

**Mejores Hábitos Mejor Vida:
An obesity prevention program plan and evaluation
for underserved populations of Costa Rica.**

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ABSTRACT

The burden of obesity and related non-communicable diseases (NCDs) in low- and middle-income countries such as Costa Rica is rapidly increasing due to globalization, urbanization, and increasingly sedentary lifestyles. NCDs are responsible for about 80% of deaths, yet these could be prevented by modifying major risk factors such as unhealthy diets and physical inactivity, which can lead to overweight and obesity. Mejores Hábitos Mejor Vida is a program created for International Service Learning (ISL), a non-governmental organization that enlists student volunteer teams, to educate underserved communities about improving nutrition and physical activity to prevent obesity and NCDs. This paper provides a review of community-based programs in Latin America that provide education about diet and exercise. Next, it provides a detailed description of the program plan, including its theoretical framework, goals and objectives, and plan for implementation. Activities for the program include curriculum development, volunteer and staff training, community member recruitment, and patient education. This is followed by a plan for evaluation of the program, which describes both observational and pre-test/post-test study designs, including evaluation planning tables, and presents the plan for dissemination. Lastly, the paper concludes with a summary of lessons learned, personal experience working with ISL in Costa Rica, and future implications.

TABLE OF CONTENTS

ABSTRACT	2
INTRODUCTION	4
SYSTEMATIC REVIEW	8
Introduction	8
Methods	9
Summary of Programs	11
Analysis	21
Conclusion	24
PROGRAM PLAN	25
Overview	25
Program Context	26
Theoretical Framework	30
Goals and Objectives	32
Logic Model	33
Implementation	33
EVALUATION PLAN	38
Rationale for Evaluation	38
Approach to the Evaluation	39
Evaluation Study Design	41
Evaluation Methods	43
Evaluation Planning Tables	44
Dissemination Plan	48
DISCUSSION	50
ACKNOWLEDGEMENTS	54
REFERENCES	55
APPENDIX	58

INTRODUCTION

Chronic, non-communicable diseases, including cardiovascular disease, diabetes, and cancer, were once thought to be problems of wealthy, industrialized nations, while infectious diseases burdened the developing world. However, non-communicable diseases (NCDs) are now the leading cause of death worldwide, consequentially threatening low and middle income countries in conjunction with persistent communicable diseases. In 2008, 36 million deaths were due to NCDs with nearly 80% occurring in low and middle income countries¹. This burden is projected to substantially increase which could have major adverse social, economic, and health effects², as well as exacerbate existing inequalities. Therefore, NCDs have emerged as an important challenge and priority in global health.

Many opportunities exist to prevent and control NCDs by using concerted efforts to address the risk factors for NCDs. Risk factors are well-known and include the following: tobacco use; energy-dense, nutrient-poor diet; physical inactivity; and harmful consumption of alcohol. Together these cause more than two-thirds of new cases and add to the complications of those with existing NCDs^{1,3}. Furthermore, these risk factors lead to metabolic conditions such as overweight and obesity which are also highly associated with development of NCDs. Risk of cardiovascular disease, stroke, and diabetes increase steadily with increasing body mass index (BMI), and the worldwide prevalence of obesity has doubled over the past twenty years¹. Therefore, prevention and reduction of overweight and obesity is needed immediately to halt the morbidity and mortality trajectory of NCDs.

Prevention of obesity and related NCDs seems deceptively straightforward: eat healthy and exercise. However, behavior change is difficult and individual choices are affected by broader social and environmental factors, making this a complex population-level problem⁴. In

addition, this demographic and nutritional transition is driven by rapid urbanization, globalization, and increasingly sedentary lifestyles ⁵. For example, people now consume more sweetened beverages, vegetable oils, and animal-source foods; watch television more; have less strenuous labor at home and work; and use more motorized transportation over walking⁶. Modern food processing and distribution techniques, technology innovations, global media expansion, global agricultural policies, and replacement of fresh markets by large supermarkets are undoubtedly some of the sources for the changes in food consumption and physical activity patterns, and consequent changes in body weight and body composition^{1, 7}. Consequently, effective prevention and management will require an integrated approach involving actions in all sectors of society to decrease the future burden of NCDs.

One way to address the issue is through health promotion strategies with a strong focus on primary prevention, which would empower people to avoid risk factors and create environments that support better behavior choices. It has been well documented that unhealthy diets and physical inactivity are the leading causes of obesity and related NCDs³. Thus, at the international level, there have been several landmark documents recognizing the need for action and recommending development of strategies and policy frameworks in support of changing diets and activity levels. However, a mismatch remains between the compelling evidence of the disease burden and concrete steps to implement effective interventions. Global health stakeholders and national governments in low- and middle-income countries must work together in order to balance competing priorities, allocate resources, build capacity, and implement programs if changes are going to be made.

Latin American and Caribbean (LAC) countries are on the front line of the demographic and nutritional transition. Overweight and obesity has increased in these countries as they

emerge from poverty, especially in urban areas⁸. The dramatic transition has occurred in less than twenty years wherein at least one out of four adults in LAC countries are overweight ⁶. Certain countries have a much higher prevalence and are rivaling the health profiles of high-income countries like the United States. In particular, a significant upward trend is seen in Costa Rica, a middle-income country of Central America, where over half of the population is overweight and 81% of deaths are attributed to NCDs⁹. In Costa Rican women aged 20-44 years, the prevalence of obesity and overweight increased steadily from 35% in 1982 to 46% in 1996 to 60% in 2009¹⁰. Similarly, Costa Rican men have a similar trend with an increase of 22% in 1982 to 62% in 2009¹⁰. Therefore, education and lifestyle interventions that address obesity and NCDs in Costa Rica are imperative to optimize nutrition and health.

International Service Learning (ISL) is an international educational, non-governmental organization that enlists medical and educational volunteer teams for the provision of services to under-served populations, mainly in Latin America¹¹. After past participation with ISL and collaboration with their Director of International Programs, Dr. Sonia Hernandez, we developed a program called Mejores Hábitos Mejor Vida to address obesity risk factors in underserved areas of Costa Rica. ISL teams typically see acute cases in clinic, but many opportunities exist to educate communities about developing better habits, notably healthy diets and increased physical activity, to prevent NCDs. The program is an innovative approach for ISL teams to integrate more public health, collaborate with the Ministry of Health or other organizations with similar goals, and reduce the incidence of NCDs in areas where routine healthcare is not available. The activities in the program include curriculum development, staff and volunteer training, community member recruitment, and patient education. With persistence of ISL teams, dedication of staff, and enthusiasm of volunteers, Mejores Hábitos Mejor Vida has the potential

to improve nutrition and physical activity knowledge in communities and initiate one small step towards better long-term health in Costa Rica.

The purpose of this paper is to provide a comprehensive overview of Mejores Hábitos Mejor Vida. The first section of the paper consists of a review of the literature for similar programs in Latin America to identify effective strategies that may help our program. The second section is a description of the program plan including goals and objectives, theoretical constructs, a logic model, and an implementation plan. The third section comprises a plan for evaluation, including the rationale for evaluation, the approach to evaluation, the study design and methods, and a plan for dissemination. Finally, the paper concludes with a discussion of the implications and future direction of Mejores Hábitos Mejor Vida.

SYSTEMATIC REVIEW

Introduction

A landmark document for NCDs called the *Global Strategy on Diet, Physical Activity and Health* was released by the World Health Organization (WHO) in 2004 after consultation with concerned stakeholders. Its recommendations included the following:

- Preventive services, whereby health-care providers give advice to patients and families about key dietary habits and physical activity combined with simple information and skill-building as a cost-effective intervention³
- International partner and nongovernmental organization involvement, whereby organizations cooperate in and support the development, testing, and dissemination of models for community involvement including nutrition and physical activity education to reduce NCDs³

International Service Learning aims to meet these recommendations and uses the WHO's strategy as the foundation for *Mejores Hábitos Mejor Vida*. In designing a new program, we must consider effective and practical interventions that will facilitate wide application and adaption of our program to achieve better outcomes.

Studies evaluating the effectiveness of interventions to improve patient compliance show that comprehensive programs that combine educational, behavioral, and affective components are more successful than single-focus interventions¹². Therefore, an important question to ask is: have other organizations or agencies in Costa Rica been successful in following the WHO's recommendations and establishing comprehensive programs that prevent obesity and promote healthy diets and physical activity?

The objective of this systematic review is to identify existing literature on community-based programs in Costa Rica that promote prevention of obesity or related noncommunicable diseases through education on diet and physical activity. After finding similar programs in the area that have been evaluated, the goal is to identify characteristics of successful programs, detect challenges of the programs, and incorporate the elements that have been successful. Comparable programs should incorporate the elements that are essential to Mejores Hábitos Mejor Vida, which include:

1. Population: adults in Costa Rica or similar Latin American countries
2. Intervention: education about healthy eating and physical activity
3. Outcome: improvement in knowledge, promotion of healthy lifestyle, reduction in BMI and other risk factors
4. Focus on preventing overweight/obesity or related diseases of diabetes or cardiovascular disease

Methods

Research Question: This literature review was conducted with the following research question: What can be learned from existing programs that utilize community-based education to encourage healthy eating and physical activity in order to prevent and reduce obesity in Costa Rica and other Latin American countries?

