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Are we ready? assessing effectiveness and implementation of cancer control strategies in primary care: a comprehensive review of systematic reviews

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Abstract

Background: Cancer is a major global cause of death, and primary care is crucial for cancer prevention and early detection. However, there is conflicting information on the effectiveness, implementation, and sustainability of cancer control interventions in primary care.

Objective: This study aimed to summarize the evidence for cancer control in primary care, focussing on identifying relevant factors for implementation and sustainability.

Study setting and design: We conducted a narrative, mixed-methods review of systematic reviews, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Four databases were screened, and two independent reviewers selected studies reporting on cancer prevention, screening, or early detection in primary or community settings. We analysed findings using the extended Reach-Effectiveness-Adopt-Implementation-Maintenance (RE-AIM) Framework.

Principal findings: From the 37 reviews that met the inclusion criteria, 6 focussed on primary prevention, 23 on screening, and 12 on early detection. Most reviews (78%) addressed intervention effectiveness, such as HPV vaccination, tobacco cessation, and cervical, breast, and colorectal screening. One-third of the reviews mentioned adoption and implementation factors, including barriers and facilitators to the implementation of cancer screening programs. Only one review addressed maintenance and sustainability factors, exploring continuous resources and funding strategies.

Conclusion: While numerous interventions are effective for cancer prevention and detection in primary care, literature on implementation and sustainability strategies is lacking. Focusing on continuous resources and funding for cancer strategies in primary care may aid sustainability. Future research should prioritize reporting on implementation and sustainability factors to enhance cancer prevention and control in primary care settings.

Keywords: cancer prevention; implementation; screening; early detection; primary care

Background

Cancer is a significant public health concern and ranks as one of the leading causes of mortality worldwide [1] In 2020 alone, there were an estimated 19.3 million new cases and nearly 10 million deaths attributed to cancer globally [1]. The burden of cancer has expanded globally and in regions such as Latin America, it is the primary cause of premature death in half of the countries [2].

Preventable factors have been associated with almost half of incident cancer cases [3] and there are numerous strategies to address modifiable cancer risk factors to reduce cancer burden. In addition, screening strategies have been shown to reduce mortality associated with highly prevalent cancers such as cervical, breast, colon, and lung cancer [4]. During the last decades, innovative preventive strategies have emerged to reduce cancer incidence and improve early detection rates. Immunization programs associated with Human Papillomavirus (HPV) and Hepatitis B Virus have been implemented worldwide. Moreover, detection for HPV infection is also included in most national guidelines to decrease the incidence of cervical cancer and Helicobacter Pylori detection has been suggested in countries with a high prevalence of gastric cancer [5]. However, the road map for cancer prevention has not been straight forward and control of modifiable factors and early screening practices are not always feasible, do not reach vulnerable populations, or are not maintained over time [6].

Most cancer control strategies from prevention to early detection have been proven to be effective in primary health care (PHC) [7–9]. PHC is crucial to the strengthening of cancer

Key messages

i. Multiple and varied interventions for cancer control in primary care are effective.
ii. Continuous resources and stable funding are components of sustainable implementation.
iii. While evidence supports cancer prevention and screening in primary care, high-quality evidence to support implementation and sustainability is lacking.

prevention and control practices and appears to be the ideal setting for implementing most of these strategies. Defined by the World Health Organization (WHO) as the "best way to provide health care services for everyone, everywhere," primary care is described as the most efficient way to achieve health for all [10]. In most countries, PHC represents over 80% of all health consultations in the general population and serves as the gatekeeper for many interventions and specialist consultations [11, 12]. The critical role of primary care in cancer control has been emphasized during the last decade [13]. Given that primary care represents an interface between the community and health care services, it holds a broad scope of influence from health promotion to palliative care, including primary prevention, secondary prevention, early detection, and survivorship care. However, the extensive and diverse clinical demands placed on primary care can hinder healthcare teams to systematically deliver preventive services, impacting the effective implementation of cancer control strategies [14].

Cancer prevention in primary care represents a dynamic process that integrates traditional modifiable risk factors and cancer control interventions with emerging evidence on new risk factors and potential strategies. Beyond the existing scientific evidence, it is crucial to ascertain which strategies have been adopted, effectively implemented, and sustained over time in primary care settings. The gap between research evidence and effective implementation of practices is a problem widely recognized significantly impedes meaningful progress in cancer control and despite abundant evidence supporting the effectiveness of these strategies in primary care, there remains a surprising scarcity of evidence on how best to implement and sustain them effectively in real-life settings [15].

This review aimed to summarise recent evidence regarding effective strategies for prevention, screening, and early detection of cancer in primary care, focussing on identifying relevant factors for implementation and recognizing validated factors for the sustainability of these interventions.

Methods

We conducted a narrative, mixed-methods review of systematic reviews, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRSIMA) criteria [16] and the six-step model proposed by Arksey and O'Malley (identify the research question, identify relevant studies, study selection, charting the data, collating and summarizing, and consultation) [17].

