancer screening uptake	Patient navigation was more effective than provider referral alone in increasing screening
(Alizadeh et al., 2025) (Iran)	To develop a mobile application to enhance women's knowledge of HPV, cervical cancer, and Pap test.	Interventional Study	mHealth (mobile health) application	Not specified	HPV knowledge and cervical cancer screening	mHealth intervention significantly improved HPV knowledge and increased cervical cancer screening uptake
(Qureshi et al., 2021) (Norway)	To evaluate the effect of a community-based intervention aimed at increasing participation in the screening program among women from these two groups.	Community-based Intervention (pre-post)	Community-based health education and outreach	Not specified	Cervical cancer screening uptake among immigrant women	Community-based intervention improved screening uptake among Pakistani and Somali immigrant women
(Huf et al., 2020) (UK)	To assess the impact of text message (SMS) reminders and their content on cervical screening rates.	Two Pragmatic Randomized Controlled Trials	Behavioral economics-informed text message reminders	Behavioral Economics Theory	Cervical screening uptake	Behaviorally informed messages improved screening attendance compared to standard reminders
(Zolfaghari et al., 2018) (Iran)	To compare the effects of motivational interviewing (MI)–based training and traditional training on the frequency of cervical cancer screening tests in a group of working female teachers.	Quasi-experimental Study	Motivational interviewing (MI)-based training	Motivational Interviewing (MI)	Cervical screening uptake	MI-based training significantly improved cervical screening uptake compared to traditional training

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Malmir et al., 2018) (Iran)	To determine the effectiveness of an educational intervention to prevent cervical cancer among marginalized Iranian women based on the Protection Motivation Theory (PMT) as a theoretical framework.	Educational Intervention (pre-post)	Educational intervention based on Protection Motivation Theory	Protection Motivation Theory (PMT)	Cervical cancer prevention behaviors among marginalized women	PMT-based intervention significantly improved threat appraisal and coping appraisal, increasing preventive behaviors
(Okunade et al., 2021) (Nigeria)	To assess the impact of mHealth on Pap test screening uptake and also determined the factors that affect screening uptake among women in Lagos, Nigeria.	Randomized Controlled Trial (RCT)	Mobile technology-based health intervention (mHealth-Cervix)	Not specified	Cervical cancer screening practices	mHealth intervention significantly improved cervical cancer screening practices in Lagos
(Bhardwaj et al., 2023) (USA)	To evaluate whether text message reminders from a health system in Galveston, Texas, USA increased uptake of cervical cancer screening as compared to usual care.	Single-institution Study	Text messaging intervention	Not specified	Pap test uptake	Text messaging significantly improved Pap test completion rates in the intervention group
(Ryan et al., 2020) (UK)	To assess the feasibility of offering women who are overdue for cervical screening the use of a smartphone app to book their appointment.	Service Evaluation	Mobile app for booking cervical screening appointments	Not specified	Cervical screening appointment uptake	App-based booking increased cervical screening appointments and was well-received by users
(Shokar et al., 2021) (USA)	To test the effectiveness of a multicomponent screening intervention for primary prevention and early detection of cervical cancer among underserved Hispanic women.	Multicomponent Culturally Tailored Intervention	Community health educator-led outreach (De Casa en Casa)	Social Learning Theory / Cultural tailoring	Cervical cancer screening among underserved Hispanic women	Significant increase in cervical cancer screening rates among Hispanic women post-intervention
(MacLaughlin et al., 2018) (USA)	To assess the effect of a complex CDSS, incorporating national guidelines for high-risk patient screening and abnormal result	Retrospective Cohort Study	Patient reminder system + Clinical Decision Support (CDS)	Not specified	Papanicolaou test completion in high-risk patients	Automated reminders integrated with CDS significantly improved Pap test completion rates