Search Strategy: To identify potential programs, I conducted a systematic literature search of electronic databases (PubMed, Embase, Global Health via EBSCO Host, and Google Scholar). The original purpose of the search was to identify all published English- and Spanish-language research articles reporting the use of primary prevention programs for overweight/obesity in

Costa Rica during the past 15 years. Considering the WHO recommendations were made about 10 years ago, the hope was to find more recent articles that may have adapted WHO strategies. My search strategy was guided by a preliminary review of the literature and the assistance of two research librarians at the University of North Carolina at Chapel Hill's Health Sciences Library.

I searched the PubMed online database using the terms "*Costa Rica*" AND ("*health education*" OR "*primary prevention*" OR "*patient education as Topic*") AND (*exercise* OR *diet* OR *obesity* OR *overweight*). All these terms were found in the MeSH database on PubMed. Other MeSH terms added included "community health services," "preventive health services," and "health promotion" which did not yield different results. I then used multiple combinations of these search terms in the other databases. Given the lack of evidence found in a preliminary search for Costa Rica, the location was expanded to all of Central America and then Latin America using the search terms ("Latin America" OR "Central America" OR "Costa Rica" OR "El Salvador" OR Belize OR Guatemala OR Honduras OR Nicaragua OR Panama).

The search in PubMed only yielded 20 articles over the past 15 years with these search terms. I reviewed the titles and relevant abstracts of the articles to look for the following inclusion criteria:

1. The article is available in full text format in English or Spanish.
2. The program took place in a Latin American country.
3. The program participants were adults.
4. The program used an educational intervention (excluded if only collected surveillance or risk factor data)

Only two programs in PubMed, Embase, and Global Health met the inclusion criteria. Google Scholar yielded two additional articles. Given the low yield of recent publications in Latin America, titles and abstracts published greater than 15 years ago were examined but proved to be irrelevant.

No literature was identified that focused specifically on primary prevention of obesity with diet and exercise education. However, the four research articles found served as guidance and will be discussed below, as well as in Table 1 in the Appendix.

Summary of Programs

Primary-care level educational nutrition program in El Guarco, Costa Rica

Valuing the importance of informing, motivating, and empowering individuals and their families about control and prevention of diabetes through education, an educational program was started in Equipos Básicos de Atención en Salud (EBAIS) in El Guarco, Cartago, Costa Rica in 1998. EBAIS are health teams that work together to deliver primary and preventive care for individuals in the area. Each team serves about 4000 people and consists of a physician, director, and support staff in dentistry, microbiology, social work, and nursing¹³. The goal of the program was to encourage health staff, patients and their families, and community organizations to be involved in educational processes, adapted to local conditions, to prevent and detect diabetes.

Type 2 diabetic patients between 30 and 60 years were identified who lived in the area, regularly attended EBAIS, and were absent of chronic complications. Thirty seven patients met these criteria. The program plan was divided into three stages. First a qualitative study of diabetes knowledge and practices of patients and medical personnel was conducted by

unstructured interviews and focus group discussions ¹³. In addition, the patients participated in an interview about food availability. In the second stage of the program, results of the first stage were used to create an educational manual and training for staff who in turn trained diabetic patients. Staff training was evaluated through a written test on topics such as disease knowledge, nutrition, teaching methods, and community characteristics. Patient training was evaluated before and after four months by anthropometric, biochemical, and dietary knowledge testing. In the third stage, strategies for sustainability in the area and promotion of community participation were incorporated into the program ¹³.

During the first stage, the qualitative study identified common beliefs and principle barriers that show that existing educational programs often inadequately served the educational demands of the population. For example, barriers identified include: lack of family support, limited communication with health staff, incongruity of health messages received, and recommended diets that are difficult to follow. The food availability survey showed that assortment of fruits and vegetables were limited, despite El Guarco being an agricultural area¹³.

During the second stage, the educational materials were developed to respond to the needs of health personnel, patients, and the health area. The staff manual included an overview of the structure of the educational sessions, teaching techniques, evaluation activities, principles of adult education, and the profile of diabetes. Topics covered about diabetes included recommended treatments, food distribution plans, characteristics of a healthy diet, symptoms, and prevention of complications. Staff training was delivered by the project coordinator in eight sessions of two hours each and included participatory techniques such as performances, demonstrations, and case discussions. Evaluation showed a significant increase in knowledge of staff in the subject areas discussed. The 37 diabetic patients participated in a course of eight

sessions. Only 26 patients participated in the entire course and 92% were women. There was a statistically significant reduction in fasting glucose, glycosylated hemoglobin and triglycerides¹³.

Progress was made to ensure sustainability. The health area of El Guarco incorporated the program as part of its commitment to improve the quality of comprehensive care for diabetic patients. Local media was used as part of the community-based outreach. A local radio station broadcasted public announcements about diabetes and its implications, and for five months a monthly diabetes education message was performed on television. In addition, the area had a health fair to screen for diabetes and its risk factors in the community, and then another fair at a farmer's market¹³.

A major limitation to the study is the small sample size of 37 patients. In addition, these patients may not reflect the majority of diabetics in the area since the study population included mainly middle-age women receiving routine care. The participants in the study may have had better compliance than the general El Guarco population. In addition, results may be confounded by education and socioeconomic status. The published results of this study did not include the patient knowledge testing which would be useful to see for ISL's Mejores Hábitos Mejor Vida. Another limitation is its use of only one modality, nutrition education, to address diabetes. We know that lack of physical activity is another main cause of diabetes³ so incorporating exercise into the program may have augmented results.

However, this primary care level program had great successes in its training and curriculum development which will be important to incorporate in Mejores Hábitos Mejor Vida. The project manual and training sessions were flexible and adapted to the needs and problems identified by patients and medical personnel in the area. This created a learning environment

more specific to the community that could potentially reduce barriers and false beliefs about preventing and managing diabetes. In addition, the initial qualitative study analysis motivated health workers to be actively involved in the diabetes education and led to implementation of community activities. Furthermore, the program identified families as important to include in education about healthy diet which will be essential for Mejores Hábitos Mejor Vida.

Community based nutrition and exercise pilot program in rural Costa Rica

Responding to the increasing prevalence of type 2 diabetes in poor, agrarian areas of Costa Rica, a pilot program was conducted with type 2 diabetic volunteers from three small communities surrounding Grecia in the central valley of Costa Rica. The objective was to deliver a community-based, group-centered nutrition and exercise intervention in order to improve glycemic control and cardiovascular risk factors among type 2 diabetics. The subjects were recruited for the study through chart review and consultation with treating physicians, a list of known diabetic patients in the towns generated by a local hospital, and public announcements¹⁴.

A total of 75 subjects from the three rural towns received diabetes education in the form of a lecture and then were randomly assigned to the intervention or control group using a randomization list¹⁴. Subjects in the intervention group (n=40) participated in a 12-week program that included 11 weekly nutrition classes (90 minutes each session) in centrally located community centers. Those approved by their doctor (n=20) were also invited to participate in 60-min walking group sessions three times per week led by local volunteer community leaders. Height, weight, blood pressure, glycosylated hemoglobin, fasting plasma glucose, and lipids were measured at baseline and at the end of the study¹⁴.

Nutrition classes were taught by three nutritionists who received instruction about the specific curriculum and helped refine it to meet local customs. The nutrition curriculum was presented in Spanish using demonstrations and participatory activities, and it focused on portion control and healthier food substitutes¹⁴. The program also used peer support and goal setting to facilitate improvement in eating behaviors. In addition, family members were encouraged to participate in both the nutrition and exercise interventions to emphasize importance of health for the whole family and not only the diabetic patient.

Thirty three subjects in the intervention group and 28 subjects in the control group completed the study. Baseline clinical and demographic characteristics were reported as not significantly different; however, after examining Table 1, the average fasting blood glucose and lipid levels in the intervention group were slightly higher. However, this difference may not be clinically significant. Of note, more women participated in the study—59 women yet only 16 men. Of relevance to ISL's Mejores Hábitos Mejor Vida, the intervention group lost 1.0 +/- 2.2 kg and the control group gained 0.4 +/- 2.3 kg ($p=0.028$)¹⁴. In addition, fasting plasma glucose and glycosylated hemoglobin levels improved in the intervention group. Other measure between the groups had very small or statistically insignificant changes. Changes in knowledge or behavior were not evaluated.

