

The PRECEDE–PROCEED model as a tool in Public Health screening: a systematic review

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Abstract

Objective. The aim of this systematic review was to summarize the scientific literature concerning the use of the Precede-Proceed model (PPM) applied to educational programs and health screenings contexts.

Study design. Systematic review

Methods. The search process was based on a selection of publications listed in Medline and Scopus. The keywords used were “Precede-Proceed” AND (“screening” OR “educational programs”). Studies included in the systematic review were subdivided into those applying the model in a screening context, and those applying it within educational programs.

Results. Twenty-seven studies were retrieved, mostly performed in the USA and, generally, the promoting center was the University. In the context of cancer screening, the PPM model was most of all applied to Mammography Screening (5 of 13 studies in cancer screening), and Cervical Cancer Screening (5 of 13). Another three studies within the cancer field investigated Menopause-Inducing Cancer Treatments, Oral cancer prevention, and cancer screening in general. In the remaining studies, the model was applied in various screening areas, particularly chronic and degenerative diseases. There were many different study designs, most of which cross-sectional (8), though several RTCs (8) and focus groups (5) were also found. For the cross-sectional studies the methodological quality varied between 3/10 and 9/10, whilst for the RCTs it ranged from 2/5 to 3/5.

Conclusion. The PPM provides an excellent framework for health intervention programs especially in screening contexts, and could improve the understanding of the relationship between variables such as knowledge and screening. Given the complexity of a behavioral change process, certain important predisposing factors could be measured in future studies, and during health intervention planning. *Clin Ter 2020; 171 (2):e167-177. doi: 10.7417/CT.2020.2208*

Key words: Precede-Proceed framework, model, screening, prevention, health

Introduction

Green and Kreuter introduced in the 1970s the Precede-Proceed model (PPM), an evaluation tool used for the analysis of determining factors which underpin behavior modifications relevant for improving the health status over time (1). For these reasons, this framework represents a functional guide in Public Health.

Precede-Proceed model goes through deductive reasoning, working backward from the expected outcome. Environment, behavior, individual motivation, or administrative policy are analyzed to create healthy state¹.

“Precede” (Predisposing Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation), an acronym that is a good summary of the enabling, predisposing and reinforcing factors able to change a behavior, aims to make the appropriateness of the program to the needs of the populations. In 1991, Proceed (Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development) was added to the framework. This phase is characterized by 4 steps regarding performance, realization and evaluations of the intervention and the impact of the intervention on the behavioral determinants. Furthermore, it is important to acknowledge the role played by environmental factors as determinants of health and health behaviors (2). It is important to remember how in the Precede-Proceed planning model, theory has an essential role in creating a planning framework that guides construction of an intervention and its evaluation (3).

So the PPM is a multidimensional model that takes into account multiple factors that “shape health status and help the planner arrive at a highly focused subset of those factors as targets for intervention” (4).

Utilization of public health approaches allows clinicians to work in harmony with current trends in healthcare that place greater focus on prevention efforts. When a problem

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affecting a particular set is highlighted, health professionals can use this framework to promote and encourage target intervention and guide the development of solutions.

The model starts from the assumption that if a health promotion intervention is to be functional, the population has to have an active role and indicate which factors hamper the efficacy of planned interventions (2). Regarding this, it was interesting to try to apply this model within screenings programs. When planning prevention programs, it is fundamental to analyze the socio-demographic and psychological characteristics that influence and determine health behavior and quality of life, and not just the consistency and adequacy of the objectives, or the intervention efficacy (5). These factors need to be considered before the implementation of any intervention, with the contribution of several disciplines, such as social marketing, epidemiology, psychology, medical sociology and public health.

Objective of the study

to conduct a systematic review of studies that have implemented the Precede-Proceed model either in screening or educational programs, especially related to cancer.

Methods

Search strategy

In February 2019 MEDLINE and Scopus databases were consulted for studies which had applied or discussed the Precede-Proceed model. All study designs were considered. There was no restriction concerning date of publication. The strategy for the search was limited to humans, and to English and Italian languages. The search was based upon the following index terms in the title or abstract: “Precede-Proceed” AND (“screening” OR “educational programs”).

The method followed the PRISMA Statement (6).

Inclusion and exclusion criteria

All type of designs were included: experimental, observational, reviews, focus groups and other studies. Publications that did not meet the inclusion criteria of having applied the PPM within educational and preventive programs or in screenings were excluded.

