

**A COMPARISON OF SCHOOL-BASED AND CLINIC- BASED INTERVENTIONS FOR
THE PREVENTION AND CONTROL OF CHILDHOOD OBESITY**

by

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In the United States, obesity is becoming an ever increasing problem, especially among youth. The prevalence of adult obesity-related health complications, until recently were only seen in adults are rising within the youth population. The increasing rate of childhood obesity is of public health importance; if not properly dealt with now, the current generation of children will grow up and face serious health complications both in their late childhood and adult years.

To address this epidemic, two approaches that can be utilized are school-based and clinic-based interventions. Even though each type of intervention takes place in a different setting, the same basic principles of nutrition education, healthy eating and physical activity are addressed. While each of the two types of interventions has strengths and weaknesses, the overall goals of both school-based and clinic-based interventions are a reduction in weight and increase in the health of the children participating in the intervention.

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1.0 INTRODUCTION

The number of overweight and obese children in the United States is rising at an alarming rate (Jehn *et al.*, 2006), with the prevalence of childhood obesity tripling in the past two decades (Katz *et al.*, 2007). An obese or overweight child is at an increased risk of developing serious health complications, some of which were not diagnosed in children until recently (Katz *et al.*, 2007). Obesity not only affects a person during childhood, it has also been shown to track into adulthood, thereby having a negative effect on a person's health over the course of a lifetime (Jehn *et al.*, 2006). If the health and wellbeing of America's youth is not improved, the current generation of children is going to face a life that is complicated with obesity-related medical problems.

To address the issue of childhood obesity, numerous types of interventions have been developed. The two that will be discussed in this paper are school-based interventions and clinic-based interventions. With the school-based intervention, a large number of children are able to participate in the intervention at one time, as compared to clinic-based interventions, which focus on either individual patients or small groups. The rationale for choosing these two types of interventions is that they take place in different settings and utilize distinct approaches to address the obesity epidemic, while incorporating similar elements. These program components include nutrition education, healthy food options, physical activity and physical and psychological examination (Figure 1).

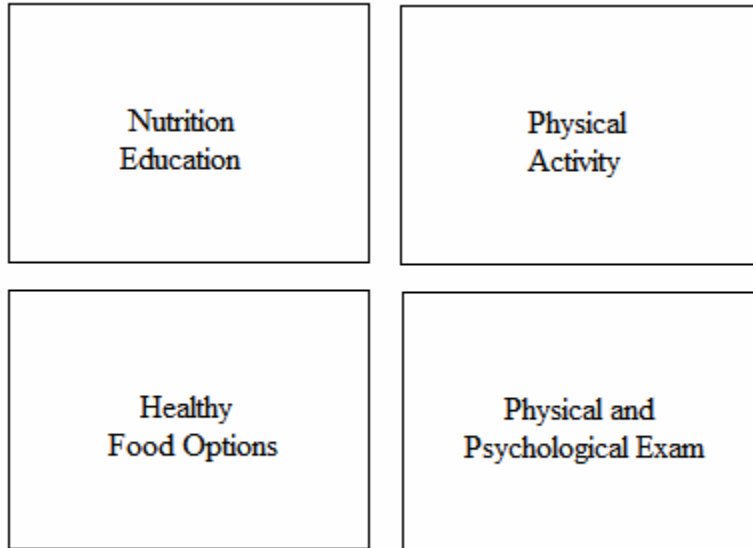


Figure 1. Matrices of Intervention Components

In every obesity prevention intervention, a combination of these four components is present and through inclusion of them, an intervention may be more likely to succeed in decreasing the number of overweight children in the United States.

While neither a school-based nor clinic-based are collectively better than the other, each has strengths and weaknesses. Therefore, due to program components, one intervention may succeed in a population where other interventions have failed to achieve results. Overall, it is important with any intervention that the needs of the population are taken into account in the development of the intervention and that the main goal of improving the health of children is maintained.

2.0 BACKGROUND

In the United States, childhood obesity is a growing epidemic (Jerome and Barnes, 2007), with 20% of school-aged children being classified as either overweight or obese (Hendy, Williams and Camise, 2005) and 31% of children at risk for overweight or obesity (Jehn *et al.*, 2005). For a child, obesity is defined as being in the 85th percentile of weight-for-height. Obesity can also be determined using a child's Body Mass Index (BMI) score, which is calculated by dividing the child's weight in kilograms by height in meters squared. Having a BMI score of greater than 30 classifies the child as obese (de Beer *et al.*, 2007). From 1973 to 1994, the number of children described as obese increased twofold (Stone *et al.*, 2007). According to Dr. Young, a pediatrician at the Pediatric Fitness Clinic of Arkansas Children's Hospital, the blame falls not on genetics but on lifestyle. Children are increasingly being exposed to high-fat fast food, sugary drinks, and hours of sedentary time in front of the television or playing computer games (Jerome and Barnes, 2007). Additionally, over 80% of children consume more than the daily recommended amounts of total fat and saturated fats (Gortmaker *et al.*, 1999).

Continued exposure to poor dietary habits and increased sedentary time in childhood are risk factors for subsequent morbidity and mortality (Gortmaker *et al.*, 1999). Obese or overweight children have more childhood diabetes, a condition that was rarely seen in this population ten years ago. Additionally, obese children have an increased risk of developing elevated cholesterol, high blood pressure (Hendy, Williams and Camise, 2005), dyslipidemia,

fatty liver, sleep apnea (Williams, Strobino and Brotanek 2007) and cardiovascular disease (Gortmaker *et al.*, 1999).

Not only are obese children at risk of developing health complications related to obesity, but they are also at risk of developing emotional problems. In a recent study conducted by de Beer *et al.* (2007) the Health-Related Quality of Life (HRQoL) of obese children was found to be substantially reduced when compared with that of average-weight children. In this study, the child's BMI and HRQoL scores were inversely related. The HRQoL of obese children was similar to that of adult cancer patients. The decrease in the HRQoL scores of obese children was linked to the physical, social and school problems that obese children face (de Beer *et al.*, 2007). This study shows that not only are obese children experiencing physical complications due to their obesity, but they are also experiencing a decreased quality of life due to the combination of both the physical and emotional complications brought about by obesity.

Obese children are more likely to grow up to be obese adults than children of normal weight (Steckler *et al.*, 2003). In order to reverse this trend, changes need to be made in the way children eat. For this to occur, children need to be taught how to eat properly through nutrition education. However, there are numerous challenges present when treating childhood obesity due to the fact that “interventions are based on motivating both child and parents to make significant changes in their usual diet and physical activity pattern” (Williams, Strobino and Brotanek, 2007, 218).

To overcome these challenges, obesity prevention and control interventions can be utilized. Numerous types of programs, which take place in different settings can be used. The two types of interventions that are going to be discussed and compared within this paper are school-based and clinic-based interventions.

3.0 SCHOOL-BASED INTERVENTIONS

School-based interventions are one type of program being used to fight childhood obesity. Due to the “near universal enrollment of children in schools,” (Gortmaker *et al.*, 1999, 976) school-based interventions have the ability to reach a maximum number of children (Gortmaker *et al.*, 1999). On average, children spend almost one-third of their day at school and eat a significant amount of their daily food consumption in the school environment, from 19% to 50% (Gorman *et al.*, 2007). This makes the school a prime target for obesity prevention and nutrition related programming (Masse *et al.*, 2007). In order to be effective, school-based interventions need to overcome the barriers present in working within the schools. They must focus on nutrition education, what children are being served in the lunch line, and what additional foods are available for purchase (Story *et al.*, 2003). In this section, relevant components of school-based interventions will be discussed, including staff training and education, food preference, nutrition education and self-efficacy.