Although small improvements in risk factors were found, the study has biases that flaw its internal validity. The subjects may not accurately reflect the source population producing selection bias. Everyone with diabetes in the three communities may have not been contacted, and those who were contacted and volunteered may be different, especially given the gender imbalance. The study does not describe how many potential eligible participants were on the pre-recruitment list and how many were actually contacted. Fourteen subjects did not complete the

program and only 9 subjects in the intervention group consistently attended at least one walking group per week which further decreases the power of the study. Measurement bias is reduced by using same measures in both groups at similar points in time and sending all assays to the same laboratory; yet looking at a difference in measures over three months may not be long enough to predict significant outcomes. In addition, important potential confounders should have been measured such as educational levels, family history, smoking status, and alcohol consumption.

One strength of the trial is the randomization to two study arms. However, this is limited by the lack of blinding of participants and health care providers which could contribute to selection bias and confounding. Although blinding would be impossible in an intervention such as this, knowing one's group could produce differential care by providers. Also, subjects in the control group could easily communicate with the intervention group or strive to be better at controlling their diabetes because they know they are part of a study.

Despite the limitations, the study has strengths that could be applicable to our obesity prevention program. The modest improvement in health indicators after three months can be used as a starting point for evidence that a community-based program that teaches about diet and exercise could effectively be implemented and make a difference in reducing obesity and chronic diseases. Some participants recruited other members to continue walk groups even after the completion of the study, contributing to the idea that peer reinforcement as well as family involvement is important for these lifestyle changes. In addition, the group structure for teaching about nutrition and volunteer community leader walking groups gives a relatively low cost, feasible model for other communities¹⁴.

Cooperative Latin American implementation study (PEDNID-LA)

The Programa de Educación de Diabéticos No Insulinodependientes in América Latina (PEDNID-LA) is an educational model program created by the Latin American Diabetes Association (ALAD) to address the increasing prevalence of diabetes in Latin America and lack of educational resources. The group education model was implemented simultaneously in Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, Paraguay, and Uruguay and evaluated for effects on clinical, biochemical, therapeutic, and economic outcomes¹⁵.

A multidisciplinary group of health care professionals designed the course based on a diabetes program at Grady Memorial Hospital by Davidson and adapted it to local conditions¹⁵. Educators participated in an intensive two day training seminar beforehand. The course included four weekly teaching units (90-120 minutes each) given to no more than 10 patients in a group setting. Family members were invited to attend. During the first unit patients were taught general diabetes concepts, trained to self-monitor glucose, and encouraged to begin active participation in treatment by following a low-calorie diet, monitoring glucose twice daily, and logging daily body weight. During the second unit, patients discussed the evolution of their disease and were taught the importance of weight reduction. They were educated about diet recommendations with the Plate Model and designed an individual meal plan. During the third unit, patients were taught about foot care and regular physical activity. During the fourth unit, they learned about basic rules for episodes of acute disease and about examinations and laboratory tests needed for diabetes care¹⁵.

Education materials used during the program included the following¹⁵:

- Colored flip charts to illustrate main points
- Teaching guidelines for each educator

- Food photographs representing 100 calories each
- Questionnaires to verify and evaluate patients' knowledge
- Logbooks for self-recorded data
- Take-home booklets for the patients

Patients for the study were recruited if they had type 2 diabetes or a BMI>27, were less than 65 years old, were without advanced chronic complications of diabetes, and had not participated in a previous diabetes education course¹⁵. The final study group included 446 patients. Clinical data, metabolic control and cardiovascular risk factors, drug intake, and cost of pharmacological treatment was collected 6 months before, on entry, and 4, 8, and 12 months after the program¹⁵. Interestingly, more men participated in this study than the two Costa Rican studies discussed above, for 36% of patients were male.

Fasting blood glucose, HbA1c, body weight, blood pressure, cholesterol, and triglycerides had all significantly improved over one year. In addition, there was a significant decrease in the percentage of patients taking pharmacotherapy (76% v. 48%, $p<0.001$). This decrease represented a 62% reduction in annual cost of pharmacological treatment. If the cost of daily urine glucose analysis is added back in, then a 34% reduction in costs was experienced¹⁵. Compliance with physical activity recommendations and results of knowledge questionnaires were not discussed.

Overall, the program presents a strong case that group education for diabetes patients in Latin America is an effective means to produce lifestyle modifications to reduce risk factors and chronic complications of diabetes. Although the sample size is larger than the previous discussed studies, the study population expands a much larger area; and therefore, issues with validity are still worrisome. The study does not describe its participant recruitment strategy so it

is difficult to assess selection bias. In addition, attendance at 12 months was only 76%, so the high dropout rate could add to potential selection bias.

Regardless of study limitations, the PEDNID-LA described a well-planned program that could be useful for Mejores Hábitos Mejor Vida. The education model first empowered patients with a knowledge base, and then promptly initiated participation one's own care with glucose checks and a logbook. The program also created a nutrition curriculum with a positive approach and visual messages to promote memory retention and solidify the connection between diabetes and diet. Another strength is the multi-focus approach to reduce complications of diabetes. It reinforced concepts and was able to troubleshoot misunderstanding with questionnaires during the four units. And lastly, the study demonstrated that educational interventions can be cost-effective which could result in the diminution of the socioeconomic burden of those in developing countries.

Agita São Paulo Program for physical activity promotion

The Agita São Paulo Program is a multilevel intervention approach to promote physical activity for the 37 million inhabitants of São Paulo, Brazil. It was created in 1996 by the Studies Center of the Physical Fitness Research Laboratory of São Caetano do Sul (CELAFISCS) and the São Paulo State Secretariat of Health with the purpose of increasing knowledge about the importance of physical activity for health, as well as increasing people's activity levels. The main message is to adapt an active lifestyle, according to the recommendation that everyone should perform at least 30 minutes of moderate intensity physical activity per day, on most days of the week. The program has become a role model for similar programs in Latin America¹⁶.

In attempting to change behavior, the program uses the transtheoretical model of stages of behavior change and prepares educational materials (posters, flyers, and brochures) targeted to groups in the different behavior change stages¹⁶. Most funding is provided by the State Health Secretariat with help of partner institutions and businesses. Three specific target groups of the program are students, workers, and the elderly. The three main activities to reach these groups are mega-events, actions carried out with partner institutions, and partnerships. Mega-events are designed to reach at least a million people, are generally linked to cultural or seasonal events, and often attract media coverage which further increases the awareness of having an active lifestyle¹⁶. In addition, 300 partner institutions have ongoing activities for physical activity promotion to reach people in their institutions and communities. Furthermore, the 300 partners have a mission to spread the Agita São Paulo Program throughout their networks and make it simple for potential partners to be involved. The diversity of tactics allows numerous effective solutions to the same problem¹⁶.

The Agita São Paulo Program has increased public awareness through free media exposure at events. The program has also been spread through multiple publications, presentations, lectures, and workshops for the scientific community. In 2000, the Ministry of Health used the Agita São Paulo Program to launch a national program called Agita Brasil to promote physical activity especially for those at risk for NCDs. Many partnerships have been formed with federal and state departments, cities, universities, and organizations through its implementation¹⁶.

Many evaluations have been done of the Agita São Paulo Program since 1999 in effort to measure qualitative and quantitative indicators, both in the population and in the diverse actions developed by partner institutions. They used the ecological model to identify the main

intervention and evaluation strategies as intrapersonal factors (demographics, biological, cognitive/affective), social environment factors (social climate, cultural, policies), and physical environment factors (weather, geography, information, transport, recreation)¹⁷. Intervention strategies were divided into short-term evaluations (immediate weeks), medium-term evaluations (months-years), and long-term evaluation (>5 years). Difficulties with the evaluations included convincing partners to include the evaluation process in their activities, identifying indicators and tools for permanent evaluation for many different interventions, and the high cost of surveys¹⁷.

The Agita São Paulo Program has been effective at promoting physical activity in large populations of a developing country¹⁶. The strengths are its multisectoral approach, broad use of partners, committed stakeholders, frequent use of media, and detailed evaluation plan. The program does not seem to involve small group interactions with professionals like the other programs discussed above, but it makes a strong attempt at a public health intervention.

Analysis

In summary, the four programs included in this literature review provide a small glimpse at efforts to reduce chronic diseases through exercise and nutrition education in Latin America. They were all making efforts even before the *WHO's Global Strategy on Diet, Physical Activity, and Health*. Likely other programs exist, but there is very little published data available on community education programs to reduce obesity. However, the programs described above give valuable ideas to incorporate into the ISL's obesity prevention program.

This literature review is very limited. Surprisingly, there is a gap in the literature about the effectiveness of primary prevention programs for adults similar to Mejores Hábitos Mejor

Vida. No studies could be found for Costa Rica. Therefore, the search was expanded to include all of Latin America, and even then, no published literature was found in journals regarding primary prevention of obesity in adults. Of note, only published literature about obesity prevention programs in children and adolescents was found, and these were primarily in a school setting which is not related to ISL's program. In addition, preliminary searches revealed many research articles that surveyed populations for risk factor data or disease prevalence in Latin America, as well as many editorials describing the increasing obesity problem in Latin America. Nevertheless, no evidence was found regarding the effectiveness of programs that have been initiated to prevent and reduce this problem.

