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REVIEW

Interventions to reach underscreened populations: a narrative review for planning cancer screening initiatives

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Abstract

Objectives This review was conducted to support knowledge translation (KT) and implementation of interventions to increase participation in organized cancer screening programs in the province of Ontario, Canada.

Methods A rigorously designed literature search yielded over 900 references which were then subjected to exclusion criteria. The remainder was organized according to type of intervention, based on the categories applied in two authoritative systematic reviews and an analysis of the level of evidence. Emerging themes in the literature were then identified to provide a bridge between high-level evidence and on-the-ground practice.

Results We identify three promising types of KT interventions: community-based health education; lay or peer health education; and targeted or tailored interventions. Each is summarized with illustrative examples and a summary of key themes and considerations.

Conclusions The authors conclude with a summary the types and a decision tool designed to help KT and implementation teams select interventions which could be adapted to their own context.

Keywords Knowledge translation · Cancer screening · Public health intervention Community-based

Introduction

The gains made in fighting cancer over the last few decades have been substantial. In Canada, 5-year survival rates are estimated to have increased for all cancers from 56 % in the mid-1990s to 63 % now; yet two of five Canadians are still expected to develop cancer in their lifetime, and about one in four will die from the disease (Canadian Cancer Society's Advisory Committee on Cancer Statistics 2013).

Organized programs in Canada and elsewhere have the goal of ensuring that more cancers are detected early in more people (Carrieri and Wuebker 2013). However, some studies have found that even where these programs exist, disparities in screening uptake remain for specific subgroups (Carrieri and Wuebker 2013; Ouedraogo et al. 2014). Frequently, such programs can only serve those people fortunate enough to have nearby accessible primary care providers (Honein-abouhaidar et al. 2013). In Ontario, where this review was conducted, organized screening programs exist for breast, cervical, and colorectal cancer. To support initiatives to raise participation in screening, we reviewed hundreds of studies identifying barriers to screening access related to age, ethnicity, race, First Nations/Inuit/Métis identity, immigration status, dis/ability, gender identity and sexual orientation, socioeconomic status, geography, and other factors; and interventions to mitigate those barriers. Some subgroups in particular—newcomers and immigrants, rural and remote populations,

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and people living on low income—are proportionally overrepresented in many Canadian regions. This diversity poses challenges to planning and delivering population-wide, effective interventions to raise screening rates.

As part of a project to develop an evidence-based strategy for public-oriented knowledge translation (KT) and education to raise screening rates, this literature review was conducted to identify exemplary interventions from the field. For our purposes, we sought interventions that aligned with a KT approach that sought to identify barriers to target groups, apply that knowledge to the design of the intervention, and ideally, incorporate an evaluation component (such as assessment of movement from "no intent to screen" to "intent to screen" between baseline and post-intervention). The projects chosen for this review reflect the recommendations of systematic reviews on effective interventions, demonstrate a robust approach designed to reach a specific population subgroup, and provide sufficient level of detail (including, ideally, an evaluative component) to support their adaptation in different contexts.

Methods

Research question

The question we sought to answer with this review was: which interventions have been found effective in supporting underscreened people to participate in cancer screening?

Search parameters and strategy

Search terms were developed to include screening program focus (e.g. colorectal), intervention type, and populations of the non-screening public targeted, and outcome of intervention (e.g. changing awareness, attitudes, and/or health behavior in non-screeners) (Fig. 1).

Using publicly available resources we searched MEDLINE, CINAHL, EMBASE, and PsycINFO to locate references. The bibliography was organized using the Zotero reference management system. We searched for articles published in English, and studies based in Canada or countries with similar systems including the United States (US), United Kingdom, Australia, New Zealand, and selected studies from Continental Europe.

Yield and inclusion/exclusion criteria

Searches identified 988 citations, 790 of which remained after screening for relevance and time period (see Fig. 2).

We developed inclusion criteria and classified the strength of interventions based on a framework developed by Brennan, Brownson and colleagues (Brennan et al. 2011; Brownson et al. 2006). The typology they propose classifies evidence in four tiers:

- *Tier 1* Effective: authoritative, rigorous systematic review (high-level aggregations)
- *Tier 2* Effective: high-quality study with peer review (rigorous individual studies)
- *Tier 3* Promising: published or unpublished evaluation report of a project
- *Tier 4* Emerging: practice summary, analogy to related topic, or untested innovation.

Organizing the evidence in this way allows an additional level of discrimination between interventions (e.g. effective interventions may be more readily adaptable into a new context than promising ones; emerging interventions should only be monitored until further evidence accrues). In adapting this approach we developed

Fig. 1 Search parameters

POPULATION		INTERVENTION		OUTCOME
Breast screening OR mammogra*		barrier		▨
		best practice		attitude
	+	campaign OR program OR intervention	+	awareness
		educat* OR information		knowledge
Cervical screening OR Pap test		health promotion		behaviour
		policy OR legislative OR regulatory		change OR increase
		evaluation		participation
Colorectal screening OR FOBT		public engagement		uptake
		[social OR mass OR small] media		structural OR system
		[social] marketing		▨
		Peer		▨

