

## Research Paper

# Practical Steps in Designing Intervention to Increase Childbearing Desires: An Intervention Mapping Approach



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## ABSTRACT

**Background:** Increasing the desire to have children is an important priority of the healthcare systems, which requires targeted planning. This paper describes the development of an intervention program using an intervention mapping approach (IMA) to increase the childbearing desires.

**Methods:** From July to November 2022, the steps of the IMA process were completed. Starting with needs assessment, in this stage, we conducted a literature review, created focus groups, and conducted interviews with local stakeholders; meanwhile, the program objectives and the target audience were determined. Then, the road map for targeted interventions was prepared.

**Results:** The needs assessment completed questionnaires (n=1288), the literature review, 3 focus groups (n=25 participants), in addition to interviews (n=30 participants) indicated that the most effective factors in the parents' childbearing low desires were concern about the future of their children, economic problems, low parenting skills, and low skills to interact with their spouse. According to the PRECEDE-PROCEED model awareness, attitude, and self-efficacy were categorized as determinants at the individual level, perceived subjective norm at the family level, and organizational changes at the social level based on the results of the needs assessment. The findings from each step of the process informed successive steps.

**Conclusion:** The IMA is a control-oriented, systematic, participation-based technique to design and implement targeted and ongoing health promotion programs.

**Keywords:** Design, Intervention, Childbearing, Intervention mapping

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## 1. Introduction

The population and its dimensions are the focal points of any social system. Almost all aspects of human life and the surrounding world are affected by population changes that have many consequences for social, economic, political, and environmental subsystems. Most countries experience reluctance to have children, thereby resulting in declining fertility [1]. The total fertility rate in Iran has decreased to 1.71 children per woman since the previous year. In 2020, the fertility rate dropped to its lowest in recent years. The total fertility rate is the average number of children that a woman can hypothetically have during the childbearing age (15 to 44 years) [2]. There is a concern that fertility will decrease to 0.8 and lead Iran to experience negative growth until 2025 to 2030 [3, 4]. According to research, the population will age but the economic dependency index will increase and governments will be heavily involved in various problems, such as the supply of active labor, the crisis of pension organizations, and the healthcare system if the total fertility rate falls significantly below the replacement level [5]. This requires targeted intervention in different dimensions, including education and cultural development, according to the needs of the society [4, 5]. Classical educational programs common in healthcare systems do not have the desired effects on parents [6, 7]. According to some experts, neglecting the cognitive cause studies and pursuing them without considering the need-based models as a specific conceptual framework in educational planning are among the reasons for the failure of educational programs [7]. Theories and models contribute significantly to the understanding of behavior change mechanisms; therefore, researchers should consider that the use of theory is necessary for a context and the selection and effective use of theories to design, evaluate, and report interventions by combining structures and methods will increase the effectiveness of interventions [8, 9]. Several studies have used this model. The results of Ziapour [10] and Nejhaddadgar [11] have shown that using a targeted approach based on the needs of the audience is effective in changing attitudes and forming behavior. This approach provides a framework to identify behavioral determinants based on the theory and environmental causes of a specific health problem along with guidance to choose the most appropriate methods and applications to address the identified determinants in achieving the alterations in related behavioral and environmental consequences concerning health problems [11]. An intervention mapping approach (IMA) is an iterative process comprising the following