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
	management, its implementation to identify patients overdue for testing, and the outcome of sending a targeted recommendation for follow-up.					
(Zammit et al., 2025) (Australia)	To explore the acceptability of SMS reminders sent by general practices to eligible patients promoting the option of self-collection for cervical screening.	Qualitative / Formative Study	mHealth approach development for primary care	Not specified	Cervical screening uptake in Victoria	Key barriers and facilitators identified; mHealth approach deemed acceptable by women and providers
(Mohammed et al., 2025) (Ethiopia)	To assess the effect of health education on screening uptake and knowledge among women aged 30 to 49 years in Addis Ababa, Ethiopia.	Randomized Controlled Trial (RCT)	Structured health education sessions	Not specified	Cervical cancer screening uptake and knowledge	Health education significantly improved screening uptake and knowledge among women in Addis Ababa
(Møen et al., 2020) (Norway)	To determine whether an intervention among general practitioners (GPs) could influence immigrant women's participation in the Norwegian CCS program.	Cluster Randomized Clinical Trial	Intervention in general practice (cultural mediation + outreach)	Not specified	Cervical cancer screening uptake among immigrant women	Intervention in general practice significantly increased screening uptake among immigrant women
(Ampofo et al., 2020) (Ghana)	To assess the effect of a video-based educational intervention (VBEI) in improving knowledge, awareness and reducing barriers to cervical cancer screening among senior high school (SHS) students in Ghana.	Before-After Study (Pilot)	Video-based educational intervention	Not specified	Cervical cancer knowledge among senior high school students	Video-based intervention significantly improved knowledge of cervical cancer among students
(Devi, 2018) (India)	To assess the effect of individual counseling and video based education regarding prevention and early detection of cervical cancer and participation of women in cervical screening.	Quasi-experimental Interventional Study	Individual counseling and video-based education	Not specified	Knowledge and participation in cervical screening	Combined counseling and video education improved screening uptake and early detection behaviors

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Onyango et al., 2024) (Kenya)	To evaluate the use of a dialogue-based approach to community health education to improve the demand for cervical cancer screening services among WRA in rural sub-counties in Kisumu County.	Pre-post Community Intervention	Dialogue-based community health education	Not specified	Cervical cancer screening rates among women of reproductive age	Dialogue-based education significantly increased cervical screening rates in rural Kisumu County
(Wang et al., 2025) (USA)	To evaluate the impact of a cervical cancer screening and prevention educational video on patient knowledge and appointment satisfaction.	Randomized Controlled Trial (RCT)	Educational video	Not specified	Cervical cancer knowledge among Hispanic patients	Educational video significantly improved cervical cancer knowledge in Hispanic patients
(Pourebrahim-Alamdari et al., 2022) (Iran)	To compare the effect of face-to-face and phone call MI on cervical cancer screening.	Interventional Study	Face-to-face and phone call motivational interviewing (MI)	Motivational Interviewing (MI)	Cervical cancer screening uptake	Both face-to-face and phone call MI significantly improved screening uptake compared to control
(Kwok & Xu, 2025) (Australia)	To assess the effectiveness of a co-designed culturally tailored cancer screening promotion program with Chinese-Australian, with a focus on using a community partnership approach, the first of its kind in Australia.	Community Partnership / Co-design Study	Co-designed culturally tailored cancer screening promotion program	Community Partnership Model	Cancer screening uptake among Chinese-Australian community	Co-designed program improved screening awareness and uptake; community partnership approach was effective
(Mbachu et al., 2017) (Nigeria)	To assess the effectiveness of peer health education on perception, willingness to screen and uptake of cervical cancer screening by women.	Before-After Study	Peer health education	Peer Education Model	Perception and practice of cervical cancer screening	Peer education significantly improved perceptions and practice of screening among urban women
(Altinel & Akin, 2022) (Turkey)	To analyze the effect of multiple initiations on beliefs about cervical cancer, health responsibility, and screening uptake.	Randomized Controlled Trial (RCT)	Multiple interventions (education, counseling, follow-up)	Health Belief Model (HBM)	Health responsibility, beliefs, and screening uptake in women at risk	Multiple interventions based on HBM significantly improved health beliefs and cervical cancer screening rates