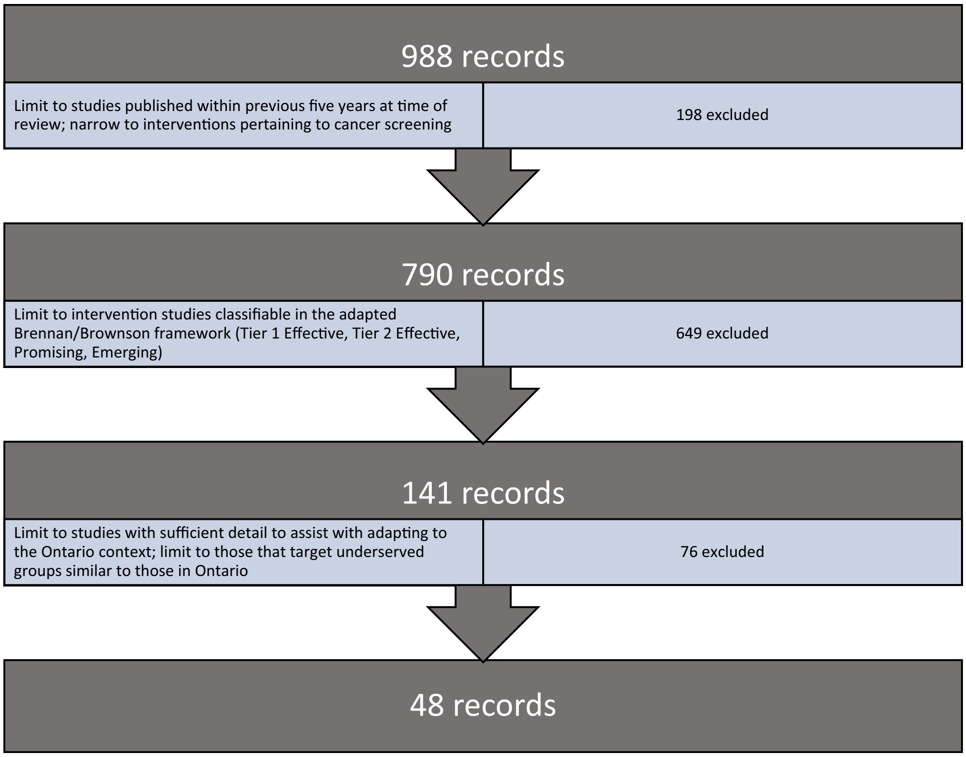

Fig. 2 Flow chart of search yield and records included. Initial yield based on search strategy to target resources on **a** barriers to screening and **b** interventions to support screening uptake; limited to those published in English and based in Canada or proximal systems to adapt lessons learned (the United States, Commonwealth and European countries)

Table 1 Detail on inclusion criteria

Indicators	Inclusion criteria	Tier			
		1	2	3	4
Evaluation or research design	Experimental, quasi-experimental, prospective cross-sectional studies and natural experiments	R	R	P	P
	Design using quantitative or qualitative data	R	R	R	P
Quality of execution and internal validity	Samples include participants within age and gender demographics relevant to screening for breast, cervical, and colorectal cancer	R	R	R	P
	Samples include hard-to-reach targeted populations such as immigrant, low income, rural or remote, low literacy	D	D	D	P
	Summative evidence for changes in awareness or knowledge of cancer and importance of screening	R	R	P	P
	Summative evidence for changes in health behaviors such as information seeking and intent to screen	R	R	R	P
	Summative evidence for impact on actual screening rates	D	D	P	P
	Internal validity	R	R	D	P
Reach	Intervention application to relevant age and gender groups	R	R	R	R
	Intervention application to targeted populations	R	R	R	R
	Duration of intervention exposure or participation	D	D	D	P
	Capacity to impact large populations	D	D	D	P
	Impact on targeted populations	D	D	D	P
	No harm to populations or subpopulations	R	R	R	R

The presence of each criterion is noted as required (R), desired (D), or possible (P). We omitted three additional indicators from the framework—adoption, implementation, and sustainability—as unlikely to be generalizable from health care contexts external to Canada

inclusion criteria (applied during review and screen of literature) to fit the classification scheme, as outlined in Table 1.

All abstracts of retained citations were reviewed for relevance, and of this total, 141 were included in the initial project report which featured literature on barriers (including theoretical contributions) as well as interventions. 48 records were retained for this narrative review; most are US-based, in part due to the level of detail provided and similarity to Canadian population and geography.

Organizing our findings: the evidence on interventions

We consulted two authoritative systematic reviews on interventions to increase participation in organized screening programs for breast, cervical, and colorectal cancer (Sabatino et al. 2012; Brouwers et al. 2011) which agreed, with some qualifications, that three intervention elements were found effective across screening programs: client reminders, small media, and one-on-one education. While we identified several broad types of intervention employing one or more of these elements, for the purposes of this narrative review we focus on three (overlapping) approaches which can be implemented in different communities: community-based, lay or peer, and targeted or tailored approaches. To be explicit: one-on-one education is central to lay or peer approaches; small media such as handouts are a key feature of community health education, and targeted or tailored approaches may involve all one-on-one education, handouts, and reminders.

While systematic reviews are appropriately regarded as sound support for policy decisions, implementation planning requires more detail and context than they can provide. This review gives context to the systematic review evidence by detailing factors contributing to success of tested examples, and speculating on how these could contribute to a KT strategy. After summarizing these effective features we develop a sample template for the application of evidence to planning—knowledge to action—as described in the "Discussion".

Results

Community-based interventions

A systematic review of colorectal screening initiatives with multi-ethnic populations found that respect for community-level factors was a key feature of the most successful interventions for underserved communities (Morrow et al. 2010). Such interventions are often designed through partnerships with community organizations, local businesses, and/or governments.

