

Interventions developed with the Intervention Mapping protocol in the field of cancer

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REVIEW

Interventions developed with the Intervention Mapping protocol in the field of cancer: A systematic review

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Abstract

Objectives: The Intervention Mapping (IM) protocol provides a structured framework to develop, implement, and evaluate complex interventions. The main objective of this review was to identify and describe the content of the interventions developed in the field of cancer with the IM protocol. Secondary objectives were to assess their fidelity to the IM protocol and to review their theoretical frameworks.

Methods: Medline, Web of Science, PsycINFO, PASCAL, FRANCIS, and BDSP databases were searched. All titles and abstracts were reviewed. A standardized extraction form was developed. All included studies were reviewed by 2 reviewers blinded to each other.

Results: Sixteen studies were identified, and these reported 15 interventions. The objectives were to increase cancer screening participation ($n = 7$), early consultation ($n = 1$), and aftercare/quality of life among cancer survivors ($n = 7$). Six reported a complete participatory planning group, and 7 described a complete logic model of the problem. Ten studies described a complete logic model of change. The main theoretical frameworks used were the theory of planned behaviour ($n = 8$), the transtheoretical model ($n = 6$), the health belief model ($n = 6$), and the social cognitive theory ($n = 6$). The environment was rarely integrated in the interventions ($n = 4$). Five interventions were reported as effective.

Conclusions: Culturally relevant interventions were developed with the IM protocol that were effective to increase cancer screening and reduce social disparities, particularly when they were developed through a participative approach and integrated the environment. Stakeholders' involvement and the role of the environment were heterogeneously integrated in the interventions.

KEYWORDS

cancer, health promotion (MeSH), Intervention Mapping, oncology, program development (MeSH), program evaluation (MeSH)

1 | BACKGROUND

A number of health promotion programmes (interventions) have been developed in cancer prevention and care. Interventions promoting health-related behaviours such as physical activity, healthy nutrition,

immunization, and tobacco abstinence are likely to reduce the incidence of new cancers.¹ Other interventions aim at increasing cancer screening such as breast, cervical, or colic cancer² or at promoting cancer care.³

Most of these are complex interventions as defined by the Medical Research Council,⁴ given the number of levels of change they

intend to achieve. As such, they are at higher risk of theory and/or implementation failure than simpler interventions. Theory failure occurs when an intervention is not based on a sound analysis of the issue at stake (or the logic model of the problem) or when its activities lack of the appropriate mechanisms to achieve their goals (or the logic model of change).⁵ Implementation failure occurs when the activities of the intervention are not implemented as expected or fail to be integrated on a sustainable basis.⁶

A better use of theories has been advocated for in the field of cancer,⁷ as well as a special attention to implementation issues^{1,8} and cultural adaptation.⁹ The Intervention Mapping (IM) protocol in health promotion programme planning was developed^{10,11} in the 1990s. It is intended to help developing, implementing, and evaluating health promotion interventions by means of 6 steps: needs assessment, matrices, theory-based intervention methods and practical applications, intervention programme, adoption and implementation, and evaluation plan (Data Electronic supplement S1). Its main characteristics are an ecological perspective integrating the social determinants of health, a participative approach involving the relevant stakeholders, and the explicit use of theories to define the logic model of the problem (step 1), the logic model of change (step 2), and the way to achieve these changes (step 3). The ecological perspective postulates that population health is not the result of individuals' behaviour, but is influenced by other interacting factors at higher interpersonal, organization, community, society, and supranational levels.¹² The consideration of these environmental factors is paramount to reduce social health disparities. The IM protocol follows the philosophy of community-based participatory research^{13,14} where the joint reflection of researchers and community members demonstrated its creativity and effectiveness to tackle community problems. The participative approach is formalized in the IM protocol by the creation of a participatory planning group involving stakeholders with the research team, from the beginning, and at each step of the intervention development. Its composition should represent faithfully all categories of stakeholders and "people affected by and/or responsible for action on the issues under study"¹⁵ at each ecological level. Importantly, the planning group should not be limited to individuals of the community, but should integrate stakeholders of their environment whenever relevant (schools, workplaces, health care organizations, etc). The IM protocol appears promising to prevent both theory and implementation failures. However, it is not known to what extent it has been used in the field of cancer. Therefore, the primary objective of this review was to systematically identify and describe the content of interventions developed with the IM protocol in the field of cancer. Secondary objectives were to assess their fidelity to the IM protocol to discuss its potential benefits to prevent theory and implementation failures.

