

The sustainability of interventions of a community-based trial on children and adolescents' healthy lifestyle

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Original Article

Abstract

BACKGROUND: Sustainability is the core of a successful health-related intervention program. This study was conducted to evaluate the sustainability of interventions of the Heart Health Promotion from Childhood (HHPC) project, one of the 10 interventional projects of the Isfahan Healthy Heart Program.

METHODS: The evaluation of HHPC included administrating surveys to 500 elementary and middle, and 500 high school students. The study participants were randomly selected from all schools in Isfahan. The questionnaires were administered by interviews to evaluate the sustainability of interventions.

RESULTS: The results of interviews showed that interventions were sustainable in 100% of elementary school, 99% of middle school, and 87% of high school students. Training of healthy lifestyle behaviors was significantly higher in all-girls middle schools ($P < 0.001$). Daily morning exercise was more frequent in girls high schools ($P < 0.001$), while selling unhealthy food was more frequent in boys high schools ($P < 0.001$). The participants attributed the success of the program mostly to students' agreement and cooperation.

CONCLUSION: Even though 5 years have passed since the end of the HHPC project, many of the interventions have been continued at the schools, often because healthy behaviors have become institutionalized in the target population. However, now all schools have the same level of sustainability, especially the middle and high schools, and all-boys schools. Therefore, it is important for future projects to place additional emphasis on these institutions for future school-based interventions.

Keywords: Behavior, Community Health Planning, Institutionalization, Schools, Sustainability

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Introduction

The escalating rise of non-communicable diseases globally¹⁻³ has required swift concerted action, at various levels of decision making from international level to the community level.⁴ Successful programs may not necessarily develop into a sustainable organizational strategy,⁵ therefore evaluation of sustainability should be mainstreamed into the evaluation process. In addition, the organizations that

sponsor the interventions implementation need to know whether funded programs should be continued.⁶ Sustainability may refer to maintaining, endure or even support,⁷ and it has become an important global target to achieve, while performing health, economic, ecologic or any other program that deals with development.⁸ It was then, that sustainability became among the evaluation indicators of successful programs.⁹

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A program is considered sustainable when its relevant activities and resources continue in the direction of its primary objectives.⁹ Crisp and Swerissen believe that program sustainability depends on the continuation of its implementation strategy, in terms of the organization concerned and program effects.¹⁰ Others have reported that a program becomes sustainable after institutionalization in relevant organizations and empowerment of its recipients.^{11,12} Most programs are evaluated on the basis of parameters such as feasibility, strategic planning, process, and outcomes. Thus, sustainability is not part of the evaluation process.¹³ One of the best definitions reported for sustainability specifically in health programs is the one introduced by Shediac-Rizkallah and Bone.¹⁴ They suggested three components for sustainability that include: (1) continued benefits to those who received health services when the program started and to new participants when the supporting funds are discontinued; (2) continued implementation of a program activities in an organization following the discontinuation of the program financial support, which is called “institutionalization” or “routinization”; and (3) community empowerment to improve their health by continuing the activities of a finished program.

In Iran, the Ministry of Health runs most health programs using its health system infrastructure and to some extent inter-sectoral collaboration; however, according to our knowledge, there has been no study conducted to evaluate the sustainability of these programs. Furthermore, there have been few comprehensive community-based programs planned, implemented and evaluated on non-communicable diseases (NCD) prevention and health promotion. “Isfahan Healthy Heart Program” (IHHP) was a comprehensive community-based interventional program that ran between 2000 and 2006 and aimed to prevent cardiovascular diseases (CVD), reduce their risk factors, and promote a healthy lifestyle.¹⁵ The program comprised 10 interventional projects and covered different target groups.¹⁶ Healthy nutrition, physical activity, and tobacco control were the main fields of interventions, while its main strategies were community education and empowerment, health professionals training, inter-sectoral collaboration, public-private partnership and policy enforcement or development. The managers of each project were among the beneficiary target groups or organizations. Different types of evaluation, including process, outcome and impact, were done to determine the optimum process of

interventions.^{15,16} The processes of implementing its interventions were extensively evaluated and applied to most activities.^{17,18} The general results of these evaluations in adults showed that the interventions were effective in promoting health-related behaviors.¹⁹⁻²² Furthermore, the mean level and the prevalence of physical and metabolic risk factors were improved.²³⁻²⁵ One of the 10 IHHP projects entitled “Heart Health Promotion from Childhood” (HHPC) was implemented for children and adolescents, their parents, and health professionals in schools.²⁶