Several studies have shown how community-based partnerships and community-designed interventions can help reach underserved populations including recent immigrants (especially those with language barriers), people with literacy challenges, and people on low income. An Adult Learning Centre partnered with the Mayo Clinic in Rochester, Minnesota to deliver educational sessions and a free breast exam to low literacy and non-English speakers twice a month (Pruthi et al. 2010). Literature at eighth-grade level literacy was distributed at these sessions. Twenty-six language-specific educational sessions were held with over 300 women in the 4 years of the project (Spanish, Somali, Arabic/Sudanese, Cambodian, Chinese, and English). Of these, 113 women (76 for the first time) had mammograms, sonograms or both. One woman was diagnosed with breast cancer, and many others were treated for minor conditions. In a larger, multi-site initiative, YWCAs in 30 US states delivered the ENCORE breast and cervical cancer outreach educational program to low-income and minority women (Fernandez et al. 2010). Community partnerships were established to customize programs, taking into account communication, transportation, child care, language, and disability barriers. Of women reached for follow-up after the first 2 years, 87.7 % of those non-adherent at baseline had completed mammograms; 62.2 % had received a Pap test. The project is estimated to have reached close to 100,000 women, with over 50,000 reporting completing mammograms and almost 35,000 reporting completing a Pap test over 4 years. Finally, the Asian Grocery Store-based Breast Cancer Education Program (Sadler et al. 2012), a randomized controlled trial (RCT) conducted in California ($n = 1540$), placed student health educators in stores catering to local Chinese, Filipino, Korean and Vietnamese communities. Outreach events featured educational posters and token incentives for study participants. Women were randomized to an education session on either breast cancer or prostate cancer (speaking to gendered family health caretaker roles), and follow-up evaluation was conducted to determine adherence to breast cancer screening guidelines (measured by self-report scheduling of a mammogram or clinical breast exam, or CBE). Of women who were non-adherent at baseline, the intervention increased adherence in scheduling CBEs, and significantly increased scheduling of mammograms. This research team was also responsible for the Black Cosmetologists Promoting Health Program (Sadler et al. 2011), another California-based RCT ($n = 984$). This study enlisted African-American community church leaders who recruited cosmetologists as lay health educators—on breast cancer, for the intervention arm; on diabetes, for the control arm. The results showed significant increase in mammography compared to baseline for both intervention and control groups.

In Western New York State, the Good For The Neighbourhood (GFTN) (Tumiel-Berhalter et al. 2011) initiative was developed by a not-for-profit arm of a health insurance provider, the Independent Health Foundation (IHF), which delivers open community-level programming. IHF developed a ‘park and stay’ model to reach four communities in Western New York (two African-American, one Puerto Rican, one Seneca Indian) selected due to risks including rates of obesity, asthma, diabetes, smoking, and living in poverty. IHF partnered with community organizations, and participants helped to tailor program design to each community. The overall principle was to set a regular event one evening a month, where community members could attend to access on-site health education, monitoring (e.g. weight, body mass index, blood pressure, cholesterol, glucose), nutrition advice, an “Ask the Expert” table staffed by physicians and pharmacists, and free fruits and vegetables supplied by local markets. In between events, GFTN also offered healthy eating and physical activity sessions, as well as tracking for participant households and health risk assessments, to support positive lifestyle changes. In the first 4 years of this ongoing program it is estimated that over 3500 people participated across the four communities, and evaluation is ongoing.

A community-based design approach was also used in the development of a breast screening program for Hopi women in Arizona (Brown et al. 2011). This project was built on Centers for Disease Control and Prevention (CDC) funding for a breast and cervical cancer prevention (BCCP) program—usually involving education and attention to structural barriers—received by the Hopi Tribe, after a 1993 survey revealed a 50 % screening rate. Ten years later, the tribe approached the Native American Cancer Research Partnership and clinical and university partners for assistance in evaluating the program. The survey had a high response rate and showed significant increases in Hopi women’s awareness. It also showed a 20 % increase in percent of women reporting mammograms, which was validated through matching to programmatic data collected by CDC. As the Hopi Tribe held the grant and was responsible for implementing the program, the success of the program may be attributable to its community-driven design. Community-based interventions have been applied in other tribal communities; for example, a small pilot using community-based participatory research and the Social-Ecological Model (Bronfenbrenner 2005) where community involvement helped to define questions about knowledge and attitudes regarding breast cancer in a New Mexico Indian tribe (English et al. 2008). It is important to remember that despite a smaller local-level focus, the impact of community-based interventions may be great. The CDC has developed other large programs with this in mind, for example, the Racial and Ethnic Approaches to Community Health (REACH) program which supported over 40 communities. In one, community health workers (CHWs) educated over 24,000 Laotian and Cambodian women over 4 years, and personally accompanied over 1800 women to screening sessions (Ngoc Nguyen et al. 2008).

Summary

While community-based initiatives vary widely in design, we can point to two common themes. First is the role of community partnerships to better the odds that community members’ needs are met, health education is delivered using appropriate local channels, and overall burden on resources is eased. As we have seen from these examples, community partner organizations can provide access to an already dedicated audience (some of whom may not be accessing health care otherwise), can lend their deep knowledge to an intervention’s design, and their authority to messaging. Another aspect of community-based projects is their openness to community-driven design. We can see from many examples that health promotion projects which have been successful in communities have attempted to reach people where they go about their daily activities, to deliver the message that health care is not reserved for the yearly checkups.

Lay and peer interventions

It is not always practical to recruit a professional health educator; as an alternative, many projects have enlisted the help of lay or peer health educators who volunteer their time or receive nominal compensation (Simoni et al. 2011). Their advantage is in their ability to reach certain populations by virtue of an already-established position in the community, or shared culture and/or language. A 2009 systematic review (Martínez-Donate 2009) on the use of lay health advisors to promote breast and cervical cancer screening among Latinas found that the majority of studies identified had used methodology too weak to support evidence-based practice, although two studies (of 14 that met inclusion criteria) showed evidence of effectiveness. In contrast, a systematic review of 30 studies (Hou et al. 2011) on culturally appropriate cancer screening interventions for Asian-American populations—Vietnamese, Korean, Chinese and Taiwanese, Cambodian, Filipina, and Mixed Asian—found the most effective interventions to be those using community-based lay health workers (LHWs) (especially when combined with locally targeted education campaigns). Finally, a 2011 systematic review (Wells et al. 2011) comprising 18 studies and over 26,000 participants provides the strongest support, finding that women who participated in this type of intervention were significantly more likely to complete a mammogram, where workers were matched to women by ethnicity or race, the effect on likelihood of mammography uptake was stronger.