2 | METHODS

2.1 | Literature search

A systematic search strategy was performed to identify studies fulfilling the following inclusion criteria: (1) describe the development of an intervention, (2) with the IM protocol, (3) in the field of cancer. To focus

on cancer, interventions related to health behaviour in primary prevention were excluded. Medline, ISI Web of Science, PsycINFO, PASCAL, FRANCIS, and BDSP databases were searched without limitation of language, with a last update on August 26, 2017. The query was "([Intervention Mapping [Title/Abstract]) AND cancer all fields" in Medline and "Intervention Mapping" all fields AND cancer all fields" in the other databases. The references included in the third edition of the IM protocol textbook were also checked.¹¹ In a second time, another literature search was performed to identify publications related to each included study. These were searched in the reference list of included studies and with search queries by authors' names. Additional references were used during the data extraction to precise the development of interventions at each step of the IM protocol and to report their evaluation whenever it was performed (step 6).

2.2 | Data extraction

As no validated data extraction form was found in the literature, a standardized data extraction form was developed (Data Electronic supplement S2), in collaboration with one of the authors of the IM reference textbook (G.K.).¹¹ This was composed of an 80-item checklist corresponding to the tasks of the 6 steps of the IM protocol described by its authors.¹¹ Other criteria recommended for a better reporting of interventions were included, such as the PICO criteria (population, intervention, comparison, outcome) and criteria recommended by the TIDieR checklist (who has done what, why, how, how much, where, with what materials).¹⁶ All included studies were reviewed by 2 reviewers blinded to each other (M.L.B. and J.B.F.) who extracted the data separately before comparing their results.

2.3 | Data synthesis and fidelity assessment

In the frame of this review, the development process of the identified interventions was assessed by comparing the information extracted from the studies with the expected content of an IM approach.¹¹ All similarities and discrepancies were identified by each reviewer for each task of the IM protocol listed in the data extraction form. At this point, all disagreement between the 2 reviewers could be solved by returning to the included studies and their related articles, discussion, and consensus. Then, data were synthesized to reduce the amount of information generated by the 80 items of the checklist. After the review of each included study, a transversal analysis was performed to assess the content of each step of the IM protocol. For each step and tasks of the IM protocol, their modalities of realization were compared across studies to identify common and specific features.

2.4 | Ethics

No ethical approval was necessary to conduct this review.

3 | RESULTS

The search strategy identified 70 records from which 31 duplicates were removed. Twenty records were excluded after screening their titles and abstracts. Nineteen full texts were assessed for eligibility,

and 3 more studies were excluded. Reasons for exclusion are described in the flowchart in Figure 1 according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses recommendations.¹⁷ Sixteen intervention/development studies were identified¹⁸⁻³³ referring to 15 interventions.

Forty additional publications were retrieved reporting their needs assessment³⁴⁻⁵¹ ($n = 18$), their step 4⁵²⁻⁵⁴ ($n = 3$), their implementation planning⁵⁵ ($n = 1$), their evaluation⁵⁶⁻⁷² ($n = 17$), and their implementation⁷³ ($n = 1$).

Most of the interventions were developed in the United States^{19,20,23-25,32} and the Netherlands.^{22,27,30,33} The other interventions were developed in the United Kingdom,^{21,26} Taiwan,¹⁸ Canada,^{28,29} and Belgium.³¹ Breast cancer and cervical cancer were the most frequently addressed.^{18-22,24,25,31,32} The objectives of the interventions were to increase cancer screening,^{18-20,22-25} improve early consultation for breast cancer symptoms in women aged older than 70 years,²¹ and improve (after)care/rehabilitation for cancer survivors²⁶⁻³³ (Table 1).

The main results of the effect evaluation of the interventions are presented in Table 2. The details of the 15 interventions developed with the IM protocol are described in Data Electronic supplement S3.

3.1 | Fidelity assessment

The 16 studies included reported the development of 15 interventions, and the 40 related publications were reviewed to assess the fidelity to the IM protocol. The step 5 (programme implementation) could not be assessed because of a lack of detailed information in the included studies, and among the 40 related publications, only one reported information for this step.⁵⁵ The detailed description of

the theories and evidence-based changed methods used in each intervention is presented in Data Electronic supplement S4. The overall results of the fidelity assessment are presented in Table 3. All criteria of the IM protocol were reported in the articles only for one interventions.¹⁹

3.2 | Step 1: participatory planning group, needs assessment, and logic model of the problem

The very first task of the IM protocol is to establish a participatory planning group to include the views and field experiences of all the relevant stakeholders. Six studies reported clearly such a participatory planning group including all the relevant stakeholders.^{19,22,24,27,28,32} Two other studies reported interviews with the stakeholders outside the scope of a planning group.^{18,26} A needs assessment mainly based on qualitative inquiries among the stakeholders was conducted in all but one of the included studies.²² The description of a logic model of the problem as a final result of step 1 was described in 7 studies,^{19,21,24,25,28,30,31} of which 5 reported using a specific theory^{19,21,24,25,31} (Tables 3 and 4 and Data Electronic supplement S4).