The main target population of this project was children and adolescents attending schools and day care centers; in addition, parents and teachers, school staff, and healthcare providers were also targeted as intermediary population.²² All groups were interviewed in this study; but only, the results of the survey related to schoolchildren (in all grades) are reported in this paper.

HHPC focused on healthy nutrition, physical activity, and tobacco control and were implemented between 2001 and 2005.²³

Interventions were implemented by beneficiary organizations (Provincial Education and Training Office, Welfare Organization, Institute for the Intellectual Development of Children & Young Adults, and Provincial Health Center of Isfahan) and were integrated with their infrastructure in order to minimize the additional expenses and to be part of their staff daily work. The investigators and their collaborators supported these organizations in the design and implementation of interventions and advocate for policy and legislation enforcement or changes.

The whole HHPC project methods, sampling, target groups, intervention activities, types of evaluation and some short-term results were reported in earlier publications.^{26,27}

The success or failure of these interventions was evaluated at the time of implementation by an internal process evaluation committee of IHHP,^{17,18} while the whole program was evaluated by an external team from the National Institute for Health and Welfare of Finland.²⁸

After finishing IHHP and evaluating its outcomes, the beneficiary organizations were given the option to continue with the interventions. In order to continue, the Isfahan Provincial Health Center collaborated with the Education and Training Office and 12 other organizations to integrate the lifestyle-modification interventions within their infrastructure in a program called “Student Health Mobilization”.

According to the importance of sustainability as an indicator for evaluating the success of health programs, in this study we presented the methods of assessing HHPC sustainability and its outcomes.

Materials and Methods

This study was conducted 5 years after the final phase of HHPC project. Considering the importance of continuing the interventions to promote a healthy lifestyle of children and adolescents, we evaluated their sustainability as an indication of the legacy of the IHHP projects.

Sustainability determinants

To develop tools for measuring the sustainability of HHPC project, we defined its determinants. A review of the literature was performed using keywords such as “sustainability,” “institutionalization,” “implementation,” “health promotion program,” “healthy lifestyle,” and “health program” in PubMed and Google Scholar. All related publications were studied, and sustainability determinants and their definitions and evaluation methods were extracted.

From the literature review, the following sustainability determinants were identified for NCD community-based intervention programs prevention and healthy lifestyle promotion:

1. Continuity of funding.
2. Constant supervision and follow-up of the funding body.
3. Supporting human resources and volunteers.
4. Community preparation.
5. Involving the community in the design process.
6. Empowerment of the community.
7. Constant monitoring and modification of strategies.
8. Being dynamic.
9. Considering new needs.
10. Sustainability of outcomes.
11. Sustainability of institutionalization process.

On the basis of interventions, the results of process evaluation, and determinants extracted from review of literature, brief questions for key informant interviews were created to be used to conduct a small qualitative study with the aim of obtaining the HHPC sustainability concepts and its determinants.

We interviewed health decision makers, schoolchildren and their parents as well as school's principals or health educators. The sample size was determined based on the rule of data saturation in qualitative studies.²⁹

The interviews were carried out to determine the sustainability or non-sustainability determinants from their points of view and based on the study objectives. The interviews were conducted with the permission of Education and Training Office. Consents of the interviewees were obtained. All interviews were recorded and transcribed, coded, and the main concepts and their determinants were extracted from the transcribed data. This part of the study was done according to qualitative studies standard methods.²⁹

Continuing interventions, education, evaluation, motivation, changes in knowledge, attitude and practice as well as the obstacles and facilitators of sustainability were concepts extracted from interviews. All determinants of the qualitative part are presented in the full report.³⁰ The questionnaire was developed based on these concepts and determinants.

