Countering Childhood Obesity: Interventions to Fight the Public Health Epidemic
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Abstract

This critical literature review examines methods of prevention and treatment of childhood obesity. Upon systematic review of childhood obesity, its massive prevalence, and its exorbitant negative consequences, it is clear that a more effective and efficient intervention is needed. The solution to this chronic epidemic may be taken from a combination of all types and channels of intervention. Attempts have been made mostly through school programming and some familial actions, while few community programs have been created. Though efforts have mainly targeted physical activity, dietary choices, and self-motivated and modified behaviors, it may be best to target the cultural attitude surrounding childhood obesity. While individualized programs make an isolated difference in obesity rates where they are implemented, ultimately, focus upon a healthier overall lifestyle and education about that lifestyle, as well as communication of the importance of healthful living may globally impact the epidemic more than those isolated and singularly focused programs.
Countering Childhood Obesity: Interventions to Fight the Public Health Epidemic

With the current soaring prevalence of overweight children, childhood obesity has become an epidemic in Westernized, developed countries. The prevalence of obese children has tripled over the past 20 years and quadrupled over the past 30 years (Budd and Volpe, 2006; Veugelers and Fitzgerald, 2006). In the US, for example, where childhood obesity rates are highest in the world (leading those of Canada, Australia, and Europe, respectively), over 41% of children are obese or at risk to become obese. Although the rate of increase in obesity has slowed over the past two years, that rate is still continually increasing (Budd and Volpe, 2006; Denghan et al, 2005; Vuegelers and Fitzgerald, 2006). This significant worldwide epidemic has also become classified as a chronic disease by the Center for Disease Control (CDC). Based on body fat, childhood obesity is classified by skin fold thickness measurements of above 3320 (Denghan et al, 2005). The CDC has created a standard measurement for the identification of obese children as a BMI in the 95th percentile and identification of children at risk for obesity as a BMI between the 85th and 95th percentile (Budd and Volpe, 2006). However, these standards of measurements are controversial and non-universal even though the adult calculations have been modified to fit children. Whatever the measure, it is obvious that obesity in children is a problem. Worldwide, the number of obese children comfortably rests above 155 million, which is at least 10% of all children (BMA Board of Science and IOTF, 2005).

Childhood overweight can be attributed to multiple causations including genetic predisposition, cultural influence on unhealthy lifestyles, obseogenic (or obesity encouraging) environments, unhealthy eating habits, and lack of exercise (Crawford,
More specifically, causes have been largely attributed to increased sedentary behaviors, such as television viewing, and decreased physical activities as well. Overweight in anyone, including children, is ultimately caused by an excessive or prolonged energy imbalance; when energy (calorie) consumption overtakes energy expenditure, the result is obesity. More basically, if a child takes in more calories than he or she burns, eventually he or she will become obese (Denghan et al, 2005, Vuegelers and Fitzgerald, 2006).

The negative impacts of this childhood epidemic are vast and considerable. Childhood obesity leads to problems in both physical and psychological wellbeing. This epidemic greatly influences low self-esteem, and depression, diminished quality of life, and shorter life expectancy (Vuegelers and Fitzgerald, 2006). Childhood overweight provokes physiological comorbidity of many other diseases and health problems including diabetes and abnormal glucose tolerance, hypertension (high blood pressure), hyperlipidemia (high cholesterol), cardiovascular disease, cancers, and infertility (Denghan et al, 2005, Vuegelers and Fitzgerald, 2006).

Further, 70% of obese children and adolescents grow up to become obese adults. When even just one parent of an obese child is also obese, there is an 80% chance that the child will become obese as an adult (Dietz, 1998). Having previously been obese as a child leads to a significant level of worsened health concerns for obese adults because of the lifespan of strain on a person’s physical condition. This means that as more and more children become obese, a larger portion of adults will also become obese, giving way to a greater perpetuation of obesity related problems in adults. When followed into adulthood, people who were obese as children show higher levels of cardiovascular and
digestive diseases. They are also more susceptible to any cause of death than non-obese adults (Denghan et al, 2005). As a result of these negative impacts, childhood obesity ultimately results in billions of dollars spent for health care during childhood and also later in life (Vuegelers and Fitzgerald, 2006).