3.3 | Step 2: logic model of change

The development of a logic model of change was reported in 10 studies.^{18,19,21,22,24-26,28,30,31} It was considered as partially done when the matrices of change were referred to but not shown in the articles^{23,27} and missing in 3 studies^{20,32,33} (Table 3). The theories used were described in 5 studies.^{18,19,23,25,26} Five studies reported change objectives at the level of environmental agents^{18,19,24,25,31} (Table 4 and Data Electronic supplement S4).

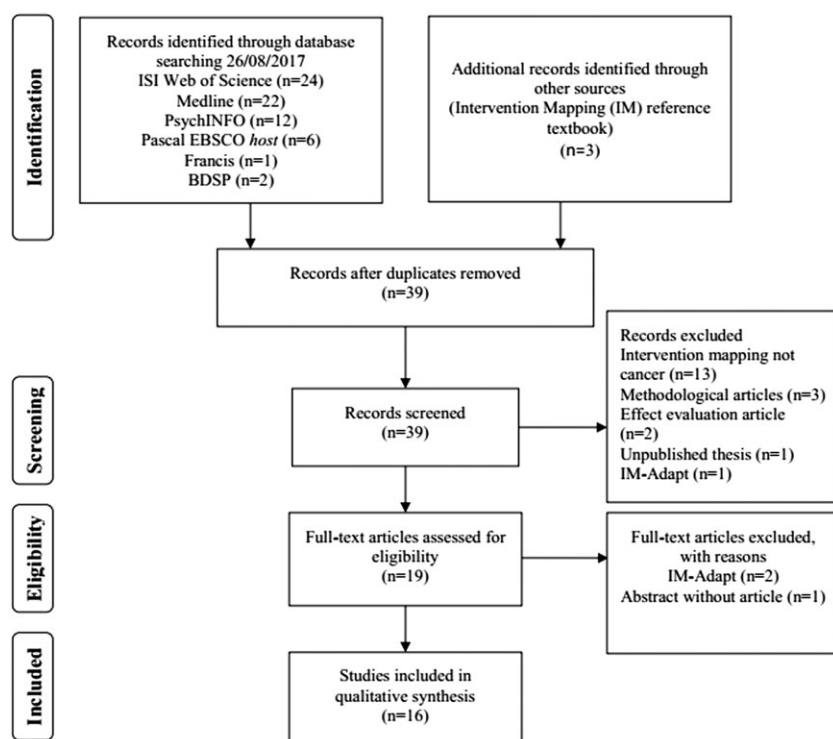


FIGURE 1 Flowchart of identification and selection of studies reporting the development of interventions with the IM protocol

TABLE 1 Main characteristics of interventions developed with the Intervention Mapping protocol in the field of cancer (in chronological order of publication)

Author Country	Related Articles	Main Phase of the Cancer Journey	Localization of the Cancer	Population	Intervention's Objectives	Type of Intervention
Hou et al ¹⁸ Taiwan	34,56	Screening	Cervical cancer	Women (30+ y) or younger if married	To increase Pap screening behaviour	Two personalized mails and a phone consultation during 3 mo
Fernandez et al ¹⁹ USA	35,57	Screening	Breast and cervical cancer	Hispanic farmworker women (50+ y)	To increase breast and cervical cancer screening	Interview with a trained lay health worker and a second interview 2 wk later (in person or by phone)
Vernon et al ²⁰ USA	36,37	Screening	Breast cancer	Veteran women (52+ y)	To increase breast cancer screening by the completion of 1 postintervention mammography (coverage) and by the completion of 2 postintervention mammographies (compliance)	An email containing both targeted and tailored intervention components or the targeted component and a generic cover letter
Burgess et al ²¹ UK	38,39,52,55,58-61,73	Early presentation	Breast cancer	Older women at the final mammogram (70+ y)	To promote early help seeking by older women with breast cancer symptoms	Intervention during the appointment for the final mammogram, in a health care setting delivered by diagnostic radiographers. Core intervention: booklet alone or boosted intervention: booklet + interview
Albada et al ²² The Netherlands	40,62,63	Screening	Breast cancer	Breast cancer genetic counselees	To enhance counselees' realistic expectations and participation during breast cancer genetic counselling	A tailored website and a question prompt sheet self-administrated
Vernon et al ²³ USA	41,53	Screening	Colorectal cancer	Patients (50-70 y) never screened or overdue for colorectal cancer (CRC) screening	To increase colorectal cancer screening	A tailored, interactive, computer-delivered intervention or a noninteractive website programme self-administered before medical appointment
Byrd et al ²⁴ USA	64,65	Screening	Cervical cancer	US women of Mexican origin	To increase cervical cancer screening	Interview with a lay health worker using a video and a flipchart (full AMIGAS programme) or without video or without flipchart
Scarinci et al ²⁵ USA	42,43	Screening	Cervical cancer	Latina immigrants	To promote cervical cancer prevention by developing a theory-based, culturally relevant intervention focusing on primary (sexual risk reduction) and secondary (Pap smear) prevention	Eight sessions (6 group sessions and 2 individual sessions) with lay health educators
Munir et al ²⁶ UK	44	(After)care/ rehabilitation	All cancers	Working-aged adults diagnosed and treated for cancer	To develop a work-related guidance tool for those diagnosed with cancer that enables them to take the lead in stimulating discussion with a range of different health care professionals, employers, employment agencies, and support services	A work-related guidance booklet self-administered
Van Bruinessen et al ²⁷ The Netherlands	45,54,66	(After)care/ rehabilitation	Malignant lymphoma	Patients	To help patients gain more control in the communications with their health care professionals	A self-directed online communication tool (website) self-administered before each hospital visit and a question prompt sheet