Among the many LHW intervention studies designed to reach Asian-American communities, an RCT tested this approach on breast cancer screening uptake in California Vietnamese-Americans (Nguyen et al. 2009). LHW outreach was combined with a media education campaign in one arm, tested against media education only. Partnerships were established with community-based organizations who hired Vietnamese coordinators to recruit, with a stipend, ten Vietnamese women to serve as LHWs. LHWs were trained on how to recruit participants using lecture, role-play, and group discussions, and offered a small cash incentive to 22 recruits each ($n = 1100$). Small group sessions using various educational resources from a toolkit were employed to raise awareness and answer questions about mammography. The media education campaign ran community-wide in Vietnamese language newspapers, radio, and television. The LHW + media education intervention significantly increased awareness, mammography uptake, and clinical breast exam uptake. Similarly, a small ($n = 81$) participatory design study using Cantonese focus groups to improve colorectal screening among Chinese-Americans (Nguyen et al. 2010), led to a significant increase in awareness and intent to screen in this mostly non-screening sample. More importantly, the team noted "an important and often underappreciated" (p. 411) effect of LHW interventions is their impact on community capacity building, as information shared in outreach sessions was spread through community social networks.

Latino communities in the US have also been engaged in interventions using LHWs, or promotoras de salud (or promotoras): generally female community members trained as lay health educators. In one study a community-based group randomized trial ($n = 1006$) enlisted Latina health workers to increase breast, cervical or colorectal screening in low-income Latina women in Phoenix, Arizona (Larkey et al. 2012). Participants were randomly assigned to two eight-week interventions: individual educational sessions or social support groups. Both were found to significantly increase screening behaviors. Another randomized study ($n = 2542$) aimed at Latino populations across multiple sites tested an educational peer volunteer program called Esperanza y Vida (Hope and Life) (Jandorf et al. 2012; Saad-Harfouche et al. 2011; Sudarsan et al. 2011; Erwin et al. 2012). The intervention arm involved a breast and cervical cancer education program, led by cancer survivors—sobrevivientes—who shared personal stories about screening and survival; the control arm involved a diabetes education program. The investigators found a significant improvement in knowledge after the intervention, but both arms showed an increase in screening by previously non-adherent women (with no significant difference). Similar to the Asian-American study, the researchers concluded that the community-based, peer-led element of the study design helped build social capital and community knowledge, which were more important for screening participation than specifically increasing knowledge of cancer.

Lay health worker interventions have been the subject of several randomized trials targeted at reaching low income populations, particularly in the US. An RCT (Ahmed et al. 2010) ($n = 2357$) designed to test the effect on mammography uptake of two interventions for very low-income women—a reminder letter, and a stepwise intervention combining reminders with LHW counseling—found both interventions increased screening compared to the control group (16, 27 and 13 %, respectively). However, only the LHW intervention showed a significantly higher effect, with participants twice as likely to receive screening compared to the control group, and 69 % more likely than the reminder-only intervention. Several such studies have focused on low-income Appalachians, whose access to care may be further complicated with rural residence—and rural populations have among the highest for rates of cancer incidence and lowest rates of screening in the US. For example, the Food Pantries project (Bencivenga et al. 2008), designed to promote no-cost mammography with low-income rural Appalachian women, involved community partnerships, one-on-one counseling, and small media. While reaching a small population (379), over 1/3 was screened and breast cancer detected and treated in three.

Our closing example is an approach to raise cancer awareness within an Aboriginal community. Set on an Apsáalooke Reservation in the US, the Messengers for Health project (Christopher et al. 2008) took a community-based participatory research approach to develop a lay health advisor (LHA) intervention targeted at Native American women, who are known to have a significantly higher cervical cancer mortality rate than the general population. Evaluation was conducted using qualitative (field notes, meeting minutes, health and community worker perceptions) and quantitative (pre- and post-test interviews) methods. Messengers were nominated by community members and trained in communicating health information, then began education and outreach activities including meeting with women to encourage scheduling Pap tests. The evaluation showed that participants were significantly more knowledgeable about, and comfortable discussing, cancer than at the study outset. The authors observed that to establish trust, much time was invested in building relationships between the academic researcher and the community-based researcher before the project began. The success of the intervention depended upon the access community members had to observing all elements of the research process. The issue of trust between Aboriginal peoples and Western medicine has been addressed elsewhere. For example, an Australian study led by Aboriginal researchers used social inclusion theory to explore how historically marginalized people experience poor access to health (in this case, cancer care) services (Treloar et al. 2014). This study, recruiting Aboriginal participants who had experienced cancer or cared for someone with it, identified culturally aware patient navigation—such as that provided by other LHW interventions described here—as a promising step towards socially inclusive health services.

Summary

Among the benefits of lay health worker interventions are (a) their ability to use their position in the community and existing relationship to be a bridge between professional practitioners and groups with barriers to accessing clinical health care; (b) their empathy (and/or cultural affinity) which helps them reach out to their underscreened audience, and (c) their capacity to provide interventions in a resource-effective manner. Some key points emerge from this literature. First, lay health workers will not necessarily be effective in a general population, but have been shown effective with specific cultural groups—providing assistance with understanding an unfamiliar system, transportation or child care, and even language translation. Second, lay health workers may be effective for working with other marginalized populations who may not see their health as a priority in their hierarchy of needs—such as low-income groups. Finally, the effectiveness of lay health interventions may be difficult to assess unless a mechanism for evaluation is established at the design stage. Indicators such as stages of change in health behavior (e.g. from no intent to screen, to intent to screen, to completion of screening) could be linked with LHW involvement to assess the effectiveness of the intervention.