Furthermore, very limited data exists as to whether diet and exercise education interventions have been successful in controlling risk factors for NCDs in Latin America, especially in community settings. Numerous studies have demonstrated that diet and physical activity in a controlled environment can control risk factors¹⁴, but there are not many studies that show progress toward NCD reduction in developing countries with this method. If rising obesity and NCD rates are such a concern, why have studies not been published about successful or cost-effective programs? Perhaps, there is little drive or incentives to publish results of these types of programs.

Regardless of search limitations, strengths of the four programs provide advantageous lessons for Mejores Hábitos Mejor Vida. Considering food availability in low-resource communities and adapting diets to local culture is necessary¹³. Incorporating family and peer support provides reinforcement¹⁴. Consistent messages and a multi-focus approach are more likely to invoke lifestyle change. Incorporating media messages provides more community involvement and support for sustainability¹⁶.

With exception of the Agita São Paulo Program, the programs focused on tertiary prevention—preventing disease-related complications in diabetes patients. Nevertheless, using group-based learning about nutrition and physical activity in communities reduced risk factors. Many community members who encounter ISL teams do not have regular access to care, and ISL is not present enough to monitor chronic diseases. However, reducing risk factors for diabetes and cardiovascular disease, whether the disease is already present or absent, would produce positive health outcomes. Furthermore, the programs were found to be cost-effective interventions which could help create self-sustaining programs in impoverished areas.

One barrier identified for lifestyle changes was lack of family support¹³. A strength of all the programs was that they encouraged family members to be part of the intervention. Family connectedness is often emphasized in the Latino culture, and family behaviors and attitudes can support or deter a patient's willingness to manage their health care¹⁸. In addition, studies in the United States among Latino populations have shown that family-oriented weight loss programs yield better results than individual approaches¹⁸. As discussed, many intervention programs for children exist in schools, but evidence is lacking about programs for adults. It seems logical that children would also need to incorporate healthy habits at home with their parents in order to prevent overweight and obesity. Including the whole family in nutrition and exercise education will be an important goal for Mejores Hábitos Mejor Vida in order to overcome the family support barrier.

Several weaknesses or loop holes exist in the studies analyzed as well. First, only the primary care level program in Costa Rica published results of the patient knowledge assessed during their community assessment. The other programs mentioned the measurement of knowledge assessments, but where is the data? Second, the programs only reported short-term

data; the longest time interval was one year. It would be beneficial to know whether the educational interventions made a difference in those communities after immediate post-program measurements. Adapting healthy eating and increasing physical activity is a lifestyle change that needs to be long-term in order to successfully reduce NCDs. Third, the programs with measurable data reported had very small sample sizes which decreased the power of the studies.

Conclusion

In conclusion, the three programs for Costa Rican diabetes patients and the program about physical activity promotion in Brazil provide insight into programs that have been successful in Latin America. The overall lesson is that allocating time and resources to educational programs that promote physical activity and nutrition in Costa Rican communities have the potential to be beneficial. They improve the quality of life of those with obesity-related chronic diseases like cardiovascular disease and diabetes, by reducing risk factors and complications. The data is limited about specifically preventing overweight and obesity, and much more research needs to be done to enhance and spread information to current programs. However, Mejores Hábitos Mejor Vida can use the training and curriculum descriptions provided and strengths identified in order to develop and improve its program plan.

PROGRAM PLAN

Overview

Although a gap in the literature exists on the best way to approach the rising rates of obesity for adults in Latin America, steps must be taken to reduce this major modifiable risk factor—a leading cause of disability and mortality in Latin American countries. The nutrition transition to high-energy dense foods and lifestyle transition to less physical activity are recognized as two of the main risk factors associated with accelerated obesity rates in the area ^{7, 19}. Therefore, International Service Learning (ISL) would like to add on a program to its existing volunteer service with underserved populations in Costa Rica to educate communities about diet and physical activity to prevent and control obesity and related chronic diseases.

Mejores Hábitos Mejor Vida will provide training for ISL staff and student volunteers to assist in educating underserved communities about maintaining a healthy weight with diet and exercise. ISL currently visits urban and rural communities in the Central Valley, Central Pacific, Guanacaste, and South Costa Rica. Despite the continuous shift in volunteers, with continuous resources and strategies for sustainability, the program will hopefully be expanded to other countries of Latin America that have established relationships with ISL.

Prevention of chronic diseases will require a supportive environment created by policy and community initiatives to address behavioral risk by promoting healthy individual choices and providing resources. Although Costa Rica has a national healthcare system, obesity is shifting to a disease of the poor ⁶, and many communities remain without access to routine care and prevention. In addition, several programs have been established to address childhood obesity, yet data is lacking on effective programs for adults. Early education is imperative for

eating and physical activity patterns for children and adolescents, but parental and social environment influences also encourage health behaviors ²⁰. Therefore, Mejores Hábitos Mejor Vida hopes to reach areas that may not otherwise receive routine healthcare to provide education and support for families and their communities and to add to other ongoing local and national efforts to reduce obesity and related chronic diseases.

Program Context

Program Priorities

Noncommunicable diseases (NCDs) have joined malnutrition and infectious diseases as health problems in developing countries of Latin America. In Costa Rica, NCDs are estimated to account for 81% of all deaths with cardiovascular disease being the largest killer. In 2008 the estimated prevalence of obesity was 23.7%--20.4% for men and 27.1% for women; and the estimated prevalence of being overweight was 58.3%-- 59.4% for men and 57.2% for women. Likewise, 40.3% of the population had elevated cholesterol and 35.6% had elevated blood pressure. Data from 1980 to 2008 showed a steady incline of mean body mass index of the population from about 22 to 27 ⁹.

Public health action is needed to increase overall awareness and understanding of the influences of diet and physical activity to reduce obesity and NCDs. NGOs, such as International Service Learning, can be used to support the Ministry of Health or government by helping in the development and implementation process of national policies and programs to promote healthy diets and physical activity. The World Health Organization's summary of recommendations for supportive programs include giving clear, consistent messages communicated through several channels and in forms appropriate to local culture, age, and gender. In addition, routine contacts

with health-service staff should include advice on the benefits of healthy diets and increased physical activity combined with support to start and maintain the patient's healthy behaviors²¹.

Global, National, and Local Priorities

The World Health Organization (WHO) and associated Pan American Health Organization (PAHO) recognize the growing burden of noncommunicable diseases that stem from obesity. Therefore, the WHO has taken the responsibility of formulating strategies and action plans over the past decade to reduce death and disease worldwide caused by NCDs. One of the objectives is to promote interventions to reduce the main shared modifiable risk factors for NCDs such as unhealthy diets and physical inactivity. The supplemental plan for this task is the WHO's *Global Strategy on Diet, Physical Activity, and Health* developed in 2004. In addition, the WHO composed a framework to monitor and evaluate implementation in 2008.

Member States which includes Costa Rica are recommended to establish and strengthen national policies and plans for the prevention and control of NCDs, to promote interventions to reduce the main shared modifiable risk factors for NCDs, to promote research and partnerships for the prevention and control of NCDs, and to evaluate progress²². Action plans are included for international partners who would like to work with Member States to achieve these objectives. Therefore, ISL's obesity prevention program in Costa Rica aligns with current global priorities.

Several health programs to address NCDs have been started in Costa Rica; however, limited data exists as to whether these have made a difference. Since 1995, Costa Rica's Ministry of Health has had a National Program for Health Promotion and Protection that encourages social participation and connects its education and mass communication components²³. In 1999, Costa Rica joined CARMEN (the Set of Actions for the Multifactorial

Reduction of Noncommunicable Diseases), PAHO's main vehicle for action in prevention and control of NCDs in Latin America and the Caribbean. One national program implemented in 2004 was the Costa Rica Da Vida al Corazon which included strategies for community participation and improving lifestyles by health education on tobacco, healthy diet, and physical activity²⁴.

In addition, Costa Rica created the CARMEN NCD Policy Observatory in 2004, jointly with Canada and Brazil, to promote the analysis and evaluation of public health policy, for little evidence exists on the effectiveness of specific policies. The CARMEN initiative is based on the principle of inter-sectoral, multidisciplinary community action to improve health by reducing morbidity and mortality rates through actions focused on prevention and health promotion. The National Executive Committee is in charge of the program with participation of the Ministry of Health, the Ministry of Public Education, and the Costa Rican Institute on Nutrition and Health Research and Teaching (INCIENSA) to name a few²⁵. Therefore, there have been national efforts to combat NCDs and support to promote healthy diets and physical activity.