(Continues)

TABLE 1 (Continued)

Author Country	Related Articles	Main Phase of the Cancer Journey	Localization of the Cancer	Population	Intervention's Objectives	Type of Intervention
McEwen et al ^{28,29} Canada		(After)care/ rehabilitation	Head and neck cancer (HNC)	HNC survivors	To help survivors of HNC determine their priority rehabilitation needs, set related goals and plans, and implement their plans to meet their goals	A rehabilitation planning consultation and a follow-up appointment 2-10 wk later
Willems et al ³⁰ The Netherlands	46,47,67-72	(After)care/ rehabilitation	All cancers	Cancer survivors	To provide cancer survivors personalized information and support and stimulate self-management during life after cancer	A tailored website containing 7 self-management training modules
Désiron et al ³¹ Belgium	48-50	(After)care/ rehabilitation	Breast cancer	Breast cancer patients	To provide adequate care that empowers breast cancer patients to maintain or resume (labour) participation and, thereby, enhance their quality of life	A 5-phased return-to-work intervention guided by a hospital-based occupational therapist will be developed
Smith et al ³² USA	51	(After)care/ rehabilitation	Breast cancer	African American breast cancer survivors (AA BCSs)	To develop an educational intervention to promote adherence to cancer prevention recommendations among AA BCSs and to evaluate the feasibility and acceptability of delivering the intervention through a smartphone application	A lifestyle smartphone application
Van Dulmen et al ³³ The Netherlands		(After)care/ rehabilitation	All cancers	Older cancer patients (65+ y)	To enhance patient participation during educational nursing encounters preceding chemotherapy and to improve older patients' information recall	A website containing information, a question prompt sheet, video fragments, and audio facility, self-administered before and after the nursing encounter preceding chemotherapy

3.4 | Step 3: theory-based and evidence-based change methods

The most frequently used theories at step 3 were the health belief model (HBM; $n = 4$),^{18-20,25,32} the social cognitive theory (SCT; $n = 6$),^{18-21,26,29} the theory of planned behaviour (TPB; $n = 4$),^{20,21,26,32} and the transtheoretical model (TTM; $n = 3$).^{20,21,26} The other theories were used only once (Table 4). Only one study reported behaviour change methods for environmental agents.¹⁸ The detailed description of the evidence-based changed methods is presented in Data Electronic supplement S4.

3.5 | Step 4: programme production

The 15 interventions included a component aimed at changing the at-risk group,^{18-27,29-33} and 4 of them included a component aimed at changing the environment^{18,19,21,31} (Table 3 and Data Electronic supplement S3).

3.6 | Step 6: effect evaluation

Nine interventions were evaluated,^{18-24,27,30} 4 were not evaluated,^{25,26} and 4 were not reported at the time of database search.^{28,31-33} Four interventions were effective to increase cancer screening and reduce social disparities,^{56,57,60,64} 1 was effective to improve moderate physical activity for early cancer survivors,³⁰ and 4 did not achieve changes of their primary outcome^{20,23,62,66} (Table 2).