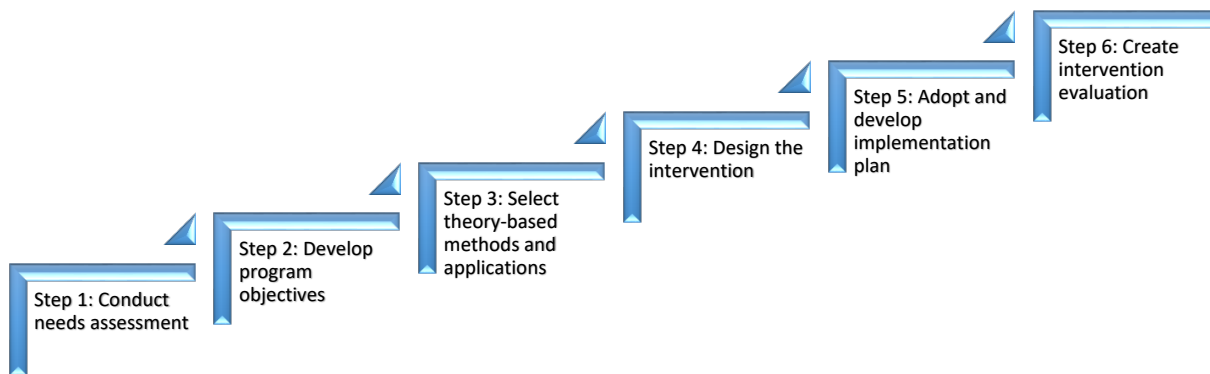
six steps: 1) Assessment; 2) identification of outcomes and change objectives; 3) Selection of theory-based intervention methods and practical applications; 4) Development of the intervention program; 5) Implementation; 6) Evaluation [12]. Since the desire to have children is an issue with multiple reasons, without knowing the reasons and the audience, intervention planning will be ineffective. On the other hand, most of the studies that have been conducted have not paid attention to this issue. The present study aims to examine this approach and its steps to design interventions to increase parents' childbearing desires for the first time. Effective interventions can be developed and implemented on a large scale if used correctly.

## 2. Methods

In this study, 1288 parents eligible to have children participated in IMA from July to November 2022, aiming to design the practical steps of the intervention to increase childbearing desires. The city was first divided into 5 regions: North, South, East, West, and Central. Then, they randomly selected several clusters (districts) proportional to the population of each region. The sample size was determined based on the inclusion criteria along with a 95% confidence level and 80% test power. The inclusion criteria were as follows: Married women in the age range of 15 to 54 without children; having 1 or 2 children; residency in Ardebil City, Iran; willing to participate in the study. Meanwhile, the exclusion criteria were having below 15 or over 54 years of age and unwillingness to participate in the study. Before designing the process, a participatory planning group (health department officials, representatives of the population and family group, health volunteers in the neighborhoods, and population and childbearing officials and planners centered on people's representatives and health education experts) was formed to ensure the participation of beneficiaries and influential people. In addition, the views of the beneficiaries, influential people, and people's representatives were considered in all steps of IMA (Figure 1).

### Step 1: Needs assessment

IMA systematically integrates theory, literature, and data from a target population to promote structured planning. Following a 6-step progression in the first step, we completed a needs assessment, and the information required for the study was collected in several stages the first phase was with a literature review, focus group, and in-depth semi-structured interviews (data from a target population). Three focus groups consisting of beneficiaries and influential people were formed. In the focus group (n=10



**Figure 1.** Intervention mapping steps adapted from the model by Bartholomew-Eldridge



to 15 participants), the topic mentioned by the researcher was discussed for 1 h without any direct suggestions from the researcher. At the end, the opinions of the participants were summarized. In addition, in-depth semi-structured interviews were then conducted with 10 parents, 5 healthcare workers, and 15 neighborhood health volunteers (people's representatives) to explain their opinions on barriers and strategies to reduce them.

In terms of barriers and solutions to reduce the factors, facilitators, influential elements, and supportive policy changes, the average interview time was 13-40 min. The Interviews were conducted by researchers and trained experts in local health centers and the data collection process in each group (parents, healthcare workers, and neighborhood health volunteers) continued until saturation was reached. Next, the literature was reviewed to identify determinants and strategies for successful interventions to increase parents' childbearing desires. In the second stage, the current situation of 1288 eligible women (married women in the age range of 15 to 54 years without children, one child, or two children) was investigated and additional data was provided by researcher-made questionnaires based on the PRECEDE-PROCEED model, including demographic variables, questions about predisposing factors (awareness, attitude, understanding of risk, and self-efficacy), enabling factors (access to experts for advice), reinforcing factors (encouragement), and policies and regulations (support organizational and environmental factors) [7]. This component focuses on individual (predisposing), interpersonal (enabling), and structural/policy (reinforcing) factors inherent in health behaviors and interventions [7]. The questionnaire was completed for 1288 people.