Data extraction and analysis

The study screening process was subdivided into titles and abstracts which were initially screened prior to a full-text assessment. This was performed by two independent researchers in parallel with each database. All disagreements between the researchers were solved after consultation with the review coordinator. Only when an agreement concerning a paper was reached was it passed to the next step. The complete texts of all selected studies, according to title and abstract, were obtained through libraries. For each full-text paper, information was extracted according to general information (authors, year, study title), study characteristics

(study design, country, type of screening or educational/preventive etc). To evaluate the quality of the study, the Newcastle-Ottawa Scale (7) was used for observational study designs, the Jadad scale for RCT studies (8), and the Amstar (9) and Insa tool (10) respectively for Systematic and Narrative reviews.

Results

A total of 27 studies were included (Figure 1). The main target population was adults, and only one study considered adolescents. Most of the trials were performed in America and, generally speaking, the promoting center was the university. In Europe no studies seemed to have focused specifically on the use of the Precede-Proceed model within public health programs.

Twelve studies implemented the Precede-Proceed model in a screening scenario. The model combines social factors and health belief model constructs, which are important factors to consider when planning screening programs. In the context of cancer screening, the PPM model was most of all applied to Mammography Screening (5 of 13 studies in cancer screening) and Cervical Cancer Screening (5 of 13). Another three studies within the cancer field investigated Menopause-Inducing Cancer Treatments, Oral cancer prevention, and cancer screening in general.

Eleven other studies had used the model in disparate screening areas, and some even in behavioral intervention programs. The Precede-Proceed model was used particularly in the area of chronic and degenerative diseases. For example in the trial “The effect of a community-based self-help intervention in Korean Americans with type 2 diabetes”, the Precede-Proceed model was used as the conceptual framework for a behavioral intervention program for diabetes management in the Korean American community. “The Cardio-metabolic health of Chinese older adults with diabetes living in Beijing, China” (29) examined the presence of metabolic syndrome and modifiable cardiovascular disease (CVD) risk factors associated with metabolic syndrome among Chinese adults with diabetes. For details see Table 1.

Most of the studies, especially in the oncologic screening fields, considered the PPM as a valid tool.

Among the studies carried out within an oncologic screening setting, Taylor et al. 1994 demonstrated, with the PPM used as a conceptual framework for considering individual physician behavior, that physicians practicing in medium-sized cities are willing to be active in community disease prevention programs (11).

Concerning minority and low-income women, Ahmed NU et al. 2004, by structuring focus groups around constructs from the Precede-Proceed Model, found that women underutilizing mammography overcome barriers thanks to some personal factors, such as awareness and knowledge of risk factors (age and family history); knowledge and trust in early detection and treatment processes; personal responsibility about ones’ own health and well-being; and self pride and satisfaction with ones’ own actions (12).

Kratzke C et al. 2010 attempted to assess factors that influence mammography use among volunteer communi-