4 | DISCUSSION

4.1 | Overview of the main results

The interventions developed with the IM protocol were diverse in terms of cancer site, timing, and objectives. The first interventions (2004-2012) aimed to increase cancer screening and early diagnosis.¹⁸⁻²⁵ More recent interventions (2013-2017) addressed later phases of the cancer journey (cancer care and aftercare/rehabilitation) and cancer survivorship.²⁶⁻³³ The most frequently used theoretical frameworks were the TPB, TTM, HBM, and SCT. The environment was rarely integrated in the interventions. Of the studies, 9 had been evaluated and half of them were effective to increase cancer screening and reduce social disparities^{56,57,60,64} and to improve moderate physical activity for early cancer survivors.³⁰

4.2 | Participative issues

The modest number of studies reporting a complete participatory planning group is surprisingly low given the importance of the participatory process in the IM protocol.¹¹ Although most of the included studies conducted a qualitative inquiry for the needs assessment, the use of the stakeholders as a source of information cannot be considered as participatory in itself.¹³ Some authors reported that mobilizing a truly participative approach was particularly enlightening

TABLE 2 Main results of the interventions

Intervention Author	Efficacy Studies	Evaluation Plan	Results
Hou et al ¹⁸	Hou et al ⁵⁶	RCT	Three months following implementation of the intervention, women in the intervention group reported a higher rate of Pap test screening than women in the comparison group (50% vs 32%; $P = .002$).
Fernandez et al ¹⁹	Fernandez et al ⁵⁷	Pre-post comparison group design	At follow-up, screening completion was higher among women in the intervention group than those in the control group for both mammography (40.8% vs 29.9%; $P < .05$) and Pap test (39.5% vs 23.6%; $P < .05$) screening.
Vernon et al ²⁰	Vernon et al ²⁰	RCT	At 3.25 y, none of the among-group differences in the crude incidence estimates for mammography coverage was statistically significant in ITT, mITT, or PP analyses.
Burgess et al ²¹	Burgess et al ⁵⁸	CBA study without group control	At 1-mo postintervention, the mean number of breast cancer symptoms identified (out of 11) increased by 1 symptom (from 5.3; $P < .001$) in the booklet group and by 1.9 ($P < .001$) in the booklet plus interview group.
	Linsell et al ⁶⁰	RCT	At 1 mo, the intervention increased the proportion who were breast cancer aware compared with usual care (interaction arm, 32.8% vs 4.1%; OR, 24.0; 95% CI, 7.7-73.7; booklet arm, 12.7% vs 4.1%; OR, 4.4; 95% CI, 1.6-12.0). At 1 y, the effects of the intervention were sustained.
	Forbes et al ⁶¹	RCT	At 2 y, the promoting early presentation (PEP) intervention increased the proportion who were breast cancer aware compared with usual care (21% vs 6%; OR, 8.1; 95% CI, 2.7-25.0).
	Campbell et al ⁵⁹	CBA study without group control	The intervention was associated with increased awareness of nonlump breast symptoms and with reported breast check frequency. There was a marked increase in breast cancer awareness at 1 mo that persisted at 12 mo.
Albada et al ²²	Albada et al ⁶³	RCT	After having accessed E-info gene(ca) counselees ($n = 101$) better knew what to expect of their first visit ($\chi^2 = 4.43$; $P = .04$) and less often showed unrealistic expectations about possibilities for DNA testing ($\chi^2 = 4.84$; $P = .03$) than counselees in the usual care group ($n = 89$).
	Albada et al ⁶²	RCT	Intervention group counselees ($n = 102$) did not ask more questions than usual care group counselees did ($n = 90$).
Vernon et al ²³	Vernon et al ²³	RCT	There was no statistically significant difference in screening by 6 mo: 30%, 31%, and 28% of the survey-only, website, and tailored groups were screened.
Byrd et al ²⁴	Byrd et al ⁶⁴	RCT	Women in any of the intervention arms were significantly more likely to report being screened. In the ITT analysis, 25% of women in the control group and 52% in the full AMIGAS programme group reported having had Pap tests ($P < .001$); in the PP analysis, the percentages were 29% and 62%, respectively ($P < .001$).
	Lairson et al ⁶⁵	Cost-effectiveness study	The cost per additional woman screened comparing the video-only intervention to usual care was US \$980. With an additional cost per participant of US \$3.90 compared with flipchart only, the full AMIGAS programme (video plus flipchart) yielded 6.8% additional women screened.
Scarinci et al ²⁵	No identified study	NR	NR
Munir ²⁶	No study developed	NR	NR
Van Bruinessen et al ²⁷	Van Bruinessen et al ⁶⁶	RCT	After the initial consultation, there was no difference between the control and intervention groups in the way they experienced their efficacy during the consultation. In the postvisit test (at 3 mo), the intervention group had significant improvement in perceived efficacy. However, the interaction effect was not significant.
Mc Ewen et al ^{28,29}	No identified study	NR	NR
Willems et al ³⁰	Willems et al ⁷⁰	RCT	After 6 mo, there was a significant reduction in depression and fatigue. In addition, significant effects were found for emotional and social functioning. There were indications that the effects of fatigue and social functioning were influenced by module use.
	Kanera et al ⁶⁸	RCT	After 6 mo, indications were found that access to the intervention may result in increases of moderate physical activity and vegetable intake. The moderate physical activity increase was meaningful with a 74.74 min/wk increase in the intervention condition. Visiting behaviour-related modules affected moderate physical activity, fruit, and fish consumption. However, after correction for multiple testing, significances expired. No significant intervention effect was found on smoking behaviour.
	Kanera et al ⁶⁹	RCT	A significant intervention effect after 12 mo was found for moderate physical activity both in PP and ITT analysis. No significant intervention effect remained for vegetable consumption after 12 mo either in PP or ITT analysis.
	Willems et al ⁷¹	RCT	After 12 mo, the intervention group no longer differed from the control group in emotional and social functioning, depression, and fatigue. The intervention gave