Data collection

The sample size of this survey was 1000 consisted of 500 elementary and middle school students and 500 high school students. Samples were selected using cluster random sampling. In each municipality areas in Isfahan, 100 students (50 from high school and 50 from elementary and middle school), were interviewed. The questionnaires were completed by trained interviewers at schools. The completed questionnaires were reviewed by an expert personal to check for correct completion and missing data.

In our analysis, we considered interventions to be sustainable when it were implemented at least on 60% of their target places.⁹

After completing the questionnaires, the collected data were managed, entered and analyzed using the Statistical Package for the Social Sciences (SPSS) software program (version 18, SPSS Inc., Chicago, IL, USA). Chi squared test was used to analyse the data based on sex in each school grade and P value < 0.05 was considered as significant.

Results

In total, 500 students from elementary and middle schools and 500 students from high schools were interviewed. Based on the pollution distribution of Isfahan, 50% female and 50% male students were selected for interviews. The mean ages of elementary, middle and high school students were 10.84 ± 0.84 , 13.72 ± 0.99 , and 16.38 ± 0.95 years, respectively.

Table 1 shows the determinates of sustainable interventions according to elementary school children responses. All participants responded

positively to the presence of healthcare staff and the existence of morning exercise. Boys were more satisfied with this exercise than girls significantly ($P = 0.002$). All schools have a healthy snack bar services with boys reporting more satisfaction than girls ($P < 0.001$). Determinants like parental pressure or liking the food ranked as the highest among factors influencing compliance with schools' healthy food plans. Almost all girls and boys experienced improvement in their health after the HHCP implementation, students' acceptance, then authorities approval and family support were the most important reasons for continued interventions.

The determinants of sustainable interventions in middle schools and students' opinions on continued or discontinued interventions are presented in table 2. While all girls' schools have healthcare staff, only 48% of boys' schools had them. Training of healthy lifestyle behaviors was persisted in all and 88% of girls' and boys' schools respectively

($P < 0.001$). Training children during morning programs was the most frequent method used among girls and boys, but its frequency is significantly higher in girls schools ($P < 0.001$). Daily morning exercise and cafeterias selling healthy snacks were available in most schools. Boys believed more in the effect of HHCP interventions on their health and behavior changes than girls ($P < 0.001$). The frequency of boys satisfied with snack bars services and daily morning exercise were significantly higher than girls ($P = 0.002$ for both). Authorities' approval for continuing interventions followed by the student's acceptance and integration into the school curriculum were the most frequent reasons for continued interventions. Discontinuation of interventions was higher among all boys schools ($P = 0.010$). The reasons for discontinued interventions were; other priorities considered by school staff, lack of rules in schools and lack of human resources.

Table 1. Sustainability determinants according to elementary students' responses based on sex