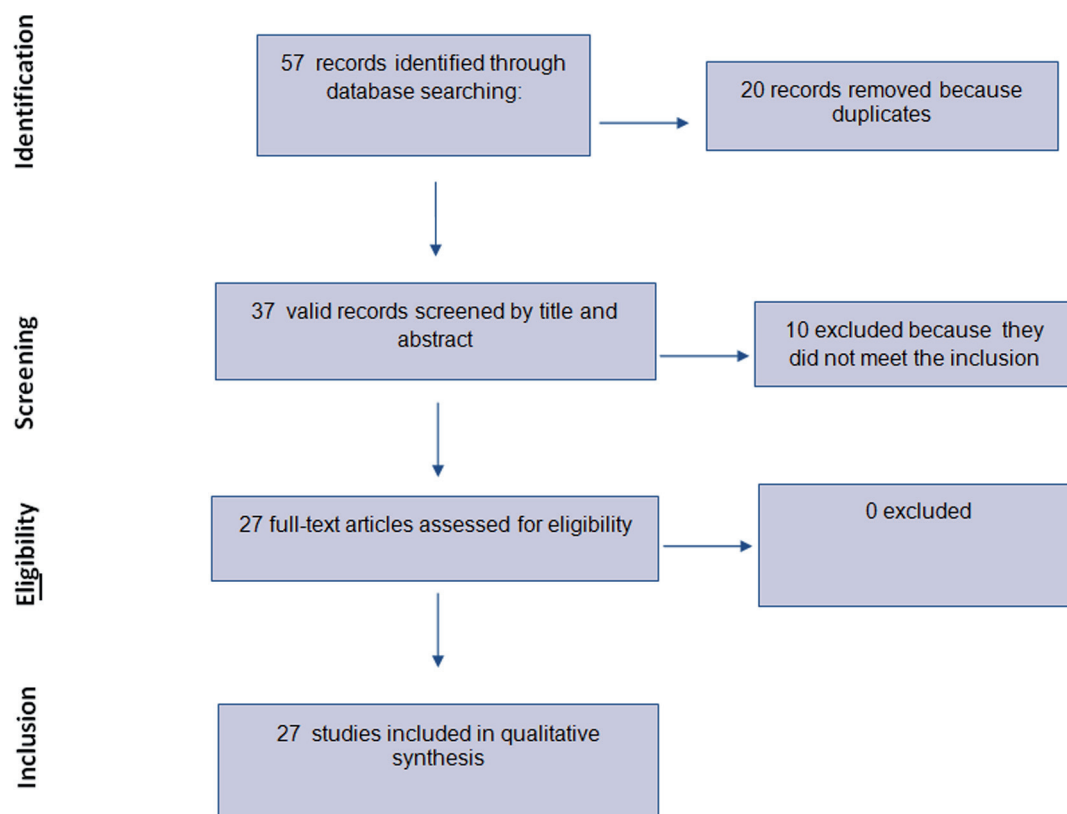


Fig. 1. PRISMA Flow-diagram

ty health workers (CHWs). Data trends indicated lower mammography rates among minority and low-income women. Using a cross-sectional study design, data were collected via a mailed survey. The dependent variable was mammography use within the past 2 years. The independent variables were categorized according to factors outlined by the PPM - Predisposing factors, Enabling factors, Reinforcing factors. The sample included 90% African American and 8% White women. CHW training focused on how to identify and address barriers to increase the likelihood of mammography use among CHWs (13).

Schoueri-Mychasiw et al. 2013 examined whether mammogram screening interventions in Canada (and other countries with comparable health-care systems) have addressed the needs of immigrant and minority women. The PPM was used to guide a critical synthesis of the reviewed interventions as well as suggest recommendations for the future. The authors concluded that it is essential to develop and implement programs to overcome the barriers unique to screening mammography if the goal is to increase participation among immigrants and minority women (14).

Hatcher, et al. 2011 with the PPM as a guide, examined factors related to obtaining Pap tests, using cross-sectional data. In multiple logistic regression analyses, several factors increased those odds, including the belief that cervical cancer

has symptoms, and whether a regular source of medical care was available (15).

Hayes Constant, et al. 2014 identified factors that influence Peruvian women's decisions to seek a clinical breast examination. Anthropological approaches incorporating the Precede-Proceed public health model guided the conversations between providers and women living in the region during the pilot intervention. Grounded theory analysis helped the authors uncover a central theme of uncertainty, a state of doubt and insecurity that created a sense of impotent worry and impeded clinical health-seeking behaviors (16).

Also regarding Pap tests, a study was conducted by Soto, et al. 2018 among 6 focus groups with 27 Chilean women aged between 25 and 64 years, and 3 focus groups with 11 Chilean health professionals. They were interviewed about their use of cell phones and about barriers and facilitators to an SMS text message intervention to encourage Pap test adherence. The PRECEDE-PROCEED model was used to determine factors that could serve as predisposers, facilitators or reinforcers of SMS text messaging as a tool to improve Pap test adherence. Results show that Chilean women were mostly favorable towards the idea of using this technology for cervical cancer prevention, preferring short SMS text messages than longer ones. However, differences in mobile phone use and preferred tone of messages were