Based on this approach, we mapped the literature to include a broad spectrum of studies, interventions, and outcomes.

Inclusion criteria
We included only systematic reviews that focussed on interventions or strategies for cancer prevention, screening, and early detection in primary care settings.

We used the following definitions for each step of the cancer continuum according to WHO Report on Cancer 2020 [18]:

Primary prevention
Control of cancer risk factors. "Primary prevention of cancer comprises a broad spectrum of interventions: legislation and policies to minimize or eliminate exposure to carcinogens; promotion of healthy behaviour; health sector programmes, such as vaccination and clinical counselling for tobacco cessation."

Screening
Identifying risk in **asymptomatic** populations

Early detection
Identifying risk in **symptomatic** populations.
  The criteria for selecting these studies were as follows:

(i)   Systematic reviews within the last 5 years. (A preliminary search within a 5-year timeframe yielded sufficient studies to provide an updated and comprehensive review of current effective practices implemented in primary care) We included only a systematic review that reported about primary studies conducted in primary care/general practice, family medicine, and/or community settings. Systematic reviews that included studies conducted in hospitals or other settings were excluded.
(ii) We accepted systematic reviews with any type of study.
(iii) Studies conducted in > 18 years old, except for HPV immunization studies.
(iv) Written in English or Spanish

Search strategy
A comprehensive search was conducted across four databases for relevant studies: Medline, Health Evidence, Cochrane Library, and Embase (Classic and Ovid) This search included publications from the past five years up to September 26, 2023. The search strategy was developed using the key terms "general practice," "cancer," "preventive health," and "early detection." Details of the full search strategies can be found in Supplementary Box 1. A supplementary search was performed by reviewing all references of included systematic reviews and expert recommendations up until 30 November 2023.

Data extraction and synthesis
All search results were imported into the Covidence systematic review platform [19]. Two independent reviewers conducted title and abstract screening, followed by a full-text review to assess compliance with the eligibility criteria. Two reviewers independently extracted key information, using a data extraction template based on an adapted version of the

Cochrane Effective Practice and Organization of Care data-collection checklist [20]. A full outline of the data items can be found in Supplementary Matrix 1. The extracted data was then compared to resolve any discrepancies and reach consensus. Disagreements in all stages were resolved by a third reviewer. Only information reported in the systematic reviews was extracted, we did not analyse each primary study included in the systematic review.

Qualitative and quantitative results were synthesized independently using a segregated design. A segregated design maintains the traditional division between qualitative and quantitative studies as these types of studies can be easily differentiated and they require specific methods for synthesis and analysis [21]. Results are analysed and reported separately, and findings are then integrated in the discussion section. Data were analysed using a deductive approach, by mapping results to the extended RE-AIM Framework [22]. The RE-AIM Framework [23] is often employed in public health research and program evaluation because it provides a comprehensive and practical approach to assess the impact and potential for the translation of interventions into real-world settings. RE-AIM is an acronym for Reach, Effectiveness, Adoption, Implementation, and Maintenance, and it is designed to address various dimensions of program evaluation beyond mere efficacy. The extended version of this framework was utilized, incorporating sustainability as an additional dimension for analysis, which was crucial to the research questions addressed in this study [22].

Deductive content analysis [24] was conducted by two independent reviewers. Controversies between reviewers were resolved by a third researcher.

Quantitative data

Quantitative results were extracted and summarised in outcome tables. Examples of data extracted were the number of participants and their demographic characteristics, and outcome measures reported such as sensitivity, specificity, and likelihood ratios (LR) for diagnostic accuracy studies, percentages and rates for screening and vaccination studies, OR and RR for effectiveness trials. Cancer site was extracted as it was reported in each systematic review. If not specifically mentioned, we classified it either as "multiple (not specified) or as "not reported" accordingly.