### Step 2: Developing program objectives

In Step 2, we developed program objectives and identified our target population for intervention design. We set

our goals based on the results of the needs assessment conducted in the first phase. A matrix of change objectives was developed in this step based on the results previous stage, according to the most important factors. The most important factors that determine parents' childbearing desires were first selected by reviewing the literature and the expert panel. Childbearing behavior was then divided into performance objectives. Finally, change objectives were written for each of the identified determinants and the determinants and performance objectives were integrated into the matrix of change objectives.

### Step 3: Selecting theory-based methods applications

This step required us to choose the theory-based methods and the generation of program ideas in the planning group. Theoretical methods and practical applications were defined following the objectives of the change created in the second step. The methods and program were chosen based on the target population and its culture. The findings of reviewing the literature with the same population were analyzed and practical applications were selected for each method. Furthermore, a brainstorming session was held with the parents to examine their views. They were asked to give feedback on the plans prepared by the planning group and provide ideas to cover the change objectives.

### Step 4: Designing the intervention

In this step, an intervention was designed by 5 researchers and experts in health education and promotion with all the components and materials needed for practical application. To implement the practical applications and program materials, a pre-test was predicted, and the coverage of change objectives by educational materials and the compatibility of strategies with theoretical methods were checked by experts.

### Step 5 and 6: Developing an implementation plan and evaluation

The intervention program was designed in 10 neighborhoods of Ardabil City, Iran. The interventions were developed at the individual, family (interpersonal), and social levels. The logos were initially designed and the slogan “loneliness is not our right and our children’s” was proposed for the intervention programs. At the individual level, the intervention included training based on the data collected from parents eligible to have children, motivational messages, distribution of posters and booklets, and playing motion graphics in cyberspace groups and newsletters. At the family (interpersonal) level, the intervention included providing a platform for the formation of peer groups concerning the role of family and peers (the literature review in the first step suggested that family and peers have a significant contribution to parents’ childbearing desires). Moreover, at the social level, the intervention included holding local festivals with the participation of parents, drawing competitions for children, cultural-educational camps, and collective programs. The neighborhood liaisons who were selected for each group were asked to brainstorm with parents twice a week in the form of peer groups, report the report of each meeting to the research team, and remove any barriers in the implementation of the programs to evaluate the progress process.

## 3. Results

### Step 1: Needs assessment

According to the results, the study population considered that factors affecting parents’ childbearing desires were concerned about the future of their children, economic problems, low parenting skills, low self-efficacy, lack of trust in the health system and incentives, the prevalence of low birth rates, mother’s education and employment, the conflict between couples, low social support of couples, lack of access to facilities, fear of pregnancy and childbirth, and medical prohibition. They also observed improving parenting skills, improving skills to interact with the spouse, reducing unemployment and income barriers, increasing social support, providing access to the same facilities, implementing incentive laws, trusting the government’s commitments, using new methods of persuasion, reducing the culture of luxury, and increasing self-efficacy as childbearing solutions and facilitators. According to the results of the literature review, some factors that determine parents’ childbearing desires were concerns about the future of their children [13], economic problems [14], fear of pregnancy [12], lack of housing and jobs [14], parenting skills [15], mother’s education and em-

ployment [13], spouse’s unwillingness [16], conflict with the spouse [14], lack of emotional and sexual satisfaction [17], medical prohibition [18] and loss of body beauty [19]. The results demonstrated that the most effective factors in the parents’ childbearing low desires were concerned about the future of their children, economic problems, low parenting skills, and low skills to interact with the spouse. In addition, access to facilities and social support from relatives and family were the next most frequently mentioned factors (Table 1).

