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Structured Physical Activity and Dietary Education Program for Obese Adolescents: An Evaluation of a Quality Improvement Project at a Rural Primary Care Clinic

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Walden University

College of Health Sciences

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Andrietta Wright Barnett

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2017

Abstract

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by

Andrietta Wright Barnett

MS, South University, 2011

BS, Medical University of South Carolina, 2008

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

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Abstract

Childhood obesity is a worldwide epidemic. In the United States, approximately 17% of adolescents are obese; and 13% of the general population is overweight. Obese adolescents are at threefold risk for developing chronic health conditions in adulthood, including type II diabetes, hypertension, and heart disease. The purpose of this project was to evaluate the results of a quality improvement program to reduce adolescent obesity as measured by BMI 5% over 18 months in a rural health primary care clinic. The health belief model and theory of planned behavior guided the project as adolescents need to first understand the risks associated with obesity and the benefits derived from a healthier lifestyle. Then, they can be prepared to engage in regular exercise and good eating behaviors. A convenience sample of 100 adolescents was randomly assigned to an intervention group with structured physical activity regimen and dietary education classes and a standard care group with normal counseling. Two separate one-sided *t* tests with 90% confidence intervals were used to analyze the data. Also, run charts were constructed to assess the effectiveness of the program. The result of the *t* test revealed the weight for the intervention group at 18 months ($M = 42.85$, $SD = 0.79$) was significantly lower than it was for those in the non-intervention group ($M = 45.06$, $SD = 0.59$), $t(36) = -9.79$, $p < 0.01$. Furthermore, the run charts demonstrate the average BMI for those in the interventional group steadily decreased over 18 months while the non-intervention group steadily increased. Positive social change was achieved at the organization level as adolescent obesity was reduced with the evidence-based interventions. This project serves as a potential model for replication in other rural health primary care clinics.

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Dedication

This project is dedicated to the sisterhood, friendship, and memory of Dr. Sheila O'Banner. Dr. O'Banner and her husband funded several research projects related to obesity in children and healthy eating habits in rural communities. Her strength and faith in God allowed Dr. O'Banner to develop multiple walking trails and community gardens in Colleton County with microscopic funding. I remembered her last words to me was to develop my research project in a rural community. Her memory lives on through my project and all the goals she set for reducing obesity in the countryside. Dr. O'Banner's dedication to reducing obesity in children had given me strength when I became tired while working on my project.

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Section 1: Nature of the Project

Introduction and Overview

Obesity is a global pandemic which affects all age groups, classes, strata, and genders. An estimated 16% to 33% of American adolescent are obese. Obesity contributes to 300,000 deaths annually and about \$100 billion for health management (American Academy of Child and Adolescent Psychiatry [AACAP], 2011). According to the Centers for Disease Control and Prevention (CDC, 2015), childhood obesity is a growing problem that has become worse in recent times; the rates are increasing every year. The United States is a leader in obesity in teenagers. As many as 35% of adolescents are now obese (CDC, 2015). The United States Department of Health and Human Services (USDHHS, 2013) reported that more than 29% of school children are overweight and obese, and nearly a fourth of them are at risk of getting heart disease, diabetes, stroke, and possibly early death.

Obesity is a serious condition with health implications across the lifespan. In adolescents, obesity may cause physical and psychological problems. Obese adolescents may suffer from certain orthopedic problems, pseudo tumor cerebri, gall bladder disease, Blount disease, sleep apnea, and hypertension (Karnik & Kanekar, 2015). Obese adolescents are at greater risk of developing diabetes, high blood pressure, heart diseases, and breathing problems (Godin, 2010). Importantly, persistent adolescent obesity over a decade results in adult chronic conditions, including diabetes and heart failure.

Problem Statement

The Healthy People 2020 national campaign seeks to achieve a 10% reduction in the number of obese children (United States Department of Health and Human Services [DHHS], 2013). Being excessively obese during childhood results in the development of obesity-related problems such as cardiovascular and metabolic disorders, such as thyroid disease, hypertension, and diabetes (Godin, 2010). Previously, these conditions were only seen in adulthood; but, they are increasing more common in adolescents. For example, although cardiovascular and metabolic disorders rarely presented in adolescents; obese adolescents now have similar risks for these disorders as adults. With adolescent obesity extending into adult morbidity and mortality, obesity identification and management in adolescents in primary care requires new clinical strategies. When obesity is identified in primary care, evidence-based behavioral modifications can be implemented to achieve weight reduction

Purpose and Project Objectives

As obesity is a sensitive topic for discussion with adolescents and their parents; primary care clinicians need to understand the perspective about obesity for the adolescents identified for obesity management. This project is an evaluation of the evidence-based quality improvement program (EB-QIP) to address adolescent obesity in a pediatric primary care clinic located in a rural health clinic McCormick, South Carolina. Specifically, this project evaluated the BMI change achieved when adolescents, ages 10 to 16, participated in a structured physical activity regimen with dietary education classes.

The evaluation focused on the two EB-QIP objectives. First, the EP-QIP was developed to increase awareness about the consequences of obesity in adolescents. This included teaching parents and children to engage in healthy eating habits, including the impact of nutritional intake on BMI. The second objective focused on increasing awareness about the importance of physical activity; including providing information about free exercise programs and activities for adolescents who are obese. The EB-QIP included observations of participants in structured physical activity sessions, pre/post dietary habits questionnaires, and nutrition questionnaires. This project evaluated the outcomes of the EB-QIP through a secondary data analysis.

Significance/Relevance to Practice

The nutritional and weight status goals for the Healthy People 2020 aim to reduce the risk for chronic disease with increased consumption of healthier foods and more physical activity (Hills, Andersen, & Byrne, 2011). This EB-QIP is relevant to clinical practice by contributing knowledge about the effectiveness of strategies for adolescent obesity reduction in a rural community. Obesity in adolescents is increasing in rural areas. THE EB-QIP attempts to address one goal of Healthy People 2020 and the evaluation will measure the success. The Healthy People 2020 goal is to “promote health by reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights” (Hills et al., 2011, p. 866).

One way to contribute to better health outcomes is to incorporate preventative care measures in the primary care setting (Hills et al., 2011). In the rural health setting, combined interventions, such as nutrition and exercise, are essential strategies for weight

reduction in children (Mathews et al., 2010). For example, in a randomized controlled study with 4,500 participants, a structured daily physical activity regimen improved obesity and decreased overall weight as compared to participants who did not perform the increased fitness regimen (Marin & Brown, 2009). In another intervention study with obese children, healthy eating habits were significant in reducing the overall BMI by 3.9% (Mathews, Moodie, Simmons, & Swinburn, 2010). In another intervention study, children aged 10 to 18, with a single intervention, including physical activity with healthy eating habits, there was a 10% reduction in weight (Mathews et al., 2010). Similarly, this DNP project evaluated an EB-QIP focused on adolescents in a rural health clinic. There was one intervention with two educational strategies, including nutritional and physical activity. The EB-QIP was developed and implemented by the rural health clinic during the practicum component of the DNP program.

The DNP program practicum was completed at a federally qualified rural health primary care clinic in South Carolina. The EB-QIP was implemented throughout the rural health clinic to address a clinical practice issue identified by the providers. The structured physical activity regimen was undertaken in the facility exercise room while the nutrition classes were provided by a certified dietician in the facility. Parents were invited to attend the nutrition classes as they are responsible for purchasing and preparing meals of the participants.

The clinic population is approximately 35% Mexican American, 50% African American, 10% Latino (other Hispanic), and 5% Caucasian. The pediatrician, medical director and preceptor for this project identified the need to reduce adolescent BMI in the

pediatric primary care clinic. Adolescent weight reduction was hypothesized to result from healthy eating habits and structured physical activity. As such, the clinic introduced an EB-QIP, focused on healthy eating habits and structured physical activity. The goals were to teach adolescents the essential routines for achieving healthy lifestyles, those with high nutritional value food consumption and scheduled physical activity. As the rural health clinic is small, the EB-QIP was focused on the adolescences above the 95th percentile for BMI for their age group. By improving these two behaviors in adolescence, the physician sought to reduce the BMI, thereby decreasing the risk for chronic diseases in adulthood.

PICOT Question and Problem Statement

The PICOT question for this doctoral project is: What is the impact of an EB-QIP as a single intervention, focused on healthy nutritional habits and structured physical activity, in reducing the BMI of adolescents between the ages of 12 and 16 in a pediatric primary care practice in rural South Carolina? The particular health-related problem for this project is decreasing the rate of obesity in children, reducing the BMI, increasing the nutritional information, and increasing the amount of structured physical activity. The specific elements of the PICOT question are provided below.

- Problem / Population / Place: Adolescent children (12 to 16 years), with a target BMI > 95th percentile attending a federally qualified rural health pediatric primary care clinic in rural South Carolina.

- Intervention: An EB-QIP, with a single education strategy with two foci, a structured physical fitness regimen and incorporation of healthy nutritional habits.
- Comparison: Change in the BMI over time, before the EB-QIP and after.
- Outcome: A 5% reduction in BMI with the nutritional educational strategy and structured physical activity regimen.
- Type of Project / Time: Evaluation of a EB-QIP. The EB-QIP was 18 months and the evaluation period was 90-days.