TABLE 1 – The use of the Precede-Proceed model in the included studies

Author and year of publication and title	Study Design/ Type of publication	Country	Type of screening	Center	Population considered	Quality of the study	Screening setting	Healthcare behavior	Tackling barriers	Minority issue	Developing programs
Taylor, V. M. et al. 1994	Cross-sectional	Washington State, USA	Breast cancer screening	Washington Community Breast Cancer Screening Project	primary care physicians, and medical office staff	5/10 N	oncologic				
Ahmed NU, et al. 2004;	Focus groups	Tennessee	Mammography	<i>Departments of Internal Medicine and Medical Education</i>	general population (women)	NA	oncologic		X		
Kratzke C et al. 2010;	Cross sectional	USA	Mammography	Department of Health Science, New School of Nursing; Department of Urban Studies and Public Administration	Volunteer community health workers (CHWs).	9/10 N	oncologic		X	X	
Schoueri-Mychasiw, et al. 2013;	Systematic review	Canada	Mammography	-School of Public Health & Health Systems -Propel Centre for Population Health Impact, -Canadian Partnership Against Cancer	immigrant and/or minority women.	2/11 A	oncologic	X			
Hayes Constant, et al. 2014	Focus group	Perù	Breast cancer screening	Department of anthropology	-Women (30 participants in three focus group) -11 Ministry of Health	NA	oncologic		X		
T.G. Hislop, et al. 2015	Focus groups and qualitative interviews	Canada	Pap test	-Cancer Control Research Program, BC Cancer Agency - Direction de la Santé Publique and others	51 Chinese women in British Columbia between the ages of 20 and 79 years	NA	oncologic	X	X		
Hatcher, et al. 2011;	Cross sectional	Kentucky	Cervical Cancer Screening	College of Nursing, University of Kentucky	Appalachian Kentucky women	7/10 N	oncologic		X		
Studs, C.R. at al. 2013	RCT	Region of the Appalachia	Cervical cancer screening	Appalachian women between the ages of 40-64	n. 345 Appalachian women aged 40-64, years	3/5 J	oncologic		X		
Tarasenko, Y.N. at al. 2011	RCT	United States	Cervical cancer screening	Institutional Review Board at the University of Kentucky	general internists and family practitioners	3/5 J	oncologic	X	X		

following table

Soto, M, Martinez-Gutierrez, J. Momany, M. Capurro, D. Ciampi Spode, F. Cea, E. Mergudich, T. Puschel, K.	Focus groups and qualitative interview	Chile	Cervical cancer screening	Universidad Católica de Chile	Women 25-64 years old nonadherent to cervical cancer screening guidelines	NA	oncologic	X	X	X
Lengerich, E.J. et al. 2007	Cross-sectional	Region of the Appalachia	colorectal cancer screening	Appalachia Cancer Network, Community Cancer Network, and the Penn State Cancer Institute and others	Survivors in rural communities, including Appalachia.	8/10 N	oncologic	X	X	
McCarthy et al. 2012	Qualitative interview	Australia	cancer treatment-induced menopause	School of Nursing	85 younger women previously treated for cancer.	NA	oncologic	X		
Cannick GF et al. 2007	Trial-type	South Carolina	Oral cancer prevention	National Institute of Dental and craniofacial research	Health professional students	2/5 J	oncologic	X		
Anastasia Antoniadis, et al. 1997	Epidemiologic considerations	Prussia	General Prevention planning/ Early Intervention	Early Intervention Technical Assistance, Prussia, Pennsylvania	General population and sub-populations.	NA	other	X		
Mirtz, T.A. et al. 2005	Retrospective study	Midwest USA	Idiopathic scoliosis	Department of Health Sport and Exercise Science, University of Kansas	School age population	4/10 N	other	X	X	
Cole, Renee E. et al. , 2009	Cross-sectional	New York. USA	Intuitive Eating Non-dieting Approach to Weight Management Pilot Program	Recruitment at Fort Drum Army Installation, New York, summer 2004.	Ninety-one military-health beneficiaries (20-65 years old)	4/10 N	other	X		
Hu, J. et al. 2009	Cross-sectional	Beijing, China	Cardiometabolic health and diabetes	Chinese adults with diabetes living in Beijing, China	Adults with self-reported type 2 diabetes .50 years or older	4/5N	other	X		
Smith, P.H. et al. 1998	Cross-sectional	United States	Frequency and Correlates of Intimate Partner Violence	Major university teaching hospital in the Southeast	Battered women.	4/10 N	other	X		