### Step 2: Developing program objectives

In the second step, performance objectives, based on theories, were predicted according to program outcomes. The opinions of behavioral specialists, psychologists, midwives, gynecologists, and health education and promotion specialists were then used to revise the performance objectives for validation. In the following, the most important and variable determinants identified in the needs assessment were selected using the focus group method. Finally, awareness, attitude, and self-efficacy were selected as determinants at the individual level, perceived subjective norm at the family level, and organizational changes at the social level based on the results of the needs assessment. The matrix of the objectives was then developed (Table 2).

### Step 3: Selecting the theory-based methods applications

In the third step, the objectives were identified. We categorized the barriers and divided them into different components of the PRECEDE model. The parents’ childbearing desires were combined with the most frequent and variable determinants obtained in the previous steps. Behavior change methods and practical applications are explained in Table 3.

### Step 4: Designing the intervention

In the fourth step, after identifying the assets, the planning team examined how the resources could address our program objectives, adjusting current assets, and discussed the use of new methods in intervention design. The program components were designed and produced. The scope of the intervention and the most suitable channels for its implementation were provided by the research team. We chose to train final semester students of health education, psychology, and sociology of health to guide eligible parents in the program, answer questions, and if needed, refer to a specialized level to obtain more information. The use of students in this role followed 2 goals: 1) Taking advantage of the capacity of young and energetic forces to establish effective communica-

**Table 1.** Demographics of the participants

Variables	Aspect	%
Age (y)	35-18	42
	36-55	58
Work status	Governmental position	22
	Non-governmental position	60
	Unemployed	18
Education level	Less than diploma	20
	Diploma to Bachelor's degree	69
	Higher than a Bachelor's degree	11
Number of children	Without children	13.6
	Single child	52.3
	Two children	34.1
Age of children (y)	<5	49.3
	5-10	50.7



tion and needs assessment, and 2) Empowering the forces to work after graduation, and being able to plan effectively in the social context and identifying the needs of the audience, which is the main goal of targeted programs [Table 4](#).

#### Step 5 and 6: Developing an implementation plan and evaluation

In this step, executive meetings were held with the members of the research team to design and plan executive actions. A meeting was then held with the participation of the beneficiaries of the program to introduce the beginning of the intervention along with their role in improving and facilitating the implementation process (the adopters of the program, health managers, and program implementers were a combination of consultants and experts, some members of the planning team, and neighborhood liaisons). Meetings were held with the employees of the units after forming executive teams and providing them with adequate training. The effect was evaluated based on the determined general and specific objectives in addition to using the tools completed in the needs assessment stage. The overall objective of the program was to increase parents' childbearing desires by 15%. The specific objectives were a relative increase in the number of parents participating in peer group programs, a relative increase in the number of educational

contents, providing parents with persuasive information, and a relative increase in the number of parents using relevant programs and software. The final evaluation of the program was delayed due to time constraints. The results will be published in other studies.

#### 4. Discussion

One of the approaches that ensure the transparency of all intervention components is IMA, which is a useful technique for developing behavior change interventions and turning theories into practice. The results of the study led to the development of an intervention program to increase parents' childbearing desires based on the theory and evidence. Health planners and policymakers can choose appropriate behavior change strategies by identifying the determinants of behavior. IMA has been successfully used in studies for planning, intervention, and evaluation [11-13]. In Saudi Arabia, this model was used for early detection and prevention of oral cancer [20]. In South Africa, Aventin [21] used this model for the adaptation of a gender-transformative sexual and reproductive health intervention for adolescent boys. In Iran, Ziapour [10] and Nejhaddadgar [11] used this model to draw a map of intervention in the issue of COVID-19.