Evidence-Based Significance of the Project

An adolescent is obese when their BMI is greater than the 95th percentile (CDC, 2017). Obesity is primarily attributed to some unhealthy nutritional habits and physical inactivity (Hills et al., 2011). For many socioeconomic reasons and living conditions, some children are more vulnerable to quick weight gains and need to consciously maintain a healthier lifestyle (Kelishadi & Soleiman, 2014). Other possible contributors to obesity include a strong family history, certain medications and disorders, mental stress, peer pressure, and depression. Chronic obesity usually begins when a child is 5 years old; easier to manage early and more difficult later (Hills et al., 2011). If uncontrolled, obesity usually contributes to other conditions such as hypertension, amnesia, diabetes, lower self-esteem, and an increased risk of heart disease (American Academy of Child and Adolescent Psychiatry, 2011). Early identification and intervention is essential to reversing the trajectory of childhood obesity to transitioning to chronic conditions in adulthood.

The two primary causes of obesity are diets high in fat with excessive carbohydrate intake and unhealthy lifestyle (Godin, 2010). Excessive sugar intake is a significant contributor to developing obesity in adolescents (Godin, 2010). Sugar consumption usually occurs in the form of cold drinks, sugar-sweetened beverages, biscuits, pastries, puddings, cereals, preserves, chocolates, fruit juices, and desserts (Godin, 2010). Sugar is problematic for adolescents as the current estimated consumption is three times the average recommended amount of 5 to 8 teaspoons per day (Godin, 2010). Therefore, a nutritional education program to reduce weight in adolescent obesity needs to focus on reducing the daily average sugar intake.

Physical inactivity is another significant contributor to developing obesity as only 50% of adolescents exercise on a regular basis (Muhlig, Wabitsch, Moss, & Hebebrand, 2014). The benefits of physical activity are not limited to overweight adolescents alone; however, it is essential to reduce weight when obese as well as to maintain a healthy weight. Contrary to the perceptions of most Americans, nationally, children are falling short in meeting the physical activity guidelines more often than adults (Brown & Marin, 2009). Obese children often spend greater than 50% of their free time watching television or using other electronic gadgets rather than playing on the ground (Brown & Marin, 2009). The total calories consumed by the adolescent are not released by the body with physical activity; instead they accumulate as fat. Other factors contributing to inactivity include passive transport facilities rather than cycling or walking and decreased physical activities in the school curriculum (Hills et al., 2011).

Implications for Social Change in Practice

In response to the rising concern of widespread obesity among adolescents, governmental and nongovernmental organizations are developing and implementing initiatives. The principal strategies to combat obesity include implementing structured physical activity programs and enforcing strict guideline-oriented dietary planning for obese adolescent (Hills et al., 2011). These types of programs provide set guidelines with requirements to identify significant changes in weight with respect to time and intensity over the course of the program. Usually, monitoring activities include recording the weight of each participant before the program and at regular intervals during the program (Hills et al., 2011). Obesity reduction and nutrition research often result in research studies with useful statistical data, they do not provide information about participant personal experiences, and the problems faced by participating. Another objective of the EB-QIP was to understand the perceptions about adhering to dietary education and structured physical activity programs.

Globally, there are approximately 1,000 obesity management programs for children are structured per guidelines set by pioneering health committees (Godin, 2010). This DNP project provides an evaluation of data from a EB-QIP, including nutritional education and a structured physical activity program, provided at a rural health pediatric clinic. This project will help rural health pediatric clinicians identify intervention strategies for their environment. Furthermore, the project provides insights into the problems faced by the participants with the aid of which better programs can be undertaken to encourage greater participation and healthier food choices.

In addition to the adolescent, the parental experience is relevant and linked to adolescent success in maintaining a healthy lifestyle. Parents are often involved in planning meals for their obese adolescent; they need to understand if they are doing it right or will the consumed calories balance with the energy expended in physical activity. Both the adolescent and the parents need to assess their knowledge deficits related to unhealthy food preferences and physical activity while working collaboratively to achieve a healthy balance. Various rural health clinics in South Carolina and the surrounding region can review the EB-QIP and evaluation as a guide to customize a program for combatting obesity their adolescents.

This program evaluation identifies the successes and areas requiring improvement. The successes need to be considered by other rural health clinics for adoption while the areas requiring improvement can inform the emergence of new strategies. Overall, obesity management programs for adolescents in rural primary care clinics need to be tailored for the specific population to provide the maximum benefit to the collective success of the individuals, families, and their communities.

Summary

Obesity in adolescents is a common but serious issue in the United States and in rural South Carolina. This section described the primary objectives of this doctoral project to evaluate the outcomes of an EB-QIP in a rural health pediatric clinic. Furthermore, the scope of the project, an overview of the methodology was summarized, including how the evidence was collected. Finally, the potential implication for this evaluation project were presented. The next section is focused on a discussion of the

relevant literature, including guidelines and research studies, specific to childhood obesity focused on adolescents. The theoretical and conceptual models are presented that guided the EB-QIP and link to the evaluation. Finally, the next section highlights the key stakeholders responsible for impacting positive social change in this field and their approach to impacting the global obesity epidemic.

Section 2: Background and Context

Introduction

Obesity is a cause for concern worldwide, especially now that it is becoming increasingly common in adolescents. Clinicians need to understand how the interventions of nutritional education and structured physical activity affect the overall weight and dietary intake of obese children. The aim of this project was to evaluate the outcomes of an EB-QIP to determine how a structured physical activity and dietary education classes impacted the obesity of adolescents in a rural health pediatric primary care clinic.

An adolescent describes any individual between the ages of 10 to 16 (Godin, 2010). An adolescent with a BMI equal to or greater than the 95th percentile is defined as obese (Godin, 2010). In addition, the term *added sugars* includes any processed food items added to food products as a sweetening agent; this is different from sugars such as fructose and lactose naturally occurring in food products. Calorie balance defines the relationship between the number of calories consumed and the number of calories consumed during physical activity and normal physiological processes. Behavior modification describes changes in eating habits and food choices, physical activity, and awareness of obesity, including consequences.

When thinking about behavioral modification through educational programs, in general, people unhappy with the program structure, enforcements, and schedules, they are less likely to actively participate (Marin & Braown, 2009). If the perceived risks linked to obesity and the perceived benefits of addressing these risks through a management programs are not sufficiently understood to elicit anxiety, people are less

enthusiastic about planning a healthy diet and engaging in healthy physical activities (Marin & Brown, 2009). Understanding the perceptions of adolescents with regards to obesity and the consequences is essential to effectively plan education-based obesity management programs. The next section reviews the literature specific to adolescent obesity and evidence-based strategies, focused on dietary and physical activity education.

Literature Review

Search Strategy

A concise literature review was performed to understand the state of the research specific to adolescent obesity and management strategies. The databases PubMed, MEDLINE, CINAHL, ERIC and other academic databases were searched for published research for obesity management in adolescents. The keywords to conduct this search included *obesity, children, adolescent management, interventions, physical activity, and diet / nutritional planning*. Due to the size of the obesity literature, research published during the last five-years was included for review; and only original articles were selected.

Childhood Obesity

Peirson et al. (2015) used primary care related behaviors to determine the behavioral pattern that contributed to obesity in children such as their diet, lifestyle, and exercise reported about a third of the children ages 8-16 in North America are obese. Peirson et al. used a randomized trial to determine the pharmacological interventions and provide data on BMI and the rate of childhood obese in society. This study is significant because it provided evidence on interventions for weight management on BMI based on

behavior or pharmacology. Similarly, the study is important in that provided evidence on the prevalence of obesity in children in North America. The results finding indicated that both pharmacological and behavioral interventions had relative impacts on BMI.

Karnik and Kanekar (2012) revealed that imbalances have facilitated an increase in childhood obesity in America in calorie intake and utilization. Consequently, Karnik and Kanekar indicated that childhood obesity results in different problems that affect the social, physical and psychological health of children. The significance of the study is that it provided interventions and actions for addressing factors that facilitate the prevalence of childhood obesity. The study is significant in that it provided strategies for managing challenges of childhood obesity in future.

Karnik and Kanekar (2012) showed that school-based interventions were most effective in promoting physical activities and education on a healthy diet. Similarly, the study results indicated that the intervention programs experienced significant challenges, which include poor finances to facilitate effective implementation of these programs and stigmatization of children with obesity. Karnik and Kanekar successfully provided effective methods of addressing childhood obesity such as school-based interventions, family-based lifestyle and behavioral interventions. The weakness of the study includes that the reviewed literature of school-based interventions did not provide consistent results thus unreliable. The study limitations included financial and stigmatization challenges (Karnik & Kanekar, 2012). Karnik and Kanekar effectively contributed to the reduction of obesity, reduced BMI, and improved nutritional habits in children through the establishment of school-based interventions. This method provides physical education

to children thereby reducing obesity. It provides nutritional education thus encouraging healthy feeding habits (Karnik & Kanekar, 2012).

