

## LOGIC MODEL FOR WALKING INTERVENTIONS IN QATAR

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**Abstract.** Logic modelling is an endorsed management method for the effective planning, implementation and evaluation of educational programs. This approach is expected to find measurable results that will bring benefits at individual, group and community levels. This empirical study gives evidence of the importance and effectiveness of planned and structured walking interventions in Qatar. The use of the logic model brings measurable achievements, providing a systematic approach and identification of results in the short term as formative evaluation, in the medium term as process evaluation and in the long term as outcome evaluation. In a walking intervention, formative evaluation provides needs assessment results, process evaluation provides physical activity and motivational levels, and outcome evaluation brings changes in lifestyle habits towards healthier choices. Walking interventions aimed at promoting physical activity within a structured approach provide opportunities to learn about the health benefits of physical activity, increase participation levels, enhance motivation levels and guide the community towards behavioural changes to reduce the occurrence of chronic diseases due to sedentary lifestyle. Walking interventions are effectively assessed through step counts using pedometers and mobile applications connected to a web database. The results confirm the effectiveness of walking intervention programs when the logic model is used as a tool to evaluate participants' engagement in the walking program. The authors of this paper recommend the implementation of planned intervention programs in Qatar with the purpose of impacting the community at national level through physical activity guidelines supporting the prevention of non-communicable diseases.

**Keywords:** physical activity, logic model, planning, walking intervention.

### Introduction

Worldwide, populations experience the challenges of the COVID-19 pandemic and many countries adopt various daily techniques to protect themselves as they return to the 'new normal' (World Health Organization, 2019). This is a current pandemic, while the physical inactivity pandemic has been existing for several years at world level (Kohl et al., 2012; Ozemek et al., 2019; Pratt et al., 2020). Globally, physical inactivity is the fourth leading risk factor for mortality and is extensively recognised as a modifiable key behaviour for the prevention of non-communicable diseases (World Health Organization, 2010). According to the aforementioned organization, 31% of people aged 15 years or older are physically inactive and about 3.2 million deaths per year are attributable to unhealthy lifestyle behaviours (Hall et al., 2021).

As regards Muslim countries, physical inactivity prevalence is 32.3% (Kahan, 2015).

Current investigation data reveal that 41.6% of people in Qatar do not follow global physical activity recommendations (World Health Organization, 2018). *The State of Qatar National Physical Activity Guidelines* recommend adults aged 18-64 years to participate in moderate-intensity aerobic exercise performed 5 days per week for at least 30 minutes or vigorous-intensity aerobic exercise performed 3 days per week for at least 20 minutes (Al-

Bibi, 2014). Some of the diseases mentioned in the scientific literature as being caused by physical inactivity are coronary heart disease, type 2 diabetes, breast cancer, colon cancer, obesity (Lee et al., 2012). The risk of developing non-communicable diseases can be combated through systematic and regular physical activity, which has been shown to lower blood pressure, prevent plaque build-up in arteries, inhibit the formation of heart clots, lower blood sugar, boost insulin sensitivity, help control weight, prevent fractures and reduce falls, improve immune function, increase quality of life, extend lifespan, etc. (Caspersen et al., 1985; World Health Organization, 2010; Harvard Health, 2015; Warburton, 2006).

In Qatar, the concepts of sport and physical activity are presented as a tool to activate the national strategy for building a stable society and create a vibrant and prosperous future for the country ("Qatar National Vision 2030", 2008). Physical activity is an essential instrument to meet strategic ambitions at national level, contribute to social and family development at community level and promote human development at individual level. These personal benefits help to improve national health, reduce healthcare costs and increase labour productivity. Qatar has a great interest in promoting recreational activities and raising public awareness of the benefits of sport and physical activity. Motor skills are usually approached in terms of physiology and psychophysiology, and movement is seen as a change in body position in space and time; motor skills are represented by the set of functions that ensure the maintenance of posture and the execution of movements specific to living beings (Epuran & Stănescu, 2010). The object of physical activity science is represented by human motor skills, which are regarded as a procedural and perfectible reality (Dragnea, 2002; Epuran, 1992). Physical activity consists of any movement that causes muscle contractions and an increase in calories burned. Exercise refers to any planned, structured and repetitive activity program aimed at improving or maintaining physical fitness (Harvard Health, 2015).