3.1 BARRIERS

In the development and implementation of school-based interventions, there are barriers that must be dealt with in order to execute an effective intervention. These barriers come in numerous forms, with some easier to overcome than others. One barrier is the need for written consent

from study participants; in the case of working with school-aged children, this involves getting parental consent. Gaining written consent from study participants can prove to be time-consuming and an administrative burden. To overcome this obstacle, “negative informed” or “opt-out” consent can be utilized. For this type of consent, a letter is mailed home to parents explaining the intervention that is going to take place in their child’s school, and allowing them the option of removing their child from the study. Through this process, parents are informed of the study and can decide to not have their child participate, and the arduous task of collecting informed consent forms from every parent is avoided (Levine *et al.*, 2007).

For schools, the amount of material that needs to be taught continues to grow, while funding is constantly being cut. Therefore, an additional barrier in the school environment is having the financial backing to fund the project (Staten *et al.* 2005, James, Thomas and Kerr, 2007). Along with obtaining initial funding, it is essential to source enough financial support to continue the program for an adequate period of time, in order to see results. This is a significant barrier for some interventions, because the amount of time for the intervention is not long enough to see positive effects (James, Thomas and Kerr, 2007).

Another financial constraint comes with the removal of vending machines and other outside food sources from school grounds. By doing so, the school becomes a healthier environment. However, vending machines and contracts with outside vendors are often important sources of revenue for a school district. Therefore, removing vending machines and losing the income they provide may not always be a feasible option. To assist in overcoming this obstacle, school officials need to assess what food is currently being offered in the vending machines and what are healthier alternatives (Staten *et al.* 2005).

An additional barrier to obtaining funding is convincing overburdened schools that health education and obesity prevention should be a priority. To overcome this issue, the researchers proposing the intervention must meet with school officials to explain the importance of both the intervention and the positive health effects it will have on the short-term health and long-term well-being of the participants. Also, the outside agency proposing the intervention needs to ensure that the intervention places as little strain on the resources of the school as possible. In addition, the intervention team must be able to provide adequate materials and training to the intervention schools (Staten *et al.* 2005). Examples of interventions that succeeded in decreasing the burden on schools, teachers and lesson time were Eat Well and Keep Moving, the 5-A-Day Cafeteria Power Plus Project, and the Christchurch Obesity Prevention Project (Gortmaker *et al.*, 1999, Perry *et al.*, 2004, James *et al.*, 2004).

A method that helps to ease the burden on teachers, and which was used to great effect by the Christchurch Obesity Prevention Project, was having a member of the research team go into the schools and teach the lessons. This reduced the time commitment needed from teachers to learn the lessons and prepare for teaching them. Additionally, students benefited from the expertise of the research team members (James *et al.*, 2004). However, having an outside health educator is not always feasible and therefore, school staff need to receive formal training before delivering the intervention to students.

3.2 STAFF TRAINING AND EDUCATION

Depending on what factor or factors an intervention is focused on changing, different populations within the school will be addressed, with the overall goal of improving the health of

the children attending the school. These populations are school officials, teachers, food service workers and children.

In order to change what children are eating at school and to make the food healthier, one population to focus on is the people preparing the food for the children: food service workers. The reason why the food children are eating needs to change is that “food intake is one of the variables that defines better the relationship between life-style and human obesity, influencing the energy balance of an individual” (Alvina and Araya, 2004, 637). Therefore, it is important that food service staff preparing the food have the skills and know-how to prepare healthy dishes and avoid unneeded fat, calories and salt. One large-scale study, conducted by Wechsler *et al.* (2000), concluded that credentialed food service managers prepare healthier food options than their non-credentialed counterparts (Masse *et al.*, 2007). These findings were supported in the 5-A-Day Cafeteria Power Plus intervention, which stated that a significant limitation of the intervention was the lack of educated food service managers and personnel (Perry *et al.*, 2004).

In addition to requiring credentialing for cafeteria managers, training food service staff who directly prepare food is another important component in improving the nutritional value of cafeteria food. One intervention that succeeded in incorporating food-service employee education was Pathways, a three-year school-based intervention that focused on lowering the body fat in American Indian children (Steckler *et al.*, 2003). There were four components to the Pathways intervention, with one section focusing on skill-building for food service employees (Cunningham-Sabo *et al.*, 2003).

To achieve this study goal, nine primary and four secondary behavioral guidelines were implemented (Steckler *et al.*, 2003). These guidelines addressed all areas of food preparation, from meal planning and food purchasing, to the actual preparation methods used to cook the

food. The guidelines were written at a literacy level that was appropriate for the food service staff (Cunningham-Sabo *et al.*, 2003). The goal of the guidelines was to help food service personnel produce low-fat school lunches (Story *et al.*, 2003).

The guidelines were presented during training sessions, which were held at the beginning of each semester over the course of the three-year study. During the initial training, the guidelines were introduced and discussed. At each subsequent training, the guidelines were reviewed, and staff members were given the opportunity to ask questions and discuss any difficulties they encountered in meeting the guidelines (Steckler *et al.*, 2003). To offer support between training sessions, posters with printed guidelines were produced and displayed in the intervention kitchens. In addition to stating the guidelines, the posters also included step-by-step directions on how to implement each guideline. Research staff visited the kitchens to provide support and encouragement (Story *et al.*, 2003). This support helped to increase compliance with the guidelines from 51.5% in the first year to 87.5% in the third year of the study (Steckler *et al.*, 2003).

In addition to food service personnel, another population to train in helping children live healthier lives is teachers. Teachers serve as role models for their students and have a great deal of influence in the lives of those they teach. Training sessions for educators are especially crucial in intervention programs that incorporate a classroom-based nutrition education component that is facilitated by the teacher (Masse *et al.*, 2007).

In most interventions, such as the Pathways intervention, teacher training occurred at the beginning of each semester. At this time, the nutrition curriculum for the upcoming semester was presented and teachers were given the resources they would need to execute the lessons. Furthermore, questions about the upcoming semester and problems that occurred in the previous

semester were discussed (Steckler *et al.*, 2003). Overall, effective teacher education is necessary in order for the instructors to deliver the desired message to their students.

3.3 CHANGING FOOD PREFERENCE

Numerous influences play a role in what food a child will consume, with a main factor being food preference. The other factors affecting food choices are availability, variety and repeated exposure.

In order to modify what children are eating, food choices offered in the cafeteria must change. Specifically, the variety and availability of fruits and vegetables in the school lunch line needs to increase (Nicklas *et al.*, 2001). The health benefits of consuming fruits and vegetables are indisputable. But in order to get children to eat more of them, fruits and vegetables must be offered in greater quantity and variety (Horne *et al.*, 2004).

To encourage children to eat fruits and vegetables, schools must offer these food items because “schools that offered more FJV [fruits, juices and vegetables] had children who ate more FJV” (Nicklas *et al.*, 2001, 226). In order to get children to eat fruits and vegetables on a regular basis, both in and out of school, they must first be exposed to these foods and given the opportunity to try them (Perry *et al.*, 2004). To encourage tasting, the food should be of high quality and should be both “esthetically and gastronomically pleasing” (Gorman *et al.*, 2007, 2529).