Ickes, McMullen, Haider, and Sharma (2014) indicated that school-based programs are the best intervention programs that have developed and implemented to fight increased rates of obesity in children. The study is significant in that it provided a review of the comparison between the school-based interventions in U.S and the international programs in preventing obesity. The methods used in the study included the use of five relevant databases and the use of inclusion criteria (Ickes et al., 2014). The inclusion criteria included the primary search, school-based interventions, child-based interventions and studies published from 2002 to 2013.

Ickes et al. (2014) revealed that the school-based interventions implemented in the U.S and internationally, significantly reduced BMI thus have a significant impact on preventing childhood obesity. The strength of the study is depicted in providing evidence on the effectiveness of the school-based intervention in curbing childhood obesity through providing education, resources, and support that promotes nutritional improvements and physical activity. Ickes et al. failed to determine the potential long-term impacts of a school-based intervention in fighting childhood obesity. The study limitations included studies that were not published in English were omitted, which resulted in the exclusion of the studies of other countries affected by childhood obesity. The significant differences among the various data collected for intervention programs and target population lead to omission of this information to prevent the notable disparities. Ickes et al. promoted a reduction in obesity through offering nutritional

programs and increased involvement of children in physical activities through physical education.

According to Ogden, Carroll, Kit, and Flegal (2014), the prevalence of childhood obesity is prevalent in children. The study design involved measuring weight and height in children. The study is significant because Ogden et al. provided national estimates and assesses the prevalence of childhood obesity in the U.S from 2003-2012. The study findings revealed that the rate of childhood obesity in America showed insignificant changes among children from 2003 through to 2012. The rate of childhood prevalence has remained high throughout the years.

Ogden et al. (2014) provided sufficient evidence on the incidence of childhood obesity throughout the years. Ogden et al. showed a thorough research on the data provided, which depicts a high level of integrity and accuracy in analyzing the data. The results of the study are an indication that immediate responses should be made to curb childhood obesity. The data provided will help the government and public health determine effective measures of reducing childhood obesity (Ogden et al., 2014).

According to Kelishadi and Soleiman (2014), childhood obesity has become a worldwide problem that has both short-term and long-term effects. Various strategies have been established to control the prevalence of childhood obesity. These plans include clinic-based interventions, school-based programs, and family-based programs. Kelishadi and Soleiman employed the use of electronic search as a study method. The electronic search was conducted in different sources such as ISI Web, PubMed, Scopus, and

MEDLINE. The study was critical in providing different strategies of addressing childhood obesity.

The results indicated that school-based programs were an effective method of applying to a large group and had long-term effects. Schools provide children with limitation to access foods that have negative health consequences (Kelishadi & Soleiman, 2014). Family-based interventions were successful in reducing obesity rates in children due to constant monitoring of children eating patterns by parents to ensure they do not practice unhealthy feeding behaviors. Clinic-based interventions showed effectiveness in providing behavioral changes in dietary and lifestyle in children. It provided behavioral therapy to children and promoted engagement in more physical activities.

The strength of the study was depicted in its provision of comprehensive information on the effectiveness of the three intervention strategies in preventing and management of childhood obesity (Kelishadi & Soleiman, 2014). The study weakness was revealed in the failure of researchers adequately to determine the sustainability of these programs in future. The study contributed to reducing childhood obesity and improving nutritional habits through a multidisciplinary approach that included involvement in family, schools, and healthcare in preventing childhood obesity (Kelishadi & Soleiman, 2014).

Schaefer et al. (2015) revealed that childhood obesity is a growing problem in California and can be prevented through physical activity. The methods used in this study included community-based research. Members of the community are involved in participation of implementation of an intervention program to curb childhood obesity

among the population in California. Schaefer et al. also included the use of anthropometric measurements as well as the utilization of the wearable accelerometer to collect data on the level of engagement in physical activity by children. The study is significant in providing adequate evidence on the effectiveness of the community-based participatory approach to measuring physical activity as an approach towards eradication of childhood obesity. Schaefer et al. indicated that physical activity provided a significant reduction in childhood obesity and enhanced development of healthy BMI. The study results revealed satisfactory measurements of the quality and quantity of physical activity with the electronic device.

The strength of the study was revealed in its ability to prove the feasibility of using physical activity in reducing obesity and BMI. Schaefer et al. (2015) successfully identified methods of evaluating the level and pattern of physical activity that is important in reducing childhood obesity and BMI. Schaefer et al. contributed to the reduction of obesity and BMI using physical activity as an intervention program. Accelerometers are useful tools in evaluating community-based and school-based physical activities programs. The accelerometers are very significant in accessing populations that are not easily reached (Schaefer et al., 2015).

Education and Treatment

Sharma (2011) provided evidence on the effectiveness of dietary education as part of school-based programs that work towards eliminating obesity in children. Childhood obesity has detrimental effects that are carried on to the adult life as the child grows up. It

is essential for children to observe their dietary behaviors through help and support of parents and teachers (Sharma, 2011).

The inclusion criteria included the use of publications written in English from 2000-2009 and focused on the general population. The study is significant in revealing the effectiveness of incorporating dietary education in a school-based program, which is important in reducing obesity and improving healthy nutritional patterns (Sharma, 2011). Sharma (2011) showed that nutritional education promoted the development of healthy dietary behaviors that contributed to reduced childhood obesity. The study results indicated that children tend to adopt unhealthy feeding practices including the regular eating of unhealthy snacks, eating junk foods regularly and drinking sweetened beverages. The weakness of the study is noted in the lack of conducting the evaluation process in most of the interventions used in the study, which causes significant impacts on the outcome of the evaluation (Sharma, 2011). The study limitations included the use of information from the three databases only, which could not provide adequate literature on the health of various countries affected by childhood obesity. The study contributed to improved nutrition and reduced obesity by changing the unhealthy eating behavior patterns to healthy ones thereby addressing childhood obesity (Sharma, 2011).

The ultimate foundation of treatment of any condition lies in its effective prevention, or in other words active promotion of health. Pender's Health Promotion Model of 2006 focuses on the promotion of health as opposed to prevention of disease, which is quite suitable especially for the management of obesity. According to Pender, importance should be given to goal-directed behavior, taking responsibility for one's

health and maintaining fulfilling relationships for a peaceful mind and healthy body (Atanda-lawal, 2012). All the above points seem tailored for obesity management as it requires strong discipline in lifestyle and behaviors and a strong personal initiative to maintain a healthy weight. This model is not specific to any condition; however, its underlying principles are ideal for fighting obesity as the promotion of healthy behaviors and habits will eventually lead to a healthy body and mind.

Attitudes and Awareness

There is bias and discrimination involved in behaviors and attitudes towards obesity, especially in the case of children (Azetsop & Joy, 2011). Children as young as 3 to 4 years discriminate between thin and fat people and consider obese people lazy or stupid (Azetsop & Joy, 2011). This leads to lower self-esteem in obese children which further affects their motivation for obesity management (Azetsop & Joy, 2011). Azestop and Joy (2011) blamed this trend on ignorance; according to the article, children are largely unaware or incapable of understanding the diverse mechanisms behind obesity and, in many cases, mimic the attitudes and behaviors of adults around them (Azetsop & Joy, 2011). One aspect of this doctoral project was also comprised of understanding the levels of self-esteem of the obese young participants of the program to identify any deterrents to achieving the maximum benefit from obesity management initiatives.

Self-esteem initiatives have primarily focused on understanding the underlying personal beliefs and opinions of parents of obese children regarding obesity management in their children. A mixed methods study conducted in Australia to understand the attitudes of 159 parents and 184 of their children towards obesity, with an aim to tailor

social marketing strategies, revealed that concerned internalises (27% of the sample) arbitrated that obesity was a grave health problem (Olds et al., 2013). Australia had among the highest levels of obesity in the world, and that frequency was rapidly growing. Olds et al. (2013) cited the causes and therapies for the obesity calamity in individual choices. Worried externalises (38% of the sample) held similar views about the severity and extent of the obesity crisis. However, Olds et al. saw accountability and remedies as a societal rather than an individual issue. The final cluster, the Moderates, which contained significantly more children and males, believed that obesity was not such a significant public health problem, and judged the extent of obesity to be less extreme than the other clusters (Olds et al., 2013). These results revealed a gap in levels of public knowledge regarding the severity and consequences of obesity. This study was done on a random sample to understand the opinions of the general population rather than those of the obese individuals and did not include a common thread among the participants, such as participants of prevention or management program.

Another study was conducted in Mississippi to understand the attitudes of parents whose children were participants in an obesity intervention program (Moore & Bailey, 2013). Moore and Bailey aimed to correlate the underlying knowledge and perceptions of parents of obese children and the successful completion rates of obesity intervention programs. The data from the parents were collected in the form of interview transcripts and analyzed independently. Results revealed that parents perceived their children were motivated by social aspects of the group setting, improved self-confidence, and

supportive staff (Moore & Bailey, 2013). Scheduling conflicts and lack of complete family support were identified as primary barriers (Moore & Bailey, 2013).