(Continues)

TABLE 2 (Continued)

Intervention Author	Efficacy Studies	Evaluation Plan	Results
			cancer patients a head start to psychological recovery after the end of cancer treatment. The control group caught up in the long run.
	Willems et al ⁷²	RCT	The intervention effects in decreasing depression and fatigue were mediated by personal control and were not mediated by problem-solving skills.
Désiron et al ³¹	No identified study	NR	NR
Smith et al ³²	No identified study	NR	NR
Van Dulmen et al ³³	No identified study	NR	NR

Abbreviations: CBA study, controlled before and after study; CI, confidence interval; ITT, intention-to-treat; mITT, modified ITT; NR, not reported; OR, odds ratio; PP, per-protocol; RCT, randomized controlled trial.

TABLE 3 Fidelity assessment of included studies

Intervention Author	Step 1		Step 2 Logic Model of Change	Step 3 Theory and Evidence-based Change Methods	Step 4		Step 6 Effect Evaluation
	Participatory Planning Group	Needs Assessment Logic Model of the Problem			At-risk Group Component of the Intervention	Environmental Component of the Intervention	
Hou et al ¹⁸	Partially	Partially	Yes	Partially	Yes	Yes	Effective ⁵⁶
Fernandez et al ¹⁹	Yes	Yes	Yes	Yes	Yes	Yes	Effective ⁵⁷
Vernon et al ²⁰	No	Partially	No	Yes	Yes	No	Ineffective ²⁰
Burgess et al ²¹	No	Yes	Yes	Yes	Yes	Yes	Effective ⁶⁰
Albada et al ²²	Yes	Partially	Yes	Yes	Yes	No	Ineffective ⁶²
Vernon et al ²³	No	Partially	Partially	Yes	Yes	No	Ineffective ²³
Byrd et al ²⁴	Yes	Yes	Yes	Yes	Yes	No	Effective ⁶⁴
Scarinci et al ²⁵	No	Yes	Yes	Yes	Yes	No	Not evaluated
Munir et al ²⁶	Partially	Partially	Yes	Yes	Yes	No	Not evaluated
Van Bruinessen et al ²⁷	Yes	Partially	Partially	Partially	Yes	No	Ineffective ⁶⁶
McEwen et al ^{28,29}	Yes	Yes	Yes	Yes	Yes	Partially	In progress
Willems et al ³⁰	No	Yes	Yes	Partially	Yes	No	Effective ⁷⁰
Désiron et al ³¹	No	Yes	Yes	Partially	Yes	Yes	In progress
Smith et al ³²	Yes	No	No	Yes	Yes	No	In progress
Van Dulmen et al ³³	No	No	No	Partially	Yes	No	In progress
Overall fidelity assessment at each step							
Yes	6	7	10	10	15	4	
No	7	2	3	0	0	10	
Partial	2	6	2	5	0	1	

and determined the effectiveness of their intervention.¹⁹ However, the requirements of participatory research were emphasized by other authors who wondered about the way to work with patients²⁷ or recommended that participants be paid for their work.²⁴ The modest number of reported participatory planning groups might be explained by its requirements in terms of time, money, and commitment. However, the authors of successful interventions emphasized their importance in the success of the endeavour.

4.3 | Logic models, theoretical issues, and change methods

The logic model of the problem was not frequently reported, which may partially be explained by its secondary importance in the first

version of the IM protocol,¹⁰ whereas it has been identified as a key task in its latest versions.^{11,74} This evolution underlies the necessity to integrate the results of the needs assessment into a global picture where the root and intermediate determinants of the problem are linked by means of relevant theories. However, this integration was rarely found in the studies, even when they reported a logic model of the problem. Although logic models of change were reported in most studies, the process followed by the authors to achieve them was not explicit.