following table

Chen, C.-C. et al. 2014	Cross-sectional	New York USA.	Public health programs (NCDs)	New York Medical College USA Rutgers University, the State University of New Jersey.	A nationally representative telephone survey of U.S. adults (aged 18 or older)	3/10 N	other	X		
Colodny et al. 2014	Longitudinal research design.	USA	Oral care program	John's University, Communication Sciences and Disorders	Participants included speech language pathology (SLP) graduate students, children, auxiliary nurses, trained-nurses and others	3/10 N	other	X		
Miyong T. Kim et al. 2015	RCT with wait-list comparison	Korea	Diabetes management	School of Nursing, University of Texas, Korea, San Francisco California; Boston College, University, Baltimore,	250 Korean Americans with type 2 diabetes	2/5 J	other	X		
Barasheh, N., Shakerimejad, G., Nounjah, S., & Haghizadeh, M. H.	RCT	Iran	Diabetes management	Ahvaz Medical Sciences University	110 women with type 2 diabetes	3/5 J	other			
Pournaghash-Tehrani, S. et al. 2014	RCT	Tehran	Coronary artery bypass graft (CABG)	Department of Psychology and Education, University of Tehran, Tehran, Iran and Cardiac Rehabilitation	Five hundred eighty-five CABG patients(59.3±7.1 years old)	3/5 J	other	X		
Chiang, Li-Chi et al. 2004	RCT	Taiwan	Asthma Educational Program	Children hospital in northern Taiwan	Parents with asthmatic children (aged 3-14 years) in the children hospital in northern Taiwan	3/5 J	other	X		
Yeo M, et al. 2007	Comprehensive review of the literature	Canada	Early psychosis public education program including psychotic disorders	Psychosis Research Unit, Department of Psychiatry,	Youth and young adults ages 15-30 years and their parents	5/7 IT	other	X		

following table

Pennington, P.M., Juárez, J.G., Arrivillaga, M.R., De Urioste-Stone, S.M., Doktor, K., Bryan, J.P., Escobar, C.Y. & Córdón-Rosales, C.	mixed methods	Guatemala	Congenital transmission of Chagas disease	Universidad del Valle de Guatemala; Ministry of Health of Guatemala	General population (women), healthcare professionals	NA	other				x
Moshki M, Mohamadzadeh F, Dehnoalian A, 2018	RCT	Iran	self-efficacy and self-acceptance of menopausal women	Gonabad University of Medical Sciences	Menopausal women from the northeast of Iran	3/5 J	other				

Legend: NA= Not appropriate; N= Newcastle scale; J= Jadad scale; A= Amstar scale; IN= Insa tool scale

identified according to participants' age, which suggests that a variety of message types should be used to reach a persuasive communication (17).

Another study was conducted by Hislop, et al. 2015 among Chinese women (n=512) aged between 20-79 years and residing in Greater Vancouver. They were interviewed about Pap testing, health care, traditional health beliefs, acculturation and socio-demographic characteristics. Predisposing, enabling and reinforcing factors associated with ever having undergone a Pap test, or having had a recent Pap test (in the 2 years prior to the study) were assessed using the Precede-Proceed model. Results underlined that continuing education about Pap testing is recommended for physicians serving under-screened Chinese women. Culturally and linguistically appropriate educational materials are needed for the Chinese community (18).

Lengerich, E.J. et al. 2007 used community-based participatory research and the Precede-Proceed model to train teams from rural cancer coalitions and hospitals in Pennsylvania and New York. Teams identified perceived barriers and community assets. All teams planned to increase awareness of community assets, and almost all planned to enhance treatment-related care and psychosocial care for colorectal cancer (CRC) survivors. In fact, 50% planned to enhance primary care and CRC screening (19).

Cannick GF et al. 2007 used the Precede-Proceed model to design a randomized pretest and post-test study of oral cancer (OC) prevention and detection skills in dental students. OC knowledge, opinions, and competencies were evaluated. Second-year students, in the intervention group, were more competent than those in the control group. The novel use of Precede-Proceed sets a precedent for designing a standardized OC curriculum for a wide range of health profession disciplines (20).

Studs, C.R. et al. 2013, analyzing cervical cancer rates, examined data from a community-based randomized controlled trial, in order to identify barriers to cervical cancer screening (21). Consistent with the Precede/Proceed framework, participants identified barriers that included predisposing, enabling, and reinforcing factors. The intervention based on the PP model was associated with increased cervical cancer screening. Tarasenko et al. 2011²¹, referring to primary care physicians, wanted to assess the degree of consensus between patients' perceived and actual colorectal cancer screening, decision-making and influential factors. During 2004-2006, 30 patients were interviewed with the aim of identifying factors influencing screening decisions, and 66 physicians were interviewed to establish what factors they thought were important to patients. The factors were categorized using the Precede-Proceed framework, and perspectives were compared (22).