Henry, Williams and Camise (2005) recommend that if children are to develop a preference for a specific food, they need to be exposed to that food more than once, a minimum eight to ten times. Repeated tasting of a particular food allows for increased consumption and

preference for that food (Horne *et al.*, 2004). Additionally, children are more willing to try a new food when it is accompanied by a familiar food or is presented in an easy-to-eat manner (Nicklas *et al.*, 2001). The presentation of healthy foods multiple times is the basis for numerous successful interventions that focused on improving the food choices and overall health of school-aged children (Cullen *et al.*, 2005, Gortmaker *et al.*, 1999 Henry, Williams and Camise, 2005, Perry *et al.*, 2004).

3.4 NUTRITION EDUCATION

In order to encourage healthy food choices, children need to know why healthy eating is important to their overall well-being. In part, this can be achieved through nutrition education, which “has the potential to increase students’ knowledge about food choices and their attitudes and skills to eat a healthy diet” (Masse *et al.*, 2007, S279).

Key elements that should be included in any school’s health education program are behavioral skill development and educational programming for students in grades K-12, allowing for the delivery of age-appropriate messages at each grade level. Also, it is important that instruction be given by qualified teachers; parents, health professionals and other community members must also be involved in the learning process. Lastly, the curriculum needs to be evaluated and updated periodically to ensure that the students are given up-to-date health information (Story, Kaphingst and French, 2006). There are numerous different ways in which the nutrition education message can be incorporated both within the school environment and the school curriculum.

One method that helps children learn about healthy eating and making healthy choices involves incorporating nutrition education into the classroom curriculum. This can be achieved in a variety of ways. For schools that already have a dedicated health class, nutrition education fits in with the curriculum of this class. An additional benefit of a health class is that it allows for time to be allotted for an in-depth review of specific health topics (Masse *et al.*, 2007).

However, not all schools are fortunate enough to have a health class. In this case, the nutrition education message needs to be incorporated within the standard classroom curriculum. This can be difficult due to the already limited time teachers have each day to teach. Therefore “to maximize classroom time, nutrition instruction [can] also be integrated into the lesson plans of other school subjects, such as math, biology and language arts” (Story, Kaphingst and French, 2006, 120). Through lesson integration, children learn the basic school subjects while at the same time getting nutrition information.

The approach taken in the Eat Well and Keep Moving intervention did exactly that (Gortmaker *et al.*, 1999). It focused on decreasing the amount of time that was devoted to teaching children about healthy eating, and thus did not subtract time from other content areas. This was done through an interdisciplinary approach that incorporated healthy eating lessons into the existing curriculum. Lessons were developed that combined healthy eating with core subjects such as math, science, language arts and social studies (Gortmaker *et al.*, 1999).

For example, one lesson within the Eat Well and Keep Moving intervention that incorporates math skills with health education is the “Sugar Water: Think About Your Drink”. In this lesson, children learn about the sugar content of their favorite beverages while practicing measuring and counting skills. An additional component of the Eat Well and Keep Moving

program is that the participating children are not only engaged in learning; they are also physically active in the classroom while learning (Cheung *et al.* 2007).

In addition to being included in classroom curriculum, health education can also be achieved by incorporating nutrition messages into the school décor. This can be done through hanging posters in the hallways, classrooms, stairwells and cafeteria. To ensure that these messages are seen, advertising of unhealthy products on school grounds should be avoided (Gorman *et al.*, 2007).

The 5-A-Day Cafeteria Power Plus Project used vegetable characters known as “The High 5 Flyers” as role models. Posters featuring these characters and healthy eating messages were displayed throughout the cafeteria (Perry *et al.*, 2004). A second intervention that used posters as a means of nutrition education did so by displaying letters from “the food dude” throughout the cafeteria and reading these letters to students before lunchtime. In these letters, “the food dude” character talked about how he ate fruits and vegetables to give him energy to fight against the evil “junk punks” (Horne *et al.*, 2004). By incorporating health education messages into materials displayed throughout the school, such interventions were able to educate the students in the intervention schools about healthy eating habits (Horne *et al.*, 2004, Perry *et al.*, 2004).

An additional approach used by interventions to increase nutritional knowledge is to focus on changing one specific consumption habit, as in the Christchurch Obesity Prevention Project. The objective of this intervention was to discourage the consumption of both sweetened and unsweetened carbonated or “fizzy” beverages, with the overall goal of living a healthier life (James, Thomas and Kerr, 2007).

The Christchurch Obesity Prevention Project consisted of a series of four educational lectures that took place over the course of a year. Each session had a different focus, with the overall goal of teaching children the benefits of a diet containing reduced amounts of carbonated beverages (James *et al.*, 2004). In the short term, this intervention was effective both in reducing the intake of “fizzy” beverages and decreasing the weight of students. However, a two-year follow-up showed that the results were not long-lasting (James, Thomas and Kerr, 2007).

3.5 INCREASING SELF-EFFICACY

Once staff have been properly trained in preparing healthy food, with the food being offered appropriate for children and the children having learned about the benefits of healthy eating, the next task is to convince the children to eat the healthy food being offered in the school lunch line.

To encourage children to make healthy selections, numerous interventions aim to increase a child’s self-efficacy, a component of the social cognitive theory. Social cognitive theory is an appropriate choice for these interventions because it considers the relationship between personal and environmental factors (Perry *et al.*, 2004). Its aim is to strengthen both behavioral and cognitive skills, allowing individuals to make changes to their own behavior (Gortmaker *et al.*, 1999). Increasing self-efficacy strengthens a child’s confidence about being able to choose and consume healthier foods such as fruits and vegetables (Henry, Williams and Camise, 2005).

One program component that helps increase a child’s self-efficacy is the incorporation of a rewards system for healthy eating (Hendy, Williams and Camise, 2005). If a reward system is

going to encourage a child to try new, unfamiliar foods and increase the child's desire to consume that food, two things are required. The reward must be desirable; and the children need to know that they are being given the reward because they have done something positive and enjoyable (Horne *et al.*, 2004). Since a reward system can be difficult to incorporate, it has the potential to have negative long-term effects. When children are offered a reward for eating a certain food, they often assume that they should not like the food (Hendy, Williams and Camise, 2005). However, when used appropriately, "rewards can be effective at altering behavior, including children's food consumption" (Horne *et al.*, 2004, 1650).

To overcome this obstacle, the Kids Choice Intervention supplied small prizes in a delayed manner. In an attempt to keep the children from feeling pressured into eating certain foods, they were told that, for each fruit or vegetable they ate, they would receive a token that could later be traded for a prize. The research assistants did not force participants to eat these foods during lunch periods, thereby rewarding children for their good eating habits and not making them feel they should eat certain food groups instead of others (Hendy, Williams and Camise, 2005).

3.6 COMPETITIVE FOODS

For a school-based obesity intervention to be effective, not only does the food offered in the cafeteria have to change, but the food items students can purchase outside the cafeteria have to change as well. The majority of food items available outside the cafeteria are high in fat and sugar, with a low nutritional value (Story *et al.*, 2003). Non-cafeteria food sources include school stores and vending machines. The foods items sold in these sources are often referred to as

“competitive foods” (Masse *et al.*, 2007), and the availability and intake of competitive foods are directly correlated with a diet higher in fat and saturated fat (Masse *et al.*, 2007).