Moore and Bailey (2013) concluded that emphasis should be placed on parental education for the sustained promotion of a healthy lifestyle. They also found comfort in the environment where all children were persevering towards a common goal of a healthier lifestyle. However, not all children had complete family support for a group intervention program and often found it difficult to juggle school activities with weight management activities. Moore and Bailey revealed a strong deciding factor for participation in obesity management programs and will receive emphasis in designing of similar sessions in the future.

Theory, Models, and Concepts

Health Belief Model

A theory that addresses management of any condition at its core is the health belief model (HBM). This model is focused on individual beliefs and perceptions about their condition and their motivation levels to seek guidance and treatment measures. According to this model, an individual's thinking about the perceived risks of their status and perceived benefits of treatment actions and initiatives will determine their likelihood of taking active measures to achieve a healthier lifestyle. As I project aimed to identify and analyze these individual beliefs regarding their children's obesity, the HBM provided direction for future strategizing of obesity prevention and management programs with careful consideration of individual preferences.

Theory of Planned Behavior

The theory of planned behavior is another important healthcare method which is quite suitable for obesity management (McEwan & Wills, 2002). The theory acknowledges to adopt a healthy lifestyle for bringing about a positive change; it is important to have the right intentions to follow good habits consistently (McEwan & Wills, 2002). Factors that affect the development of plans include perceived social norms, the degree of perceived control of one's behavior and personal attitude towards this practice (Azetsop & Joy, 2011). As I aimed to understand the perceived beliefs and intentions of participants and their parents towards obesity management, it helped guide the structuring of physical activity programs and diet management for the elimination of obesity.

Summary

All studies conducted so far have focused on collecting data from parents and children in different settings regarding obesity in general and as a growing epidemic. Although there are differences in opinions based on cultural differences and socioeconomic status, the underlying concern about their obese children's weight is a common anxiety among the parents. The primary objectives for these types of studies focus on future strategizing and structuring of programs to elicit better participation and satisfaction levels and successful elimination of obesity in groups of the population. Although this doctoral project has similar aims and objectives, the difference in approach of this study lies in real time tracking of participation and adherence levels of the

participants and their parents to physical activity and dietary guidelines laid down in the program manual. This study will help draw a correlation between the attitudes of participants and their parents and their involvement in the activities of the training program. Although different studies conducted so far have focused on these two aspects of obesity management separately, no study has combined these two objectives in an integrated approach to the understanding of obesity management. The uniqueness of this study lies in the fact that it will provide a combined assessment of parental and participant attitudes and their adherence to habits for a healthy lifestyle.

This section was a review of the current literature with regards to attitudes towards obesity in general and participation in obesity management initiatives. Obesity is a public health problem that has become a national and global concern. Childhood obesity is contributed by various factors such as genetic, unhealthy eating habits and lack of physical activity. Childhood obesity has detrimental effects because the problem is carried on into adolescent and adult life. Multiple researchers have provided strategies for reducing obesity through improving nutritional behavior patterns and reducing BMI. Obesity can be reduced through various intervention programs such as school-based programs, family-based lifestyle, and clinic-based lifestyle. These interventions provide dietary education, behavioral therapy, and physical education that are effective in combating childhood obesity. Childhood obesity is a growing problem that requires immediate response measures to prevent and manage childhood obesity effectively. This provide will provide a connection between personal opinions of obese individuals about their health status and how their perspective affects their lifestyle choices. The next

section is focused on the methodology that will be adopted in addressing the objectives of this study.

Section 3: Collection and Analysis of Evidence

Approach

This project was an evaluation of the implemented EB-QIP to determine if a structured physical activity regimen with nutritional support helps decrease BMI and change eating habits in adolescents. The project used secondary data collected by the pediatric primary care clinic to evaluate their EB-QIP. The secondary data accessed included questionnaires, observational data, and health records. In this section, the evidence collection for the evaluation phase of the project is described. A brief overview of the EB-QIP implemented in the pediatric primary care clinic is discussed. Finally, the ethical considerations for this evaluation project are stated.

Evaluation Project

Secondary data served as evidence about participants eating habits before starting the EB-QIP. The current eating habits and physical activity regimen of members and parents of an obesity management program will help the dietitian develop nutritional education for the participants. The dietitian collected data pre-and post-intervention from questionnaires and semi-structured interviews which covered aspects such as food choices, exercise regimen, and planning of meals.

Data obtained by face-to-face interviews and pre and post intervention questionnaires were analyzed in detail and categorized thematically to understand people's problems and reasons for passive participation levels. Analysis of data helped validate evidence such as attendance, punctuality, motivation, enthusiasm, attention to detail, positive and negative behaviors, interaction with other participants, adherence to a

planned diet, and discipline and awareness regarding food choices. In addition to, face to face interviews and questionnaire data was collected by observation of the physical activity class.

Observing participants and their parents during the program promoted understanding of their reasons for joining the session and their attitudes towards the objectives of the program. Assessment of pre/post questionnaires contributed to understanding levels of adherence to dietary restrictions set by the program guidelines and parents' enforcement of these limitations in their children's diets. It also aided calculation of the total energy consumed during a day and about energy burned during the physical activity sessions. This information helped parents understand the gap between these two variables and the amount of work that needs to be done to eliminate obesity in their adolescents.

Evidence-Based Quality Improvement Project (EB-QIP)

This area describes the EB-QIP that was implemented in the pediatric primary care clinic. In addition, the specific data collected by the clinic and available for evaluation is described. This data was accessed, secondarily, to complete the evaluation for this project.

Method

The evidence analyzed for this evaluation project was gathered from two sources: (a) Indirect evidence using observation and assessment and (b) Direct evidence using questionnaires.

Participants

For the initiation of the EB-QIP, all adolescent clinic patients, between the ages of 10 and 16 with a BMI equal to or greater than the 95th percentile, were asked to participate in a structured physical activity program held at the clinic for obese children including adolescents and their parents. All the patients were adolescents who were current clinic patients. The parents of the patients were asked to participate in program; the parent obesity status was not relevant for participation. Also, there was no data available for the parental obesity status. The facility provided each adolescent and their parent with information about the EB-QIP. Similar to any clinical treatment or therapy, each patient and their child, the parent, were asked to consent to participate.

The initial phase of the EB-QIP included participant observations during the structured physical activity class. Prior to the observations, an informal personal interview was conducted with each participant by the dietician and nutritionist. The purpose of this interview was to record important information such as age, BMI, family structure, and siblings. During the observation session, the assessment included attendance and punctuality, enthusiasm in the performance of activities, and levels of self-esteem. Structured nutritional education classes were also provided by a certified dietician to each adolescent and their parent. Then, their knowledge was evaluated based on their ability to plan four meals daily for a week.

The second phase of the EB-QIP included the administration of the pre- and post-program questionnaires to both the adolescent and their parent. The questionnaire covered aspects such as opinions about the obesity epidemic, perceived risks, nutritional

habits, and consequences (see appendix A). Attitudes towards obese individuals, acceptance of their condition, reasons for adherence or nonadherence to the program guidelines regarding physical activity and calorie consumption, problems encountered while attending the program, and improvements they would like to see in similar programs in the future. The data collected by the facility which include, face to face interviews and questionnaires, during both phases of the EB-QIP were analyzed as part of this evaluation project. After the analysis was complete, the findings for each participant were summarized and analyzed for similarity in the responses and action-reaction behaviors.

Ethical Considerations

Evaluation Project

The secondary data analysis to evaluate the EB-QIP for this DNP project was approved by the Walden University Institutional Review Board (IRB #12-05-16-0156445). In addition, the evaluation was approved by the health clinic medical director. At the completion of the data analysis, there were no reported lapses or breaches in confidentiality.

The data accessed for this project was obtained from the patient health records and other clinic program, policy, procedure, and practice related documents. The personal information accessed within the clinic, including physiological data and responses to questionnaires, were maintained in a secure environment, locked room and cabinet. This information was maintained in the same manner as patient health records in the clinic. No other persons, except for myself and medical director, had access to the information.

Each patient was assigned a code number, and all responses were stored with the respective code number in the password protected computer to protect the privacy and confidentiality of the information. Original data forms were stored in the secured off site storage for patient medical records, compliant with federal laws specific to record management.

The EB-QIP

The facility provided parents and adolescents with an information sheet about the planned EB-QIP and the clinician explained the new program at an office visit. In the following office visit, the clinician asked the adolescent and their parent if they wanted to participate in the program. The facility provided each adolescent and their parent with the initial questionnaire, which included a basic consent agreeing to participate in the program. Similar to other segments in the plan of care for the adolescents, they could choose to stop their participation in the program. As the EB-QIP documents were part of the normal care at the pediatric clinic, the documents became part of the patient health record. As such, the patient information was protected as required by clinic policies and procedures. All patient health records at the clinic are protected per the applicable laws in the State of South Carolina as well as the federal privacy protections.

Summary

Critical questions in the field of obesity management in an integrated approach to understanding why obese children and individuals do not adhere to recommended obesity management strategies. The evidence collection strategies such as observation, meal planning assessment, and questionnaires were used during this research project. The data

were analyzed independently and correlated at the end to identify common behaviors that will guide future structuring of obesity management programs.