Identified barriers that prevent the Qatari population from meeting national recommendations on physical activity are the following: extremely high temperatures, cultural constraints, the use of outdoor spaces in hot weather (Chaabane et al., 2021; Al-Bibi, 2014), hence it is very important to unify efforts (at individual, community and national levels) to promote physical activity.

Universities in Qatar are attractive places to perform physical activity. They offer an extremely generous outdoor environment for physical activity, and some examples are: parks and alleys arranged for walking; a protected private environment with recreation and sports centres, generous spaces for walking without the dangers of traffic congestion. These spaces can be used on most days of the year regardless of the weather or seasonal differences. Security staff are present so that students, faculty and the entire staff feel less fearful and vulnerable when walking through university spaces than in more unpredictable environments.

Walking is the motor skill by which the human body performs locomotion, a voluntary motor activity that becomes automatic, stereotyped through involuntary exercise. Moderate walking influences respiratory and circulatory functions, produces general relaxation of the body and contributes to the formation of a correct posture. The gait mechanism consists of the movement of the whole body: head, torso, shoulders, upper limbs, pelvis and lower limbs. The elements of normal gait are: the antigravity support of the body, stepping, balance and propulsion. (Cordun, 1999)

Walking is an effective way to attract adults to become more active, given that it is an easy, accessible and low-cost form of physical activity. Walking enhances or maintains an individual's overall health (Allender et al., 2006; Jackson & Howton, 2008; Sisson et al., 2008) and can be influenced by various factors such as social considerations on the acceptability of going walking among social groups or individual motivation to start and remain engaged in regular walking. Group approaches show significant increases in walking levels. Several studies report that the use of pedometers is a motivational strategy for adults and increases self-reported walking (Ogilvie et al., 2007).

One of the eight investments that work for physical activity is represented by the community-wide programs, as they operate at multiple levels (individually, social network, neighbourhood and society) to challenge physical inactivity in a population and therefore to impact behaviour (Milton et al., 2021; Spence & Lee, 2003).

A public health intervention is any policy or effort that seeks to improve mental and physical health at the population level (*Cambridge Dictionary*, 2021). Public health interventions can be conducted by a variety of organizations, including government health departments and non-governmental organizations. Common types of interventions include screening programs, vaccinations, food and water supplements as well as health promotion. Common issues in public health interventions include obesity, drug, tobacco and alcohol use, the spread of infectious diseases. (Bauman & Nutbeam, 2013)

Health-promoting interventions are frequently developed and managed starting with planning models. These models support evidence-based practice and provide a basis for systematic evaluation. Some planning models use the population and individual facilitators to identify the best approach to project planning; others use planning models to specify the intervention components to be delivered. The use of a model allows those who plan a project or program to structure the different sources of information that have guided the development of the intervention and to consider, in a logical sequence, the probability of achieving the program goals through each step and strategy planned for that program. Over time, a model provides a structured description of the impact and outcomes of the health-promoting intervention but also a solid basis for evaluating an intervention. (Bauman & Nutbeam, 2013)

Walking interventions have a significant clinical effect on risk factors for cardiovascular diseases including body mass index, adipose tissue, systolic and diastolic blood pressure, blood glucose, increased  $VO_2$ max. Even modest amounts of walking provide health benefits. National recommendations on physical activity are the cornerstone of health promotion efforts. Walking can vary considerably in terms of frequency, intensity, daily/weekly duration and total volume. (Oja et al., 2018)

During childhood and adolescence, students develop their knowledge and improve their attitudes towards physical activities performed to improve health through systematic activity supported by an appropriate information environment. A possible way of maintaining a positive attitude towards an active lifestyle during adulthood is continuous learning in the field from an early age (Stănescu et al., 2014). Similarly, the methodological approach can be implemented among adults by engaging them in public health programs aimed at increasing knowledge and improving attitudes towards physical activity as an option to improve health.