Positively, health can be recovered if obesity is eliminated during childhood (Denghan et al, 2005). Benefits of decreased obesity on an individual level include enhanced health during critical growth and development periods, social enrichment, a lowered risk for health care problems in adulthood, establishment of positive thinking and healthy behaviors that may remain forever (Vuegelers and Fitzgerald, 2006). The extreme costs and health risks associated with childhood obesity, as well as the positive outcome for recovery, merit investment in research to assemble strong and comprehensive prevention and recovery programs (AAP, 2003).

Beginning with basic knowledge of the problem and the roots of the problem, it can be noted that strategies should be specific to the group targeted (Denghan et al, 2005). Strategies may include formation of a built environment (like creating a bike path or making healthy choices more accessible), increasing physical activities, evaluating eating and television viewing patterns, encouragement of portion control, changing dietary knowledge and choices, and general education to all ages of the public about health and wellbeing (Denghan et al, 2005). Measures can be taken in the school system, in the home, through pediatricians and counselors, in the community, or on a societal level. Beyond evaluating effective measures for juvenile obesity intervention, this review seeks to culminate with an ideal strategy to change the state of severe epidemic the world is facing today.
The CDC refuses the term obesity in referring to children due to its negative stigma. However, at population level, the term childhood obesity is the acceptable and standard reference (Sothern, 2001). Therefore, throughout this review, the terms childhood overweight and childhood obesity will be used interchangeably. It is also important to recognize that there is likely a publication bias that keeps unsuccessful or ineffective studies from being published. This means researchers do not learn as much about solutions and treatments that are not working or what may actually be making the problems worse.

**Prevention versus treatment**

In order to consider childhood obesity intervention, the aim of the intervention must be determined. Two distinct approaches toward the issue exist. Mediation can focus on treating those children who have already become obese or it can focus on normal weight or at risk children thusly halting the epidemic from further progression. The difference between the two is a question of whether to stop the epidemic or actually reverse it. Obesity treatment simply addresses those young people suffering from overweight and how to decrease their levels of overweight. When discussing obesity prevention, there are several degrees of which to speak: primary, which is prevention of overweight altogether before it ever starts; secondary, which is the prevention of gaining weight back after loss; and tertiary, which is the restriction of further weight gain in already obese children (Denghan et al, 2005).

Research on the preventative concept began with a 1978 study when Pisccano, et al tested prevention method by targeting non-obese children at risk for becoming obese with direct education concerning obesity. Prevention has usually shown that by enacting
the same intervention methods on children who have not yet become obese, further
weight gain can be avoided. Prevention methods include education in schools and home,
“eat smart, play smart” programs focusing on healthy habits like eating better foods and
exercising more often, and increasing parental involvement. Preventative methods seem
to be easier and more promising than the treatment of already obese children. Prevention
seems to be the most effective means by which to control this epidemic currently
research based only on prevention in which there was no inclusion of treatment for
already obese children. After 2 years of education and alterations of school diet, 28%
fewer obese children became obese than those children receiving no alterations in a
control group (Sallis, 2003). These results indicate that it is possible to block overweight
and obesity in children using prevention. When evaluating high-risk children, the same
type of preventative measures seemed to be less effective although high-risk children still
had an insignificant 11.3% lower prevalence rate of increased obesity than those at-risk
children in control groups according to (Müller, 2001 as cited by Flodmark et al, 2005).

Treatment methods are far more difficult to employ and frequently unsuccessful
once a child has become obese, so it is important to stop a child from ever getting obese
(Larsen et al, 2006). Conversely, prevention of obesity in normal weight children
through encouragement of physical activity is more successful and less challenging than
increasing activity in efforts to help already obese children lose weight (Sothern, 2001).
This is to say that regardless of exactly what kind of prevention method a program
imparts on children, it seems to be easier to instill good, healthy habits before bad habits
have already caused a child to become obese than to change a child’s formation of poor
choices and unhealthy lifestyle after they have already been established (Denghan et al, 2005; Epstein and Wing, 1987). Returning to normal weight is much more difficult than remaining at a normal weight. On the other hand, since there are many obese children and adolescents, they cannot simply be ignored because methods or potential methods for treating them have not been fully exhausted. Since obesity exists in young people, there treatment efforts are in high demand and badly needed.