Section 4: Findings and Recommendations

Introduction

Childhood obesity is a serious health issue worldwide. In the United States, about 17% of adolescents are obese. Additionally, 13% of this population is overweight (CDC, 2017). Obese children are at a high risk of developing other health problems including Type II diabetes, hypertension, arthritis, and stroke among others (Agency for Healthcare Research and Quality, 2013). It is necessary to address this health problem to keep children healthy so that they grow up to be the fit and contributing members of the society.

There are gaps in current practices adopted by the healthcare professionals and in the level of public awareness. Trials such as the HopSCOTCH randomized trial are conducted at regular intervals in the field of obesity management in children to collect evidence on the most effective management strategies for this condition (Wake et al., 2013). These types of the directorate programs only promise a certain amount of weight loss and not a complete reversal of obesity due to lack of discipline and adherence to the program guidelines (Muhlig et al., 2013). In addition to that, there is a gap in the level of public knowledge regarding the severity and consequences of obesity. This study was done on a random sample to understand the opinions of the general population rather than those of the obese individuals and did not include a common thread among the participants, such as participants of prevention or management program.

The practice-focused question for this project was: How effective is nutritional education combined with a structured physical activity program in reducing the weight

and BMI in children? The health-related problem for this project was decreasing the rate of obesity in adolescents, reducing the BMI, increasing the nutritional information, and increasing the amount of structured physical activity.

The purpose of this doctoral project was to evaluate a EB-QIP in a pediatric primary care clinic in rural South Carolina. The EB-QIP was implemented to increase awareness about obesity in adolescents, decrease the rate of obesity in adolescents, to teach healthy eating habits to adolescents and their parents, and to increase knowledge as it relates to nutritional intake. Another objective was to raise awareness about physical activity; providing provide information for free exercise programs and activities for adolescents who are obese or physically inactive. The EB-QIP included observation of adolescents in a structured physical activity session, pre/post questionnaires related to dietary habits, and nutritional education. Finally, this doctoral project evaluated the outcomes of the EB-QIP.

Findings and Implications

Primary data from the evaluation as well as secondary data was analyzed from the relevant literature, including research studies conducted on the same topic (i.e. adolescent obesity, nutritional and exercise interventions). From the primary and secondary data, there are direct findings with implications. These findings are discussed in the next subsections.

Direct Evidence

Several intervention studies, including randomized controlled trials, were identified to understand the efficacy of obesity management programs in children.

Different approaches such as shared care and telehealth models have been probed to understand the outcomes of various approaches (Shaikh et al., 2011; Wake et al., 2013). Trials such as the HopSCOTCH randomized trial are conducted at regular intervals in the field of obesity management in children to collect evidence on the most effective management strategies for this condition (Wake et al., 2013). These types of the directorate programs only promise a certain amount of weight loss and not a complete reversal of obesity due to lack of discipline and adherence to the program guidelines (Muhlig et al., 2013). This review of the literature, however, did not cover differences in opinions and management efficacy for different sections and sub-sections of the society. It also did not take into consideration the attitudes of practitioners who are consulted in the management of child obesity.

Evidence-Based Quality Improvement Project (EB-QIP)

One hundred adolescents agreed to participate in a EB-QIP at a federally qualified rural health center, between January 1, 2015, and September 10, 2016. The EB-QIP included both male and female adolescents, ages 10-16, BMI 20-35 or greater than the 95th percentile. Moreover, the adolescents included different races and ethnicities. This was an evaluation of an 18-month quality improvement project.

The convenience sample of 100 adolescents was randomly divided, by odd and even number assignments, into two groups of 50 adolescents, and then the interviews were performed. One group actively participated in the EB-QIP (physical activity regimen and nutritional education classes) while the other group carried on with their

normal lifestyle. All the adolescents at the clinic will receive the EB-QIP, exercise and nutrition management, at staggered time periods.

The rationale for the separation of the two groups is twofold. First, the small practice setting is a limitation to a large quality improvement project due to the intensity of resources required to provide the obesity management. Second, the extensive resource allocation for the EB-QIP needed to be justified through demonstrating a difference in the outcome from the normal care provide at the clinic and the evidence-based care advocated by national guidelines and the research literature. The resource allocation is unfunded by current payment models.

For the groups, both the weight and the BMI were measured at the 6-months, 12-months, and 18-month marks. The table below shows the baseline characteristics of the participants in each group.

Table 1. *Baseline Characteristics of the Participants*

Characteristics	Intervention Group ($n = 50$)	Nonintervention Group ($n = 50$)
Age (years?)	10.4 \pm 1.9	10.1 \pm 1.7
Male	31 (62 %)	30 (60%)
Female	19 (38 %)	20 (40 %)
White	16 (32 %)	14 (28 %)
African American	15 (30 %)	16 (32 %)
Latino	11 (22 %)	9 (18 %)
Asian	8 (16 %)	11 (22%)
Height (inches)	54.5 \pm 4.6	54.3 \pm 4.8
Baseline Weight (kg)	43.9 \pm 9.6	44.1 \pm 9.8
BMI	28.6 \pm 6.4	28.2 \pm 6.8

From the table, there were no noticeable differences between the two groups. The values of Age, Height, Weight, and BMI, were shown in Mean \pm SD.

Intervention and Measurement

All 50 participants in the EB-QIP group took part in the structured physical activity (30 minutes/day, 5 days/week) and nutritional education classes for 18-months, while the other 50 participants continued attending the clinic, receiving the routine care, and continuing with their normal lifestyles. The weight and BMI of both groups were measured at the 6-month, 12-month, and 18-month marks.

Statistical Analysis

Two separate one-sided t tests with 90% confidence intervals were used to analyze the results. Also, run charts were constructed to assess the effectiveness of the program. The run charts compared the weight of those in the intervention and non-intervention groups for 30-day, 60-day and 90-day intervals over 18-months. These charts demonstrate the average weight for adolescents in the interventional group decreased over time while the weight for those in the non-intervention group was higher on average at the 6-month, 12-month, and 18-month marks (see Appendix B). The charts further revealed the adolescents in the intervention group had continuously decreased weight after the initial 60-days while the weight for the adolescents in the non-intervention group steadily increased for the 18-months.

The result of the t test revealed that the weight of those in the intervention group ($M = 42.85$, $SD = 0.79$) is significantly lower than those in the non-intervention group ($M = 45.06$, $SD = 0.59$), $t(36) = -9.79$, $p < 0.01$. The statistical analysis results are shown in the table below, Table 2 and Table 3.

Table 2. *Weight Change in the Intervention Group*

Baseline weight (kg)	Weight in 6 months	Weight in 12 months	Weight in 18 months	Change in weight	90% <i>CL</i> mean for change	<i>P</i> value
43.9 ± 9.6	43.36 ± 9.2	42.62 ± 8.7	41.67 ± 8.4	- 2.23 (1.95)*	- 1.92, - 2.54	<0.0001

Table 3. *Weight Change in the Nonintervention Group*

Baseline weight (kg)	Weight in 6 months	Weight in 12 months	Weight in 18 months	Change in weight	90% <i>CL</i> mean for change	<i>P</i> value
44.1 ± 9.8	44.8 ± 9.8	45.3 ± 9.9	45.9 ± 10.1	+ 1.8 (1.38)*	+ 1.5, + 2.1	<0.0001

All the values given in the tables above are Mean ± *SD*. *P* values that are statistically significant are written in bold letters, and figures with $P < 0.05$ (statistically significant) are pointed out by the asterisk “*” symbol. Table 2 shows that the adolescents who went to the physical activity regimen and nutritional education classes for 18 months lost 5% of their weight. The rate they lost weight was much slower in the first 180 days. This was because the children had to go through a period of adjustment in the beginning with a new routine. However, the rate at which they lost weight, and their bodies responded to the increased level of physical activities accelerated later. On the other hand, the adolescents receiving the normal clinic care, not including the physical and nutritional activities on average gained 4% more weight compared to their baseline weight. There is a positive correlation between regular physical activities and the change in dietary habits.

The primary purpose of this project was to evaluate the EB-QIP that was implemented to lower the prevalence of childhood obesity by 5% and improve nutritional habits within 90 days. The EB-QIP program showed a statistically significant 5% reduction in the weight of participants and as well as the descriptive analysis demonstrated improvement in healthier food preferences.

Strengths and Limitations

The strength of this project is the local rural clinic setting that provides family centered care was given to all the adolescents and their parents focused on health and wellbeing. The focus of the EB-QIP program was to maximize the effectiveness of the strategies for obesity reduction while minimize the discomforts and inconveniences in participating in an obesity management program. The program was effective in keeping the adolescents, and their parents, engaged in the program. All the participants completed the 18-month program.

Due to time limitations and resource constraints, the number of participants was small, 50 adolescents in the EB-QIP, and another 50 adolescents received the normal clinic care. However, this evaluation project would be more robust if all 100 adolescents could have participated in the EB-QIP at the same time. The larger number of adolescents would make the causal link clearer between physical activities and nutritional education and weight loss. With more time for the evaluation project, all the participants could be evaluated with the intervention.