Great efforts are being made by communities to increase walking levels among the adult population. Scientific evidence requires for each program to include an evaluation framework

in the planning phase as an integral part of project development to demonstrate its effectiveness. Each program aims at different outcomes, and evaluation will determine the extent to which a program has been successful. Evaluation measures the involvement of different processes applied to reach the outcomes. The evaluation cycle is applied in all phases of the program, such as planning, implementation and measurement in the form of a cycle. (Bauman & Nutbeam, 2013) If professionals in the field do not undertake a comprehensive evaluation of implementation, they will not replicate the program, hence there will be no wider community engagement (Adams et al., 2017).

An evaluation cycle of complex walking programs delivered at community level will use the logic model approach to incorporate in its journey a planning phase, data collection activities, reflection, action, evaluation and improvement. A logic model is a tool used to explain the direction or conceptual framework of a program, a graphical representation of the program that underlies planning and any evaluation process and describes anticipated effects. A logic model supports the strategic program planning, helps to communicate program goals and progress and serves as a basis for ongoing learning. (Innovation Network, n.d.)

The authors believe that implementing the walking program in Qatar universities to increase the community's wellbeing can contribute to enhancing the scientific evidence in the field. A starting point is to improve collaboration between stakeholders while delivering physical activity programs in a systematic, measurable and evaluated approach. We propose to align the public health and education sectors and develop methodological programs in order to increase the chances of reaching a larger number of the university population. This study proposes a logic model for walking interventions to promote and raise awareness of physical activity in adults (18-64) from Qatar universities.

The use of logic models as a systematic approach to the implementation of walking among adults from Qatar universities creates opportunities for developing relationships with stakeholders and increases the number of self-reported steps and engagement levels if the intervention is designed in accordance with the needs of the target audience.

## **Methodology**

This empirical study emphasises the importance of structured walking programs in Qatar and provides conceptual data for a logic walking program model addressed to adults from universities, using evaluation cycle components, step measurement theories, ways of engaging participants in the program and types of walking intervention designs.

### *Logic model components*

Logic modelling is an endorsed management method for the effective planning, implementation and evaluation of educational programs. This approach is expected to find measurable results that will bring benefits at individual, group and community levels. Walking interventions aimed at promoting physical activity within a structured approach provide opportunities to learn about the health benefits of physical activity, increase participation levels, enhance motivation levels and guide the community towards behavioural changes to reduce the occurrence of chronic diseases due to sedentary lifestyle. This

technique helps stakeholders to meet public health recommendations and achieve national health goals.

The measurable components of the logic model are: goal - a statement of the change that the program intends to make during the program journey; conditions - resources needed to implement the program; inputs - activities or actions needed to implement the program while making use of the resources; outputs - results of program activities expressed in terms of size and/or scope of services and products delivered or produced by the program; outcomes - results reflecting the changes that occur or the difference that is made for individuals, groups, families, organizations, systems or communities during or after the program (Innovation Network, n.d.).

#### *Evaluation cycle components*

A successful evaluation of a walking program includes a thorough analysis of the health problem and has clearly defined goals and objectives, also involving formative, process and outcome evaluations. The components of an evaluation cycle are mentioned below and are adapted to the needs of the walking program applied in Qatar universities and addressed to adults: Problem definition - a stage for collecting data about the needs of the target audience at epidemiological, demographic or social level, Solution generation - this stage states how and when the change is expected to occur, Resource mobilisation - this stage refers to obtaining the necessary resources to implement the program, Implementation - this stage ensures that program implementation will be as close as possible to the original plan in real life conditions, Impact assessment - direct results of the program as short-term effects, Intermediate Outcome assessment - results of the program as medium-term effects, Outcome assessment - results of the program as long-term effects (Bauman & Nutbeam, 2013).

#### *Tools and theories for step measurement*

Walking interventions are effectively assessed by program managers through step counts using pedometers and mobile applications connected to a web database. Daily steps are assessed using the Omron HJ-324U pedometer (OMRON Healthcare, n.d.). Through a USB connection, participants can upload their electronically recorded information using a self-monitoring online account, which is connected to a web database.

Mobile applications measure the steps accumulated during daily routines, monitor athletic performance and compare it to the average healthy standard of 10,000 steps per day. Mobile applications usually offer several innovative features designed to help monitor the level of fitness. In addition to counting steps and measuring distance, they also calculate calories and the amount of fat burned. (Aspire Zone Foundation, n.d.)