Given that availability of school vending items is one cause behind the obesity epidemic, the simple solution would be to remove the machines and close school stores (Masse *et al.*, 2007). However, this is not always a feasible option for school districts. For many school districts, the profits from school stores and vending machines are a source of revenue to fund extracurricular activities. Therefore, removing the vending machines would make funding these programs difficult. However, there are solutions that would allow for the retention of vending machines and school stores while still supporting a healthy eating initiative. One solution is to remove all high-calorie beverages from the vending machines and replace them with water, 100% fruit juices, and other low-calorie beverages. The same approach can be taken with food in vending machines, with high-fat food removed and replaced with healthier alternatives, such as pretzels and baked snacks. Similar changes could also be made in school stores (Staten *et al.*, 2005).

In addition to offering only healthy options in vending machines, a second way to decrease the temptation to substitute a cafeteria lunch with snacks from the vending machine is to move vending machines. By placing vending machines in areas that are not accessible during lunch, children will be less tempted to use vending machine snacks as an alternative to lunch. Vending machine foods could then be eaten as after-school snacks only, thereby decreasing a child’s overall consumption of junk food (Gorman *et al.*, 2007).

Vending machines and school stores are not the only places where unhealthy snack options are present in schools. Additional sources include school fund-raisers, snack bars at sporting events, classroom parties and teacher rewards. As with vending machines and school

stores, the majority of these provide income for both the school and specified activities. With all of these examples, the same approach as discussed above can be utilized. Healthier food options could be offered during class parties, as rewards and at snack bars. For school fund-raisers, non-food items such as wrapping paper and greeting cards could be sold, or a fruit and granola sale could replace the traditional baked goods or candy bar sale. The above examples of incorporating healthy food into the school setting were developed and implemented by schools in the Santa Cruz, Arizona and Yuma County, Arizona schools. Each school integrated options that worked best for it and each experienced success, both in acceptance of the new food items and a steady sale of the new items (Staten *et al.*, 2005).

3.7 ASSESSMENT AND MONITORING

In order to determine whether an intervention is successful, data collection and evaluation are necessary. Data collection, both before and after an intervention is implemented, allows us to conclude whether the intervention achieved the desired results or not. Evaluation measures the effectiveness of the intervention and help determinate what study participants gained, as well as areas that were missed. From this information, areas for improvement can be identified and enhanced.

When working with children to decrease the prevalence of obesity, physical measurements of the children need to be obtained. These measures include height, weight and percent body fat (Levine *et al.*, 2007). This information can then be used to calculate each child's Body Mass Index (BMI) (Masse *et al.*, 2007). In a school setting, this information can be collected in the classroom. When taking measurements, it is important that each child's privacy

is maintained. This can be done by placing a screen around the scale and not stating the weight out loud, but instead writing it down. The same set of measurements can then be taken at the conclusion of the intervention, allowing for the amount of weight lost during the intervention to be calculated (Levine *et al.*, 2007).

For interventions that include an educational component, it is imperative to know what a child learned from the intervention, not just how much weight was lost. This can be done through pre- and post-testing that measures knowledge of healthy eating (Gortmaker *et al.*, 1999). To determine if there was a behavioral change in a child's eating patterns after learning about making healthy choices, a food frequency questionnaire or 24-hour recall can be used (Cullen *et al.*, 2005, Gortmaker *et al.*, 1999). Similar to pre- and post-testing, either of the above methods can be conducted before and after the intervention to determine if the intervention increased knowledge about healthy eating and if there was a behavioral change towards making healthier choices. However, when conducting either a food frequency questionnaire or 24-hour recall, it is important to take into consideration the bias and subsequent under-reporting of food intake that is present with a self-reported food consumption assessment (Ventura *et al.*, 2006). With any questionnaire, it is important to first pilot test it to assure that it is understandable to the target age group (Cullen *et al.*, 2001).

When the goal of an intervention is to change the food being served in the school cafeteria, one way to evaluate this is to collect school lunch menus and the recipes for food items on the menu. The recipes can then be analyzed to determine fat, calorie, sugar and micronutrient content. Recipe analysis also allows for the identification of improvements in cooking and preparation methods. Menu collection allows for calculating the number and variety of fruits and vegetables served on a daily basis (Cunningham-Sabo *et al.*, 2003). It is important to know this

before, during and after the intervention to see where improvements can be made and what changes have taken place.

Without the participation of school personnel, primarily teachers and food service workers, the interventions discussed in this paper could not take place. Therefore, it is important to ensure that these interventions are easily implemented and taught. Also essential is the effective staff training that accompanies the interventions. One way to evaluate teacher and staff training is through questionnaires and staff interviews, performed by members of the research team. Both tools allow for the collection of staff opinions about the intervention and for issues pertaining to the program to be addressed (Steckler *et al.*, 2003). By addressing issues that are raised by participating staff members, the intervention can be strengthened.

4.0 CLINIC- BASED INTERVENTIONS

Although effective, school-based obesity interventions are not the only ones that can be used to improve the health of today's youth. A second option is a clinic-based intervention. In this setting, children are seen on an individual or small-group basis by physicians and other health professionals who work with them to help decrease their weight and improve their health. For most of the children who seek a clinic intervention, it is not the first time that they have tried to lose weight. However, it is probably the first time they have utilized a clinic-based program. For some children, the one-on-one or small group attention they receive in the clinical setting is the key to successful weight loss. In this section, relevant components from several clinic-based interventions are discussed, including dietary intake guidelines, behavioral changes, increasing physical activity and parental involvement. Throughout this section, more emphasis is placed on the Weight Management and Wellness Center, at the Children's Hospital of Pittsburgh, Pennsylvania due to direct involvement with this clinic-based weight loss program.

4.1 GUIDELINES FOR DIETARY INTAKE

When a child enrolls in a weight-loss program, one of the main objectives is to work with the child in developing lists of healthy and unhealthy foods. These will serve as a basis for what should be eaten and what foods should be avoided. Depending on the clinic, guidelines for eating

may be a detailed list of foods, a day-by-day diet or a calorie intake guideline. Overall, these guidelines need to be specific, yet also allow for flexibility (Williams, Strobino and Brotanek, 2007, Weight Management and Wellness Center).

One approach to dietary counseling is to give a specific caloric number that should not be exceeded over the course of a day. This value will vary from client to client, depending on age and gender. Once this value is assigned, a specific diet will then be discussed with the child. This approach was taken in a pilot study conducted by researchers in the Department of Pediatrics at Columbia University (Williams, Strobino and Brotanek, 2007). In this study, 11-year-old to 15-year-old girls were placed on a 1,500 kcal/day restricted diet. To allow for flexibility, the girls were allowed to consume two 150 kcal snacks throughout the course of the day. They were given a list of snacks that met this rule and were allowed to choose what they wanted for themselves. By taking this approach, the girls lost weight by adhering to a strict diet; selecting their own snacks gave them the flexibility and choice over some of what they were consuming throughout the day (Williams, Strobino and Brotanek, 2007).

When using dietary counseling to establish dietary guidelines, another approach is to educate children about healthy eating and making healthy choices. This can be done in an individual or group setting. Topics that can be covered include portion control, how to read food labels, the benefits of packing a lunch, eating at home as opposed to eating out, and healthy substitutions and alternatives (Savoye *et al.*, 2007, Weight Management and Wellness Center).

In the Bright Bodies Weight Management Program, these kinds of lessons were taught in a group setting. Each week, over the course of six months, participants met for 40 minutes to discuss topics related to healthy eating, weight loss and weight maintenance. After the initial six months, 40-minute meetings were held every other week for an additional six months. The

sessions were facilitated by a registered dietician and helped the children not only to lose weight in the short-term, but also to learn the skills necessary for maintaining weight loss (Savoye *et al.*, 2007).