Children below 12 are not conscientious about how their behavior impacts their health (Koletzko, Demmelmair, Grote, Prell, & Weber, 2016). Thus, during childhood,

parents and other older family members to take care of the nutritional needs of the children along with making sure that the children get enough opportunity to participate in different kinds of sports and other forms of physical activities daily. This leads to another limitation of this evaluation project, the lack of data specific to the parent, and sibling obesity and health behavior status.

The community leaders should ensure that there are ample spaces and facilities in neighborhoods for children to participate in sports and physical activities. Schools must make sports and physical activities mandatory parts of the children's education and grading systems. Healthcare institutions should incorporate the weight management programs mentioned in this literature review when dealing with the obese and overweight children. A strength of this project is the clinic engaged in a structured EB-QIP where resources were provided to adolescents and their parents and the outcome was evaluated.

There are few studies reporting obesity management programs and adolescents in rural health settings. However, literature in urban settings specific to adolescents' report obesity awareness, nutritional and dietary education, and physical activity are the three essential factors to achieving effective obesity management for weight normalization (Chung, Skinner, Steiner, & Perrin, 2012). A strength of this evaluation project is these three essential factors were implemented and the outcomes reported.

Section 5: Dissemination Plan

To make sure that the findings of this study are implemented into practice, and thus benefitting both the patients (i.e.: the obese children) and the professionals, I have come up with several dissemination strategies. They involve collaborating with the American Association for Physical Activity and Recreation (AAPAR), the National Association of Health and Fitness NAHF), CDC, and Health Promotion Advocates. This will guarantee the dissemination of the research to different kinds of audiences all over the country. The organizations specialize in disseminating studies to the general people that are non-specialists but have the greatest need for health-related information. In addition to that, they provide researchers with important advice, support, and tools to disseminate results to the public (Decelis, Jago, & Fox, 2014). The professional networks, rapports, and connections I have built up throughout the duration of the study will also be used as a part of the dissemination strategy. I will use face-to-face and other vehicle distribution strategies for promoting the results. Other dissemination activities will include:

- Twelve workshops throughout the country to promote the good practice guidelines.
- Capitalize on the already established networks of the partners such as CDC, NAHF, and Health Promotion Advocates.
- Use of the social and electronic media.
- Open a channel on YouTube and conducting several webinars there.

- Contact renowned, and peer-reviewed health and medical journal, and local and national health newsletters and magazines.

Analysis of Self

I am confident enough that this preemptive and multipronged dissemination strategy will offer the reach I need for promoting this work to various types of specialized and nonspecialized audiences. I want my research to benefit the audience in their efforts of battling obesity in children.

As a practitioner, scholar, and project manager, I have achieved some practical insights about the current condition of obesity among young children in the country. For example, there remains a significant portion of the parents are not so careful about their children's obesity and their dietary habits. Moreover, many health care professionals usually adopt a single strategy (either using physical activity, or raising awareness about the issue, or providing diet plans) to deal with obese children. In the future, I plan to spread the findings of this study among as many people as possible, and as a professional, I will utilize this combined approach to help obese children and their families.

Summary

The primary purpose of this project was to evaluate the success of a EB-QIP in lowering the prevalence of adolescent obesity by 5% in 90 days through the combination of a structured physical activity regimen and formal nutritional education with dietary instruction. The goal evaluated by this project was successful. The evaluation suggests that physical activities, coupled with an increased awareness of dietary habits and the adverse effects of obesity, have a positive impact on curbing the prevalence of obesity

among young children. The EB-QIP project with this evaluation has significant practical implications for obese adolescents living in rural communities.

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Appendix A: The t test for the 30-days IntervalHypothesis Test: Independent Groups (t test, pooled variance)

Intervention Group	Non-Intervention Group	
42.8521	45.0616	mean
0.7866	0.5909	std. dev.
19	19	n
	36	df
	-2.20947	difference (Intervention Group - Non-Intervention Group)
	0.48399	pooled variance
	0.69570	pooled std. dev.
	0.22571	standard error of difference
	0	hypothesized difference
	-9.79	t
	1.10E-11	p-value (two-tailed)

* The result shows that there is a significant difference in the mean values ($t=-9.79$, $p<0.01$). There is a significant difference between the intervention and non-intervention group data. This implies that the program is effective.

Appendix B: The t test for 60 Days IntervalHypothesis Test: Independent Groups (t test, pooled variance)

Intervention Group	Non-Intervention Group	
42.8530	45.0540	mean
0.8325	0.6217	std. dev.
10	10	n
	18	df
	-2.20100	difference (Intervention Group - Non-Intervention Group)
	0.53981	pooled variance
	0.73472	pooled std. dev.
	0.32858	standard error of difference
	0	hypothesized difference
	-6.70	t
	2.78E-06	p-value (two-tailed)

* The result shows that there is a significant difference in the mean values ($t=-65.70$, $p<0.01$). There is a significant difference between the intervention and non-intervention group data. This implies that the program is effective.

Appendix C: The t test for 90-days Interval

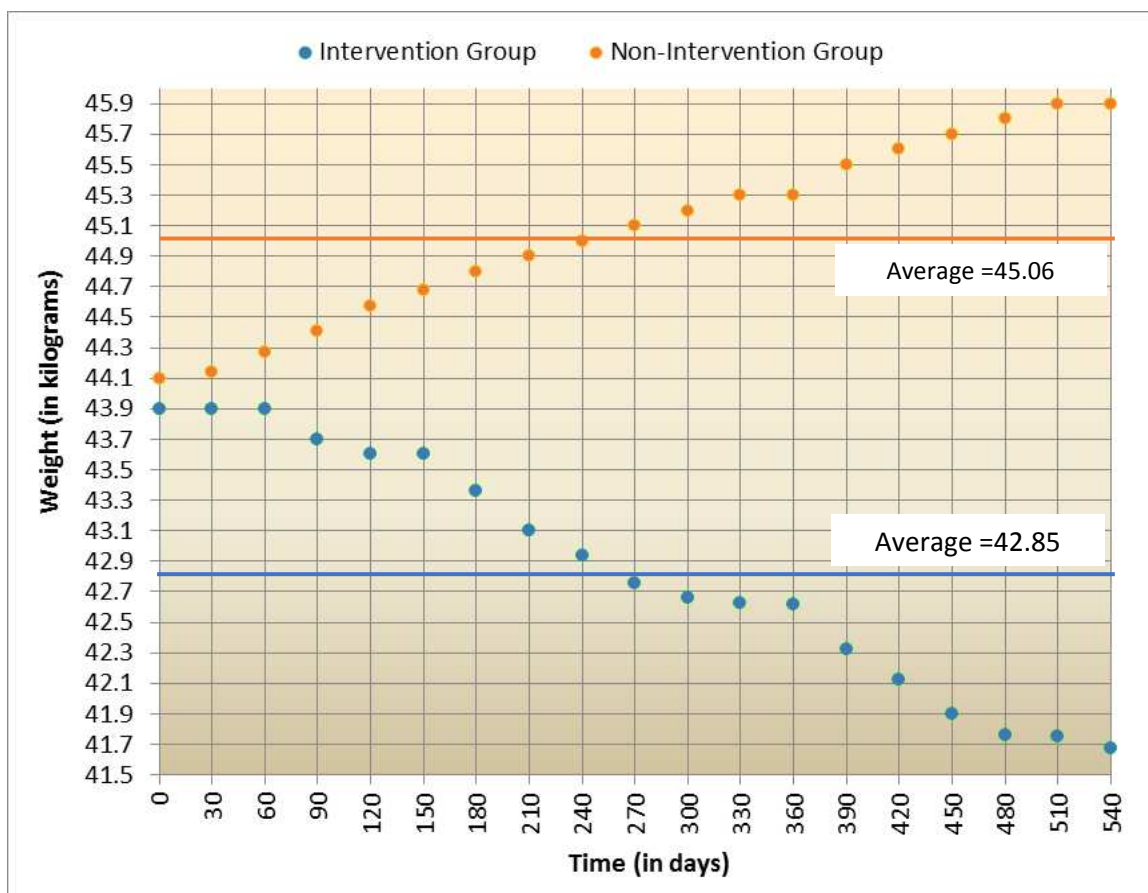
Hypothesis Test: Independent Groups (t-test, pooled variance)

Intervention Group	Non-Intervention Group	
42.8443	45.0443	mean
0.8603	0.6563	std. dev.
7	7	n
		12 df
		difference (Intervention Group - Non-Intervention Group)
		-2.20000
		0.58543 pooled variance
		0.76513 pooled std. dev.
		0.40898 standard error of difference
		0 hypothesized difference
		-5.38 t
		.0002 p-value (two-tailed)

* The result shows that there is a significant difference in the mean values ($t=-5.38$, $p<0.01$). There is a significant difference between the intervention and non-intervention group data. This implies that the program is effective.