Determinants	Total	Girls	Boys	P
Presence of healthcare staff in schools	250 (100.0)	125 (100.0)	125 (100.0)	-
Training on lifestyle modifications in school	250 (100.0)	125 (100.0)	125 (100.0)	-
Extracurricular education	66 (26.4)	28 (22.4)	38 (30.4)	0.151
Education during morning programs	241 (96.4)	119 (95.2)	122 (97.6)	0.500
Education as part of curriculum	191 (76.4)	85 (68.0)	106 (84.8)	0.002
Education using training aids	205 (82.0)	97 (77.6)	108 (86.4)	0.070
Face-to-face education by teachers	34 (13.6)	17 (13.6)	17 (13.6)	1.000
Daily morning exercise in schools	250 (100.0)	125 (100.0)	125 (100.0)	-
Satisfaction with morning exercise	172 (68.8)	73 (58.4)	99 (89.2)	0.002
The existence of snack bars or cafeterias in schools	250 (100.0)	125 (100.0)	125 (100.0)	-
If yes				
Not selling unhealthy food in schools	250 (100.0)	125 (100.0)	125 (100.0)	-
Satisfaction with snack bars services	134 (53.6)	52 (41.6)	82 (65.6)	0.002
School plans for student food menus	157 (62.8)	78 (62.4)	79 (63.2)	0.896
Compliance with food plans	125 (79.6)	52 (66.7)	73 (92.4)	< 0.001
If yes				
Factors influencing compliance with food plans				
Liking the food	123 (98.4)	50 (96.2)	73 (100.0)	0.171
School forcing students to comply	7 (5.6)	2 (3.8)	5 (6.8)	0.698
Peer pressure	27 (21.6)	16 (30.8)	11 (15.1)	0.036
Parental pressure	88 (70.4)	29 (55.8)	59 (80.8)	0.002
Need for interventions	244 (97.6)	123 (98.4)	121 (96.8)	0.373
Experiencing improved health after interventions	240 (96.0)	115 (92.0)	125 (100.0)	0.002
If yes				
Reasons for implementing interventions				
Authorities' approval	190 (80.5)	88 (77.9)	102 (82.9)	0.328
Family support	180 (76.3)	72 (63.7)	108 (87.8)	< 0.001
Students' approval	216 (91.5)	103 (91.2)	113 (91.9)	0.843
Simplicity of implementation	148 (62.7)	65 (57.5)	83 (67.5)	0.114
Existence of legislations	120 (50.8)	44 (38.9)	76 (61.8)	< 0.001
Integration into school curriculum	164 (69.5)	71 (62.8)	93 (75.6)	0.033

Table 2. Sustainability determinants according to middle school students' responses based on sex

Determinants	Total	Girls	Boys	P
Instituting interventions to improve lifestyle in schools	247 (98.8)	124 (100.0)	123 (97.6)	0.247
Presence of healthcare staff in school	185 (74.0)	124 (100.0)	61 (48.4)	< 0.001
Training on lifestyle modification in schools	236 (94.4)	124 (100.0)	112 (88.9)	< 0.001