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Wong et al., 2021) (Canada)	To evaluate the effects of a community health worker–led multicomponent intervention on improving cervical cancer screening uptake among South Asian women in Hong Kong.	Cluster Randomized Controlled Trial	CHW-led multicomponent program	Not specified	Cervical cancer screening among South Asian women	CHW-led multicomponent program significantly increased screening uptake compared to control
(Vahabi et al., 2022) (India)	To determine the effectiveness of this program in increasing sexual health literacy, reducing the gendered stigma of HPV and cervical cancer, and promoting cervical cancer screening by using HPV self-sampling.	Community-based Pilot Study	Family-centred sexual health education + HPV self-sampling	Not specified	Cervical cancer screening among hard-to-reach rural/tribal women	Combined educational and self-sampling approach improved screening access and uptake in tribal areas
(Tavasoli et al., 2016) (Iran)	To explore the impact of invitation and reminder letters on cervical cancer screening uptake among eligible Ontario women 30 to 69 years of age.	Quasi-experimental / Pre-post Study	Invitation and reminder letters	Not specified	Cervical cancer screening uptake rates	Invitation and reminder letters significantly increased participation in organized cervical cancer screening
(Mutisya et al., 2026) (Kenya)	To pilot a multi-modal intervention to increase HR-HPV screening uptake by offering women convenient self-sampling, health education, and enhanced partner support.	Community-based Intervention Study	Community-based cervical cancer screening intervention	Not specified	Cervical cancer screening uptake among women of reproductive age	Intervention was accepted and implementable; improved screening uptake in Kiambu County
(Romli et al., 2020) (Malaysia)	To examine the effectiveness of a health education program to improve; knowledge and attitude towards cervical cancer and Pap test, and uptake of Pap test among female entrepreneurs in Kedah, a northern state of Malaysia.	Controlled Community Trial	Health education program	Not specified	Knowledge and attitude towards cervical cancer and pap test	Health education program significantly improved knowledge and attitude toward cervical cancer screening

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Lott et al., 2020) (Sub-Saharan Africa)	To identify studies of interventions to increase uptake of cervical screening among women in the region and uses the Integrated Behavioral Model (IBM) to describe how interventions might work.	Scoping Review	Various interventions reviewed	Integrated Behavioral Model (IBM)	Cervical cancer screening uptake in sub-Saharan Africa	Behavioral model-based interventions most effective; multi-level approaches showed greatest screening improvement
(Firmino-Machado et al., 2017) (Portugal)	To assess the effectiveness of a stepwise approach, with increasing complexity and cost, to improve adherence to organised cervical cancer screening.	Protocol for Population-based RCT	Automated text messages, phone calls, and face-to-face interviews	Not specified	Cervical cancer screening adherence	Protocol study; multi-step approach designed to progressively engage non-attendees; results awaited
(Sodipo et al., 2025) (Nigeria)	To assess the effect of a mobile health intervention on the perception and uptake of cervical cancer screening among nurses in Jos University Teaching Hospital.	Interventional Study	Mobile health (mHealth) intervention	Not specified	Cervical cancer screening perception and uptake among nurses	mHealth intervention improved screening perception and uptake among nursing staff
(Devi et al., 2023) (India)	To assess the effect of multimodal interventions on women's knowledge, attitude, and behavior towards the participation in the cervical screening test.	Interventional Study	Multimodal interventions (education, counseling, visual aids)	Not specified	Knowledge, attitude, and participation in cervical screening	Multimodal interventions significantly improved knowledge, attitude, and participation in cervical screening programs
(Mboineki et al., 2022) (Tanzania)	To assess peer-led navigation (PLNav) in promoting cervical cancer screening knowledge, intention, and practices among urban women in Tanzania.	Randomized Controlled Trial (RCT)	Peer-led navigation approach (task shifting)	Peer Education / Task Shifting	Cervical cancer screening knowledge, intention, and practices	Peer-led navigation significantly improved screening knowledge, intention, and practices among urban women
(Tin et al., 2023) (LMICs-Multiple)	To identify effective interventions to increase the uptake of cervical cancer screening (CCS) for low- and middle-income countries (LMICs).	Systematic Review and Meta-analysis	Various interventions (educational, reminder-based, community, mHealth)	Not specified	Cervical cancer screening uptake in LMICs	Educational and community-based interventions most effective; mHealth showed promising results in LMICs