Qualitative data

Barriers and facilitators for implementation were also extracted and summarised as well as perceptions, attitudes, and any other qualitative information pertaining cancer control interventions.
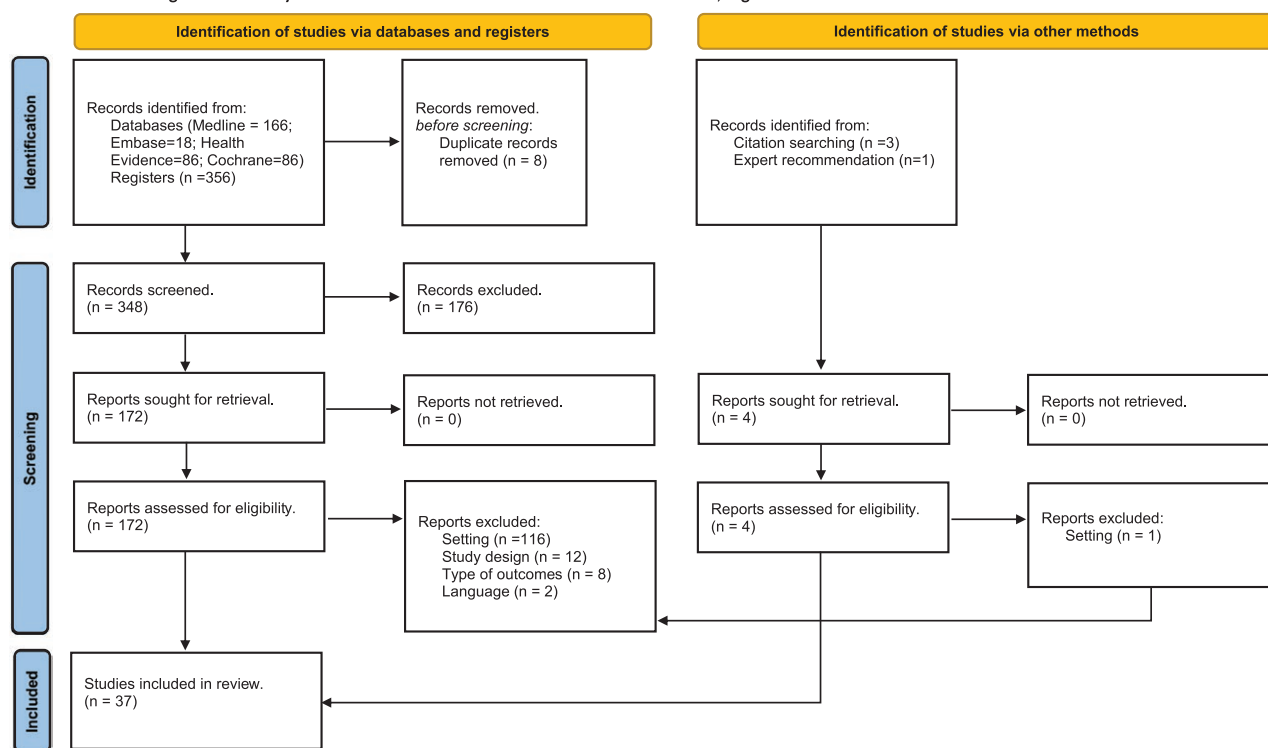
Results

A total of 352 systematic reviews were initially screened. After duplicate removal, full-text selection, and revision of references and expert recommendations, 37 reviews were included (Fig. 1).

Every step of selection and extraction was performed by two independent reviewers. Characteristics of the primary studies of the selected systematic reviews can be found in Table 1 and Supplementary Table S1.

The 37 reviews included a total of 1362 primary studies. Most reviews focussed on screening strategies (23/37) and

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372: n71. doi: 10.1136/bmj. n71. For more information, visit: http://www.prisma-statement.org/

Figure 1. PRISMA flow diagram. (From Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372: n71. doi: 10.1136/bmj. n71.).

early detection of cancer (12/37). The number of studies according to place in the cancer continuum is depicted in Fig. 2.

Implementation strategies according to RE-AIM dimensions

Figure 3 shows the result of the systematic reviews mapped according to the extended version of the RE-AIM framework [22]. Detailed descriptions of these classifications are those defined by Shelton *et al.* [22] and are available in Supplementary Table S2. In summary, 78% (29/37) of systematic reviews selected addressed the effectiveness of interventions. 14% (5/37) reviews addressed Reach, 32% (12/37) addressed Adoption, and 35% (13/37) addressed implementation. Only one review comprehensively covered all dimensions of the RE-AIM framework [25], and it was also the sole review that considered the maintenance, sustainability, and equity aspects of the interventions.

We categorized the types of interventions identified in the reviews into relevant groups to better understand their focus and approach. These categories included:

Table 1. Summary characteristics of primary studies in the selected systematic reviews.

Region of primary studies	Number of articles ($N = 37^*$)
North America	30
South America	9
Europe	28
Asia	15
Africa	4
Oceania	19
Setting	
Primary care	33
General Practice	33
Family Medicine	7
Community health	13
Other (academic setting, one stop clinics, secondary care, paediatric practice (immunizations), virtual settings, and population-based screening programs)).	19
Cancer site	
Breast	14
Colorectal	18
Cervical	13
Lung	9
Prostate	8
Skin	4
Other (ovarian, melanoma, bladder, haematologic, head and neck, brain, lymphoma, leukaemia and myeloma.)	7
Multiple (but not specified)	5
Not reported	8