Targeted or tailored interventions

"Tailoring", as used here, refers to flexible interventions designed to address health behaviors (possibly culturally influenced), knowledge needs, and barriers to participation in cancer screening (such as navigation support). As a review of Canadian interventions targeted at immigrant subgroups found, interventions are more likely to achieve their desired outcomes if they are tailored to specific cultural groups (Schoueri-Mychasiw et al. 2013). One systematic review of 31 studies designed to improve cervical screening uptake, follow-up after an abnormal screen, diagnosis, and treatment in racial and ethnic minority populations (Glick et al. 2012) concluded that there was insufficient evidence to support the use of any interventions to increase uptake. The exception: low to moderate evidence for telephone and lay health worker support, with navigation tailored to the patient's needs (e.g. help scheduling appointments, finding low-cost transportation). The authors recommend these approaches but warn against navigation alone without education or support, and suggest further studies to build evidence of effectiveness in specific racial or ethnic communities. Finally, a review of international studies on interventions to increase screening uptake in women with low socioeconomic status (Spadea et al. 2010) found that organized screening programs alone are not effective at reducing the health inequities which create barriers for low-income women. The most effective strategies identified were those that relied on theoretical models of behavioral change to develop individually tailored messages to support uptake. The authors recognize such interventions are challenging to implement on a large scale, but have proven successful when targeted at specific groups such as low-income, ethnic minority, or immigrant populations.

Computer-tailoring—using programs or web tools to customize feedback and support patient decision-making—have been found effective in some areas (Albada et al. 2012; Krebs et al. 2010; Layton 2012). An RCT ($n = 1224$) comparing the relative effectiveness of tailored intervention software, the CDC's Screen for Life program, and a survey-only arm to increase rates of colorectal screening (Vernon et al. 2011) found no significant differences in intent to screen—but the tailored intervention showed positive effect on screening among those who had a family history of colorectal cancer. An RCT testing a computer-delivered tailored intervention to support uptake of colorectal screening provided tablet computers to the intervention arm in a sample of African-American participants ($n = 556$) (Rawl et al. 2012) to run assessments of their risk and barriers to screening. The program then delivered tailored messages, graphics and video in response. The intervention was shown to improve knowledge, change health beliefs consistent with behavior change, and reduce perceived barriers to screening. In a variation on the health-belief-tailored computer-delivered intervention, one study looked at the effects of tailoring to knowledge (Jerant et al. 2013) to support patients making screening choices. Drawing data from an ongoing multisite RCT ($n = 1164$) of an interactive multimedia computer program designed as a decision aid between fecal occult blood test (FOBT) and colonoscopy, differences across ethnicity (Hispanic/non-Hispanic) and language (Spanish/English) were explored. Participants had the option of selecting program elements appropriate for their literacy, language skills, and health literacy. A significant difference was found between the intervention and control arms with regard to each patient's ability to formulate a screening preference.

REACH interventions have sometimes employed more traditional motivational methods as part of tailoring to specific groups. One program in Boston (led by the Boston Public Health Commission and funded by the CDC) addressed barriers related to social determinants of health with the goal of decreasing deaths due to breast and cervical cancer among African-American women (Clark et al. 2009). This project recruited 918 women from primary care, social workers, and community-based counselors who were identified as black or of African descent, and at risk for having inconsistent or no primary care. Participants were followed by case managers for 5 years via questionnaire, chart review, and statistical correlates of mammography uptake and follow-up. Case management increased screening uptake, and having a regular health care provider supported first-time mammography (consistent with other studies). The researchers also found that housing concerns were an important barrier to mammography uptake. Another REACH initiative designed to promote both mammography and Pap screening in African-American women was conducted in Alabama (Fouad et al. 2010). 143 volunteers were recruited through community organizations and events, trained to be Community Health Advisors (CHAs), and given a modest incentive for each participant they recruited. On average, 16 participants were recruited per CHA, and 1513 of the original 2333 recruits were retained at (multi-year) follow-up. Participants were monitored for their movement between stages—from never, to infrequently, to regularly screened. They completed a baseline survey and were assigned a tracking card containing tailored motivational messaging for that participant. Cards of women due for mammography were sent to CHAs to prompt them to make contact, and talk through barriers to screening with these women. The majority of participants made a positive move: women in stage 2 rose by 4 %, and those in stage 3 rose by 6 %. Other studies have taken the approach of assessing movement between stages, for example using the Precaution Adoption Process Model (Weinstein 1988) to identify and address barriers at each stage from "unaware of cancer" to "decided to be screened" (as used in a project to increase mammography in Latinas and American Indians/Alaska Natives (Engelman et al. 2011).

Summary

Evidence of the effectiveness for the targeted and tailored interventions we reviewed, especially at the highest levels (systematic reviews and meta-analyses) seems to be less conclusive for tailored interventions than it is for lay or peer health education. Nevertheless, tailored interventions have been shown to improve awareness, knowledge and uptake. Like lay health workers, this type of intervention may not be suitable for a general population, but could be effective with underscreened or at-risk subgroups, especially in terms of support to overcome barriers. Themes apparent from this subset of the literature include: (a) they tend to be effective when health beliefs and attitudes are a significant barrier, as they use a theoretical underpinning such as the Health Belief Model (Rosenstock 1966) to support an evidence-based approach to tailoring; (b) they may also be effective for reaching people who have barriers associated with low literacy or education; and (c) there is considerable variability in their resource requirements, but some appear to be resource-intensive (tablet computers, one-on-one staff time, etc.). In addition to these more specific points, generally speaking there appears to be utility in culturally tailoring messages to different audiences—even quite simply through small media or lay health education.

Discussion

Based on the evidence reviewed, we developed a decision tool to add to the resources available for intervention planners. Figure 3 shows a possible decision-making process for planning interventions to increase participation in cancer screening. This example represents evidence-based decision-making as it might apply to a community known to have disproportionately high populations of immigrants who may have a language barrier, and disproportionately low rates of participation in screening programs. The target audience is identified on the basis of data from regional demographics and best available knowledge about underscreened subgroups, and the intervention—in this case, a lay health worker program—is selected according to evidence on barriers and effective interventions to reach this subgroup. This diagram is a necessarily oversimplified representation of the process, but could be used as a template to promote thinking about the connection between evidence and action—and between lessons learned "there", and whether they can be applied "here" (wherever that may be).