In fact, while patient barriers to CRC screening were identified, how well this knowledge is utilized during the patient-physician interaction is not fully understood.

McCarthy, et al. 2012 investigated the health behaviors of younger women with cancer treatment-induced menopause in one health jurisdiction in Australia, and guided by the Precede-Proceed framework. Several predisposing, enabling and reinforcing factors that influenced participants' will or abilities to engage in health-promoting behaviors after cancer treatment were identified in the interviews. These

included entrenched pre-cancer diagnosis health behaviors, the disabilities resulting from cancer treatments, perceptions of risk, focused intervention by health professionals and the nature of participants' social support (23).

Among the studies focusing on screening settings other than oncologic ones, Anastasia Antoniadis, et al. in 1997 examined the determinants of communication disorders that are preventable within the general population or within sub-populations (24).

"Old" epidemiologic theory, based on populations, blends with the "new" epidemiologic approach emphasizing the contribution of individual behaviors to adverse health outcomes, to provide the working clinician with a framework from which to determine the direction that prevention efforts must take. The Precede-Proceed model of program planning and evaluation is utilized in public health and has the potential to be used by clinicians in preventing communication disorders. Its Application to communication disorders is offered as an example of prevention planning.

Mirtz, T.A. et al. 2005 wanted to study adolescent idiopathic scoliosis (AIS) in a school age population, using the PP model and its relevance for community, school, and clinical health promotion. The PP model was a useful tool for a comprehensive study of this particular health concern. That research showed where gaps in AIS research exist, suggesting that there may be problems in the implementation of school screening (25).

Cole Renee E. et al., 2009 described the use of a consolidated version of the Precede-Proceed participatory program planning model to collaboratively design an intuitive eating program with Fort Drum military spouses, tailored to their readiness to reject the dieting mentality and make healthful lifestyle modifications. A consolidated version of Precede-Proceed efficiently guided participatory planning to tailor this program (26).

Hu, J. et al. 2009 using the Precede-Proceed model, examined the presence of metabolic syndrome, and modifiable cardiovascular disease (CVD) risk factors associated with metabolic syndrome, among Chinese adults with diabetes living in Beijing, China. The association between predisposing and enabling factors, and health behavior with the metabolic syndrome, needs to be further explored. Persons with diabetes should have regular health screenings to check for blood pressure, BMI, cholesterol, glucose, and triglycerides in order to decrease the risks associated with metabolic syndrome and CVD (27).

Smith, P.H. et al. 1998 used the Precede-Proceed model of behavior change as a guide to investigating baseline factors associated with clinician screening behaviors prior to its implementation. Perceived competence, a composite measure of self-efficacy around specific clinically relevant behaviors, emerged as the primary predictor of all behaviors - in addition, the belief that clinicians should screen all women as part of a routine case history or physical examination emerged as a predictor for routine screening (28).

Chen, Y. et al. 2015 described a national random controlled school-based obesity intervention program developed in mainland China involving more than 70,000 children and adolescents aged 7-18 years from 7 provinces in China. The multi-component, school-based, and family-involved scheme was conducted within the intervention group for 9

months, while students in the control group followed their usual health practices. The intervention consisted of four components: a) the Creation of supportive school and family environment, b) Health lifestyle education and related compulsory physical activities, c) Instruction and promotion of physical education at school, d) Self-monitoring of obesity related behaviors. Four types of outcomes including anthropometric, behavioral, blood chemical and physical fitness, were measured to assess the effectiveness of the intervention program. The intervention was based on the Social Cognitive Theory and Social-Ecological Model of Health, and followed a stepwise approach guided by the Precede-Proceed Model and Intervention Map. The results of (and lesson learned from) this study will help guide future school-based national childhood obesity prevention programs in Mainland China (29).

The purpose of the study carried out by Colodny et al. 2014 was to evaluate a long-term on-going international academic service-learning (I-ASL) intervention. Its goal was to improve swallowing, feeding and the oral care techniques of medical staff operating in an orphanage in Guatemala and improving how they deal with children who are medically complex and have special needs.