Healthy nutrition	222 (94.1)	123 (99.2)	99 (88.4)	< 0.001
Appropriate physical activity	213 (90.3)	121 (97.6)	92 (82.1)	< 0.001
Tobacco control	138 (58.5)	76 (61.3)	62 (55.4)	0.356
Methods to cope with stress	162 (68.6)	91 (73.4)	71 (63.4)	0.098
Training methods				
Extracurricular training	87 (36.9)	52 (41.9)	35 (31.3)	0.089
Training during morning programs	207 (87.7)	121 (97.6)	86 (76.8)	< 0.001
Training as part of school curriculum	166 (70.3)	103 (83.1)	63 (56.3)	< 0.001
Using educational materials	169 (71.6)	112 (90.3)	57 (50.9)	< 0.001
Face-to-face education by teachers	28 (11.9)	16 (12.9)	12 (10.7)	0.604
Daily morning exercise	233 (93.2)	122 (98.4)	111 (88.1)	< 0.001
Presence of snack bars or cafeterias in schools	225 (90.0)	99 (79.8)	126 (100.0)	< 0.001
Selling unhealthy food at snack bars	48 (21.3)	25 (25.3)	23 (18.3)	0.203
Behavior changes	208 (83.2)	101 (81.5)	107 (84.9)	0.463
Improvement of health	219 (87.6)	106 (85.5)	113 (89.7)	0.314
Necessity of interventions	224 (89.6)	109 (87.9)	115 (91.3)	0.383
Authorities prioritizing interventions	198 (79.2)	97 (78.2)	101 (80.2)	0.707
Student's opinion on improving interventions	70 (28.0)	47 (37.9)	15 (11.9)	< 0.001
Success of interventions	190 (76.0)	94 (75.8)	96 (76.2)	0.943
Reasons for success				
Authorities' approval for instituting interventions	143 (75.3)	85 (90.4)	58 (60.4)	< 0.001
Allocating appropriate budget to implement interventions	40 (21.1)	27 (28.7)	13 (13.5)	0.010
Family support	119 (62.6)	69 (73.4)	50 (52.1)	0.002
Students' acceptance	157 (82.6)	90 (95.7)	67 (69.8)	< 0.001
Ease of performance	92 (48.4)	59 (62.8)	33 (34.4)	< 0.001
Integration into school curriculum	114 (60.0)	70 (74.5)	44 (45.8)	< 0.001
Discontinuing interventions	47 (18.8)	14 (11.3)	33 (26.2)	0.010
Reason for discontinuation of interventions				
Lack of authorities' willingness	13 (27.7)	3 (21.4)	10 (30.3)	0.726
Lack of budget	6 (12.8)	1 (7.1)	5 (15.2)	0.653
Lack of need for interventions	13 (27.7)	5 (35.7)	8 (24.2)	0.486
Authorities' disapproval	6 (12.8)	3 (21.4)	3 (9.1)	0.344
Failure of interventions	9 (19.1)	5 (35.7)	4 (12.1)	0.102
Other priorities	24 (51.1)	9 (64.3)	15 (45.5)	0.238
Lack of rules in schools	12 (25.5)	8 (57.1)	4 (12.1)	0.003
Lack of human resources	9 (19.1)	6 (42.9)	3 (9.1)	0.013
Some interventions may lead to side-effects	4 (1.6)	2 (1.6)	2 (1.6)	1.000