Systematic reviews are used to support planning because they show what is effective across multiple study approaches and a variety of contexts, but drawing conclusions across broad populations necessarily brackets or elides differences between groups. The value of adding an in-depth analysis as we have attempted in this review is to unearth the minute level of detail required for KT planning and implementation, revealing how or why some interventions work better or worse with various populations—detail which may be "invisible" at the higher level of review and synthesis.

Successful interventions in each type of approach had common elements. Community-based approaches were most effective when based on community-driven design and partnerships; lay or peer health educators were best at reaching particular groups, such as immigrant communities or people on low income; and targeted or tailored interventions addressed barriers associated with health beliefs

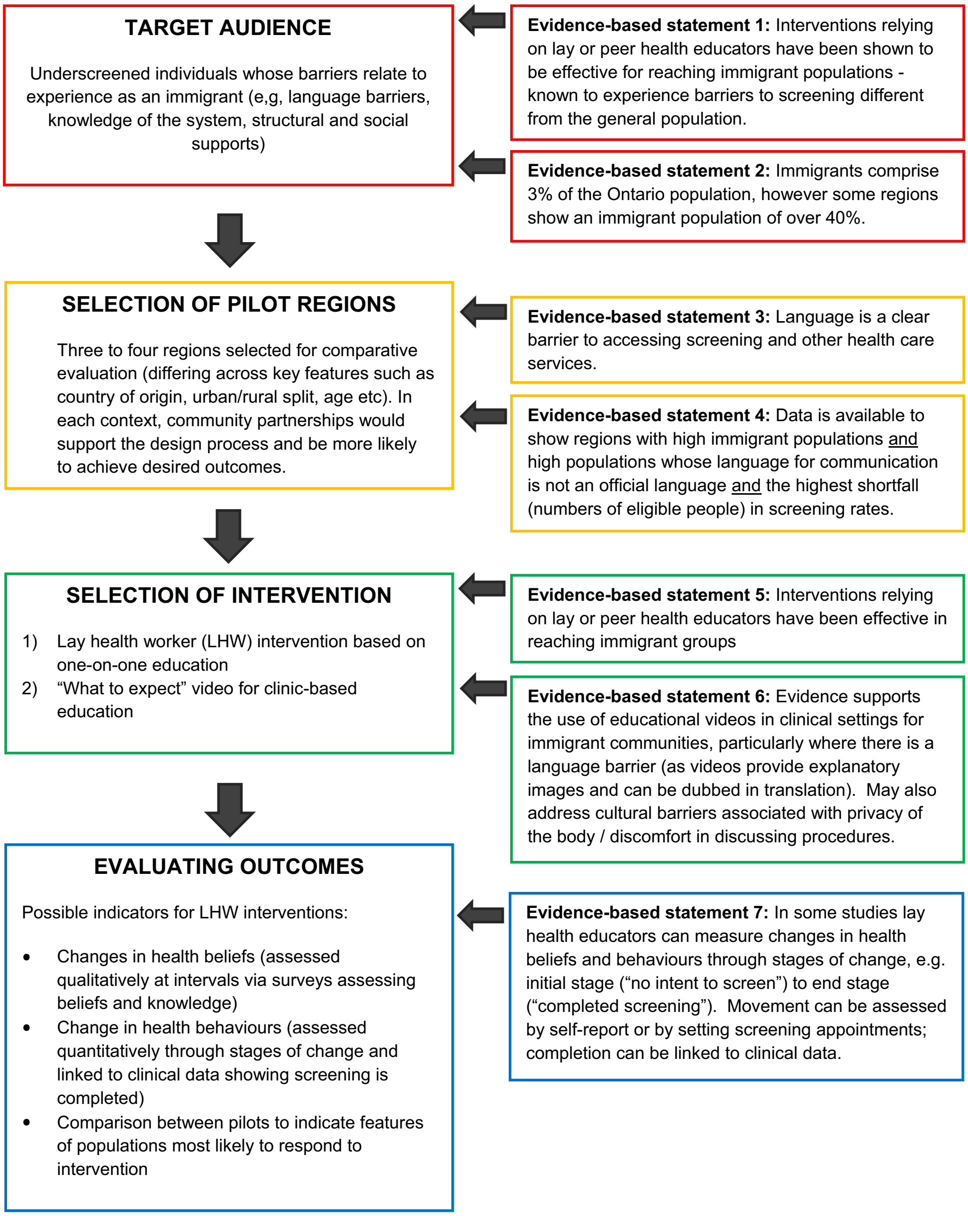

Fig. 3 Sample decision chart for intervention planning

TARGET AUDIENCE

Underscreened individuals whose barriers relate to experience as an immigrant (e,g, language barriers, knowledge of the system, structural and social supports)

Evidence-based statement 1: Interventions relying on lay or peer health educators have been shown to be effective for reaching immigrant populations - known to experience barriers to screening different from the general population.

Evidence-based statement 2: Immigrants comprise 3% of the Ontario population, however some regions show an immigrant population of over 40%.

SELECTION OF PILOT REGIONS

Three to four regions selected for comparative evaluation (differing across key features such as country of origin, urban/rural split, age etc). In each context, community partnerships would support the design process and be more likely to achieve desired outcomes.

Evidence-based statement 3: Language is a clear barrier to accessing screening and other health care services.

Evidence-based statement 4: Data is available to show regions with high immigrant populations and high populations whose language for communication is not an official language and the highest shortfall (numbers of eligible people) in screening rates.

SELECTION OF INTERVENTION

1) Lay health worker (LHW) intervention based on one-on-one education
2) “What to expect” video for clinic-based education

Evidence-based statement 5: Interventions relying on lay or peer health educators have been effective in reaching immigrant groups

Evidence-based statement 6: Evidence supports the use of educational videos in clinical settings for immigrant communities, particularly where there is a language barrier (as videos provide explanatory images and can be dubbed in translation). May also address cultural barriers associated with privacy of the body / discomfort in discussing procedures.