In 2011, the Costa Rica Ministry of Health in collaboration with the Ministry of Sports and Recreation presented a guideline called *Plan Nacional de Actividad Física y Salud 2011-2012* to promote the increase of physical activity in the Costa Rican population to prevent chronic diseases. The plan also includes the partnership with other organizations such as La Red Costarricense de Actividad Física para la Salud (RECAFIS), El Instituto Costarricense del Deporte y la Recreación (ICODER), and Organización Panamericana de la Salud (PAHO), which each have objectives to promote active lifestyles²⁶. As discussed in the systematic review, published local programs and initiatives were difficult to find, yet international and national

plans indicate that Costa Rica has made the prevention of chronic diseases through nutrition and exercise a priority.

The Political Environment

Costa Rica is a Democratic Republic and has long emphasized respect for human rights. In addition, the United States is one of Costa Rica's most important trading partners²⁷. Programs that promote a decrease of NCDs are a national and global priority. Therefore, no problems are expected from allowing students from ISL to participate in community initiatives that are congruent with the country's health objectives.

Program Acceptability

The program is expected to be widely accepted. ISL already has permission to provide care to certain communities and has alliances with many churches, schools, and community centers. Providing education about diet and physical activity is non-invasive and will follow national guidelines. Students who are fluent in Spanish and receive cultural competence training could assist in delivering information and leading activities.

Stakeholders

The Ministry of Health, PAHO, ISL staff, and community members are the key stakeholders in this project.

Financial Resources

Financial resources to fund this program arise primarily from International Service Learning. Students fund their own trips; and therefore, an allotted percentage could be provided

towards Mejores Hábitos Mejor Vida. In addition, any supplies such as paper hand-outs could be printed in the USA before trips and brought with students in order to defray costs.

Technical Feasibility

Participation on clinic days can vary. With effective announcements during village triage, many members of the community will have the opportunity to decide whether they would like to attend an educational session. In addition, students can easily give educational handouts while making house visits to target those who may not attend clinic days. Physical space to accommodate workshops may become an issue, as buildings used to set up temporary clinics are small with limited seating. Spanish interpreters or students with adequate fluency will be necessary to teach and answer questions appropriately. With adequate personnel to lead discussions, the flow of other clinic activities will not be interrupted.

Theoretical Framework

Risk of noncommunicable diseases among poor rural and urban Costa Ricans is indicated by rising rates of obesity which can result from unhealthy diet and lack of exercise. Many reasons could exist for the increased prevalence of obesity, and a health promotion program could tackle the problem in different ways. Theoretical frameworks will lay the foundation for our program in order to explain the dynamics of these health behaviors and how to create appropriate interventions. An ecological perspective which focuses on the multiple levels of influence on health behavior must be considered in order to be most effective²⁸.

At the individual level, we will use the Health Belief Model (HBM). Health motivation is the central focus which will be imperative in order to promote a healthy diet and exercise program. The HBM addresses the patient's perceptions of the health problem, severity of the

problem, and benefits to taking action, as well as promoting action and building confidence to achieve desired behaviors²⁸. Our program will use these concepts to understand individual's beliefs about obesity through discussion and educational materials. Workshops or presentations on clinic days will be used to address perceived susceptibility, barriers, and severity of disease and to explain how diet choices and exercise can bring positive results. Handouts or brochures will be given in clinic and during village triage to promote awareness and remind individuals of key components of the lessons.

At the interpersonal level, Social Cognitive Theory (SCT) will be used to explore the influence that personal interactions, the environment, and human behavior have on each other in order to consider multiple ways to promote behavior change. In this theory, changing behavior relies on the concepts of self-efficacy, goals, and outcome expectancies²⁸. Workshops with ISL groups will provide the knowledge and promote learning. Positive outcomes will be discussed with a layout of small, achievable goals that can be built upon so that individuals are not overwhelmed or discouraged easily. To offer modeling and reinforcements, hopefully a community member will be identified during the first few trials who is eager to lead their village in changing behaviors. This point person could establish community goals and monitor results as the program progresses with each ISL group and to initiate sustainability. As new behaviors increase, decreased burden of disease, less stress, and increased stamina should provide an internal reward to encourage continued participation.

At the community level, Diffusion of Innovations Theory will be used to raise the priority of healthy diet and exercise regimens by spreading new ideas and initiatives. This theory focuses on the innovation's advantages, compatibility, complexity, trialability, and observability²⁸. The communities we are reaching are underserved with limited access to health care and have not had

any formal programs to address these health problems. After starting the program in one community; hopefully, we will see positive outcomes to demonstrate the relative advantage. Workshops and brochures will be designed for the specific communities and with relatively easy language and pictures, therefore limiting the complexity. In addition, material is compatible with the WHO's recommendations. The attribute of trialability could be used by testing the program in a few villages that ISL travels to before implementing the program in all traveled villages. Since ISL visits the same villages several times a year to provide continuity, we should be able to see changes in the community with focus groups and measuring BMI in clinics in order to present observable results.

Goals and Objectives

Goal: Prevent and control obesity and related noncommunicable diseases of adults in underserved communities of Costa Rica through healthy eating habits and physical activity.

- **Short Term Objectives**

- By month 3, all program staff will be trained about teaching lessons on nutrition and physical activity and facilitating student volunteer participation.
- In one year, 100% of ISL medical teams to Costa Rica will add the program to their itinerary.
- In one year, 75% of adults in targeted communities will be invited to participate during village triage days.
- In one year, 50% of adults in communities will have participated in educational workshop at least once and demonstrate better practice and knowledge in regards to obesity, nutrition, and physical activity.

- Within one year, community members will be identified who would like to partner with ISL to lead initiatives in their community even when no ISL trips are scheduled.
- **Long Term Objectives**
 - In five years, at least 90% of community members will have been reached whether via personal communication, brochures, or clinic workshops lead by ISL.
 - In five years, at least 50% of community members visited by ISL teams will have reduced the consumption of unhealthy foods and increased physical activity.
 - In five years, at least 50% of returning community members will demonstrate greater knowledge in regards to effects of obesity, nutrition, and physical activity.
 - In five years, the obesity rate for adults in served Costa Rican communities will decrease by 3%.
 - Within five years, ISL will add the obesity prevention program to other country program itineraries in Latin America.

Logic Model

See Figure 1 (Appendix) for the Mejores Hábitos Mejor Vida Logic Model

Implementation

Mejores Hábitos Mejor Vida will be implemented in both rural and urban underserved communities of Costa Rica under its parent organization, International Service Learning. The program has the mission of reducing the burden of weight-related disease by decreasing the prevalence of obesity and increasing healthy eating and physical activity for all Costa Ricans. The main activities for the program include staff and volunteer training, community member

recruitment, curriculum development, and patient education. The program will begin the summer of 2012, and hopefully achieve sustainability and expand to other countries visited by ISL who are facing the burden of noncommunicable diseases after one year.

Curriculum development

The main component of Mejores Hábitos Mejor Vida is volunteer-led workshops to increase the awareness of problems stemming from obesity and to educate about primary prevention through healthy eating and physical activity. Lessons on prevention of obesity will be adapted from the WHO Global Strategy on Diet, Physical Activity, and Health as well as evidence-based recommendations identified in a literature search. The Ministry of Health will be contacted to see if existing materials on this subject matter exist.

The curriculum will aim to meet the needs of the individual communities and be reflective of local cultures. Additionally, presentations and activities will be adjusted to accommodate various age groups and literacy levels. Participants will have the opportunity to express their concerns and limitations regarding diet and exercise in hopes that we can use the feedback to further tailor our curriculum to meet the community needs and break down barriers to achieving our objectives.

Staff and Volunteer Training

In order to ensure that staff and volunteers understand the goals of the program and are comfortable with delivery of the interventions, a component of the program will be separate staff and volunteer training. ISL-Costa Rica employees typically meet 2-3 times per year to discuss upcoming plans. Before the starting date, ISL staff including physicians, team leaders, team leader assistants, the country coordinator, and interpreters will meet to discuss the objectives and

activities. If it is not feasible to have all the staff meet, then a detailed powerpoint will be issued to introduce the curriculum.

Typically 6-25 student volunteers are scheduled for each ISL team trip by a team manager in the United States. Before departing for Costa Rica, student volunteers will receive a handout in their ISL packet with information regarding the new obesity prevention program. Students will be trained during their orientation on the 1st or 2nd day of their ISL trip to Costa Rica. In one hour or less, a seminar will be given to educate students on how obesity and noncommunicable disease has become an important public health issue in Costa Rica, to instruct what they should do on village triage days, and to introduce the curriculum and materials that will be provided to the community. Afterwards, students will have the opportunity to sign up to help lead workshops on scheduled clinic days with preference given to those with Spanish fluency. At least two volunteers should be available to deliver the workshops and can rotate between sessions if desired.