The sustainable interventions in high schools and student's opinions on continued or discontinued interventions are presented in table 3. While integrating interventions was similar in girls' and boys' high school, only 22% of boy's schools have health care staff compared to 66% of girls schools ($P < 0.001$). High school children of both sexes referred to receiving training during morning programs as the most frequent method while face to face education by the teachers as the least used method. The frequency of boys trained for tobacco control was higher than girls ($P < 0.001$).

Daily morning exercise was more frequent in girls schools ($P < 0.001$) while selling unhealthy food was more frequent in boys' high schools ($P < 0.001$). Students acceptance followed by authorities' approval, and family support were the most frequent reasons for success, while lack of related rules and the perception that interventions were not needed in schools were the most reasons for failure. Other priorities considered by school staff followed by lack of willingness of authorities were the main reasons for discontinued interventions according to students' opinions.

Table 3. Sustainability determinants according to high school students' responses based on sex

Determinants	Total	Girls	Boys	P
Instituting interventions to improve lifestyle in schools	433 (86.6)	220 (88.0)	213 (85.2)	0.358
Presence of healthcare staff in schools	222 (44.4)	165 (66.0)	57 (22.8)	< 0.001
Training on lifestyle modification in schools	412 (82.4)	208 (83.2)	204 (81.6)	0.639
Healthy nutrition	270 (65.5)	134 (64.4)	136 (66.7)	0.632
Appropriate physical activity	307 (74.5)	150 (72.1)	157 (77.0)	0.259
Tobacco control	214 (51.9)	82 (39.4)	132 (64.7)	< 0.001
Methods to cope with stress	261 (63.3)	160 (76.9)	101 (49.5)	< 0.001
Training methods				
Extracurricular training	97 (23.5)	57 (27.4)	40 (19.6)	0.062
Training during morning programs	339 (82.3)	180 (86.5)	159 (77.9)	0.022
Training as part of school curriculum	231 (56.1)	131 (63.0)	100 (49.0)	0.004
Using educational materials	257 (62.4)	133 (63.9)	124 (60.8)	0.508
Face-to-face education by teachers	29 (7.0)	14 (6.7)	15 (7.4)	0.805
Daily morning exercise	287 (57.4)	188 (75.2)	99 (39.6)	< 0.001
Presence of snack bars or cafeterias in schools	498 (99.6)	248 (99.2)	250 (100.0)	0.156
Selling unhealthy food at snack bars	130 (26.1)	13 (5.2)	117 (46.8)	< 0.001
Behavior changes due to interventions	292 (58.4)	118 (47.2)	174 (69.6)	< 0.001
Necessity of interventions	449 (89.8)	214 (85.6)	235 (94.0)	0.002
Improvement of health due to interventions	373 (74.6)	177 (70.8)	196 (78.4)	0.051
Authorities prioritizing interventions	318 (63.6)	143 (57.2)	175 (70.0)	0.003
Student's opinion on improving interventions	83 (16.6)	58 (23.2)	29 (11.6)	< 0.001
Success at performing interventions	251 (50.2)	107 (42.8)	144 (57.6)	< 0.001
Reasons for success				
Authorities' approval for instituting interventions	183 (72.9)	88 (82.2)	95 (66.0)	0.004
Allocating appropriate budget to implement interventions	56 (22.3)	33 (30.8)	23 (16.0)	0.005
Family support	163 (64.9)	76 (71.0)	87 (60.4)	0.081
Students' acceptance	193 (76.9)	92 (86.0)	101 (70.1)	0.003
Ease of performance	116 (46.2)	56 (52.3)	60 (41.7)	0.094
Integration into school curriculum	115 (45.8)	57 (53.3)	58 (40.3)	0.041
Reasons for failure				
Disapproval of some authorities	24 (28.6)	8 (21.6)	16 (34.0)	0.211
Lack of budget	28 (33.3)	14 (37.8)	14 (29.8)	0.437
Lack of need to implement interventions	32 (38.1)	13 (35.1)	19 (40.4)	0.620
Families' disapproval	5 (6.0)	1 (2.7)	4 (8.5)	0.378
Students' disapproval	33 (39.3)	9 (24.3)	24 (51.1)	0.013
Lack of necessary rules in schools	31 (36.9)	17 (45.9)	14 (29.8)	0.128
Lack of human resources in schools	17 (20.2)	5 (13.5)	12 (25.5)	0.173
Discontinuing interventions	180 (36.0)	98 (39.2)	82 (32.8)	0.199
Reason for discontinuation of interventions				
Lack of authorities' willingness	74 (41.1)	39 (39.8)	35 (42.7)	0.695
Lack of budget	39 (21.7)	26 (26.5)	13 (15.9)	0.083
Lack of need for interventions	56 (31.1)	31 (31.6)	25 (30.5)	0.869
Authorities' disapproval	32 (17.8)	20 (20.4)	12 (14.6)	0.313
Failure of interventions	53 (29.4)	29 (29.6)	24 (29.3)	0.962
Other priorities	89 (49.4)	44 (44.9)	45 (54.9)	0.182
Lack of rules in schools	62 (34.4)	31 (31.6)	31 (37.8)	0.385
Lack of human resource	52 (28.9)	30 (30.6)	22 (26.8)	0.577
Some interventions may lead to side-effects	9 (1.8)	2 (0.8)	7 (2.8)	0.176

Discussion

In this study, we evaluated the sustainability of HHPC interventions 5 years after the completion of the project by conducting qualitative and quantitative studies. The results obtained from the qualitative

study constitute the variables used to develop questionnaires that were later administrated in the surveys. The survey conducted on schoolchildren of all grades showed that most of the interventions were sustainable in 100% of elementary schools, 99% of middle schools, and 87% of high schools. The

frequency of sustainable interventions was higher in girls' than in boys' schools.