*The total number of studies in each category may exceed 37, as each systematic review could report multiple factors within a single category. For example, a review might include primary studies from multiple regions, address more than one cancer site, or cover various relevant settings.
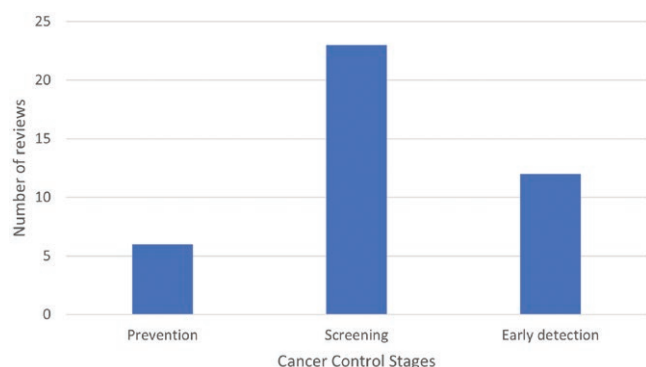
(i) Clinical/Interpersonal: A review assessing mostly interventions consisting of individual clinical encounters between a health provider and a patient. E.g.: Evaluating skin lesions, motivational interviewing for tobacco cassation, and LDCT scan for lung cancer.

(ii) Organizational: Reviews that primarily focus on studies addressing the barriers and facilitators related to the implementation of cancer interventions or programs within healthcare systems. E.g.: Barriers and facilitators to implementation of non-specialist genetic assessments, mammography screening of a particular population, or HPV immunization.

(iii) Community based: This includes reviews that focus primarily on studies of interventions delivered in patients' homes or within community settings, rather than in traditional healthcare facilities. These reviews typically explored programs aimed at improving cancer care through home visits, community health workers, or local support networks.

(iv) Media/virtual: This category includes reviews that primarily focus on studies of interventions delivered through technology, such as digital media, telemedicine, mobile apps, online platforms, or virtual health services.

(v) Multi-modal: This category refers to reviews that encompass studies combining elements from two or more of the previously mentioned categories—Organizational, Community-Based, and Media/Virtual. These reviews examine interventions that integrate various approaches, such as blending technology with in-person care or addressing both organizational barriers and community-based solutions.

By grouping the interventions in this way, we aimed to create a structured understanding of the diverse approaches used to improve cancer care across different contexts.

A summary of the systematic reviews, cancer site, type of intervention, place in the cancer continuum, RE-AIM dimensions addressed, can be found in Table 2.

A detailed description of the interventions and results described in each review can be found in Supplementary Table S3.

Reach

To assess "Reach" the key questions to ask according to the extended RE-AIM framework [22] are: Who was the intended audience and who actually participated? Why or why not? How can we better reach them and engage them?

Five reviews explicitly included studies addressing the "Reach" aspect of interventions [25, 26, 40–42]. Among these, a review to evaluate genetic interventions in non-specialized settings was the only study that addressed all dimensions of the RE-AIM Framework [25]. It described that most studies employed simple screening instruments to detect individuals with a family history indicative of hereditary breast and ovarian cancer syndrome or Lynch syndrome. Across these studies, the reported reach of genetic risk screening (ranging from 11% to 100%) and genetic counselling (ranging from 11% to 100%) showed significant variability. Eisenhauer 2021 conducted a systematic review of interventions to increase HPV vaccination rates in adolescents and highlighted that the most effective programs adopted a three-step approach: (i) determine the practice's current vaccination rate;

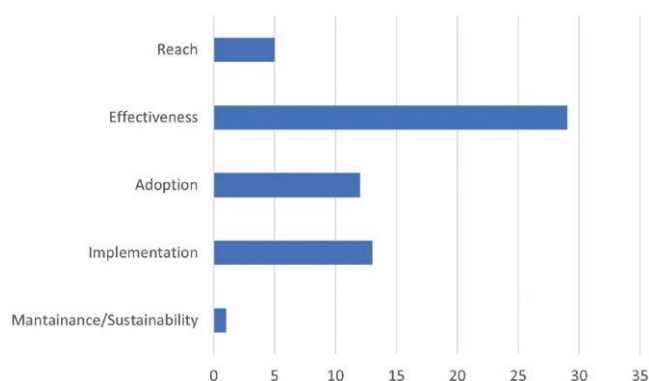**Figure 2.** Number of studies in the cancer continuum.

Figure 3. Classification of included systematic reviews according to the extended RE-AIM framework [22].

(ii) select and implement evidence-based strategies; and (iii) evaluate improvements in vaccination rates. Also, multimodal interventions that targeted all pre-visits, during-visits, and post-visits stages were more likely to increase reach and vaccination rates [26].

Three studies explored the reach of cancer screening programs, particularly breast [40–42], cervical and colorectal cancer screening [40]. Rodriguez et al described that multi-component interventions effectively increased breast cervical and colorectal cancer screening among rural populations, and nurse-led interventions contributed to community participation in cancer screening [40]. Sala *et al*. described a patient navigation strategy through community health workers (CHW) to increase the reach of breast cancer screening [41]. They highlighted flexibility in program goals; community engagement; team training; and active search of the target population by CHWs as some of the facilitating strategies. The systematic review by Zha *et al*. included 29 primary studies, encompassing retrospective cohort studies, cross-sectional studies (surveys), and one review. Findings were presented in a qualitative format, as the review was designed to be descriptive. They described barriers for breast cancer screening in Canada for hard-to-reach populations, including new immigrants and refugees, individuals of low socioeconomic status, ethnocultural minorities, individuals with comorbidities, and those in remote geographic locations [42].