Table 2. Matrix of change objectives

Performance Objectives	Awareness Individual (Predisposing)	Attitude Individual (Predisposing)	Self-Efficacy Individual (Predisposing)	Perceived Subjective Norm Interpersonal (Reinforcing)	Organizational Changes (Community/Organizational Enabling)
Familiarizing parents with the importance of childbearing	<ul style="list-style-type: none"> <li>- Parents should list the importance of childbearing.</li> <li>- Parents should state the problems of having only one child/few children.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should express their positive feelings about childbearing.</li> <li>- Parents should describe the positive consequences of childbearing for the family.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should express their confidence about childbearing.</li> <li>- Parents should express their confidence concerning planning to reduce the barriers to childbearing.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should state which people are involved in accepting and not accepting childbearing behavior.</li> <li>- Parents should state that they can get help from relatives in childbearing.</li> </ul>	Facilitating the installation of warning and motivational signs throughout the city
Participation of parents in training sessions on parenting skills	Parents should express the importance of learning parenting skills.	<ul style="list-style-type: none"> <li>- Parents should discuss their positive parenting experiences in peer groups.</li> <li>- Parents should discuss the importance of increasing parenting skills in the peer group.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should be confident in their ability to implement parenting skills.</li> <li>- Parents should be confident in their ability to participate in peer group meetings.</li> </ul>	Parents should express who can help them improve their parenting skills.	Preparing interactive educational applications
Parents' participation in training sessions for interaction with their spouses	Parents should express the importance of getting to know the skills to interact with their spouses.	<ul style="list-style-type: none"> <li>- Parents should discuss in the peer group their positive experiences of interacting with their spouses.</li> <li>- Parents should discuss the importance of increasing the skills to interact with their spouses in the peer group.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should be confident in their ability to implement the skills to interact with their spouses.</li> <li>- Parents should be confident in their ability to participate in peer group meetings.</li> </ul>	Parents should express who can help them improve their skills to interact with their spouses.	Preparing interactive educational applications
Discussion about the role of family support (relatives and spouse) in childbearing	<ul style="list-style-type: none"> <li>- Parents should discuss the problems of having only one child.</li> <li>- Parents should discuss the role of family support in childbearing.</li> </ul>	<ul style="list-style-type: none"> <li>- Parents should state that they believe in the importance of population reduction.</li> <li>- Parents should discuss the positive role of family support in childbearing.</li> </ul>	Parents should express their confidence about getting family support.	Parents should state whose support motivates them to childbearing.	-
Discussing access to facilities	<ul style="list-style-type: none"> <li>- Parents should know about childbearing facilities.</li> <li>- Parents should explain the types of facilities and how to access them.</li> </ul>	Parents should believe in the importance of the positive role of facilities for childbearing.	Parents should state the barriers to accessing facilities.	Parents should state which organizations can help them access facilities.	Facilitating the installation of information signs in the city and offices



Table 3. Methods based on the theory, applications, program components and intervention materials