Community Member Recruitment

Community members will be recruited on village triage days. Typically students travel on foot throughout the village on the day before clinic with an interpreter and local leader of the community to inform the community about the free clinic and pharmacy, make home visits, provide educational materials, and choose patients with acute illness to attend clinic. Students also fill out a health assessment and census form for each household. In addition, students will inform each household about the opportunity to attend a workshop on nutrition and exercise and answer initial questions. Handouts will be given to each household to remind them of the

opportunity and its importance to their health. It will include the time and location of the workshop.

Patient Education

An educational workshop will be provided to community members on clinic days or Share-with-the-Community days. It will be delivered by student volunteers in the clinic waiting room or other available space with the help of interpreters. The ISL team typically only sees 35 patients per day, but anyone is welcome to join whether or not they are waiting to be seen in clinic. Additionally, anyone will be able to join on Share-with-the-Community Days. ISL teams have this day 1-2 times per student trip to reach out and get to know the community apart from clinic days. ISL teams often visit the same communities 4-5 times per year which will give community members several opportunities to attend a workshop.

The workshop presentation will last about 45 minutes, and ideally be given once in the morning and once in the afternoon on clinic days. The presentation will include a handout outlining the topics discussed so that participants can share what they learn with their family and friends. A pre- and post-test will be administered to assess knowledge. Depending on the facility space, we may be able to cycle a powerpoint presentation with facts in the waiting room.

Resources

Resources needed to successfully implement the program include human resources, physical resources, and monetary resources. Success in the program lies within the ability to distribute information and educate about the importance of healthy diet and exercise to reduce obesity. Therefore, enthusiastic staff and volunteers are the primary resource to achieve the desired outcomes.

Physical resources include materials, facilities, and supplies. We will need a powerpoint to train staff and student volunteers. Facilities used for clinic are donated spaces of churches, schools, and community centers. We will need a designated space where all participants can see and hear the lessons. Paper needed for handouts could be donated from ISL's partnering organizations, or the students could print out the flyers and handouts in the United States before coming on their trip to help defray printing and paper costs. Scales and tape measurers are already owned by ISL for clinics and can be borrowed for the workshops to measure BMIs for participants who will not be seen as patients.

Limited monetary resources are needed apart from the established ISL budget. Continued efforts for donations and support of ISL in general will be continued, rather than pinpointed efforts for the obesity prevention program. Once implemented, if more interpreters are needed to assist students, then the budget and resources will have to be reconsidered.

EVALUATION PLAN

Rationale for Evaluation

In response to the rising rates of obesity and noncommunicable diseases in Costa Rica, International Service Learning planned Mejores Hábitos Mejor Vida, in an effort to educate about nutrition and physical activity to prevent and control overweight and obesity. In order to make effective decisions that will continuously strengthen and improve the program in a systematic way, an evaluation plan is necessary as an integrated part of the program. Given that reduction of noncommunicable diseases is a global and national priority and very little published data exists on similar programs in Latin America, it will be important to confirm whether objectives are reached and to analyze information collected which can be used to assess project fit in similar communities.

In evaluating Mejores Hábitos Mejor Vida, we would like to determine its effectiveness in educating community members about diet and exercise and its adaption by the community. The program has the potential to influence health in communities visited by ISL; and therefore, it is necessary to ensure that the activities of the program are promoting an operational health message in a culturally appropriate manner. Barriers could exist for why members do not make behavior changes which could be identified through evaluation.

Additionally, an evaluation will provide opportunities for feedback by important stakeholders including program participants to promote continuous quality improvement of the program. Since student volunteers will be disseminating the materials and lessons to community members, it is essential that the short training received in orientation is sufficient and gives the

tools necessary to promote confidence and willingness to participate in a culturally competent manner.

Lastly, if the program is to be expanded both within Costa Rica and other Central American countries, further funding and support will be likely and require justification. Evaluation is necessary in order to ensure resources are not wasted on an ineffective program. The most valuable resources in Mejores Hábitos Mejor Vida are time and people. ISL teams have numerous responsibilities and programs and only about two days in each underserved community. Therefore, it is essential to determine whether the program is effective, in order to utilize time in the best way to achieve the best results.

Approach to the Evaluation

Mejores Hábitos Mejor Vida will benefit most from an internal evaluator who is more familiar with the program, the staff, and the community members rather than an external evaluator. Moreover, the program is in the beginning stages and has limited funding through volunteer donations; thus, using an evaluator who understands the needs of the program will be vital in completing a successful evaluation. In addition, an internal evaluator is more likely to have access to organizational resources and receive more informal feedback from the project stakeholders ²⁹. If Mejores Hábitos Mejor Vida is disseminated to additional communities or countries, then it may be necessary at that time to include an external evaluator who can be detached from daily operations of the program, bring a different perspective, and contribute professional expertise.

Concerning key skills and characteristics, the evaluator must be flexible, able to problem solve, and have team-building skills. ISL is a cross-cultural program with a highly volatile

program environment; teams change locations and volunteers weekly and biweekly. Therefore, the evaluator must be able to adapt quickly to a variety of situations, bring together different perspectives and values, and identify skills of different team members. In addition, critical skills of an effective evaluator include the ability to listen, negotiate, analyze specific situations, and assist in developing an evaluation process that will lead to the most useful and important information²⁹. Using an internal evaluator who knows the program well will be beneficial if they are reflective in order to focus on how to make program improvements.

In the evaluation process, it is important to involve stakeholders i.e. any person or group who has an interest in the evaluation results, those involved in running the program, and those who are served by the program³⁰. For Mejores Hábitos Mejor Vida, stakeholders include ISL administrative staff, ISL funders, ISL program consultants, ISL international team staff, ISL student volunteers, collaborating agencies or community groups, local community leaders, program participants, evaluators, and the public. The stakeholders are the primary users of the evaluation results and are more likely to support the program and act on results if they are involved in the evaluation process from the beginning³⁰.

Stakeholders could serve as members of the evaluation team that could meet quarterly or biannually if possible to make ongoing decisions about the evaluation. Involving many stakeholders will help gather multiple perspectives to help determine and prioritize key evaluation questions. In addition, using this team will help reduce staff concerns, increase the reliability of information collected, and increase the likelihood that recommendations will be accepted and implemented²⁹.

Key questions that stakeholders may ask are: How many community members found out about the program? How many actually participated? Did the program change the health status of the community? How can the program be improved? Were participants and volunteers satisfied with the program? What did student volunteers learn from the program? What parts of the program worked well and what parts didn't work well? Who else can we involve in our efforts? How were resources used?

Challenges are anticipated for the evaluation process. First, program outcomes rely on community involvement, and we are unsure of how enthused participants will be to provide information about themselves, return to subsequent program days, or make lifestyle changes. In addition, many community members in areas visited by ISL have very low education status which may prove difficult in written assessments. Second, we may face difficulty in recruiting stakeholders to meet to participate in the evaluation process. Many stakeholders live in the United States and ISL teams are constantly changing. Third, producing quantifiable outcome data such as weight and BMI may prove difficult if participants are lost to follow-up.

Evaluation Study Design

In order to assess the implementation of Mejores Hábitos Mejor Vida, an observational study design will be used to gain insight from program stakeholders, including strengths and weaknesses in the operations of the program and suggestions for improvement. Both quantitative and qualitative data will be used to measure the progress. Opinions of the program coordinator, program staff, volunteers, and participants will be requested by interviews, focus groups, and surveys at various points during implementation of the program. Quantitative data such as number of participants and material resources required will be collected at each session with activity logs.

A one group pre-test/post-test design is currently the best option and most realistically feasible to document our outcomes. The primary outcomes of the program relate to the community participants and include increase in knowledge about obesity and improvement in eating habits and amount of physical activity. Outcomes are unbounded by time or an event and can be collected prospectively; and therefore, it is possible to collect data before the program begins. After receiving the program, data can be collected again from participants. In addition, the design can be longitudinal, given that pre-test and post-test can be collected multiple times with different groups throughout the year if the resources allow.

The main advantage of using the one group pre-test/post-test design is that data can be analyzed to look at the amount of change in program participants³¹. In addition, the pre- and post-scores are typically easy to calculate, and the design has low cost. This simple design will be imperative for a program that is based on volunteers and has minimal resources.

However, the pre-experimental design does not allow us to attribute causality to our program. Other disadvantages include the “testing effect” if participants are encouraged to exercise more and eat healthy to see a change in the post-test responses³¹. Another is “instrumentation,” meaning a change in data collection for the post-test compared to the pre-test that could influence the results³¹. Participants could also receive education on obesity prevention from other community members who participated in the program before them, thus effecting difference in pre-test/post-test scores. We will need to take these limitations into consideration when interpreting the data.

Ideally, we would like to use an experimental study design, in which community members are randomly assigned to participate or not, in order to show the program was a cause

to the effect. Although this would increase the ability to show causality and reduce bias, it would also tremendously increase costs and complexity of the design, which ISL cannot support at this time³¹. Perhaps at a later time, ISL could test a comparison group from the same community of the participants for a quasi-experimental design or increase complexity to random selection design. However, currently, it is necessary to pilot the training and curriculum to ensure Mejores Hábitos Mejor Vida is a valuable program that can be expanded and make a difference in the underserved Costa Rican communities visited by ISL before the evaluation design can be expanded.