To assess the walking intervention program, the number of daily steps are classified as follows: sedentary lifestyle index ( $\leq 5,000$ ); low active (5,000-7,499); somewhat active ( $\geq 7,500$ ) (Tudor-Locke et al., 2002; Tudor-Locke et al., 2013).

### *Participants' engagement in the program*

Participants' motivation levels are assessed by the number of steps uploaded. Intervention methods recommended: walking interventions - pedometer distribution and walking competitions for adults on Qatar campuses; educational interventions - on campuses, implementation of bilingual educational materials, lectures, videos regarding the role of physical activity (PA) in the prevention of non-communicable diseases (NCD); online articles; monthly e-mails and SMS notifications for pedometer use; media campaign - radio advertising, yearly pre-/post-press releases; community stakeholder interventions - bi-annual planning/ reporting/achievement/rewarding/quality meetings; continuous follow-up communication, bi-weekly step reports.

### *Types of walking intervention designs*

Different intervention designs and types can be implemented as part of walking programs in Qatar as follows: longitudinal studies - participants are observed repeatedly over short or long periods of time (Sayegh et al., 2016), cohort studies - same participants are followed-up and evaluated at each stage of the program, both before and after the intervention (Hamer & Chida, 2008), randomised controlled trials - participants are randomly assigned to one of two groups: one group receives the intervention that is being tested, while the control group does not receive the intervention; the two groups are measured at baseline, then followed up for a certain period and post-intervention to see if there are any differences between groups in terms of outcome; the results and further analysis of the trial are used to assess the effectiveness of the intervention by determining whether there is a cause-and-effect relationship between the intervention and the outcome (Richards et al., 2017).

## **Results and Discussion**

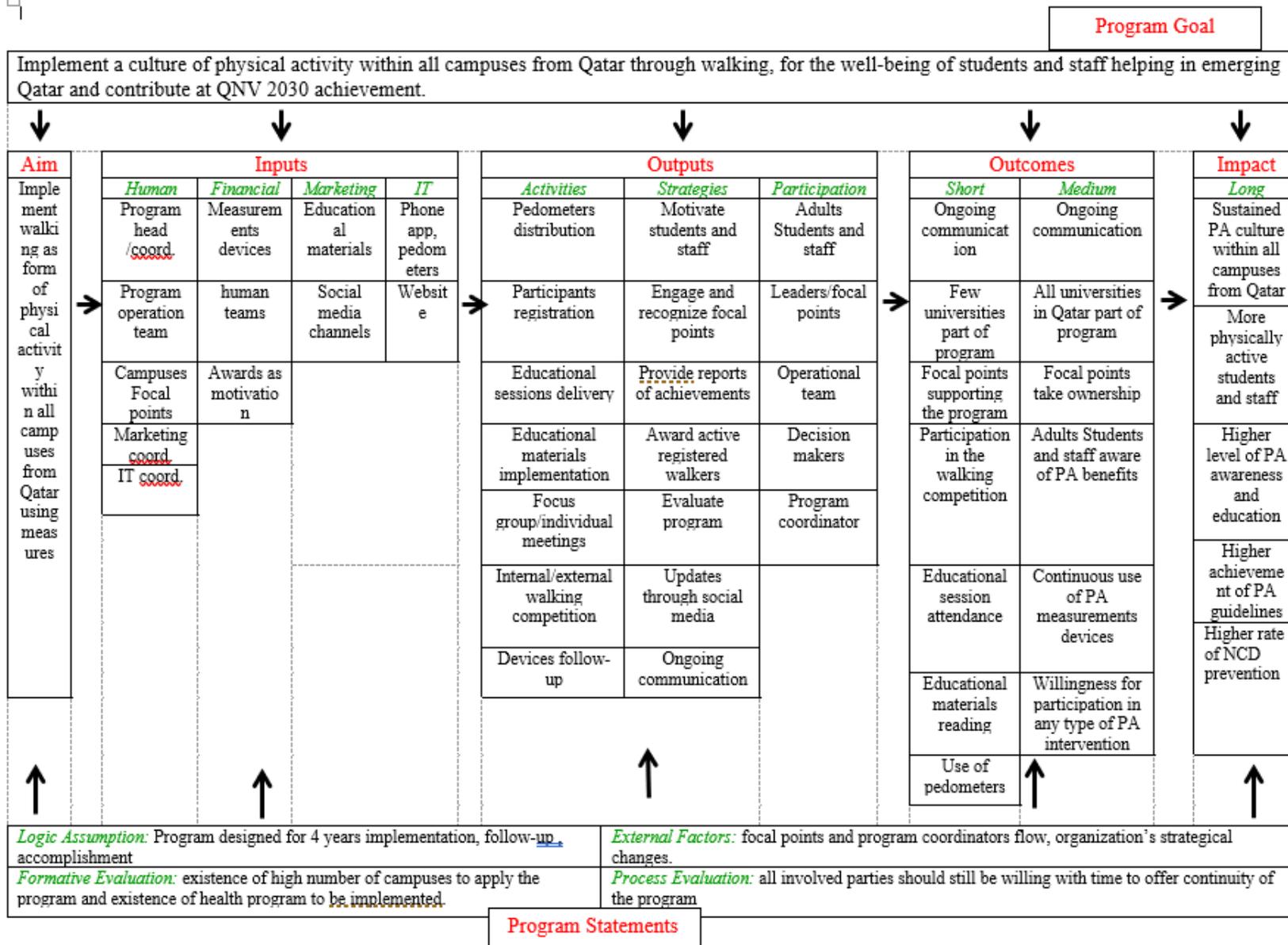
This empirical study gives evidence of the importance and effectiveness of planned and structured walking interventions in Qatar. The use of the logic model brings measurable achievements, providing a systematic approach and identification of results in the short term as formative evaluation, in the medium term as process evaluation and in the long term as outcome evaluation. In a walking intervention, formative evaluation provides needs assessment results, process evaluation provides step-count results and motivational levels, and outcome evaluation highlights changes in lifestyle habits towards healthier choices.