Determinants	Methods (Relevant Theory)	Definition	Components and Materials of the Program	Channels and Tools	Practical Applications
Awareness	<ul style="list-style-type: none"> <li>- Increased awareness (trans-theoretical model)</li> <li>- Risk personalization (precautionary process model)</li> </ul>	<p>Providing information and feedback on the causes and alternatives to the problem</p> <p>Providing information about the individual costs of engaging or not engaging in the behavior relative to the target behavior</p>	<ul style="list-style-type: none"> <li>- Introducing authoritative sources, databases, advantages and barriers to childbearing, and related solutions</li> <li>- Explaining the problems of having only one child or few children for children, families, and society</li> </ul>	Interpersonal and collective health workers, health volunteers, interviews, and movies	Posters, motion graphics, motion paints, logotypes, infographics, and booklets
Attitude	<ul style="list-style-type: none"> <li>- Direct experience (learning theory)</li> <li>- Cultural similarity (matrix of persuasive communication)</li> </ul>	<p>Encouraging is a process in which knowledge is created through the interpretation of the practice performed</p> <p>The use of target group characteristics in source, message, and channel</p>	<ul style="list-style-type: none"> <li>- Advice and persuasion by successful individuals and families in childbearing and explaining the benefits of childbearing</li> <li>- Forming a peer group</li> <li>- Motivational messages</li> </ul>	Interpersonal and collective health workers, health volunteers	Influential and successful people, heroes, movies, gatherings, and interviews
Self-efficacy	<ul style="list-style-type: none"> <li>- Preparation of contingent rewards (learning theory)</li> <li>- goal setting (self-regulation theory)</li> <li>- Planning coping responses (theory of purposeful behavior)</li> </ul>	<ul style="list-style-type: none"> <li>- Encouraging or providing rewards concerning the achievement of the target behavior</li> <li>- Defining the goal behavior that leads to the behavior</li> <li>- Preparing a list of possible barriers and ways to overcome them</li> </ul>	<ul style="list-style-type: none"> <li>- Encouraging people who decide to bring a child or reduce barriers</li> <li>- Targeted planning for childbearing and reducing barriers</li> <li>- Providing creative solutions to reduce childbearing barriers, identifying childbearing barriers, and providing practical solutions</li> </ul>	Interpersonal and collective health workers, health volunteers, interviews, and movies	<ul style="list-style-type: none"> <li>- Interpersonal</li> <li>- Interpersonal and personal</li> <li>- Interpersonal and collective communication</li> </ul>
Perceived subjective norm	<ul style="list-style-type: none"> <li>- Role modeling by mass communication (diffusion of innovation theory)</li> <li>- behavioral journalism (diffusion of innovation theory)</li> </ul>	<ul style="list-style-type: none"> <li>- Providing a suitable model to encourage the desired activity through mass media</li> <li>- Encouraging social networks to provide information, emotions, encouragement, and support</li> </ul>	Introducing successful people who have several children and taking advantage of the capacity of influential people and heroes	Interpersonal and collective health workers, health volunteers, interviews, and movies	Educational movies and debates
Organizational changes	<ul style="list-style-type: none"> <li>- Sensitization (theory of organizational change)</li> <li>- Organizational diagnosis (theory of organizational development)</li> </ul>	<ul style="list-style-type: none"> <li>- Leaders reinterpret the processes in the organization</li> <li>- Evaluating the organizational structure, employee beliefs and attitudes, and the desired outcomes and using surveys</li> </ul>	<ul style="list-style-type: none"> <li>- Appointing an organizational consultant who advises employees on the positive aspects of childbearing</li> <li>- The organizational consultant surveys childbearing desires and plans health promotion programs</li> </ul>	-Interpersonal and collective health workers, health volunteers, interviews	Interpersonal and collective communication



Table 4. Evidence-based messages and communication channels

Channel	Message Title	Message Content/Concept
Logo	Logotype Logo motion	Explaining the importance of increasing childbearing Transmitting the slogan of the program: "Loneliness is not our right and our children's"
Motion graphics/ motion paints	Important points of parenting	Explaining the concepts and practical tips for parenting
Movie	Interviews reports	Managers and influential people in the organizations Holding related meetings and workshops
Booklets	All the messages in the picture	Summarizing all related items and messages
Posters	Social marketing	Notification Sensitization



## 5. Conclusion

IMA was successfully used to draw a roadmap for educational interventions to increase the desire to have children. This study has provided a good understanding of the role of intervention mapping in the design of educational interventions to increase the desire to have children, and it is a good basis for effective interventions can be implemented and guided accordingly.

### Study strengths and limitations

The limitation of the design of this intervention program is implementation in one province of the country which may limit the generalizability. Regardless of these limitations, the successful use of IMA in intervention design and having a strong coalition of stakeholders and experts provided the first essential steps toward the development of a targeted national program that could replace conventional programs as program implementation. Without the need for assessment and recognition of the influencing factors, it will be ineffective in most cases. Our future research programs include evaluating the effectiveness of this intervention model. Then, using the results of that study and the lessons learned during the intervention development process, we can conduct a larger-scale intervention.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of [Ardabil University of Medical Sciences](#) (Code: IR.ARUMS.REC.1401.263).

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### Authors' contributions

All authors contributed equally to preparing this article.

### Conflict of interest

The authors declared no conflict of interest.

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