NCDs are on the rise trend³¹ and community-based interventions that improve health and lifestyle can reduce the morbidity and mortality rates of these diseases.⁴ Policy makers and financial sponsors as well as the society are interested in determining what constitutes a successful program and more importantly, what will happen to these programs after the research phase is completed and the financial support is withdrawn.⁶

Despite these facts, our knowledge on the sustainability of community-based intervention programs for health improvement is limited. One of the problems in evaluating the sustainability of such programs is the need to wait for at least 3 years after the termination of these projects to start evaluating its sustainability, a fact that was considered in our study.³²

In HHPC project, different types of evaluations were done to assess the implementation of interventions and their short- and long-term results.¹⁶ The results showed that the prevalence of hypercholesterolemia, hypertriglyceridemia, and high levels of low-density lipoprotein (LDL)-cholesterol decreased significantly among children and adolescents after interventions. While overweight and obesity decreased significantly in girls, it was increased in boys at the same grades.²⁶ This project, like the other projects under the IHHP, ended in 2006 while most of its interventions were integrated in the collaborating organizations.²⁸

The present study included a qualitative part that was done on HHPC target groups to extract the sustainability concepts and its determinants from their point of view. Its results that are presented, beside a literature review on the same topic consist the variables used to develop the questionnaire used in the surveys. The surveys assessed how far HHPC intervention activities were sustainable and ongoing 5 years after the completion of its research phase in 2006.

Among 19 studies that were reviewed by Scheirer, 18 reported its continuity, 6 reported continued benefits, and 2 reported continued community capacity.⁹ Shediac-Rizkallah and Bone study showed that sustainability is influenced by the manner in which the program is designed and institutionalized, the factors involved in the performance of the program in related places and the characteristics of the environment and target population.¹⁴ While our study showed that the main reason for sustainable interventions according to the schoolchildren view

points in all grades were their acceptance of the intervention followed by authorities approval and their families support. One of the important reasons that led to the sustainability of HHPC interventions is the fact that IHHP projects were performed simultaneously²² which helped to increase the dose of interventions and had a booster effect.²⁶ Furthermore, the managers of each project involved the directors or chiefs of cooperating offices or organizations in the planning, implementation, and evaluation of interventions, a strategy that later helped in institutionalizing these interventions and saving the study funds to perform the research part of the whole program.²⁸

Most of the studies on sustainability have evaluated only the outcomes and maintenance of health results. Cene *et al.* studied the level of risk factors, lipid profile, and blood pressure 1 year after program completion to evaluate the level of sustainability of community-based interventions.³³ Smith-Dijulio and Anderson studied the sustainability of women's behavior changes 5 years after implementing an interventional program to prevent CVD.³⁴

In HHPC, all target groups, behaviors were evaluated annually.¹³ While, other cardiometabolic risk factors were evaluated after 4 years of interventions. Some behaviors and risk factor levels were improved to some extent and some were not. Changes differed based on age and sex.²⁶

Pluye *et al.* performed a complete evaluation of the level of sustainability of a health-related interventional project 13 years after project termination in seven centers. Their results showed that only three centers continued to conduct the activities completely.³⁵ The New Jersey Health Initiatives Expecting Success: Excellence in Cardiac Care (NJHI-ES) program funded health-promotion projects in 10 hospitals in New Jersey. After the financial support stopped, the sustainability results showed that only three projects were completed.³⁶

Among community-based interventional programs for NCD prevention and healthy lifestyle promotion, programs for children and adolescents are of special importance. The prevalence of some risk factors, especially overweight and obesity, are rising in this age group.³⁷ Because most of the children can be reached in schools, school-based studies are especially important, and financial sponsors fund such programs easier than adult ones.³⁸ However, there are limited studies on the sustainability of such programs in children. Health policymakers are interested in finding out how

effective and sustainable the interventions that they funded are.³⁹

HHCP interventions are among limited projects that remained sustainable after 5 years. During the HHPC, Isfahan Provincial Health Center and Provincial Education and Training Office had close cooperation. Since the chiefs of both organizations were HHPC directors, they integrated several of its interventions in their daily activities. Apparently, such cooperation has substantially increased the sustainability of the HHPC. They are performing a healthy lifestyle program with expanded areas of interventions and have added the evaluation, follow-up of interventions and continuous reporting as part of their activities.