The logic model for walking interventions in Qatar universities, which was applied between December 2017 and December 2021 (Table 1), describes a program delivered as an intervention to increase the level of physical activity among the population by implementing and promoting safe, accessible and environmentally friendly walking as an enjoyable activity for all citizens. The model provides a map of activities to be implemented on campuses and targets adults aged 18-64, part of the university community in Qatar. The logic model components presented in Table 1 are the following:

- Program Goal - Implementing a culture of walking-based physical activity on all campuses in Qatar for the wellbeing of students and staff who help in emerging Qatar and thus contributing to the achievement of “Qatar National Vision 2030” (2008);
- Aim - Implementing walking as a form of physical activity on all campuses in Qatar by using measurements;
- Inputs - Human: program head, coordinator, program operations team, campus focal points, marketing and IT coordinators; Financial: measurement devices, manpower compensation, educational materials, awards as motivation, pedometer purchase and maintenance; Marketing: social media channels, website maintenance and engagement; IT: development and maintenance of phone apps and pedometers;
- Outputs - Activities: pedometer distribution, participant registration, delivery of educational sessions, implementation of educational materials, focus group/individual meetings, internal/external walking competitions, device follow-up. Strategies: motivating and engaging students and staff, recognising focal points, providing achievement reports, awarding registered active walkers, program evaluation, updates through social media, ongoing communication. Participation: students and staff, leaders/focal points, operational team, decision makers, program coordinator;
- Outcomes - Short term: ongoing communication, few universities are part of the program, focal points support the program, participation in the walking competition, attending educational sessions, reading educational materials, using pedometers. Medium term: ongoing communication, all universities in Qatar are part of the program, focal points take ownership, students and staff are aware of PA benefits, continuous use of PA measurement devices, willingness to participate in any type of PA intervention;
- Impact - Long term: sustained PA culture on all campuses in Qatar, more physically active students and staff, higher level of PA awareness and education, higher achievement of PA guidelines, higher rate of NCD prevention;
- Program statements - Logic assumption: Program designed for 4 years of implementation, follow-up and accomplishment. External factors: flow of focal points and program coordinators, strategical changes in the organization. Formative evaluation: existence of a high number of campuses to apply the program and existence of a health program to be implemented. Process evaluation: all parties involved should be willing to continue the program over time.