Evaluation Methods

Multiple evaluation methods will be used to approach the evaluation from a variety of perspectives in order to answer the evaluation questions. The primary methods will be surveys, face-to-face open-ended interviews, focus groups, documentation review, and pre- and post-tests. Combining quantitative and qualitative methods will complement each other and help the evaluator better understand the context of the program to draw conclusions.

Staff interviews and program activity logs will be important in order to gather information on training, community outreach, and program participation. Document review will also be necessary to track quantitative data like health characteristics of patients including height, weight, and calculated BMI. Interviews with both program staff and student volunteers will be important in identifying adequacy of training, enthusiasm for the program, problem with activities, and opportunities for improvement. In addition, interviews and focus groups with participants will be utilized to make adjustments to curriculum and promote efforts to make culturally appropriate lessons that are understandable at many ages and education levels. Interviews with clinic attendees who do not participate in Mejores Hábitos Mejor Vida will also

be used to identify reasons community members do not participate. We hope to obtain detailed and reflective information that can be used to make changes to improve the implementation of the program and ultimately improve the health of the community.

Education of the participants will be assessed through pre- and post-tests to determine change in knowledge, attitudes, and behaviors regarding obesity prevention recommendations. Test data will be obtained through use of paper surveys that will be completed before and after the educational intervention. These surveys will be reading level appropriate to ensure questions are understood by most participants. If the participant is illiterate or confused by questions, he or she may seek clarification by program staff or volunteers in order to complete the questionnaire.

Evaluation Planning Tables

Short-term Objective 1: By month 3, all program staff will be trained about teaching lessons on nutrition and physical activity and facilitating student volunteer participation.

Evaluation question	Participant	Evaluation method
Have all program staff completed the training? If no, why not?	Program coordinator	Document Review Open-ended interviews
At the completion of training, did staff feel they had the knowledge and resources to oversee the lessons?	Program coordinator Staff members	Open-ended interviews
Did student volunteers feel comfortable in leading workshop lessons after the training by program staff?	Volunteers	Post-ISL program survey
Are there any important problems or questions that training did not address?	Program coordinator Staff members	Open-ended interviews
Did anything unexpected happen during the training?	Program coordinator Staff members	Open-ended interviews
How can the staff training be improved?	Program coordinator Staff members	Open-ended interviews

Short-term Objective 2: In one year, 50% of adults in communities will have participated in educational workshop at least once and demonstrate better practice and knowledge in regards to obesity, nutrition, and physical activity.

Evaluation question	Participant	Evaluation method
Did 50% of community adults participate in the workshop? If no, why not?	Program coordinator Staff members	Document Review Open-ended interviews
What knowledge have the participants learned in the program compared to their baseline?	Staff members Volunteers Participants	Pre and post test Focus groups
Do the participants feel they have enough resources to practice the lessons learned?	Participants	Survey Focus groups
Did the participants enjoy the workshop?	Participants	Survey Focus groups
How understandable was the information presented?	Participants	Survey Focus groups
How appropriate was the length of the workshop?	Staff members Volunteers Participants	Survey Open-ended interviews
Did anything unexpected happen during the workshop?	Staff members Volunteers Participants	Open-ended interviews
How can the workshop be improved?	Staff members Volunteers Participants	Open-ended interviews Surveys

Short-term Objective 3: Within one year, community members will be identified who would like to partner with ISL to lead initiatives in their community even when no ISL trips are scheduled.

Evaluation question	Participant	Evaluation method
How many community members were recruited to be leaders?	Program coordinator	Open-ended interview
What were the reasons members wanted to participate?	Program coordinator Community members	Open-ended interview Survey
What were the reasons members did not want to participate?	Program coordinator Community members	Open-ended interview Survey

Did any members initially agree to be leaders and then withdraw? If so, why?	Program coordinator Community members	Open-ended interview Survey
What were the barriers to recruiting community leaders?	Program coordinator	Open-ended interview
What activities or initiatives are members leading?	Program coordinator	Open-ended interview
Did anything unexpected happen during the recruitment process?	Program coordinator	Open-ended interview
How can the recruitment process be improved?	Program coordinator Community members	Open-ended interview Survey

Long-term Objective 1: In five years, at least 90% of community members will have been reached whether via personal communication, brochures, or clinic workshops led by ISL.

Evaluation question	Participant	Evaluation method
Were 90% of community members reached? If no, why not?	Program coordinator	Document review (including population data) Open-ended interviews
What types of information did the community receive?	Program coordinator Staff members Volunteers Community members	Open-ended interview Survey Focus groups
How many community members participated in the workshops? Did community members attend multiple times?	Program coordinator Staff members	Document review Open-ended interview
What type of information was most helpful?	Community members	Survey Focus groups
Was the information presented at the literacy level of the target population? Was it culturally appropriate?	Community members	Survey Focus groups
How were the brochures distributed to community members? How many were distributed?	Program coordinator	Document review Open-ended interview
What were the challenges to distributing information?	Program coordinator Staff members Volunteers	Open-ended interview Focus groups

Long-term Objective 2: In five years, at least 50% of community members visited by ISL teams will have reduced the consumption of unhealthy foods and increased physical activity.

Evaluation question	Participant	Evaluation method
Did 50% of community member participants reduce consumption of unhealthy foods and/or increase physical activity?	Program coordinator Community members	Open-ended interview Survey
What are reasons participants are not engaging in recommendations?	Program coordinator Community members	Open-ended interview Survey Focus group
What steps can be taken to help reduce consumption of unhealthy foods?	Community members	Survey Focus group
What steps can be taken to help increase physical activity?	Community members	Survey Focus group
What types of physical activities are community members engaging in?	Community members	Survey Focus group
Have community members encouraged family members and peers to be involved?	Community members	Survey Focus group

Long-term Objective 3: In five years, the obesity rate for adults in Costa Rican communities served by ISL will decrease by 3%.

Evaluation question	Participant	Evaluation method
What is the percentage of obese individuals in communities visited by ISL?	Program coordinator	Document review (epidemiological data, chart review) Open-ended interview
Did any participants increase their BMI score? Why?	Program coordinator Participants	Document review Open-ended interview Survey
Do participants understand the risk factors associated with obesity?	Participants	Survey Pre and post test
Do participants think the program contributed to prevention of gaining weight?	Participants	Survey Pre and post test
How was the BMI data collected? Was it effective?	Program coordinator	Document review Open-ended interview

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Dissemination Plan

To ensure that relevant findings of the evaluation are communicated with stakeholders, we will disseminate our evaluation findings in a number of ways. Ongoing communication of findings throughout Mejores Hábitos Mejor Vida will ensure that solutions for improvements can be developed and implemented to advance the program incrementally. In addition, dissemination may convince diverse audiences of the importance of our program and generate more support²⁹. At quarterly staff meetings, the program coordinator and evaluator will meet with ISL staff to present both qualitative and quantitative key findings via a Power Point presentation with graphics. At the end of the evaluation, a final written report will be created to ensure the dissemination of findings to all stakeholders, especially administrative staff in the United States who may not be able to attend quarterly meetings. The report will give a brief overview of the methods and results as well as provide usable information and recommendations to involve parties directly in making decisions and taking action.

To increase local understanding and involvement, a summary of our findings could be disseminated, along with information about the importance of physical activity and healthy eating, using a variety of techniques such as visual displays in community centers, oral presentations at town meetings, press releases, church bulletins, and informal conversations. A commitment to ongoing dialogue will increase awareness of the health issue, motivate the community to be involved, and create a launching point for policymaking decisions.

Another potential goal is to generate new knowledge and collaborate with other programs and initiatives with similar goals. Considering that the program is novel and limited data exists

on obesity prevention for adults in Costa Rica, evaluation findings could be disseminated broadly by publishing in journals as a contribution to science and literature. Making the report more widely accessible would increase awareness to a broader audience about the potential effectiveness of our interventions. However, this broader dissemination would need to be agreed upon with program partners. In addition, an IRB approval and ethics training for those involved would be necessary before the evaluation process begins.

DISCUSSION

The burden of obesity and related NCDs in low- and middle-income countries such as Costa Rica is rapidly increasing and already has significant adverse social, economic, and health effects². Capacity for prevention and control of NCDs has been inadequate². Considering that most NCDs are preventable yet are currently the leading cause of death, more attention is needed for action against NCDs. Seeing the potential for community-based interventions as a possibility for prevention, Mejores Hábitos Mejor Vida was created for ISL with the intent of improving nutrition and physical activity knowledge in underserved communities who many not otherwise be receiving routine contact with healthcare professionals. By providing community members with the knowledge about how to make healthy lifestyle choices, it is hoped that they will engage their families and friends in joining the effort to eat healthier and increase physical activity together to maintain their health.