EVALUATING OUTCOMES

Possible indicators for LHW interventions:

- Changes in health beliefs (assessed qualitatively at intervals via surveys assessing beliefs and knowledge)
- Change in health behaviours (assessed quantitatively through stages of change and linked to clinical data showing screening is completed)
- Comparison between pilots to indicate features of populations most likely to respond to intervention

Evidence-based statement 7: In some studies lay health educators can measure changes in health beliefs and behaviours through stages of change, e.g. initial stage (“no intent to screen”) to end stage (“completed screening”). Movement can be assessed by self-report or by setting screening appointments; completion can be linked to clinical data.

(including culturally determined ones) or literacy. There are, of course, limitations to this review. To begin with, the interventions covered here target specific groups; it has been argued that compared to a diversity-based approach this risks being reductive and discriminatory (Razum and Spallek 2014). Our argument would be that regardless of the target audience, planners must engage with the people, the context, and the evidence thoroughly from the outset. Further, cancer screening itself is not uncontroversial. Debates continue around appropriate intervals and methods for screening, costs, and harms vs. benefits. Our objective with this work, however, has been to identify ways to raise participation in screening according to the evidence-based guidelines informing organized screening programs in our area; thus, these controversies fall outside the scope of the current work. A further issue is that the centrality of education to these interventions may be problematic, and increased knowledge is no guarantee of achieving the desired behavioral change. Here, we would argue for the importance of aligning methods, objectives, and indicators to support an evaluation plan capable of assessing whether the tools used and resources invested in an intervention were justified.

Many of the studies we have presented here have their own limitations; some were able to assess changes in awareness, knowledge, health beliefs, or intent, but less able to assess the intervention’s impact on actual screening rates. Even in interventions with positive impacts, the authors were not always able to attribute that impact to a specific feature of the intervention. This is why the identification of desired outcomes and indicators of success is so vitally important, if KT intervention designers are to know whether they have truly achieved their goals.

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References

Ahmed NUN, Haber GG, Semenya KAK, Hargreaves MKM (2010) Randomized controlled trial of mammography intervention in insured very low-income women. Cancer Epidemiol Biomark Prev Publ Am Assoc Cancer Res Cosponsored Am Soc Prev Oncol 19:1790–1798

Albada A, Dulmen S, Lindhout D et al (2012) A pre-visit tailored website enhances counselees' realistic expectations and knowledge and fulfils information needs for breast cancer genetic counselling. Fam Cancer 11:85–95. doi:10.1007/s10689-011-9479-1

Bencivenga M, DeRubis S, Leach P et al (2008) Community partnerships, food pantries, and an evidence-based intervention to increase mammography among rural women. J Rural Health Off J Am Rural Health Assoc Natl Rural Health Care Assoc 24:91–95

Brennan L, Castro S, Brownson RC et al (2011) Accelerating evidence reviews and broadening evidence standards to identify effective, promising, and emerging policy and environmental strategies for prevention of childhood obesity. Annu Rev Public Health 32:199–223

Bronfenbrenner U (2005) Making human beings human: bioecological perspectives on human development. Sage, Thousand Oaks, CA

Brouwers MC, De Vito C, Bahirathan L et al (2011) Effective interventions to facilitate the uptake of breast, cervical and colorectal cancer screening: an implementation guideline. Implement Sci IS 6:112. doi:10.1186/1748-5908-6-112

Brown SR, Nuno T, Joshweseoma L et al (2011) Impact of a community-based breast cancer screening program on Hopi women. Prev Med 52:390–393

Brownson RCR, Haire-Joshu DD, Luke DAD (2006) Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. Annu Rev Public Health 27:341–370

Canadian Cancer Society's Advisory Committee on Cancer Statistics (2013) Canadian Cancer Statistics 2013. Canadian Cancer Society, Toronto

Carrieri V, Wuebker A (2013) Assessing inequalities in preventive care use in Europe. Health Policy 113:247–257

Christopher S, Gidley AL, Letiecq B et al (2008) A cervical cancer community-based participatory research project in a Native American Community. Health Educ Behav 35:821–834. doi:10.1177/1090198107309457

Clark CRC, Baril NN, Kunicki MM et al (2009) Addressing social determinants of health to improve access to early breast cancer detection: results of the Boston REACH 2010 breast and cervical cancer coalition women's health demonstration project. J Womens Health 18:677–690

Engelman KKK, Cupertino APA, Daley CMC et al (2011) Engaging diverse underserved communities to bridge the mammography divide. BMC Public Health 11:47

English KCK, Fairbanks JJ, Finster CEC et al (2008) A socioecological approach to improving mammography rates in a tribal community. Health Educ Behav Off Publ Soc Public Health Educ 35:396–409

Erwin D, Thélémaque U, Saad-Harfouche F, Jandorf L (2012) Esperanza y Vida Intervention to Increase Breast and Cervical Cancer Screening by Latinas: what are the Crucial Factors in Outreach That Influence Behavior Change? Psycho Oncol 21:22

Fernandez ME, DeBor M, Candreia M, Flores B (2010) Dissemination of a breast and cervical cancer early detection program through a network of community-based organizations. Health Promot Pract 11:654–664. doi:10.1177/1524839908325064

Fouad MN, Partridge E, Dignan M et al (2010) Targeted intervention strategies to increase and maintain mammography utilization among African American Women. Am J Public Health 100:2526–2531

Glick SB, Clarke AR, Blanchard A, Whitaker AK (2012) Cervical cancer screening, diagnosis and treatment interventions for racial and ethnic minorities: a systematic review. J Gen Intern Med 27:1016–1032. doi:10.1007/s11606-012-2052-2

Honein-abouhaidar GN, Baxter NN, Moineddin R et al (2013) Trends and inequities in colorectal cancer screening participation in Ontario, Canada, 2005–2011. Cancer Epidemiol 37:946–956

Hou S-I, Sealy D-A, Kabiru CW (2011) Closing the disparity gap: cancer screening interventions among Asians—a systematic literature review. Asian Pac J Cancer Prev APJCP 12:3133–3139