The Precede-Proceed model was used as the conceptual framework of the program. Five major target areas were identified during the diagnosis, assessment, implementation and evaluation phases of the model. A five-day intervention designed to increase feeders' knowledge of feeding and oral care techniques, signs symptoms and complications of dysphagia, and to improve positioning. Statistical analyses showed significant increases in knowledge of appropriate feeding, positioning and oral care techniques (30).

The purpose of the study carried out by Miyong T. Kim et al. 2015 was to test the effectiveness of a community-based, culturally tailored, multimodal behavioral intervention program in an ethnic/linguistic minority group with type 2 diabetes. An RCT, with waitlist comparison based on the Precede-Proceed and self-help models, was designed. The intervention group showed statistically significant improvement in diabetes-related self-efficacy and quality of life when compared to the control group (31).

The study conducted by Pournaghash-Tehrani, S. et al. 2014 attempted to examine the status of ED following a PPM-based educational intervention program in coronary artery bypass graft (CABG) patients. The results of this study showed that the implementation of the intervention program following surgery not only significantly decreased ED but enhanced the QoL. Thus, the utilization of educational intervention programs after CABG operations is recommended (32).

The study published by Chiang, Li-Chi et al. 2004 was conducted to evaluate the comparative effectiveness of two different asthma educational programs. One was an asthma self management education based on the Precede Proceed model to change the influential factors that had emerged from a previous need assessment study in Taiwan. The other consisted of regular outpatient asthma education. The trend indicated that educational effects were sustained for at least 3 months, and some even for 6 months (33).

The study carried out by Yeo M, et al. 2007 described the use of the Precede component of Precede-Proceed model

as a conceptual framework in the development of an early psychosis public education program objective designed to meet the learning needs of the target population (in this case youth and young adults aged 15-30 years and their parents). The Precede framework provided a strong conceptual model in the planning of that program (34).

The purpose of the study carried out by Moshki M et al. 2017 was to test the effectiveness of a group-based educational training on the self-efficacy and self-acceptance of Iranian menopausal women using the PRECEDE-PROCEED model. Eighty menopausal women aged between 47-55 years residing in the northeast of Iran were included, divided in test and control group. The intervention group showed significantly increased knowledge regarding menopause, which was considered an enabling factor, and also increased self-efficacy and self-acceptance (35).

The study published by Barasheh, N. et al. 2017 evaluated the efficacy of an educational program based on the precede-proceed model in training type 2 diabetic patients and improving their predisposing, reinforcing and enabling factors and also their self-care behaviors. After the intervention, improvements in all the variables (knowledge, attitudes, self-efficacy, enabling factors, reinforcing factors, self-care behaviors) were found in the intervention group compared to the control group (36).

Pennington, P.M et al. 2017 aimed to develop and implement a community process for the surveillance of congenital Chagas disease in rural communities of Guatemala, and for that used the PRECEDE-PROCEED planning model. The strategy developed included promotional and educational material based on sociocultural data previously collected, and was made in collaboration with midwives, nurses and nongovernmental organizations. Before the intervention, no neonatal screening had been performed, and after it, by August 2016, seven of eight newborns of Chagas seropositive women had been parasitologically screened at the Health Center, proving a successful community-based neonatal screening strategy (37).

We also retrieved some different study designs: 5 focus group (all dealing with cancer screening), 1 retrospective study (of other screening type i.e. non cancer), 8 cross-sectional studies (4 dealing with cancer screening and 4 other screening studies), 1 longitudinal study (no cancer screening type), 8 RTC (3 on cancer screening and 5 of other screening types), 1 Narrative review (of other screening types), 1 SR (of cancer screening type) and two different types of publication: 1 editorial including epidemiological consideration (dealing with other screening types), and the other one concerning a mixed method for preventing Chagas disease.

Concerning the quality of the studies, this varied among different study designs: In cancer screening cross-sectional studies it varied between moderate and high - from 5/10- to 9/10-. whilst in studies dealing with "other" types of screening it was lower - between 3/10 to 4/10 -; In relation to the RCT studies, the quality of these was similar between cancer screening studies and other types of screening, resulting between 2/5 and 3/5. For the only longitudinal study the quality was judged very low: 3/10 just like the quality was very low for the only systematic review found which was carried out in the cancer screening field (2/11) .