A similar approach was taken in Project KidFIT. In this intervention, the children participated in 30-minute nutrition education sessions twice a week. Throughout the course of the intervention, areas of focus included the food pyramid, food groups, portion size, food safety, and how to read food labels. These lessons were taught in an interactive manner that helped to keep the children engaged and active throughout the course of the lesson (Bush *et al.*, 2007).

Educating clients is also a main goal at the Weight Management and Wellness Center at the Children's Hospital of Pittsburgh, Pennsylvania (Weight Management and Wellness Center). Similar to the Bright Bodies Weight Management Program, the wellness advisors at the Weight Management and Wellness Center work with children to teach them how to lose weight and live a healthy life. This is done on an individual basis and meetings take place every two to three months.

At the onset, the wellness counselor asks the child to describe a typical day of eating. Next, questions are asked regarding how many times a week the family eats meals away from home, what types of foods are kept in the home, how food is prepared, and the manner in which the family eats meals (separately, in front of the television or at the dinner table). These questions are asked to get a sense of what the child eats on a daily basis and what the home environment is like. By doing this, the wellness counselor is able to identify areas for improvement.

In this initial meeting, the wellness counselor looks for a few changes that can be made to better the diet of the child. Areas for improvement include what the child is eating, how food is

prepared, what the child is drinking, and how much time in the child's daily routine is sedentary. The goal is to make a few minor changes at every meeting so as not to overwhelm the child and family with a lot of major changes all at once. At the conclusion of each meeting, a goal sheet is prepared that is signed by both the child and the wellness advisor. This sheet serves as a reminder of the goals agreed upon.

With most children, the same basic initial goals are set. First, to follow the 5/10 rule. The 5/10 rule states that every food item a child eats needs to have fewer than five grams of fat and 10 grams of sugar. This rule is straightforward and simplifies label reading and calorie control for children. When this is discussed, the child is also given an information sheet with a food label on it. This provides the child with an opportunity to practice label reading and become familiar with where fat and sugar content are located. If a child is too young, this is still discussed with the child, with a greater emphasis placed on teaching the parent the rule. Getting the parents involved is critical, especially with younger children who cannot read.

Second, a goal that is often set at this initial meeting is the elimination of sweetened beverages. Empty calories a child drinks throughout the day can add up. So instead of high-calorie beverages, children are encouraged to have diet drinks with fewer than five calories per serving, to choose water, and to drink no more than three glasses of milk a day. Any additional amount of milk is not required for healthy growth and adds unnecessary calories.

A third goal typically set in this first session is following the "healthy plate," which serves as a guide to how a meal should be composed. In a healthy plate meal, half of the plate is filled with fruits and vegetables, a quarter with lean protein, and a quarter with starch. The 5/10 rule, elimination of sweetened beverages, and following the healthy plate are the three main food-related goals set with a child on the first visit to the Weight Management and Wellness

Center. With each subsequent visit, these lessons are reinforced and new lessons are taught to help each child continue to lose weight and get healthier (Weight Management and Wellness Center).

In each of the above programs, children are taught not only how to lose weight, but also how to keep the weight off. By educating children about how to eat healthy, they are learning tools that they can use for the rest of their lives to maintain their weight (Savoye *et al.*, 2007).

4.2 BEHAVIORAL COUNSELING

Teaching children how to eat healthy and make good food choices is a positive step towards weight loss. For some children, however, there are emotional issues underlying why they overeat. To aid in successful weight loss, these issues need to be addressed. In order to do this, a holistic approach to weight loss, in which the child meets with a psychologist in addition to a wellness advisor, needs to be taken.

The addition of a psychologist to the weight-loss team will allow for addressing issues that may underlie poor eating habits. At the Weight Management and Wellness Center, at Children's Hospital of Pittsburgh, Pennsylvania, each child meets with a psychologist to tackle these issues, which is necessary for wellness goals to be achieved. Success rates with weight management programs are in direct correlation with accurately identifying causes for overeating. The psychologist can also work with the child to address other issues, such as sneak-eating and emotional eating. If needed, the child will continue to meet with the psychologist on each subsequent visit to the center (Weight Management and Wellness Center).

Psychological issues may not be the only mental barrier to weight loss. Some children need to get healthy to save their own lives, yet they lack the motivation necessary to make these changes. One method that helps increase the incentive to lose weight is motivational interviewing. Motivational Interviewing “is a patient-centered method of counseling that seeks to elicit intrinsic motivation for changing behavior and encourages patients to understand and resolve their ambivalence to such change” (Schwartz *et al.*, 2007, 495). Motivational interviewing strives to help patients understand how their current behavior is having a negative effect on achieving their goals. It is another useful tool in understanding the emotional barriers that prevent a child from losing weight (Schwartz *et al.*, 2007).

4.3 PHYSICAL ACTIVITY GOALS

Teaching a child how to eat better and addressing psychological issues are two important steps towards helping a child lose weight. However, exercise must also be incorporated, allowing the child to burn more calories throughout the course of the day, and thereby helping to further shift the energy balance in favor of weight loss (Taylor *et al.*, 2007). The National Association for Sport and Physical Education recommends that children “engage in at least 30 to 60 minutes of age-appropriate and developmentally appropriate physical activity on all or most days of the week” (Bush *et al.*, 2007, 514). To assist a child in achieving this goal, a multitude of approaches can encourage a child to increase the amount of time spent exercising and being active each day.

One way of doing this is to set goals pertaining to the child’s activity level. In the initial consultation at the Weight Management and Wellness Center, the child is asked about activity

level and sedentary time. These questions ask about physical education and recess time during the school day, activities after school and how free time is spent. For most children, the majority of their time outside school is sedentary, spent in front of the television or computer. If this is the case, the wellness advisor will help both the child and parent brainstorm about activities in which the child can participate. This could be as simple as playing with a sibling or taking the family pet for a walk. Once discussed, a goal to increase a child's physical activity will be set.

Depending on the child, either activity goals or goals limiting television and computer time will be established. With the latter, the concept is this: if children have to limit the amount of time spent in front of the television or computer, they have to come up with other things to do that will most likely be more active than playing video games. Additional goals may be set with the child, depending on areas where improvement can be made. The aforementioned goals are typical; however, depending on the child, other goals may be set (Weight Management and Wellness Center).

In addition to setting goals about how much time a child will spend being active each day, goals can also be set regarding how many steps the child takes in a day. This is done through the use of a pedometer and step journal, used in a pilot study conducted by Williams, Strobino and Brotanek (2007). In this study, participants were given pedometers and asked to track the number of steps they took each day. On the first day, the number of steps taken was measured, recorded and used as a baseline value. At the conclusion of the study, the goal was for each participant to have added 5,000 daily steps to the initial daily baseline value. Therefore, if a participant's baseline value was 2,000 steps/day, by the end of the study, the goal was to be taking 7,000 steps/day (Williams, Strobino and Brotanek, 2007). One drawback of this approach

is that participants must be old enough to monitor and record the number of steps they are taking each day.

A third method for increasing the amount of exercise — this can be used with all age groups — is to include exercise classes in the intervention meetings. A structured exercise time built into the intervention is a good way of encouraging children to avoid making excuses about not wanting to exercise. Also, for children who are more social, a group exercise setting may be more motivational than exercising alone (Savoie *et al.*, 2007).