Effectiveness

Is the evidence-based intervention effective? For whom? Are there any negative/unintended effects?

This study found that 29/37 reviews described the effectiveness of cancer interventions in primary care. 65% of these studies reported interventions for cancer screening (19/29), five studies reported interventions in prevention, and nine for early cancer detection (Table 2).

Smoking cessation was one of the preventive interventions reported in the systematic reviews analysed [28–31]. There is moderate evidence that behavioural interventions are effective in increasing smoking cessation rates in primary care. Behavioral change strategies, such as motivational interviewing, can be effective when delivered by physicians, nurses, allied health professionals, and/or CHWs in a community setting [28, 29]. Brief advice, even though less effective, requires less time and resources [29].

In terms of the integration of technology resources, a systematic review indicated moderate evidence of the effectiveness of text messaging as a tool for smoking cessation, while the evidence for smoking cessation apps was found to be insufficient [31].One systematic review in 2019 found insufficient evidence of the effectiveness of real-time video counselling for smoking cessation [30].

The most effective interventions for cancer screening were multi-level involving different care providers, in the clinic and the community, such as patient navigation and CHWs for remote, rural, and underserved populations [40, 45, 47].

Some of the interventions and modes of delivery deemed effective for cancer screening include decision aids (paper and e-media) for prostate, colorectal, and breast cancers [48–50]; behavioural change techniques for breast cancer screening [43]; motivational interview (MI) for breast and cervical cancers though not for colorectal cancer [35], low-dose computed tomography (LDCT) for lung cancer [36]; artificial intelligence (AI) and machine learning (ML) algorithms for early detection of skin cancer [38]; and HPV testing for cervical cancer screening [33]. Ineffective strategies or strategies lacking sufficient evidence included: financial incentives for healthcare providers [37], educational interventions for primary care providers to improve clinical skin examination (CSE) for skin cancer [39], and pamphlets as a standalone strategy to increase cancer screening [46].

It is noteworthy that 62% (18/29) of reviews reporting the effectiveness of interventions were not able to find reported adoption, implementation, and/or maintenance components reported despite some authors actively looking for these components [29, 38, 40].

Adoption

"Adoption" relates mostly to the characteristics of the site/staff delivering the interventions. The main questions to answer in this dimension are: Was the evidence-based intervention applied and by who? Which sites/staff were invited, and which were excluded? Who participated and not? How can setting/context/staff can be better supported to deliver the intervention?

In this review, 32% (12/37) of studies described results relating to adoption. Most (8/12) [7, 25, 34, 40, 42, 44, 47, 52] adoption factors mentioned referred to cancer screening strategies. A consistently identified key element for successful adoption across all eight studies was a positive attitude towards screening among healthcare providers. Good patient–provider communication and having a regular primary care provider were also described as positive for the adoption of cervical and breast cancer screening [34, 44].

Table 2. Summary of reviews including type of intervention and RE-AIM dimension classification.

Stage in cancer continuum	Target condition	(N)	Reference	Type of intervention (predominant)	(N)	Reference	RE-AIM dimension	(N)	Reference
Primary Prevention (6 reviews)	HPV Vaccination	2	[26, 27]	Clinical/Inter-personal	1	[28]	Reach:	1	[26]
	Smoking Cessation	4	[28–31]	Community-based:	0	NA	Effectiveness	5	[26, 28–31]
				Organisational:	1	[27]	Adoption	2	[27, 29]
				Media/Virtual	2	[30, 31]	Implementation	1	[26]
				Multimodal:	2	[26, 29]	Maintenance	0	NA
Screening (23 reviews)	Cervical Cancer	3	[32–34]	Clinical/Inter-personal	6	[33, 35–39]	Reach:	4	[25, 40–42]
	Breast Cancer	4	[41–44]	Community-based:	5	[32, 41, 45–47]	Effectiveness	19	[25, 32–40, 43–51]
	Colorectal Cancer	5	[7, 45, 46, 49, 50]	Organisational:	5	[25, 42, 44, 51, 52]	Adoption	8	[7, 25, 34, 40, 42, 44, 47, 52]
	Lung Cancer	1	[36]	Media/Virtual	2	[49, 50]	Implementation	10	[7, 25, 34, 35, 40–42, 44, 49, 52]
	Skin Cancer	2	[38, 39]	Multimodal:	5	[7, 34, 40, 43, 48]	Maintenance	1	[25]
	Other/unspecific	2	[51, 52]						
	Multiple	6	[25, 35, 37, 40, 47, 48]						
Early detection (12 reviews)	Cervical Cancer	1	[34]	Clinical/Inter-personal	9	[38, 39, 53–59]	Reach:	0	NA
	Breast Cancer	0	NA	Community-based:	0	NA	Effectiveness	9	[34, 38, 39, 51, 53, 54, 57, 58, 60]
	Colorectal Cancer	2	[58, 59]	Organisational:	2	[51, 60]	Adoption	3	[34, 53, 55]
	Lung Cancer	1	[57]	Media/Virtual	0	NA	Implementation	3	[34, 54, 56]
	Skin Cancer	2	[38, 39]	Multimodal:	1	[34]	Maintenance	0	NA
	Other/Unspecific	6	[51, 53–56, 60]						
	Multiple	0	NA						