HHPC was an intervention project that was conducted in schools and kindergartens, aiming to improve lifestyle habits and to prevent and control CVD risk factors. The target groups who were trained on healthy nutrition, tobacco control measures and physical activity include children and adolescents, their parents, school staff, and health care providers. Our results of school children showed that the sustainability of health-promoting interventions in elementary and middle schools of Isfahan was high as currently 100% of elementary schools and 99% of middle schools have integrated the interventions, including educational programs, morning workouts and ban of unhealthy food sales like snacks including chips and cheese balls.

The number of interventions integrated in girls' middle schools was 100%, however it was less in boys' middle schools, and the least in boys' high schools. For example, sales of unhealthy food reached 46.8% in boys' high schools. Furthermore, only 39.6% of boys in high schools did morning exercise. We considered interventions to be sustainable if they were implemented in at least 60% of target places, therefore, the interventions in high school boys were often non-sustainable. Lack of need of these interventions was the response provided by 41% of boys in middle and high schools.

Differences in childrens' perception might be one of the reasons of the results in this study, however, questions with large sex-based differences were direct and objective like whether they have a healthy snack bar services in their schools or whether they received educational sessions or not. Furthermore, the principals of girls school are usually women and boys' ones are men in Iran, a fact that may lead to better results among girls, as women pay more attention to health behaviors.^{40,41} Another reason might be related to girls attitude

and behaviors, because girls in this age are more concerned about their body shape and health, which may lead them to do more physical activity and eat healthier food.^{42,43}

Taking the opportunity of morning programs to teach students and conduct daily exercise might be effective. Morning programs are conducted daily in all schools in Iran. In this program, different issues about life, society, religion, family, and environment are discussed. Because all students took part in these programs, schools can take advantage of this opportunity to educate all students about the interventions. Furthermore, policy makers, school teachers, and principals have used this opportunity as the most important way to teach students programs. In addition, daily exercise is done in 100% of elementary schools and most of middle and high schools. Another advantage of the morning programs is the participation of principals and some teachers beside students in these programs. It seems that students will be encouraged to have a healthy behavior when they see their principals' exercise or modify their lifestyle.

When tobacco control is considered, boys' school's were more successful in continuing their activities than girls' schools. The difference was significant in this regard. It may be related to the higher frequency of tobacco use among boys than girls and the early age of starting tobacco among boys in Iran⁴⁴ (Table 3).

HHPC sustainable interventions may also be related to improved knowledge and practice of the target population, together with the school childrens' acceptance, feeling of necessity for the interventions by policy makers, proper planning and implementation, developing rules/legislation, training of the teachers and principals, frequent evaluations and application of their results, and use of appropriate opportunities and available facilities.

Considering the results obtained and the fact that the implementation of these interventions does not need extra financial and human resources, it can be applied in other countries in the region because of the similarity in culture, socioeconomic status, and religious beliefs.

The strengths of our study are that it included qualitative component beside a comprehensive literature review to extract the determinants that constitute the variables related to sustainability to be included in the survey questionnaires; that school children in different grades and both sexes; and that our study was conducted 5 years after project completion.

Conclusion

Although 5 years have passed since the final phase of HHPC project, its interventions still continues at schools and in some cases, outcomes in lifestyle change have been sustained in populations. The sustainability is higher in elementary and middle schools than high schools and in girl school more than boy school. Therefore, it is important for future projects to put additional emphasis in these institutions for future school-based interventions to ensure intervention sustainability.

What's New

Although there are several studies on healthy lifestyle promotion or NCD prevention, few studies have examined the sustainability of their interventions. Such studies may need a combination of qualitative and quantitative components which can make the study complicated and hard to conduct. This study was done not only on school children at all grades, but on their parents and teachers, it consisted of qualitative and quantitative parts and was done 5 years after the completion of the original study.

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Conflict of Interests

Authors have no conflict of interests.

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