Considering prevention and treatment, prevention, at first glance, seems like the exclusively positive method. Nevertheless, the need for both approaches is evident. Because obese children are often ridiculed and ignored, active and outdoor situations may induce social anxiety. Therefore, overweight children generally elect to remain involved in more sedentary and isolated activities so as to avoid drawing negative attention to them. This means that while monitored and organized physical activities aid in the prevention of obesity in non-obese children, which is positive, they have the potential to create a negative environment for already obese children. Further, already obese children receive reinforcement from activities that only supplement their obesity. Often, only slightly overweight children also respond adversely and are sometimes noncompliant to vigorous aerobic activities because of discomfort or pain, which is not an effective means of prevention (Sothern, 2001). So, other alternatives must be created for those who need treatment, such as walking and free play.

In order to conduct efficient and successful programs for preventing obesity, those young people susceptible to or at risk for obesity must be identified in order to target those individuals in preventative measures (Epstein and Wing, 1987). Prevention must become a priority in the overall combat against childhood obesity. However, even
though obesity treatment is more difficult and requires more intensity, it is necessary to solve the problem in the many cases that it has already been created (Vuegelers and Fitzgerald, 2005).

**Method of Intervention**

*School Based*

Because nearly every child attends school, at least through adolescence, schools are favorable environments in which to deliver health programming (Sahota et al, 2001). Moreover, since, during the school year, six hours of a child’s day are spent in school and one to two meals are consumed in a cafeteria, the school system has the potential to create a significant impact through primary prevention (Budd and Volpe, 2006). Beneficially, a school structure also provides a homogenous and constant environment. Therefore, it is an opportune environment to manipulate for studies and an opportune environment to adjust for healthy change. It is more effective, both with cost and outcomes, to target already established structures, such as schools, in which to incite change and prevention (Denghan et al, 2005).

Not only is school a convenient setting for change, but the public school system is technically required to help combat the chronic disease in its students. Since childhood obesity has been classified as a chronic disease and schools are responsible for the wellbeing of students with a chronic disease, schools cannot perpetuate the disease of childhood obesity (Budd and Volpe, 2006). Schools also have the responsibility to provide physical education, which has an active mission to promote physical activity and health in school aged juveniles. Physical education classes are the primary social institution to ensure that all children are meeting at least the minimum requirements for
activity. Since physical education classes influence the largest amount of children and are the easiest tool to modify to fit the physical needs of student groups, well-designed and constructive physical education classes show significant health benefits (Schwartz et al, 2002).

Primary schools are especially important because at such a young age, children are very receptive to messages dealing with health, and it is easier to form and shape behavioral changes at an early age. Also, if successfully created, these behavioral, choice, and attitude changes surrounding health will likely be maintained into adulthood because they can become habit (Sahota et al, 2001). Because children are easier to influence and their environments are easier to control and restructure, it is best to target younger children in these efforts (Denghan et al, 2005).

Overall goals for obesity reduction through school programming include: removal of high-energy beverages and foods from school property, removal of advertising for certain restaurants, brands, and foods, and working with advertisers to create healthier marketing development. They also focus on ensuring every student participates in 30 minutes of moderate to vigorous physical activity (such as running or brisk walking or stretching exercises) during the school day and enhancing curricula surrounding health development. Behavioral skills training methods include self-monitoring, goal setting, stimulus control, healthy eating, and increased physical activity. These interventions are also crucial to the success of school-program sustainability. Expansion opportunities during physical education classes and making use of community facilities and programs are also included as means by which to aid on overall obesity reduction. Other efforts include incorporation of health services such as annual assessments and parental updates.
Food services alterations are necessary such as creation of uniform nutrition standards according to the Dietary Guidelines (Budd and Volpe, 2006).

In efforts to reduce and prevent childhood obesity through use of the school system, the CDC has created specific guidelines for school programs to follow. These programs have been created with a focus on encouragement of healthier eating patterns and more physical activity within school children. The CDC requires a child to be provided with a variety of foods with a strong emphasis on grains, vegetables, and fruits and a reduced emphasis on sugars, fat, and cholesterol; to balance their consumption with physical activity; and to be exposed to educational material concerning nutrition. These multifaceted programs include alterations of school curricula, adding classes specifically for nutrition education and also adding nutritional information to everyday lessons using orange slices to explain fractions, for example. School policies as well as food services and provision of better food options as well as dining staff training are currently undergoing evaluations for alterations. One thought is that having trained staff members present at lunch can help to promote healthier eating because the staff can efficiently answer nutrition questions about the food options. Community participation is also being targeted and encouraged through school advertising and promotion. The presentation methods of these programs are variable and studies have been performed evaluating the efficacy of some but not all of the presentation methods (Vuegelsers and Fitzgerald, 2005).