This type of intervention can be complemented by an enhanced walking infrastructure. Walking is an ideal PA intervention to improve the health and awareness of the population. Walking interventions among healthy populations are effective and safe, with good adherence and widespread health benefits. These could be a promising intervention as an adjunct to other health services or as a proactive health-promoting activity. (Hanson & Jones, 2015)

Table 1. Logic model for walking interventions in Qatar universities  
December 2017 - December 2021



The logic model for engaging adults in physical activism for a healthy lifestyle proposes an educational approach as part of the walking program. Education is a system of circumstances and actions provided at the society level to shape personalities and behaviours. Educability is a person's ability to be educated. Human development is the result of the interaction between internal and external factors (environment and education). (Dragnea & Bota, 1999; Epuran & Stănescu, 2010) The logic model components for participants' engagement in the walking program in Qatar universities are illustrated in Figure 1 and mentioned below:

- Objective - designing a logic model to engage adults (18-64) from universities in learning the concept of physical activity for health as an approach to the community's wellbeing in Qatar;
- Situation - the need to implement physical activity learning among adults (18-64) from the university community in Qatar for health improvement;
- Inputs - knowing the current learning system in this field, allocating budget and resources, assessing knowledge, attitudes and behaviours, understanding current levels of PA knowledge as alignment to the WHO and regional requirements;
- Outputs - Activities for adults aged 18-64 years - developing educational materials for the public, identifying and approaching the target audience in the environment concerned, developing the action plan, implementing learning activities;
- Short-term outcomes (raising awareness) - better understanding the benefits of regular physical activity, increasing motivation levels to participate in physical activity, better understanding the importance of regular physical activity, understanding the concept of nation's wellbeing;
- Medium-term outcomes (behavioural changes) - increasing willpower, attention and voluntary effort, identifying the reason why adults want to perform physical activity, increasing education levels, participating in physical activity, creating opportunities to participate in physical activity;
- Long-term outcomes (improved fitness, increased active behaviour) - gaining health benefits through physical activity at community level, gaining individual behavioural experience at community level, establishing an engagement model to facilitate the continuity of physical activity promotion, repeating interventions in the long term to learn the benefits of physical activity, evaluating outcomes.

Promoting physical activity education can result in improved health and behavioural changes to reduce the occurrence of chronic diseases. This topic is a priority in the field of health. Significant health benefits could be achieved by engaging the target audience in moderate amounts of physical activity (such as 30 minutes of walking) on most (if not all) days of the week. This approach helps to meet public health recommendations and achieve national health goals. The scientific literature states that interventions promoting physical activity at community level lead to an increase of about 4% in the percentage of people involved in physical activity and a 16% increase in energy costs (Centers for Disease Control and Prevention, 2011).