There has been some recent literature showing increased attention and recommendations about addressing NCDs in developing countries, yet there are inadequate reports or evaluations on community-based interventions in Costa Rica. In particular, no programs were found that focused on preventing obesity in adults. Nevertheless, the four programs reviewed provided insight into educational strategies that included nutrition or exercise promotion. For example, patients indicated that barriers to success included diet recommendations that were difficult to follow, lack of family support, and incongruity of health messages from providers. Tips like these are important to consider during Mejores Hábitos Mejor Vida. Producing curriculum and handouts with culturally and economically feasible recommendations, including the entire family, and collaborating with local providers and NGOs will prove imperative to the success of Mejores Hábitos Mejor Vida.

Although most of the reviewed programs demonstrated success in improving the patient's clinical risk factors, knowledge, and behaviors, an important consideration is that the studies only looked at short-term successes and used a very small sample size. Evaluations of Mejores Hábitos Mejor Vida and other studies will need to look at long-term changes and a substantial patient selection to determine whether educational community-based interventions truly affect lifestyle changes and prevention of disease.

Fortunately I was able to travel to Costa Rica and work with ISL in several of the underserved communities they provide care to such as El Cairo, a rural community of Siquirres, and La Carpio, an urban slum of San Jose, to determine the feasibility of Mejores Hábitos Mejor Vida and make an informal community needs assessment. Both rural and urban communities could potentially benefit from ISL's obesity prevention program. Indeed, many of our patients were overweight or obese and may have benefited from extra education on weight reduction and prevention of NCDs, as well as a laboratory work up for metabolic diseases. ISL is not able to provide routine healthcare for chronic diseases; however, time was available to speak with patients while they were waiting to see a doctor. In addition, materials could have been given out while doing community assessments before clinic, as well as during clinic.

Participating with ISL gave me the chance to communicate with ISL staff and volunteers, observe the typical clinic set-up in communities, view the patient population, observe common health problems, and experience the local food and setting. The ISL teams eagerly answered questions and seemed on board with adding Mejores Hábitos Mejor Vida. In addition, pre-med and medical student volunteers were interested in learning more about local health problems and helping however needed. Not many volunteers spoke Spanish, but translators were always readily available to help us. Women in communities will probably be the main participants in

Mejores Hábitos Mejor Vida, for most women remained at home and were the ones who could attend clinic or answer questions during community visits. Therefore, it will be important to provide handouts so that the men in the homes can be reached as well. Both parents have to want to make changes in order for the entire family to change.

Interestingly, I became familiar with the significance of Equipos Básicos de Atención en Salud (EBAIS), the local primary care health provider of Costa Rica and the setting of the first article I reviewed in the aforementioned literature review. ISL doctors referred patients who we could not treat or needed follow-up care to seek out EBAIS. It is a much cheaper option than visiting a private doctor, and one EBAIS is located in each district. It would be valuable to see whether EBAIS has done any follow-up evaluations to their diabetes study that was completed over ten years ago. Coordinating with EBAIS and seeing what preventative health opportunities exist will be important to keep educational messages consistent and properly refer patients who need secondary or tertiary prevention.

Food and exercise recommendations will need to remain general so that ISL will be able to distribute the same message to all of the communities visited. In addition, they must be adjusted to accommodate the customs and culture of Costa Rica. The staple diet in Costa Rica consists of rice and beans, meat, plantains and sometimes salad; yet processed foods and sweetened drinks are evident in small local stores even in rural areas. In addition, the urban area of San Jose looks similar to the United States, featuring Walmart, McDonald's, KFC, and other popular chains in close proximity. Exercise feasibility would depend on the community. Some places had adequate access to sidewalks and open spaces, and others were located on busy highways or had crowded streets without safe space to walk or play. Clearly, helpful

recommendations can be made to make better choices whether food/drink choices, portion control, or physical activity options.

Mejores Hábitos Mejor Vida can reach a fragment of the population to prevent obesity and related NCDs; however, in order to be successful both locally and nationally, environments must be created that support and empower individual behavior choices that prevent the risk. The determinants of NCDs extend beyond the realm of the health sector; and for that reason, coordinated approaches are needed in the Costa Rican government that look at agriculture, urban planning, transportation, and education, along with health policies⁴. Furthermore, we must monitor the progress of national NCD prevention activities and evaluate programs in order to see if we are reaching the expected outcomes and to receive support².

In conclusion, obesity is a widespread and obstinate issue that will require a collaboration of efforts. Acceleration in the momentum and mobilization of resources for NCD prevention is needed. Change is possible at community, national, and global levels; but stakeholders will have to combine efforts with ISL in order to decrease BMI, promote healthy diets and exercise, and change other risk factors that are contributing to the escalating burden of NCDs in Costa Rica. There is potential for great progress in NCDs in Costa Rica, and we are hopeful that Mejores Hábitos Mejor Vida will make a small difference in underserved communities and set a trajectory to contribute to better health into the future.

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APPENDIX

Table 1: Summary of Similar Programs

Program	Goal(s)	Implementation	Evaluation	Outcomes
Primary-care level educational nutrition program in El Guarco, Costa Rica ¹³	To encourage health staff, patients, families and community organizations to be involved in education to prevent and detect diabetes	- Unstructured interviews and focus group discussions with patients and medical personnel - Creation of educational manual - Staff training in 8 sessions	- Written tests for staff - Anthropometric, biochemical, and dietary knowledge pre-/post-tests for patients	- Increase in knowledge of staff - Reduction in fasting glucose, glycosylated hemoglobin and triglycerides of patients
Community based nutrition and exercise pilot program in rural Costa Rica ¹⁴	To deliver group-centered nutrition and exercise intervention to improve glycemic control and CVD risk factors in diabetics	11 weekly nutrition classes (90 min each) - Triweekly walking groups (60 min each)	- Pre-/post-test clinical and biochemical measurements - Changes in knowledge or behavior were not evaluated	- Fasting plasma glucose and glycosylated hemoglobin levels improved - Small weight loss
PEDNID-LA ¹⁵	To address the increasing prevalence of diabetes and lack of educational resources in 10 Latin American countries	- Two day training for educators 4 weekly teaching units given to small groups of patients	Pre-/post- clinical data, metabolic and cardiovascular risk factors, drug intake, cost of treatment	- Improvement in fasting blood glucose, HbA1c, body weight, blood pressure, cholesterol, and triglycerides over one year - Significant decrease in use of pharmacological treatment and therefore reduction in costs
Agita São Paulo Program ^{16, 17}	To promote physical activity in Brazil with a multilevel intervention	- Education materials (posters, flyers, brochures) - Mega-events to attract media attention - Relationships with partner institutions	Intrapersonal factors, social environment factors, and physical environment factors using surveys, questionnaires, interviews, and document reviews	- Increase in physical activity and knowledge - Significant media attention

Figure 1: Mejores Hábitos Mejor Vida Logic Model

Resources	Activities	Outputs	Short-Term Outcomes	Long-Term Outcomes	Impact
<i>In order to accomplish our set of activities we will need the following:</i>	<i>In order to address our problem we will conduct the following activities:</i>	<i>We expect that once completed or under way these activities will produce the following evidence of service delivery:</i>	<i>We expect that if completed or ongoing these activities will lead to the following changes in 1-3 years:</i>	<i>We expect that if completed or ongoing these activities will lead to the following changes in 4-6 years:</i>	<i>We expect that if completed these activities will lead to the following changes in 7-10 years:</i>
- Needs assessments - Collaboration with local health related agencies - ISL in-country staff - Premed volunteers - Materials - Community leaders - A location to hold workshops	- Develop curriculum - Train staff and premed volunteers - Enroll community members in educational workshop - Measure pre- and post-knowledge - Educate patients about healthy eating - Educate patients on chronic problems of obesity - Educate patients about physical activity - Distribute print materials	# of community members receiving education # of ISL teams participating # of BMIs recorded at workshops and clinic	- Establishment of program as part of all ISL team itineraries in Costa Rica - Expansion of program to new underserved areas - Recruitment and outreach to majority of communities visited - Improvement in participants' eating habits and amount of weekly time engaged in physical activity - Increase knowledge about obesity and importance of diet and exercise	- Establishment of program for ISL teams in other Latin American countries - Further outreach and education in communities of Costa Rica - Further improvements in knowledge and practice regarding eating habits and amount of physical activity - Reduction in overweight/obesity rate for adults in served Costa Rican communities	- Decrease in risk factors for chronic disease - Decrease in future health care costs and DALYS - Reduction in the proportion of adults who are overweight or obese - Increase in family and community support for healthy eating and active lifestyles

Figure 2: Mejores Hábitos Mejor Vida Example Project Timeline

Activity	April	May	June	July	August	September	October	November	December	January	February	March	April	May
Curriculum Development														
Staff Training														
Student Training														
Trial Run														
Expansion to more ISL Teams														
Revision of Training and Materials														
Expansion to New Country														