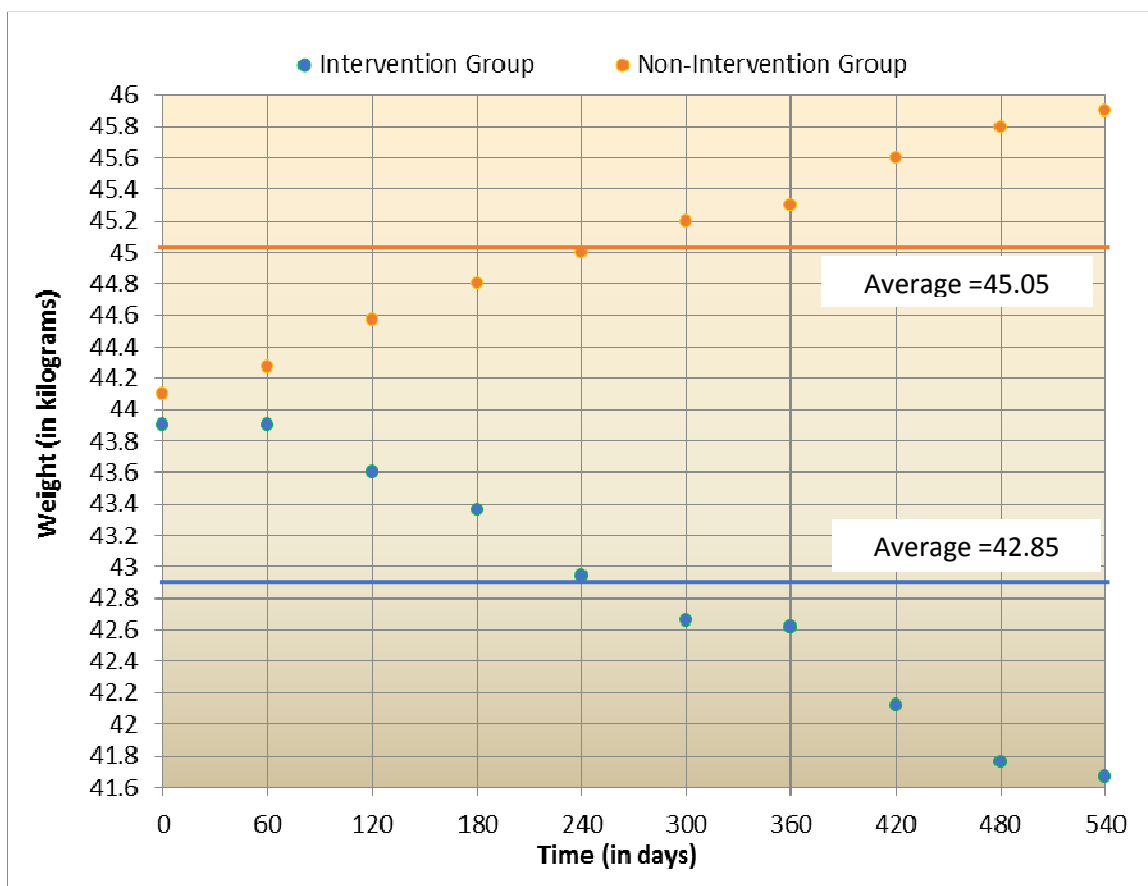
Appendix D. Run Chart for the 30-day Interval

Weight (in kilograms)					
Days	Intervention Group	Non-Intervention Group	Days	Intervention Group	Non-Intervention Group
0	43.9	44.1	300	42.66	45.2
30	43.9	44.14	330	42.63	45.3
60	43.9	44.27	360	42.62	45.3
90	43.7	44.41	390	42.32	45.5
120	43.6	44.57	420	42.12	45.6
150	43.6	44.68	450	41.9	45.7
180	43.36	44.8	480	41.76	45.8
210	43.1	44.9	510	41.75	45.9
240	42.94	45.0	540	41.67	45.9
270	42.76	45.1			
			Average	42.85	45.06



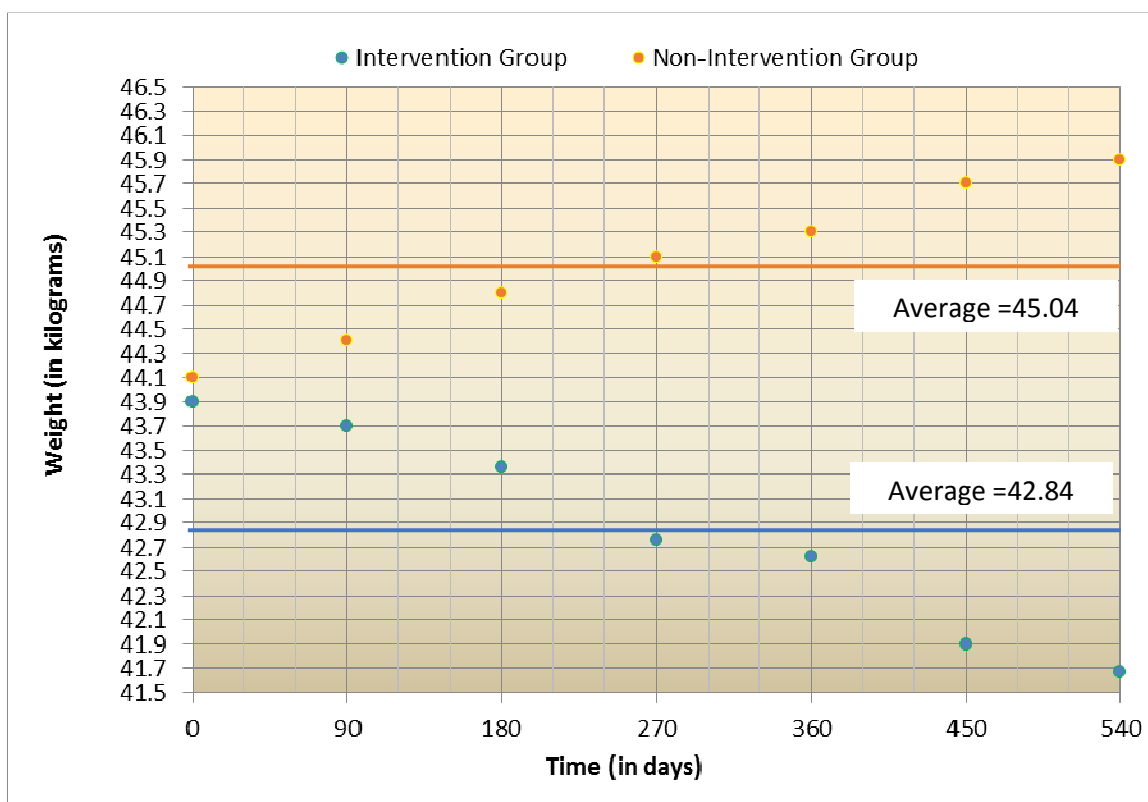
Appendix E. Run Chart for the 60-day Interval

Days	Weight (in kilograms)	
	Intervention Group	Non-Intervention Group
0	43.9	44.1
60	43.9	44.27
120	43.6	44.57
180	43.36	44.8
240	42.94	45
300	42.66	45.2
360	42.62	45.3
420	42.12	45.6
480	41.76	45.8
540	41.67	45.9
Average	42.85	45.05



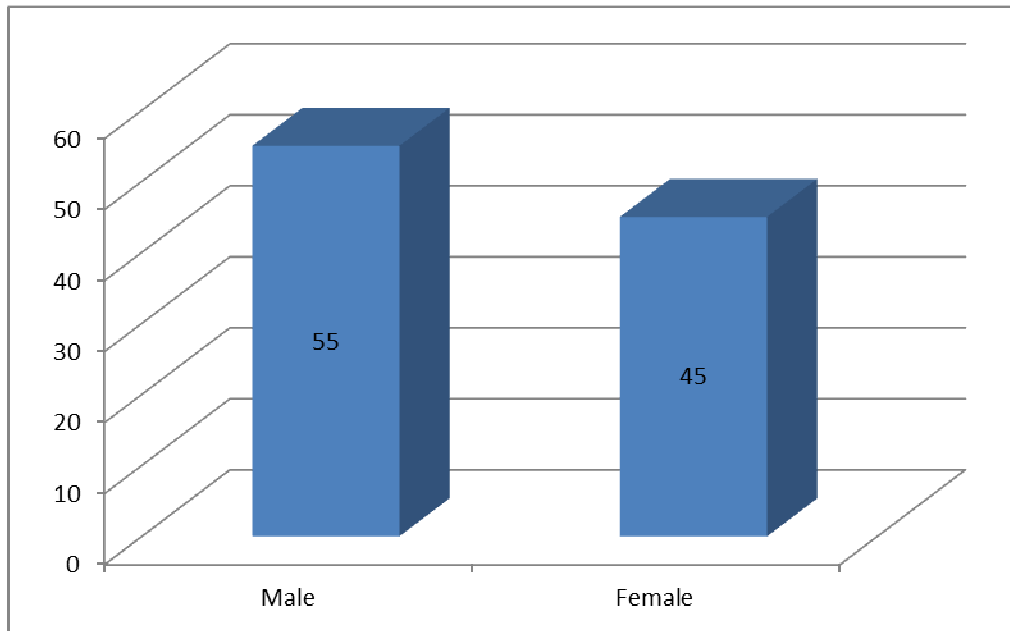
Appendix F. Run Chart for the 90-day Interval