To evaluate the efficacy of obesity prevention through school programs in which diet and activity are manipulated, Veugelers and Fitzgerald (2005) performed a study including 5,200 fifth graders. These students participated in the Children’s Lifestyle and
School Performance Study (CLASS), a study comparing factors of excess body weight, dietary choices, and physical activity levels in students between schools in the control group with no manipulation, schools that simply made nutrition programs and healthy menu choices available without promotion, and schools following CDC guidelines in their nutrition programs, where healthier options were made available and also promoted and encouraged through education. Schools following the recommended guidelines established by the CDC showed less calorie and fat consumption, more fruit and vegetable consumption, more participation in physical activities, and less participation in sedentary activities than the schools following a simple nutrition plan or schools following no plan at all. The students participating in CDC qualified programs had a significantly lower rate of obesity than those students in schools without programs or with another type of nutrition program. The rates of obesity for students participating in non-CDC qualified nutrition programs were still lower than those of student in schools with no program at all (Vuegelers and Fitzgerald, 2005).

Another study, the active program promoting lifestyle education in schools (APPLES), was conducted for one year. In this study, intervention schools received teacher training concerning proper nutrition information and effecting means of advocating healthy living style. School meals underwent alterations to make better-balanced lunches with less of an empty calorie content, meaning a lower combination of high-energy and low-nutrient dense foods. Finally, action plans were created specifically to each school targeting effective means of communicating to the students of that region. These plans were implemented for promotion and within school marketing of healthy diets and healthy physical activities. After participating in the program for one academic
year, the 314 children in the intervention group did not lose a significant amount of weight, and there was a similar overweight level between them and the 322 students in the control group who did not receive the intervention. There was no significant difference of weight or any measurable rate of health improvement from baseline to 12 months after baseline. Some positive differences were found between the two groups, though. The children in the intervention program had a higher level of fruit and vegetable intake. Negatively, obese children in the intervention group still showed a higher intake of high sugar drinks when they were made available, meaning that after school or on weekends, obese children who were part of the intervention group still self-reported a high intake of sodas and artificial juices. There was a significant increase of reported self-worth in obese children belonging to the intervention group. Also, students who received the APPLES intervention reported greater behavior changes than students in the control group. They reported a better understanding of health benefits of good diet and exercise, had a better grasp on ideas and vocabulary related to health, had a higher basic knowledge of well-being, and an increased confidence levels leading to willingness to share ideas. Because of the other successful outcomes of the program implementation, it might be logical to consider the possibility of extending the program, as it may have shown a difference in weight reduction levels over more time. More evidence that more time could have made a difference is the fact that the children reported changed attitudes and the APPLE schools experienced a change in culture becoming altogether more health friendly and aware (Sahota et al, 2001). However, the children in the experimental group were offered no incentive for choosing the altered and healthier school meal or for their increase in physical activity. The lack of incentive, combined with the lack of
enthusiasm displayed by the trained teachers implementing the program, may have contributed to part of the downfall of the program.