Two programs that incorporated group exercise into the intervention were the Bright Bodies Weight Management Program and Project KidFIT (Savoie *et al.*, 2007, Bush *et al.*, 2007). Both helped children meet the goals of the National Association for Sports and Physical Education by holding exercise classes throughout. In the Bright Bodies Weight Management intervention, two meetings a week were dedicated to 50 minutes of exercise (Savoie *et al.*, 2007). Project KidFIT took a similar approach and held two one-hour exercise classes each week. To keep the participants from becoming bored with the activities, the children participated in numerous types of physical activities, such as outdoor fitness drills, Pilates, obstacle courses and resistance training (Bush *et al.*, 2007). In both Bright Bodies Weight Management Program and Project KidFIT, exercise time was incorporated with the other program components. Thus, participants did not have to find additional time in their day to exercise in addition to the time already dedicated to participating in the intervention. This time consideration resulted in both programs having high participation rates at the group exercise classes (Savoie *et al.*, 2007, Bush *et al.*, 2007).

4.4 PARENTAL INVOLVEMENT

When working with children, not only is it important to have the child participating in the intervention but it is also necessary to have parental support and involvement. Even though families are seeking weight-loss programs to get assistance and to make improvements in their lives, making the changes necessary to lose weight and be healthier is challenging. Numerous obstacles exist.

Most children are not old enough to grocery shop or prepare meals themselves; they must rely on what their parents purchase and prepare. Therefore, parental involvement is vital in making a commitment to the weight-loss program. This is a challenge for some parents because they themselves may not be willing to change their own lifestyle habits, adopt a healthier diet and eliminate empty calorie food. Most parents, however, are ready to take the steps necessary to facilitate change in both their lives and the life of their child.

One way to gain and maintain parental support is by establishing goals that are not only realistic for the child but also for the parent. Each goal that is set for the child is discussed with the child and the parent to assure that the goal is both attainable and reasonable. Parents are given opportunities to ask questions, express concerns and address how to achieve the goals. If a goal seems unrealistic, it is modified to better fit the lifestyle of the child and family (Weight Management and Wellness Center).

In addition to setting goals that are attainable and sensible for the child as well as the family, a second way to maintain parental support is to involve the entire family in the weight-loss process. This can be done by having the parents attend the education sessions with the children and giving the parents the opportunity to ask questions (Weight Management and Wellness Center). Additionally, parent-only meetings should be held, allowing time for

educating them about weight loss and healthy eating (Savoye *et al.*, 2007). Both approaches allow the parents to be involved in the process and ultimately give them the time to learn about and understand what is going on with their child.

4.5 ASSESSMENT AND MONITORING

A key component of any weight-loss program is tracking how much weight each participant has lost. This is done through recording the child's height and weight at the beginning of the intervention. With children, it is important to collect both the height and weight because an increase in height could be a reason for low weight loss (Williams, Strobino and Brotanek, 2007).

Additionally, each visit or intervention meeting serves as a progress check for the child. For clients who are doing well, each appointment is a check-in to see their progress. At this time, adjustments to eating habits may be made, which will better assist them in losing weight. For clients who are struggling with the weight-loss process, this time is an opportunity to re-evaluate their diet and to resume a proper diet and exercise routine (Weight Management and Wellness Center). With each subsequent visit, the goal is not only weight loss, but also learning about those tools that will facilitate maintaining an appropriate weight and living a healthy life (Savoye *et al.*, 2007). Once the child is no longer involved with the clinical weight-loss center, the tools acquired through the experience will remain with them and can be used throughout life to maintain a healthy lifestyle (Weight Management and Wellness Center, Savoye *et al.*, 2007).

5.0 DISCUSSION

When a child is obese, two main approaches that can be utilized to aid in weight loss are school-based interventions and clinic-based interventions. Each has the same goal, but differ in the setting and approach to weight loss. While neither approach is superior to the other, each has strengths and weaknesses. Also, each category of intervention can draw on the strengths of the other; and each kind of intervention has optimal settings in which it works best.

5.1 SCHOOL-BASED INTERVENTIONS

School-based obesity interventions have both strengths and weaknesses. Due to the “near universal enrollment of children in school” (Gortmaker *et al.*, 1999, 976), a strength of this type of intervention is the number of children who can potentially participate in the intervention and learn the tools necessary to lose weight and live a healthy life. The large number of children enrolled in school is of benefit to the researcher because a school provides a sizable number of centrally located participants and parents/guardians. To obtain parental consent, forms can be mailed home. Also, if the intervention includes parent meetings, the school functions as a central meeting location.

An additional strength of school-based interventions is the ability for programming to be adapted to any school in any community. In each school, a program must be tailored to meet the specific needs of that school, but overall, a school-based intervention can be done in any school.

When an intervention includes nutrition education that is integrated into the existing classroom curriculum, the intervention and the lesson that is being instilled in the students are strengthened. This is because integrating nutrition into the traditional classroom lessons makes nutrition a part of life, not a separate entity. Therefore, children are shown that nutrition is an important aspect of their daily lives.

Children consume up to two meals a day while at school, and a large amount of this food is produced by the school cafeteria. Therefore, another strength of school-based interventions is that control can be exercised over food that children eat. For those children who buy breakfast and/or lunch, their only option is to purchase the food provided by the school. If the food offered in the school cafeteria line is healthy, then the food that the children are eating will also be healthy.

Food offered in schools can also be a weakness of school-based interventions. In most schools, the cafeteria is not the only location to purchase food. Many schools have school stores, vending machines and snack bars. All of these outlets allow children the opportunity to purchase foods that may be unhealthy. However, this weakness could become a strength if schools change what is offered and choose to sell only healthy food options.

Traditionally, school is in session nine or ten months out of the year, leaving two to three months when children are not in school and therefore not participating in a weight-loss intervention. This gap in time each summer is an additional weakness to setting an intervention in the school environment.

When working with either a single classroom or the whole school population, there will not be enough time to tailor the intervention to the food preferences of each child. Therefore, a third weakness of school-based interventions is the lack of individual attention. Also, tailoring the program to the food preferences each child is difficult.

Tailoring the intervention to meet the needs of the individual client is one area where school-based interventions could benefit from clinic-based interventions. In clinic-based interventions, there is a greater opportunity to work one-on-one with each client. In a school-based setting, this could be achieved through individual or small group counseling sessions in which children are given the opportunity to address issues they are experiencing with regards to the intervention and weight loss. By tailoring the weight-loss plan to the child, there is a greater likelihood that the child will comply with the dietary changes presented in the intervention because the foods that can be consumed are foods that the individual likes.

5.2 CLINIC-BASED INTERVENTIONS

As with school-based interventions, clinic-based obesity interventions have both strengths and weaknesses. A major strength of clinic-based interventions is the individual and small-group attention that participants experience when they take part in such an intervention. Most of these types of interventions take place on a one-on-one basis. Therefore, the child is the focus of the intervention and the program components can be altered to fit into the life of both the child and the child's family.

In a clinic-based intervention, in addition to being monitored by a wellness counselor and most often a psychologist, each child is also under the care of a physician (Weight Management

and Wellness Center). A second strength of this type of intervention, the medical attention that a child receives in a clinic weight-loss program means that previously undetected medical conditions may be diagnosed. This attention can be a great benefit for the child, especially if that child does not receive routine medical care.

The time that a child spends attending a weight-loss clinic is separate from the time spent attending school. Therefore, an additional strength of a clinic-based weight-loss intervention is the fact that it does not interfere with the child's academic commitments. Also, since the child is receiving nutrition education and counseling outside the school, a clinic-based intervention reduces the pressure on teachers to incorporate and teach nutrition education in the already full school day (Taylor *et al.*, 2007).