Nurses and CHWs were key players in carrying out cancer screening interventions in rural and remote areas [40, 47].

Laforest described a positive attitude from general practitioners (GPs) towards genetic testing in primary care, as they viewed it as an important and feasible intervention to be adopted by them [52]. Regarding preventive strategies, Escriba-Boulley *et al.* described the negative attitudes of French GPs towards HPV vaccines as negatively influencing HPV vaccination rates [27].

For early cancer detection, GPs were more likely to adhere to recommendations provided by an electronic clinical decision support tool (eCDST) when these recommendations aligned with existing guidelines and if they considered the recommendations valuable for early cancer detection [53].

Implementation

Was the intervention delivered consistently—Why or why not? How was it adapted and why? How much did it cost? How can we ensure the key functions are delivered? Implementation factors for cancer control in primary care were addressed in 35% (13/37) [7, 25, 26, 34, 35, 40–42, 44, 49, 52, 54, 56] of systematic reviews mostly as barriers and facilitators to implementation. All reported barriers and facilitators for implementation of strategies regarding prevention, screening, and early detection of cancer. Most (10/13) described barriers and facilitators for cancer screening.

For colorectal cancer (CRC) screening, facilitating factors included the motivation and commitment of providers, leaders, and organizations to improve CRC screening rates, the promotion of awareness about CRC screening to patients and their families, and the review of data to bolster CRC screening endeavours [7, 35] Reported system barriers included conflicting opinions among clinicians towards CRC screening, problems with FIT test availability, the impersonal nature of a mailed FIT test, and the availability of colonoscopy after a positive FIT test [7].

For mammography screening, facilitators were patient navigation, CHWs, the flexibility of program goals inclusion of physicians and nurses, good patient–provider communication, and access to information systems [41, 44].

Zha described barriers to breast cancer screening in Canada including hard-to-reach populations, limited time from physicians, language, transportation, health care knowledge, and low patient prioritization of screening services [42].

Some of the facilitators mentioned for cervical cancer screening included the presence of a regular primary care provider and the direct notification of women regarding abnormal test results. Factors negatively influencing cervical cancer screening rates were younger age, lower education attainment, and lower socioeconomic status [34].

Rodriguez Gomez described that community involvement in all stages of the development of cancer screening strategies was a facilitator for uptake in rural areas [40].

Regarding HPV immunizations, Eisenhauer *et al.* highlighted several facilitators that enhance HPV vaccination rates. These include sending reminders via letters, emails, and/or text messages, as well as education for patients, providers, and staff, also, providing vaccinations within family practice settings. Barriers were less explored but parental prejudice and lack of insurance coverage were reported [26].

Regarding early cancer detection, one review found that one-stop clinics were acceptable by both patients and GPs.

One-stop clinics are specialized healthcare services designed to provide patients with a comprehensive evaluation, diagnosis, and sometimes initial treatment during a single visit. These clinics aim to streamline care, reduce the need for multiple appointments, and improve patient convenience. They are commonly used in areas like cancer diagnostics, breast care, and certain chronic or multidisciplinary conditions [54].

Jones et al reported the presence of frailty, comorbidities, cognitive impairment, and the need for additional time in the consultation to be barriers to opportune early cancer detection in older adults [55].

Guan *et al.* noted that few studies provided details on their effective implementation strategies for genetic screening. Notably, approaches in public health settings appeared more effective, with a median counselling reach of 65%, compared to those in clinical settings, where the median counselling reach was 26%. Research findings with the broadest service reach integrated risk assessment seamlessly into pre-existing infrastructures with well-defined target populations [23]

Maintenance and sustainability

What sustainability strategies can be used to sustain the program long-term beyond 1 year of implementation or longer? What are the costs and return on the value of sustainability of the intervention? How can we support and incorporate the intervention once the funding is over? As mentioned, only one systematic review mentioned maintenance factors. In their systematic review, Guan [25] briefly described elements of maintenance/sustainability to expand the reach of cancer genomic services outside of specialty clinics. The review included 16 studies and highlighted two factors for assessing maintenance and scalability: resources (training, education, or technical ongoing support for implementation) and costs (for set-up, delivery, and maintenance). Only 31% [5] of studies in the review reported information on training and none reported cost indicators.