The quality was good (5/7) for the Narrative review (other screening types).

Discussion

Green and Kreuter's PPM for health promotion has been widely used by government and specialist health organizations (e.g. Centres for Disease Control and Prevention (CDC) (1).

The included studies, guided by the PPM, identified a number of predisposing, enabling and reinforcing factors that contribute to poor care and control of various diseases (due to barriers to care related to the patient, the health care provider, and to health system inadequacies) whilst they all suggest to implement screening strategies and programs (38)(39).

As reviewed in the current work, the PPM has served as a successful model in several health fields and has been successfully applied across a range of preventive health promotion programs including early detection initiatives (40)(41).

In various studies, the PPM provided a conceptual framework, bringing together social, epidemiologic, behavioral, environmental, educational, and organizational views on a health problem within a community context. This model allows (and is used) for comprehensive planning within a variety of situations. In fact, the application of the PPM could then be modified for use in planning a prevention program.

A lot of studies have implemented the PPM in the screening field, but the framework covers many other fields. Some studies, in fact, examined the use of the model in several cancer areas, and in the area of chronic and degenerative diseases such as diabetes, or in mental health, or in general community contexts.

It is not surprising that control levels remained suboptimal in some diseases given the high prevalence of unhealthy lifestyle behaviors, social and economic challenges, and healthcare system inadequacies. The patient-related factors predisposing one to poor chronic diseases control (ie, lack of lifestyle-related knowledge) are commonly reported in the studies. Importantly, they are modifiable through culturally appropriate, tailored patient education and treatment strategies that increase patient understanding of the disease and its control. Sometimes, the limited presence of enabling factors was related to a series of healthcare provider and health system inadequacies. Various studies demonstrated that individual health decisions must be supported by enabling and reinforcing factors that help stakeholders to take action for their own health.

This model asserts that predisposing, reinforcing, and enabling factors influence the likelihood that behavioral and environmental change will occur. Predisposing factors are antecedents to behavior that provide the motivation for that behavior. These include individuals' knowledge, attitudes, and beliefs, as well as certain socio-demographic characteristics. Enabling factors are antecedents to behavior that allow the motivation to be transformed into achievement, such as cost, availability of transportation, and other environmental issues. Reinforcing factors are those that follow

a behavior and provide continuing reward or incentive for that behavior. In any of the included studies, individual-level predisposing, enabling, and reinforcing factors were examined as potential predictors of cervical, / breast, and/ colorectal cancer screening status.

Although significant public health resources are now concentrated on strategies that aim to reduce health risks in the general population, some consideration is given to promoting healthy lifestyles in people previously treated for cancer. In fact, cancer survivors do not necessarily adopt these behaviors. A lot of studies focused on this category (19)

Most of the studies included in the review, especially those dealing with oncologic screening, consider the Precede–Proceed model as a valid tool in the planning of effective prevention programs.

The theoretical framework could be useful to provide a better understanding of the relationship between knowledge and screening. Given the complexity of the behavioral change process, certain important predisposing factors -such as attitude, beliefs, risk perception and emotional behaviors - could be measured in future studies. Economic considerations associated with screening programs (e.g. cost of analysis and processing system, property value loss) and strategies to enhance citizen participation in such interventions should be included in future studies.

The Limitation of this review is that there could be a possible publication bias. In addition, the nature of the studies was heterogeneous, and too few studies were available. Different study designs were assessed (RTC, observational and focus groups) and different populations were considered in terms of diseases, characteristics etc. In addition, the overall quality of the included studies was poor.

However, this is the first systematic review literature dealing with the validity of this framework, and the results of the application of the PPM seem encouraging.

Conclusion

The PPM provides an excellent framework for health intervention programs, especially in cancer screening. The model is multidimensional and is founded in social/behavioral science, epidemiology, administration, and education. The systematic use of this framework in a series of clinical trials confirmed the utility and predictive validity of the model as a planning tool and as a participatory model for creating successful community health promotion and other public health interventions, such as, just for making an example, in the dental screening or screening for cystic fibrosis settings (42, 43). Because the model is a comprehensive structure for assessing health needs, for designing, implementing, and evaluating health promotion and other public health programs to meet those needs, all interventions aiming at behavioral change as a tool for preventing diseases, improving health, and increasing the quality of life of some communities should be developed or evaluated using the Precede–Proceed model as a guideline.

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