One weakness of a clinic-based weight-loss intervention is the fact that participants must seek out and come to the facility, unlike school-based interventions where the services and staff go into the schools. Also, if parents do not know that such places exist to assist their child in losing weight, they will not look for these services. Even if parents do seek out assistance for their child, the parent still needs to make the time commitment to bring the child to the clinic for all of the child's appointments.

A second weakness of a clinic-based intervention is the limited access that some people may have to this type of program. In a major city such as Pittsburgh, Pennsylvania, with a population that can support a clinic devoted to childhood weight loss (Weight Management and Wellness Center), this type of program thrives. However, the population of an area needs to be large enough to warrant such a clinic. In small suburban and especially rural communities, the population is not large enough to support this type of facility, nor is the population centrally

located. Therefore, children who could benefit from the services offered at a clinical weight-loss center will not be able to attend due to the great distance away from their home.

A third disadvantage to a clinic setting is the lack of direct day-to-day contact. A clinician who sees a client on a monthly or bi-monthly basis does not have a great deal of influence in the daily life of the child. In a school setting, the goals and lessons of the intervention can be reinforced daily through both direct and indirect means. The daily contact that school-based interventions have with the participants is one area in which clinic-based interventions can draw on school-based interventions. Even though daily contact would be nearly impossible with a clinic-based program, more effort could be made to have regular contact with patients between visits. This could be done through reminder e-mails, encouragement postcards and phone calls to check on the progress of the participants.

6.0 RECOMMENDATIONS

6.1 PROPOSED IDEAL INTERVENTION

After reviewing the above-mentioned components of both school-based and clinic-based obesity interventions, an ideal program would be one that incorporates the best of both types. It would be set in the school, allowing for the maximum number of children to be involved. Ideally, the intervention would begin with children when they first enter school and would continue to grow with the children as they move through the grades, allowing for continued reinforcement of how to maintain a healthy lifestyle. In each grade level, the lessons would be integrated into the subject matter of that grade and would be taught at an age-appropriate level. Lessons would incorporate nutrition education, healthy food options in the cafeteria and physical activity.

For a school intervention to be successful, changes must be made to the school environment. One major change would be removing of all unhealthy competitive foods. So as not to hurt the schools by taking away a revenue source, these foods would be replaced with healthy choices. Removing unhealthy choices and replacing them with healthy options, benefits children by having nutritious snack choices available, and the school benefits because the revenue from vending machines or snack bars is maintained.

Not only must healthy options be made available in vending machines and snack bars, but the food being offered in the cafeteria line must also be healthy. To do this, the cafeteria

manager needs to be credentialed and the food service staff needs to be trained in how to prepare food in a healthy manner. Also, the raw ingredients being brought into the school must be healthy and of good quality. By starting with ingredients that are healthy and having food service managers and staff who know how to prepare the food properly, meal options offered in the cafeteria will be in line with missions of nutritious eating, losing weight and living a healthy life.

An additional component would focus on how to make healthy choices and exercise outside the school setting. This would include healthy cooking; incorporating exercise into one's day; eating healthy when eating out — all of which are important in maintaining weight loss. Also, parental involvement would be encouraged. This could be achieved through parent information nights, family cooking classes and exercise classes for the entire family.

Lastly, routine medical examinations would take place. This component is especially important for children in low-income families who may not receive regular medical attention. By performing the physical in the school, children could be screened for both obesity and non-obesity related diseases and health complications. Ideally, this screening would include a psychological screening to identify children who need additional counseling in dealing with issues that are causing them to eat out of emotion and not hunger. If a child did need additional counseling, this service would be offered through the school as well, either during the school day or after school. By incorporating the best components of the clinic-based program with a school-based intervention program, the maximum numbers of children can be served, while still receiving a degree of individualized attention.

One limitation of this intervention is the amount of time it would require within the school day. To see if such an intervention would even be feasible, further research would need to

be conducted and would need to be piloted in a school to see if an intervention of this size could take place in a school setting.

6.2 FUTURE INTERVENTIONS

In the past two decades, the prevalence of childhood overweight has tripled (Katz *et al.*, 2007). To control this epidemic, new interventions are constantly being created and implemented. One area in which it would be interesting to see an intervention developed is in a program that targets the entire family and involves them together in the weight-loss process. Currently, a great number of the interventions for children contain an educational component for the parent, but it might be fruitful to pilot a program focused on the family.

A family-centered intervention could focus on numerous aspects of the family dynamic. It could include family exercise classes, ideas on how to prepare healthy meals as a family, encourage active family pursuits and nutrition education for the entire family. A family-focused intervention would not only help the entire family to lose weight and become healthy but it would also help strengthen the family bond.

A second area for future interventions could be an obesity clinic set up in schools. The same components present in an obesity clinic — such as individualized attention, and medical and psychological screenings — would be utilized, but the clinic would be located within the school. This would mean that children could receive individualized attention, while not having to travel great distances to get it. Also, the clinic itself could be mobile, moving from school to school on different days of the week. The maximum number of children could therefore be

served. This type of mobile obesity clinic would be best suited to small suburban and rural communities that may not otherwise have access to an obesity clinic.

A third area for future interventions could be focused on the physical school environment, specifically the cafeteria size and layout. In order for a cafeteria to run smoothly, it must be of sufficient size to meet the needs of the population it is serving. However, with some areas of the nation experiencing rising school enrollment rates and the consequent overcrowding, inadequate size of the cafeteria can place a strain on its ability to produce enough meals to meet the school's growing needs. In turn, this results in longer cafeteria lines and increased wait time. If children are forced to wait in long lines because of inefficient cafeterias, they may turn to alternative food options such as buying lunch from a vending machine or the school store (Gorman *et al.*, 2007). Therefore, further work could be done in the area of improving the efficiency of school cafeterias. This could include an intervention focused on cafeteria staff in which they are taught how to better utilize the space already available or working with school boards in remodeling school cafeterias so that they better accommodate the growing populations of schools.

6.3 FURTHER RESEARCH

Both school-based and clinic-based programs for obesity prevention have shown positive results in decreasing not only the prevalence but also the incidence of childhood obesity in America. However, long-term studies have not yet been conducted that follow children to track the effectiveness of the interventions over the long term (Gorman *et al.*, 2007). One area for further

research would be follow-up studies over the next five to ten years to see if participants were able to maintain their weight loss. By following up with study participants, individuals who are both striving and struggling to maintain a healthy weight could be identified. For the children who were unable to sustain their weight loss, those factors that caused them to gain back the weight should be addressed to determine how to improve the interventions.

When looking at school-based versus clinic-based interventions, little work has been done to compare the two types of interventions. Therefore, a research study that looked at the overall effectiveness of school-based versus clinic-based interventions would be useful. The information collected could then be used by numerous populations, including school officials to decide if they want to bring an intervention into their school, parents of overweight or obese children to determine the best course of action for their child and funding groups to decide what type of program they will fund. However, a comparison study of the two intervention types could prove harmful to the intervention that was found to be the less effective of the two. Overall, a great deal of research has been conducted in the field of childhood obesity, but more work needs to be done to determine the long-term results of the interventions and what type of intervention is the most effective.

As discussed earlier, one possible area for future interventions lies in addressing the space issues present in school cafeterias (Gorman *et al.*, 2007). For this type of intervention to work, additional research is needed on how to make existing cafeteria kitchens more efficient. This research should be centered on what types of changes made within the cafeteria have the greatest impact on the speed of meal preparation and how to implement these changes in a cost-effective manner.