Discussion

To our knowledge, this is the first review to analyse cancer strategies for prevention, screening, and early detection with a focus on the evidence of their potential for sustainable implementation in primary care. Our findings indicate that there is robust evidence regarding effective interventions for cancer prevention and control, however, evidence for strategies for sustainable implementation, adoption, and maintenance is very limited. Using the extended Re-AIM framework to focus on sustainability, allowed us to search specifically for maintenance and sustainability factors that would improve equity in the delivery of the interventions within primary care.

Most articles analysed in this review addressed short-term implementation factors. The National Cancer Institute (NCI) has recognized sustainability as a key factor in cancer control and an essential component of implementation science in cancer [61]. Some of the main factors associated with the sustainability of public health interventions include political support, funding stability, partnerships, organizational capacity, and program evaluation [25, 62] Maintenance of an effective intervention over time has been associated with a higher probability of impact at a population level [61] However, achieving and reporting on such outcomes can prove challenging, as evidenced by the scarcity of studies

addressing this issue in our review. Based on the RE-AIM [22] approach to evaluate implementation, we identified only one systematic review [25] that briefly addressed the sustainability of interventions over time suggesting, as the NCI, that providing continuous resources and stable funding to PHC is a crucial element to consider for any effective intervention to become sustainable. In their paper to extend the RE-AIM framework to include sustainability and equity, Shelton *et al.* acknowledge that this is not something easy to implement or measure [22]. They propose a more comprehensive approach including at least an evaluation after a year of implementation to measure, not only the fidelity of the intervention at the 1-year mark but also its level of "evolvability" or, how well does the intervention adapts to the ever-evolving health environment, what changes have been made and why. They report continuing to measure health outcomes and what community and infrastructure capacity has been put in place to sustain the intervention [22]. The WHO in their "Short Guide" for screening programmes, recommends similar processes for successful implementation and sustainability [63]. Successful screening programs such as Australia's and Canada's cervical cancer screening programs have achieved over 70% coverage using both population and primary care strategies. Guan *et al.* only briefly touch these concepts but there is a lack of evidence this has been adopted regarding most cancer interventions in primary care.

Regarding effective interventions, tobacco smoking is still the major contributor to cancer death worldwide [64]. In 2007, the WHO launched its MPOWER initiative to reduce global tobacco use [65]. The strategies employed include monitoring tobacco use, protecting people from tobacco smoke, promoting smoking cessation, warning about the harm caused by tobacco, enforcing bans on tobacco advertising, promotion, and sponsorship, and raising tobacco taxes [65]. At the primary care level, brief counselling is an effective strategy that can increase the success of quitting by 30%, while intensive counselling can increase the chances of quitting by 84% [65]. Regarding adoption, doctors, nurses, and allied health professionals can deliver counselling effectively in primary care as well as adequately trained lay health care workers [28, 29].

Cervical cancer control remains a challenge in many countries. The effectiveness of the HPV vaccine in reducing the incidence of cervical cancer has been well-established [66]. While some countries have achieved a first dose coverage of over 80% (Andorra, Brunei Darussalam, Canada, Chile, Denmark, Iceland, Ireland, Latvia, Norway, Palau, Portugal, Republic of Korea, Seychelles, Spain, and Sweden) [67] and their immunisation programs have robust sustainable processes, global coverage with the first dose of the HPV vaccine among girls was only 27% in 2023 [68]. The WHO has set a goal of 90% of girls to be vaccinated against HPV by age 15, 70% of women to undergo a high-sensitivity test at the ages of 35 and 45, and 90% of women diagnosed with cancer to have been treated opportunely. If these objectives are achieved by 2030, it is estimated that the prevalence of cervical cancer will decrease by 97% and prevent approximately 62 million deaths by 2120 [69]. Many low-income countries have incorporated the HPV vaccine in their immunization programs [68]. However, the mere introduction of the HPV vaccine, might not be enough to achieve this goal without organized primary care interventions to improve coverage. Our study identified a number of primary care strategies, including reminders via letters, emails and/or text messages,

staff education, and community participative initiatives to improve HPV vaccination coverage [26, 27, 35, 40]. The HPV screening target proposed by WHO can be facilitated by introducing self-sample HPV testing for women between 35 and 45 years old, as evidence suggests that it is at least as effective as cytology [32, 33], and there is increasing international literature reporting self-sampling as an effective alternative in non-adherent populations [32, 70–72]. However, our review identified a significant information gap regarding implementation, adoption, and maintenance of HPV self-sampling in primary care programs. Regretfully, evidence on how to implement these strategies to make them sustainable is lacking.

Breast cancer is the first or second cause of cancer death in women in 95% of countries [73, 74].