The authors infrequently explained their motivation to select one theory among those available; the theories seemed mostly taken “off the shelf” irrespectively of the IM step and possibly according to the authors' knowledge of available theories. This result is in accordance with the findings of a recent study

TABLE 4 Use of theories at different steps of the development process of interventions

Intervention Author	Step 1 Needs Assessment/Logic Model of the Problem	Step 2 Logic Model of Change	Step 3 Theories Underlying Behaviour Change Methods
Hou ¹⁸	Not reported	HBM TPB TTM	HBM Public communication SCT
Fernandez ¹⁹	HBM SCT TPB TTM	HBM TPB SCT	SCT
Vernon ²⁰	Not reported	Not reported	HBM SCT TPB TTM
Burgess ²¹	SCT SRT TPB Implementation intentions	Not reported	SCT SRT TPB Implementation intentions
Albada ²²	Not reported	Not reported	Elaboration Likelihood model
Vernon ²³	Not reported	TTM	TTM Processes of change from Michie et al, Mevissen et al, and Subs et al
Byrd ²⁴	HBM SCT TPB TTM	Not reported	Not reported
Scarinci ²⁵	HBM PEN-3	HBM PEN-3	HBM PEN-3
Munir ²⁶	Not reported	SCT TBP	Empowerment SCT Theories of learning TPB TTM
Van Bruinessen ²⁷	Not reported	Not reported	Not reported
McEwen ^{28,29}	Not reported	Not reported	SCT
Willems ³⁰	Not reported	Not reported	Not done yet
Désiron ³¹	MOHO ICF	Not reported	MOHO
Smith ³²	Not reported	Not reported	HBM TPB
Van Dulmen ³³	Not reported	Not reported	Not reported

Abbreviations: HBM, health belief model; ICF, International Classification on Functioning, Disability and Health; MOHO, model of human occupation; PEN-3, perceptions enablers nurturers; SCT, social cognitive theory; SRT, self-regulation theory; TPB, theory of planned behaviour; TTM, transtheoretical model.

reviewing the use of the IM protocol (3 first steps) to enhance health care professional practice.⁷⁵ For example, Vernon et al²³ linked the lack of impact of their intervention to the fact that the TTM they chose a priori was possibly not the most useful theoretical framework. It is worth mentioning the preponderance of health psychology theories focusing at the individual level of the patients (TPB, TTM, and HBM) and to a lesser extent at the interpersonal level (SCT), which is congruent with the results of Durks et al⁷⁵ who identified a majority of interventions using the TPB and SCT. As useful as these theories are, they are obviously insufficient to account for the many social, cultural, and political factors that shape the behaviours of individuals in their environment. Environmental theories were missing in the interventions included in this review, as were theories focusing at the individual level of the environmental agents.

Regarding step 3, the differences between underlying theories, change methods, and practical applications (or strategies) were

hard to disentangle in the published studies. Some authors chose behaviour change methods without specifying their theoretical background.^{24,27,30,33} It is worth mentioning that the TPB and the HBM are theories of behavioural determinants. As such, they only indicate what determinants should be changed without indications about which change methods should be used. Furthermore, the parameters for effectiveness of behaviour change methods⁷⁶ were never discussed. It has been emphasized that the respect of such parameters is crucial for the change methods to produce their effects.^{76,77} Conversely, the absence of their consideration could contribute to the theory failure of the intervention and its lack of effect.

4.4 | The issue of the environment

Most of the included studies had no action directed to change either the determinants or the behaviours of agents in the environment.

Theories focused at the individual level and other theories potentially relevant at the environmental level⁷⁸ were not used. This finding was unexpected given the emphasis on the ecological approach in the IM protocol and the importance of both the social and physical environment in many cancer issues. Durks et al⁷⁵ presented similar results. This shortcoming could be linked to the nonecological definition or to the lack of a logic model of the problem.^{11,12} As an example, Vernon et al²³ linked the failure of their intervention to health care system barriers not addressed in the intervention.