In addition to studying the cafeteria environment and how to better utilize the space, additional research also needs to be conducted around how the physical environment of a school can influence the health of the students. A school's layout and its surroundings can have a great deal of influence on activity levels, social interactions, and the health and eating habits of students. There has been very little research done in this area (Gorman *et al.*, 2007). Therefore, in order to determine the best floor plan for schools and the design of surrounding land, more research must be done. This should look at the relationship between the built environment, open green spaces, physical activity and social interactions. Additionally, research should also consider how the school structure and outdoor space can foster physical activity and social interactions.

6.4 LIMITATIONS

The main limitation of this paper is it analyzes only two different types of obesity interventions, school-based and clinic-based. Additional types of interventions utilized in the fight against obesity include weight-loss camps, in-patient weight-loss centers and community-based interventions.

7.0 CONCLUSION

Childhood obesity is an ever-increasing epidemic in the United States, with 20% of school-aged children being classified as either overweight or obese (Hendy, Williams and Camise, 2005). The increased prevalence of overweight and obesity has led to a generation of children that is experiencing health complications not seen in this population in previous generations, including coronary heart disease, stroke, respiratory disease and type-2 diabetes. Additionally, being overweight as a child increases the risk of being an obese adult, further adding to the risk of developing obesity-related health complications (Bush *et al.*, 2007).

In order to reduce this obesity trend, steps need to be taken with children to assist them in losing unnecessary weight in childhood and learning the tools essential to live a healthy life. The nutrition lessons necessary to promote health in children can be taught through numerous approaches, two being school-based and clinic-based interventions, both of which have proven to be effective in their target populations. Each of these types of interventions has both positive and negative aspects, and can draw from the strengths of the other. Overall, the key to a successful intervention is knowing the needs of the population that the intervention is serving and customizing the program to address these specific needs. With either type of intervention, school-based or clinic-based, in order to make an impact in the lives of overweight and obese children, the intervention has to properly address the needs of the target population and by doing

so, will be effective in assisting the individuals involved in the intervention to succeed in losing weight and learning the tools to help them live a healthy life.

BIBLIOGRAPHY

- Alvina, M and H Araya. "Rapid carbohydrate digestion rate produced lesser short-term satiety in obese preschool children." European Journal of Clinical Nutrition 58(2004): 637-642.
- Bush, Cresendo L. et al. "Park-Based Obesity Intervention Program for Inner-City Minority Children." The Journal of Pediatrics (2007): 513-517.
- Cheung, Lillian W.Y. et al. Eat Well and Keep Moving. 2007. Harvard School of Public Health. 04 Mar 2008 <<http://www.eatwellandkeepmoving.org/>>.
- Cullen, Karen W., et al. "Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures." Health Education Research 16(2001): 187-200.
- Cullen, Karen W., et al. "Squire's quest: intervention changes occurred at lunch and snack meals." Appetite 45(2005): 148-151.
- Cunningham-Sabo, Leslie et al. "Impact of the Pathways food service intervention on breakfast served in American-Indian Schools." Preventive Medicine 37(2003): S46-S54.
- de Beer, M., et al. "Health-related-quality-of-life in obese adolescents is decreased and inversely related to BMI." Foundation Acta Paediatrica 96(2007): 710-714.
- Gorman, Nicholas et al. "Designer Schools: The Role of School Space and Architecture in Obesity Prevention." Obesity 15(2007): 2521-2530.
- Gortmaker, Steven L., et al. "Impact of a School-Based Interdisciplinary Intervention on Diet and Physical Activity Among Urban Primary School Children." Archives of Pediatrics and Adolescent Medicine 153(1999): 975-983.
- Hendy, Helen M., Keith E. Williams, and Thomas S. Camise. "Kids Choice" school lunch program increases children's fruit and vegetable acceptance." Appetite 45(2005): 250-263.
- Horne, PJ, et al. "Increasing children's fruit and vegetable consumption: a peer modeling and rewards-based intervention." European Journal of Clinical Nutrition 58(2004): 1649-1660.

- James, Janet, Peter Thomas, and David Kerr. "Preventing childhood obesity: two year follow-up results from the Christchurch obesity prevention program in schools (CHOPPS)." BMJ (2007):
- James, Janet et al. "Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomized controlled trial." BMJ (2004):
- Jehn, Megan L. et al. "Prevalence of Overweight among Baltimore City Schoolchildren and its Associations with Nutrition and Physical Activity." OBEILITY 14(2006): 989-995.
- Jerome, Richard, and Steve Barnes. "Childhood Obesity: The Fight Against Fat." PEOPLE 12 February 2007: 82-88.
- Katz, DL et al. "Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis." International Journal of Obesity (2007): 1-11.
- Levine RS, et al. "Monitoring trends in childhood obesity: A simple school-based model." Public Health (2007):
- Masse, Louise C., et al. "Development of a School Nutrition-Environment State Policy Classification System (SNESPCS)." American Journal of Preventive Medicine 33(2007): S277-S286.
- Nicklas, Theresa A., et al. "Family and Child-care Provider Influences on Preschool Children's Fruit, Juice and Vegetable Consumption." Nutrition Reviews 59(2001): 224-235.
- Perry, Cheryl L., et al. "A Randomized School Trial of Environmental Strategies to Encourage Fruit and Vegetable Consumption Among Children." Health Education and Behavior 31(2004): 65-76.
- Savoie, Mary et al. "Effects of a Weight Management Program on Body Composition and Metabolic Parameters in Overweight Children." Journal of the American Medical Association 297(2007): 2697-2704.
- Schwartz, Robert P., et al. "Office-Based Motivational Interviewing to Prevent Childhood Obesity." Archives of Pediatric Adolescent Medicine 161(2007): 495-501.
- Staten, Lisa K. et al. "The School Health Index as an Impetus for Change." Preventing Chronic Disease; Public Health Research, Practice and Policy 2(2005):
- Steckler, Allan, et al. "Pathways process evaluation results: a school-based prevention trial to promote healthful diet and physical activity in American Indian third, fourth, and fifth grade students." Preventive Medicine 37(2003): S80-S90.

- Stone, Margaret A., et al. "Dietary Habits of young people attending secondary schools serving a multiethnic, inner-city community in the UK." Postgraduate Medical Journal 83(2007): 115-119.
- Story, Mary, et al. "Changes in the nutrient content of school lunches: results from the Pathways Study." Preventive Medicine 37(2003): S35-S45.
- Story, Mary, Karen M. Kaphingst, and Simone French. "The Role of Schools in Obesity Prevention." The Future of Children 16(2006): 109-132.
- Taylor, Rachael W., et al. "APPLE Project: 2-y findings of a community-based obesity prevention program in primary school-age children." American Journal of Clinical Nutrition 86(2007): 735-42.
- Ventura, Alison K., et al. "Understanding Reporting Bias in the Dietary Recall Data of 11-Year-Old Girls." Obesity 14(2006): 1073-1084.
- Wechsler H., et al. "Food service and food and beverages available at school: Results from the School Health Policies and Programs Study" Journal of School Health 71(2000):313-24.
- Weight Management and Wellness Center. Children's Hospital at the University of Pittsburgh Medical Center.
- Williams, Christine L., Barbara A. Strobino and Jane Brotanek. "Weight control among obese adolescents: A pilot study." International Journal of Food Sciences and Nutrition 58(2007): 217-230.