Regarding mammography screening, international recommendations advise conducting it biennially for women aged 50 to 74 years, promptly referring them to specialized care when necessary [75]. In 2023, the WHO published the "Framework for Implementation of the Global Breast Cancer Initiative," proposing strategies to diagnose over 60% of women at early stages to improve health outcomes for breast cancer [74]. However, there is significant variability between countries and regions in the implementation of breast cancer screening. While most high-income countries report breast cancer screening rates over 70%, in Latin American countries screening rates are still below 50% and estimates of fatality rates remain high [76]. Long-term implementation outcomes of breast cancer screening programs in middle and low-income countries were lacking in our review. In a 10-year follow-up study conducted in primary care within a socially vulnerable population in Chile, the authors found a significant decrease in mammogram screening rates after a highly effective initial intervention. The authors highlighted the diluted effect of the intervention over time and the need to sustain organizational capacity for shared decision making and evaluation [77].

Mortality for colorectal cancer worldwide has been on the rise. It is an increasing burden in most middle-low-income countries [78]. Randomized studies conducted within white populations have demonstrated that screening for colorectal cancer based on annual faecal occult blood testing (iFOBT) are effective in reducing disease-specific mortality by 15% to 30% [79, 80]. In Australia, predictive models have estimated that between 2015 and 2040, more than 92 000 cancers and 59 000 deaths will be prevented with a 40% adherence to their national program based on biennial iFOBT and the number of deaths prevented would increase to 84 000 with 60% participation [81].

However, population-level screening programs for CRC in developing countries remain controversial due to the high cost associated with subsequent diagnostic colonoscopies [1]. Our study identified two systematic reviews regarding the use of FIT/iFOBT in symptomatic patients for early cancer detection [58, 59] that might be a promising early detection strategy in primary care settings within middle-low-income countries. Nonetheless, the impact on mortality at a community level has not yet been assessed.

This review demonstrated that interventions with multi-components, which target pre-visit, during-visit, and post-visit stages in family practice, are not only effective but feasible for successful implementation in primary care settings [26]. Decision aids designed to enhance shared decision-making have been identified as valuable tools [48, 50] however, there

is a paucity of information regarding clear pathways for their implementation [49].

Emerging technologies are being included in the cancer prevention and control landscape. The Australian Cancer Plan proposes the development of policies to integrate genomic screening and artificial intelligence (AI) to improve cancer care, although they acknowledge the need for further research in primary care settings [82]. Electronic clinical decision support tools (eCST) are being tested at different stages of the diagnostic pathway [53, 60], with varying degrees of implementation in primary care. eCDST has been proven effective for early cancer detection in primary care, facilitated by positive provider attitudes and inclusion in the workflow [53]. Efforts should be made to address barriers such as lack of confidence in the tool and increasing workload. In this review, two reviews assess the potential for implementing different AI technologies in primary care, yet they report insufficient information about their safety and accuracy [38, 60].

Strengths and limitations

One limitation of this study is that, although the broad approach allows us to synthesize and map a wide range of studies addressing cancer care in primary care, it sacrifices precision, making it difficult to define a specific outcome related to effectiveness or implementation. The review's emphasis on implementation and sustainability is a significant strength, as it underscores the practical relevance and potential impact of the research. By prioritizing implementation and sustainability factors highlighted in this review, in real-world settings, we offer valuable insights for practitioners and policymakers. Another important limitation is that only tobacco cessation and HPV immunization strategies were identified for cancer prevention. We acknowledge that these are not the only existing strategies for cancer prevention. A healthy diet, exercise, and decreasing alcohol consumption have also been described as cancer-preventive strategies [83], yet they were not identified in our search. We hypothesize that studies focussing on healthy diet, exercise, and alcohol reduction may not have been explicitly framed as cancer prevention strategies in the literature, and thus were not captured by our search terms.

Importantly, the absence of quality assessment for the synthesized evidence is another limitation. The lack of evaluation of the quality of the included studies introduces the risk of overlooking potential biases or inconsistencies, which could affect the overall reliability of the review's conclusions. Future iterations of our review could benefit from incorporating a robust quality assessment framework to further strengthen the credibility and validity of the findings.

Conclusion

This review summarizes evidence on cancer prevention, screening, and early detection strategies, with a specific focus on their potential for sustainable implementation in primary care settings. While interventions like HPV vaccination, tobacco cessation, and screening for cervical, breast, colorectal, and lung cancers have shown effectiveness in primary care, information on implementation strategies is limited, particularly regarding sustainability. Only one systematic review explored the long-term sustainability of cancer control interventions, highlighting the crucial role of continuous resources and stable funding in PHC. To make interventions sustainable, a need to plan continuous evaluation that includes evolvability, health outcomes, and allocation of community and infrastructure resources is needed. Future research should prioritize identifying and detailing strategies that ensure the sustainability of cancer prevention and control efforts within primary care.

Supplementary material

Supplementary material is available at *Family Practice* online.

Conflict of interest

The authors declare no conflict of interest

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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