Conversely, cancer screening interventions that were able to take their environment into account proved effective. Barriers in the environment were addressed by the interventions, thanks to the presence of stakeholders in the planning committee who guaranteed the ecological view of the problems and helped to find solutions.^{11,12,18}

4.5 | Strengths and limitations of the IM protocol in the field of cancer

The IM protocol was acknowledged as helpful to face the challenges of intervention development and implementation in cancer.¹⁹ It improved collaboration among planning partners, guided the researchers in applying theory and empirical evidence, and guided the implementation process. The careful use of each step of the IM protocol in the development of complex interventions allows building their mechanisms of action. It opens the “black box” that limits the interpretation of the (lack of) effects of randomized controlled trials. The observance of community-based participatory principles by the planning committee helped the acceptability of the intervention in the community.²⁴ It allowed the construction of culturally relevant interventions (such as linguistic adaptations in Spanish¹⁹ and integrating patients' preferences about the gender of the care provider¹⁸) that were effective to reduce social disparities. The adoption of an ecological perspective allows reaching the determinants of behaviours beyond the individuals and situated in their environment. For instance, the access to screening services could be expanded through changes in the clinic environment such as increased referral by providers and enhanced clinic resources to provide low-cost screening services.¹⁹ When the intervention proves ineffective, the IM protocol allows evaluating more accurately intermediary outcome to decipher which parts of the intervention contributed (or not) to its effects. As an example, Willems et al⁷² showed the contribution of “personal control” and the unexpected lack of effects of “problem-solving skills” as mechanisms of action of their intervention.

All the authors mentioned some constraints encountered while using the IM protocol, namely, time investment, sustained funding, community involvement, and multidisciplinary skills of the research team including behavioural science expertise.^{19,25,26} However, these constraints are not specific to the IM protocol; rather, they are associated with the specific requirements of complex interventions.⁴ Future users of the IM protocol should be aware of and anticipate these difficulties commonly reported.

4.6 | Strength and limitations of the review

Several limitations of this review must be acknowledged. The literature search was restricted to the main databases and may have missed unpublished studies. The search for publications related to the interventions was not exhaustive. Furthermore, because of the absence of a validated quality assessment form to evaluate the studies using the IM protocol, we had to develop and test our own with a large sample of items.

The complexity of IM terminology, the evolutions of the IM protocol with time, and the variety of interventions led to include heterogeneous interventions, the assessment of which was difficult to standardize. In case of incomplete information in the articles, we adopted an inclusive approach and assessed the items of the checklist as partial. However, nonreporting of IM steps does not necessarily mean that were not used by the authors; there may not have been enough space to provide all the details. This may particularly be the case for information about step 5 that was not developed enough to perform a fidelity assessment of the implementation phase. Furthermore, the link between fidelity to the IM protocol and the effectiveness of the interventions is not straightforward and may depend on evaluation design considerations, not covered by this review. A more general limitation was that the different interventions could not be compared because of their heterogeneity regarding their population, objectives, and content.

The first strength of this review pertains to its innovative nature. To the best of our knowledge, it is the first study to review cancer interventions developed with the IM protocol. Systematic efforts were made to identify not only the primary studies describing the development of interventions but also the companion publications pertaining to their implementation and evaluation. The review process followed a structured methodology to extract the data and compare the results of the 2 reviewers blinded to one another, and disagreements and questions were all resolved. Furthermore, for this review, an innovative data extraction form was developed and which may be used by other authors.

4.7 | Clinical implications

Stakeholders and researchers should be aware that the IM protocol is not a magic panacea to prevent theory and/or implementation failures of interventions in the field of cancer. The results of the review suggest that the careful use of each step of the IM protocol is an asset to overcome the complexity of intervention development, implementation, and evaluation. It could improve its chance of effectiveness at the end of the process. The participative planning group requires a special attention and sufficient resources to make the relevant stakeholders contribute on a partnership basis. A better integration of the environment in the problems analysis and solutions is also required. A careful use of the protocol is an asset to develop complex interventions in cancer, such as screening in specific subgroups, reduce social health disparities, and face the challenges of cancer survivorship.

4.8 | Recommendations for future research

The use of relevant theories should be expanded beyond the hegemony of cognitive and social psychology. Theories in occupational

psychology, sociology, political sciences, and management, among other disciplines, are likely to improve the conceptualization of both problems and solutions. Research projects around the implementation phase (step 5) are lacking in the literature. They are warranted to better understand this specific step. The extraction grid developed in this review proved useful to answer the research question. Its criteria could be validated by experts of the IM protocol by means of consensus to improve its validity. This would allow other reviews and meta-synthesis to be conducted so as to improve the IM protocol and its use. Last, a systematic review of the effectiveness of cancer interventions developed with the IM protocol compared with interventions developed with other protocols would bring important information regarding its relative advantages.

5 | CONCLUSION

The IM protocol was used successfully to develop culturally relevant interventions in the field of cancer that proved effective to reduce social disparities. Overall, the careful use of each step of the IM protocol appears relevant to address successfully development and implementation challenges of complex interventions in the field of cancer.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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SUPPORTING INFORMATION

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