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(Author, Year) (Country)	Purpose	Study Design	Intervention	Theoretical Framework	Outcome	Key Findings
(Ayanto et al., 2024) (Ethiopia)	To determine the effectiveness of couple education and counseling on the uptake of cervical screening among women.	Cluster Randomized Trial	Couple education and counseling	Not specified	Cervical cancer screening uptake among women	Couple education and counseling significantly increased cervical cancer screening uptake in Southern Ethiopia
(Al-Oseely et al., 2025) (Malaysia)	To develop and evaluate the effectiveness of an educational intervention on knowledge, attitude, and practice of cervical screening among Yemeni immigrant women in Klang Valley, Malaysia.	Randomized Controlled Trial (RCT)	Educational intervention	Not specified	Knowledge, attitude, and practice re: cervical cancer screening among Yemeni immigrant women	Educational intervention significantly improved KAP scores among immigrant women in Klang Valley
(Ahadi et al., 2025) (Iran)	To compare the effectiveness of two educational interventions, a mobile application-based program (mHealth) and face-to-face training (F2F), in improving knowledge, attitudes, self-efficacy, practices, and Adherence Intention to Pap testing among women in Saveh, Iran.	Randomized Controlled Trial (RCT)	mHealth vs. traditional training	Not specified	Knowledge, attitudes, practice, self-efficacy, and pap test adherence	mHealth was non-inferior to traditional training; both groups showed significant improvement in all measured outcomes

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Approximately 40% of included studies (n=22) explicitly reported a theoretical or conceptual framework guiding intervention design. The most frequently applied frameworks were Protection Motivation Theory (PMT, n=4; Ghahremani et al., 2016; Malmir, Barati, Jeihooni, Bashirian, & Hazavehei, 2018), Health Belief Model (HBM, n=3; Interis et al., 2016; Altinel & Akin, 2022), Social Cognitive Theory, (n=3; Calderon-Mora, Byrd, Alomari, Salaiz, Dwivedi, Mallawaarachchi, & Shokar, 2020; Shokar, Calderon-Mora, Molokwu, Byrd, Alomari, Mallawaarachchi, & Dwivedi, 2021), Motivational Interviewing theory (n=4; Zolfaghari, Rezaee, Shakiba, & Navidian, 2018; Pourebrahim-Alamdari, Mehrabi, Nourizadeh, Esmaeilpour, Mousavi, & Hakimi, 2022), Behavioral Economics Theory (n=1; Huf, Kerrison, King, Chadborn, Richmond, Cunningham, & Vlaev, 2020), and the Integrated Behavioral Model (n=1; Lott et al., 2020). The remaining 60% of studies did not explicitly report a theoretical framework, relying on empirically driven educational content.

Primary outcomes included cervical cancer screening uptake/participation (n=41), knowledge (n=35), attitudes and beliefs (n=22), self-efficacy (n=12), behavioral intention (n=10), and perceived susceptibility or severity (n=8). Of 54 included studies, 47 (87.0%) reported statistically significant improvements in at least one primary outcome. Among studies reporting screening uptake as primary outcome (n=41), 37 (90.2%) demonstrated significant increases post-intervention. Theory-grounded interventions achieved a higher success rate (95.5%) compared to interventions without an explicitly reported theoretical framework (81.3%), suggesting that behavioral theory substantially enhances intervention effectiveness.