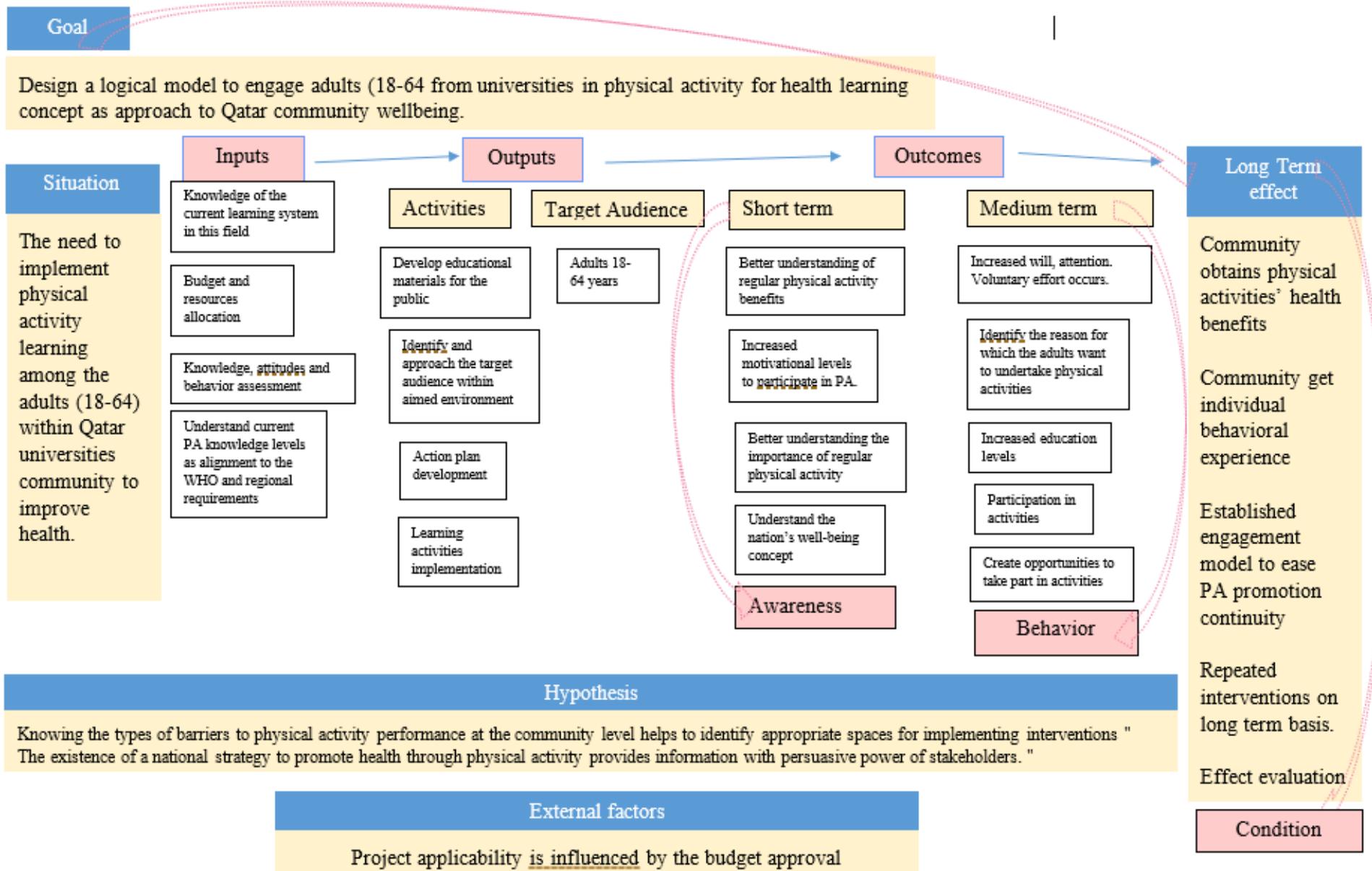


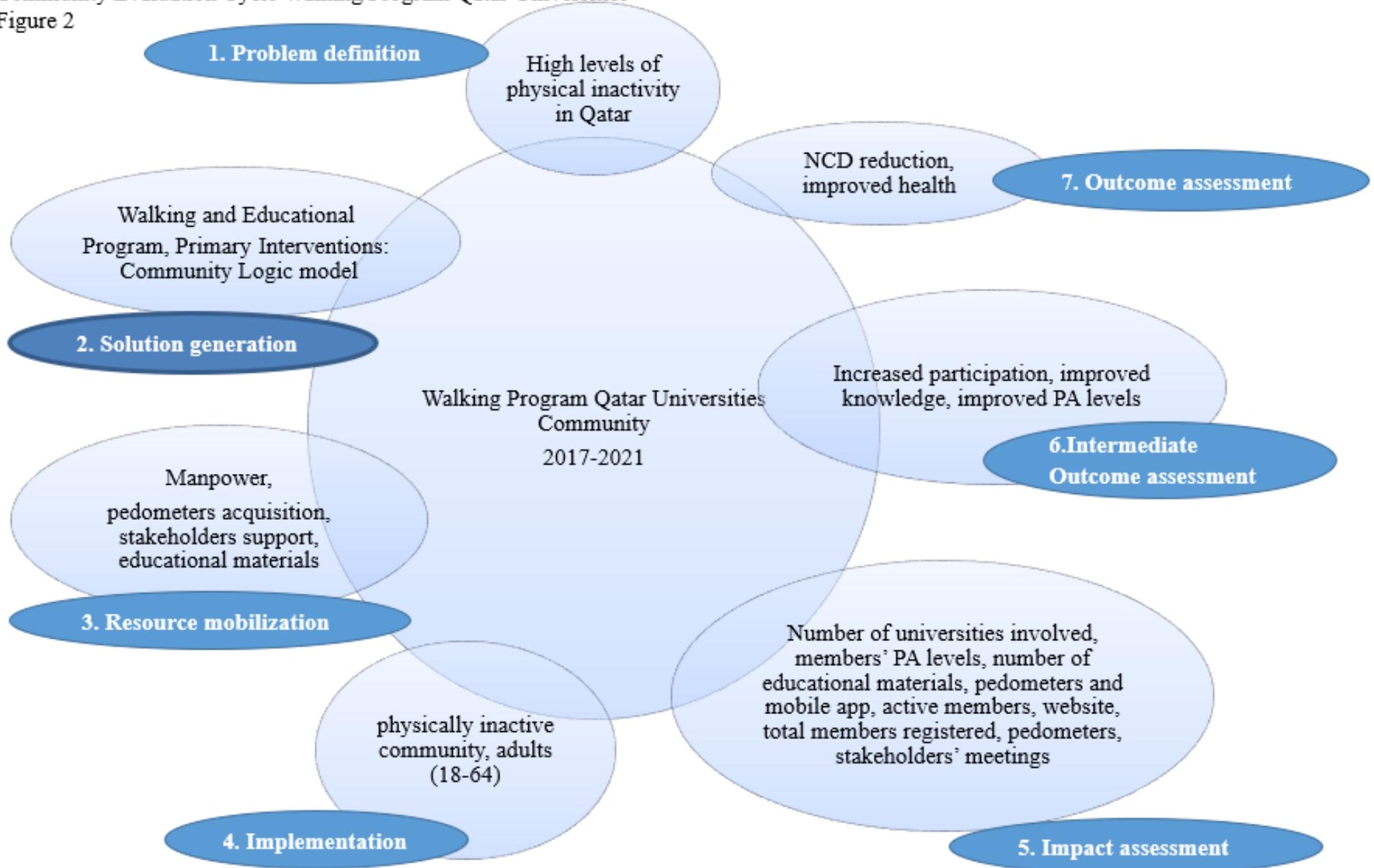
Figure 1. Logic model for participants' engagement in the walking program in Qatar universities

The community evaluation cycle for the walking program applied in Qatar universities (2017-2021) (Figure 2) is addressed to adults (18-64) and represents a planning model that provides a basis for systematic evaluation. The use of this model allows program coordinators to structure the different sources of information that have guided the development of the intervention and to consider, in a logical sequence, the probability of achieving the program goals through each step and strategy planned for the program (Bauman & Nutbeam, 2013).

The components of community evaluation cycle for the walking program used in Qatar universities are as follows:

1. Problem definition - High levels of physical inactivity in Qatar
2. Solution generation - Walking and educational program, primary interventions, community logic model
3. Resource mobilisation - Manpower, pedometer purchase, stakeholder support, educational materials
4. Implementation - Physically inactive community, adults (18-64)
5. Impact assessment - Number of universities involved, members' physical activity levels, number of educational materials, pedometers and mobile apps, active members, website, total registered members, pedometers, stakeholder meetings
6. Intermediate outcome assessment - Increased participation, improved knowledge, improved PA levels
7. Outcome assessment - Reduction of non-communicable diseases, improved health

Community Evaluation Cycle Walking Program Qatar Universities  
 Figure 2



## Conclusion

This study provides a theoretical contribution to the physical inactivity pandemic at global, regional and Qatar levels and suggests as a solution the implementation of a walking intervention within a systematic approach. A combination between the logic model, educational map, proper step-counting tools and appropriate intervention design according to the needs of the target audience is a successful journey to engage participants in a walking program. The authors of this paper recommend the implementation of planned intervention programs in Qatar with the purpose of impacting the community at national level through physical activity guidelines supporting the prevention of non-communicable diseases. This study contributes to the current theoretical evidence on the logic model effectiveness for program evaluation and recommends that professionals in the field use these findings as guidelines when evaluating real-life situations. While this study is envisioned as a guide for professionals in the field, the authors support further understanding of the seriousness of the problem, the needs and specifics of the target audience, the environment and the adaptation of the model to each particular situation.

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