Days	Weight (in kilograms)	
	Intervention Group	Non-Intervention Group
0	43.9	44.1
90	43.7	44.41
180	43.36	44.8
270	42.76	45.1
360	42.62	45.3
450	41.9	45.7
540	41.67	45.9
Average	42.84	45.04

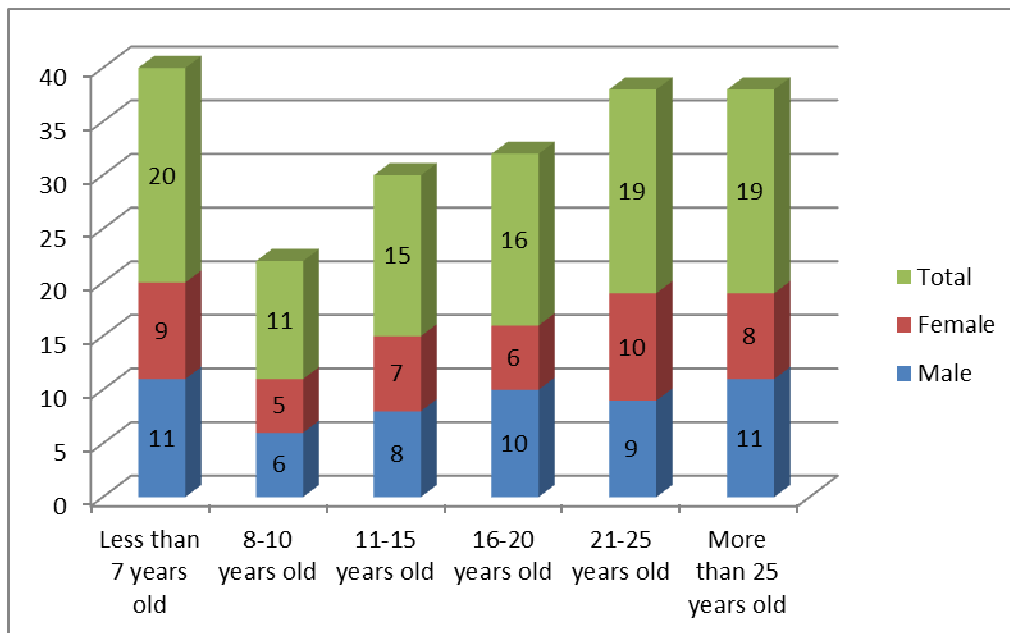


Appendix G. Questions and Results

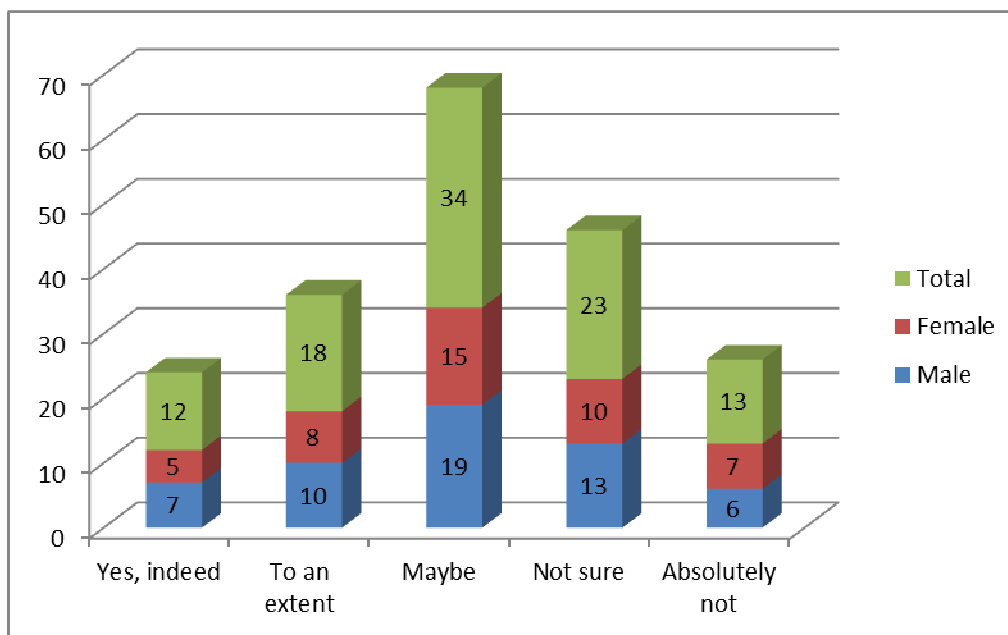
1. What is your gender?



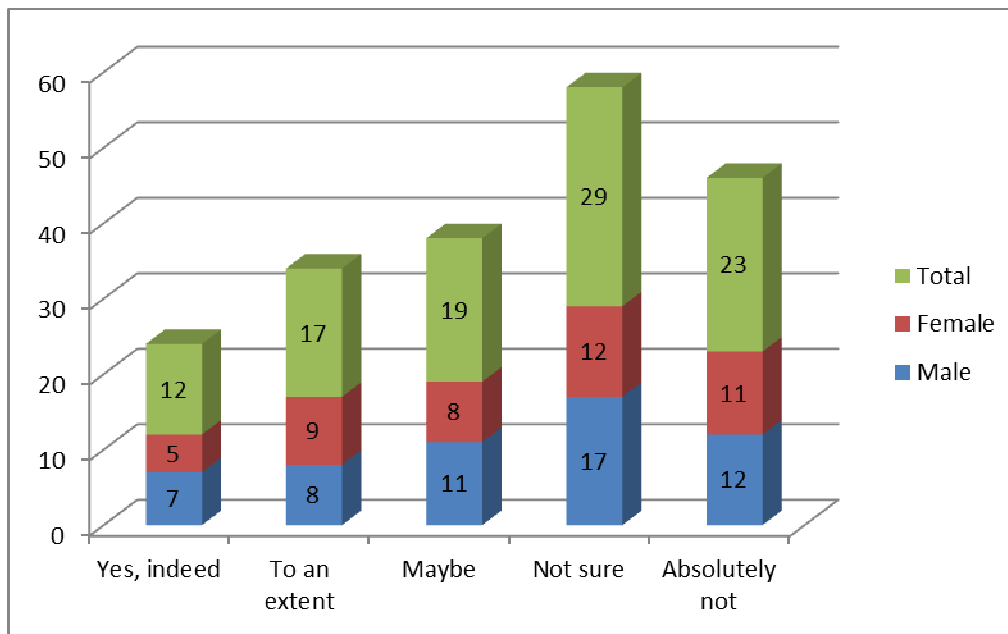
2. How old are your children?



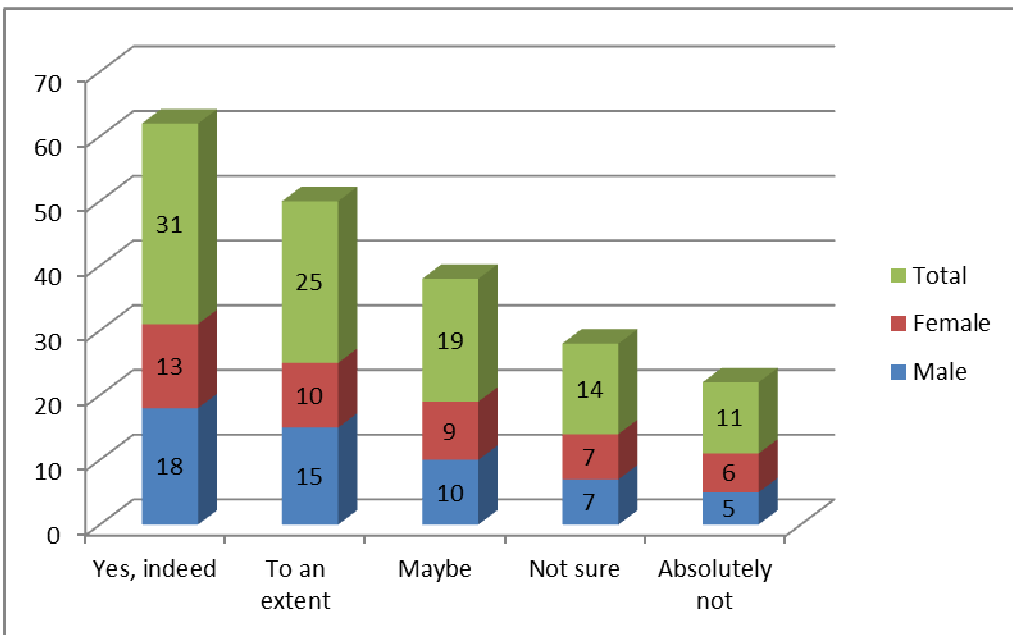
3. Do your children know their body mass index (BMI)?



4. Do your children consume healthy meals?



5. Do your children have any chronic illnesses or psychological problems?



6. Are you trying to solve the problem of your children?