DISCUSSION

This systematic review synthesized evidence from 54 studies across 25 countries, confirming that behavioral-based health promotion interventions are broadly effective in increasing cervical cancer screening uptake. Consistent with prior systematic reviews (Tin et al., 2023; Lott et al., 2020), face-to-face health education remained the most prevalent and consistently effective approach, particularly in LMICs where community delivery infrastructure is established. Health education addresses the fundamental knowledge deficit that underpins low screening uptake in many settings, though its sustainability and scalability may be constrained by workforce and resource limitations.

The rapid growth of mHealth and digital interventions represents a paradigm shift in health promotion delivery. Studies from Iran (Alizadeh, Keshavarz, Shalbaf, & Iranpour, 2025; Ahadi, Zarei, & Kazemnejad, 2025), Nigeria (Okunade, Soibi-Harry, John-Olabode, Adejimi, Allsop, Onyeka, & Berek, 2021), and Australia (Ryan, Marlow, Forster, Ruwende, & Waller, 2020; Zammit, Ashfaq, Boyd, Paton, Jiang, Brotherton, & Nightingale, 2025) demonstrated that mobile applications and web-based platforms can reach large populations efficiently, overcome geographic barriers, and provide personalized and interactive health content. Non-inferiority of mHealth compared to face-to-face approaches, evidenced by several RCTs, supports mHealth as a scalable alternative in resource-constrained settings. Behaviorally informed reminder systems demonstrated that subtle modifications in message framing, grounded in behavioral economics principles, can meaningfully enhance screening attendance beyond standard reminders (Huf et al., 2020; Firmino-Machado, Mendes, Moreira, & Lunet, 2017; Firmino-Machado, Varela, Mendes, Moreira, Lunet, Carmo, & Santos, 2018).

Motivational interviewing emerged as theoretically coherent and practically effective across all four studies that evaluated it, with both face-to-face and telephone-delivered MI achieving significant improvements in screening uptake (Zolfaghari et al., 2018; Pourebrahim-Alamdari et al., 2022). The client-centered ethos of MI, which targets intrinsic motivation and resolves ambivalence, aligns well with person-centered care frameworks and may be particularly suitable for women with entrenched cultural or attitudinal barriers. Culturally tailored interventions consistently achieved significant outcomes by aligning health messaging with cultural values, community trust, and lived experiences of target populations (Hamdiui, Stein, van Steenbergen, Crutzen, Bouman, Khan, & Van den Muijsenbergh, 2022; Calderon-Mora et al., 2020; Shokar et al., 2021; Kwok & Xu, 2025). Community health worker-led programs demonstrated the critical role of social proximity and shared identity in bridging formal healthcare systems and underserved communities

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(Wong, Choi, Law, Chan, & So, 2019; Wong, Choi, Chen, Law, Chan, & So, 2021).

A notable finding is that 60% of included studies lacked explicit theoretical grounding, which limits explanatory power, replicability, and cumulative knowledge generation. Studies applying behavioral theories achieved slightly higher effectiveness rates, reinforcing the well-established principle that theory-driven interventions outperform atheoretical ones (Glanz et al., 2015). PMT, with its dual appraisal of threat and coping, was particularly well-suited to cervical cancer screening promotion contexts. Policy frameworks should mandate explicit theoretical reporting in funded health promotion research. Limitations of this review include the considerable heterogeneity across studies precluding formal meta-analysis, restriction to English-language publications, and inclusion of several protocol papers without outcome data. The potential for publication bias toward positive findings should also be considered when interpreting overall effectiveness estimates.

CONCLUSION

Behavioral-based health promotion interventions are effective in increasing cervical cancer screening uptake across diverse countries, populations, and healthcare settings. Theory-driven, culturally tailored, and multicomponent strategies demonstrate the greatest and most consistent effectiveness. Integration of digital health technologies and peer education represents a promising approach for reaching underserved and hard-to-reach populations. To achieve the WHO's 2030 target of 70% cervical cancer screening coverage, evidence-based behavioral interventions must be scaled and sustained, particularly in LMICs where the burden remains highest. Future research should adopt implementation science frameworks, conduct long-term outcome evaluations, and co-design interventions with community stakeholders to ensure cultural relevance, acceptability, and sustainability.

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