Jandorf L, Ellison J, Shelton R et al (2012) Esperanza y Vida: a Culturally and Linguistically Customized Breast and Cervical Education Program for Diverse Latinas at Three Different United States Sites. J Health Commun 17:160

Jerant A, Kravitz RL, Fiscella K et al (2013) Effects of tailored knowledge enhancement on colorectal cancer screening preference across ethnic and language groups. Patient Educ Couns 90:103–110

Krebs P, Prochaska JO, Rossi JS (2010) A meta-analysis of computer-tailored interventions for health behavior change. Prev Med 51:214–221. doi:10.1016/j.ypmed.2010.06.004

Larkey LK, Herman PM, Roe DJ et al (2012) A cancer screening intervention for underserved Latina women by lay educators. J Womens Health 21:557–566

Layton B (2012) Effects of a web-based decision aid on African American men's prostate screening knowledge and behavior. 3506316, Walden University

Martínez-Donate APA (2009) Using lay health advisors to promote breast and cervical cancer screening among Latinas: a review. WMJ Off Publ State Med Soc Wis 108:259–262

Morrow JB, Dallo FJ, Julka M (2010) Community-based colorectal cancer screening trials with multi-ethnic groups: a systematic review. J Community Health 35:592–601. doi:10.1007/s10900-010-9247-4

Ngoc Nguyen T-UT, Tanjasiri SPS, Kagawa-Singer MM et al (2008) Community health navigators for breast- and cervical-cancer screening among Cambodian and Laotian women: intervention strategies and relationship-building processes. Health Promot Pract 9:356–367

Nguyen TTT, Le GG, Nguyen TT et al (2009) Breast cancer screening among Vietnamese Americans: a randomized controlled trial of lay health worker outreach. Am J Prev Med 37:306–313

Nguyen TT, Love MB, Liang C et al (2010) A pilot study of lay health worker outreach and colorectal cancer screening among Chinese Americans. J Cancer Educ 25:405–412

Ouedraogo S, Dabakuyo-Yonli T, Roussot A et al (2014) European transnational ecological deprivation index and participation in population-based breast cancer screening programmes in France. Prev Med 63:103–108

Pruthi SS, Shmidt EE, Sherman MMM et al (2010) Promoting a breast cancer screening clinic for underserved women: a community collaboration. Ethn Dis 20:463–466

Rawl SM, Skinner CS, Perkins SM et al (2012) Computer-delivered tailored intervention improves colon cancer screening knowledge and health beliefs of African-Americans. Health Educ Res 27:868–885. doi:10.1093/her/cys094

Razum O, Spallek J (2014) Addressing health-related interventions to immigrants: migrant-specific or diversity-sensitive? Int J Public Health 59:893–895. doi:10.1007/s00038-014-0584-4

Rosenstock IM (1966) Why people use health services. Milbank Meml Fund Q Health Soc 44:91–124

Saad-Harfouche FG, Jandorf L, Gage E et al (2011) Esperanza y Vida: training Lay Health Advisors and Cancer Survivors to Promote Breast and Cervical Cancer Screening in Latinas. J Community Health 36:219–227. doi:10.1007/s10900-010-9300-3

Sabatino SA, Lawrence B, Elder R et al (2012) Effectiveness of interventions to increase screening for breast, cervical, and colorectal cancers: nine updated systematic reviews for the guide to community preventive services. Am J Prev Med 43:97–118. doi:10.1016/j.amepre.2012.04.009

Sadler GRG, Ko CMC, Wu PP et al (2011) A cluster randomized controlled trial to increase breast cancer screening among African American women: the black cosmetologists promoting health program. J Natl Med Assoc 103:735–745

Sadler GR, Beerman PR, Lee K et al (2012) Promoting breast cancer screening among Asian American women: the Asian grocery store-based cancer education program. J Cancer Educ 27:612–617. doi:10.1007/s13187-012-0419-z

Schoueri-Mychasiw N, Campbell S, Mai V (2013) Increasing screening mammography among immigrant and minority women in Canada: a review of past interventions. J Immigr Minor Health 15:149–158

Simoni JM, Franks JC, Lehavot K, Yard SS (2011) Peer interventions to promote health: conceptual considerations. Am J Orthopsychiatry 81:351–359. doi:10.1111/j.1939-0025.2011.01103.x

Spadea TT, Bellini SS, Kunst AA et al (2010) The impact of interventions to improve attendance in female cancer screening among lower socioeconomic groups: a review. Prev Med 50:159–164

Sudarsan NR, Jandorf L, Erwin DO (2011) Multi-site implementation of health education programs for Latinas. J Community Health 36:193–203. doi:10.1007/s10900-010-9297-7

Treloar C, Gray R, Brener L et al (2014) "I can't do this, it's too much": building social inclusion in cancer diagnosis and treatment experiences of Aboriginal people, their carers and health workers. Int J Public Health 59:373–379. doi:10.1007/s00038-013-0466-1

Tumiel-Berhalter LM, Kahn L, Watkins R et al (2011) The implementation of good for the neighborhood: a participatory community health program model in four minority underserved communities. J Community Health 36:669–674. doi:10.1007/s10900-011-9358-6

Vernon SW, Bartholomew LK, Mcqueen A et al (2011) A randomized controlled trial of a tailored interactive computer-delivered intervention to promote colorectal cancer screening: sometimes more is just the same. Ann Behav Med 41:284–299. doi:10.1007/s12160-010-9258-5

Weinstein ND (1988) The precaution adoption process. Health Psychol Off J Div Health Psychol Am Psychol Assoc 7:355–386

Wells KJ, Luque JS, Miladinovic B et al (2011) Do community health worker interventions improve rates of screening mammography in the United States? A systematic review. Cancer Epidemiol Biomark Prev Publ Am Assoc Cancer Res Cosponsored Am Soc Prev Oncol 20:1580–1598. doi:10.1158/1055-9965.EPI-11-0276