The professionally developed Children’s Health Interventional Trial (CHILT) combined health education with focus on physical education in primary schools. The trial was conducted to better understand the effectiveness and influence of active intervention on BMI and motor abilities in young obese or at risk of overweight children. It was designed as a promotion of healthy lifestyle in children who are currently experiencing increasing rates of obesity. Because overweight is a result of energy over-consumption and under-expenditure, the program was designed to create more energy expenditure during a school day, capitalizing on breaks and opportunities during class, as well as enhancement of physical education classes. As an example, during breaks between subjects, the teacher would lead the class in a brief aerobic or vigorous stretching exercise, creating an increased heart rate several times throughout the academic school day. An extra measure was also to enhance students’ knowledge about health and wellbeing through education and incorporation of heath material into regular class information. Teachers were trained to promote their own personal awareness of the need for healthy lifestyle and avoidance of obesity. This training served to assist in the implementation of the program and also enhanced teachers’ effectiveness as skilled instructional instruments targeting physical activity. Students participated in a 30-minute group discussion program every week and health education classes were taught weekly covering information such as self-esteem, nutrition, body image, hygiene, how to deal with food advertising, dangers of and avoidance of sedentary behaviors, and medical education from pediatricians. Handouts, posters, and other supplemental materials were
used in the CHILT schools throughout the 20 months of the trial. The additional physical education emphasis included skill specific exercises focusing on coordination, posture and balance, rhythm, music and dance, team sports or group games, relaxation techniques, and creative movement. This intervention created a dramatic increase in motor skills, which are skills that can be maintain and useful throughout life. Although the amount of obese students was not significantly decreased, the significant acquisition of motor skills was a positive combatant against effects of physical inactivity. When given a physical fitness test including tasks such as lateral jumping and a six-minute run, performance increased 7% (lateral jumping) and 15% (six-minute run) more in the intervention group than in the control group. There was no excess weight gain in the participating intervention students at the end of the study, while in the control group 68% of already obese students remained obese and 4.5% of the normal students became obese. Creating activity in children promotes and increases the chance of having active adults. Future benefits from CHILT are potentially great (Graf et al, 2005).

The Planet Health program consists of incorporation of health and nutrition education into the lesson plans for English, math, science, and social study classes. These lessons are appropriate and acceptable according to grade level and the state’s school curriculum. Classroom education required at least one lesson per nutritional objective (for instance, importance of exercise or importance of whole grain consumption) to be incorporated in each subject (math, social studies) to involve a healthful message. Also behavioral modification tasks were created concerning training of choice technique, which simply serves as a method of assistance in making better choices, training for self-assessment, and creation of goal setting techniques. These
efforts were employed with an aim to try to motivate less television watching and sedentary behaviors, to increase physical activity, to decrease intake of fat, sugar, and calories, and to increase fruit and vegetable intake. BMI was measured and showed a decrease, but the decrease was not significant. Anthropometric measurements including skin fold thickness and waistline, chest, arm, leg, and neck measurements also showed a decrease. This indicates that adiposity may have been converted into lean fat and muscular structure, indicating healthier children (Budd and Volpe, 2006). Specifically, the level of overweight for girls decreased from 23.6% to 20.3% after the two-year intervention. After culminating with a 10-day TV turn off program, the program showed to have reduced television time from 14.46 hours per week to 8.8 hours per week. Along with this, the number of meals consumed in front of the television was reduced on average by 2 per week (Budd and Volpe, 2006).

School programs are beneficial because they can reach practically all children, impacting their overall health through simple and affordable systems. School programming is an easy means by which to alter what a child eats or does with his or her break time. However, data shows that if programs simply offer healthy foods with no incentives, no mandate, or no education, then children infrequently choose those healthy options. A school needs to use an integrative approach, such as education along with healthy options, in order to truly be effective. Intensive and comprehensive school based programs that focus on the previously mentioned recommended guidelines established by the CDC are an effective method of childhood obesity prevention (Vuegeler and Fitzgerald, 2005).
Further measures schools can take to reduce student obesity include avoiding sales of sodas and other foods and beverages containing high fructose corn syrup. Having teachers and administrators and parents modeling healthy diets and healthy levels of activity is important as well; role modeling and observational learning have a significant influence on juveniles, especially younger children (Budd and Volpe, 2006). Another conclusion that can be drawn through these results is that programs must be age, gender, and culturally appropriate. For example, differences exist in boys and girls and their enjoyment of and need for certain activities, especially in adolescence. It is important that each group have these enjoyable and effective activities available. Girls have shown a greater improvement after participating in moderate to vigorous dance, while boys have shown greater improvements in team sports involving point systems. Differences must be accounted for and targeted (Budd and Volpe, 2006). Upon evaluating different programs implemented in schools, it seems that with limited intervention that is only applicable in school, there is less of an effect on the prevention of obesity (Flodmark et al, 2005). This indicates that the more generalized a program can be to carry over outside of school, the more efficient and effective it is.

*Family and Community Based*

Families and communities can also offer independent intervention implementation. Though family based interventions do not operate within homogenous environments, a familial atmosphere provides a more individualized plan with more concentrated monitoring (Epstein et al, 2000). Community centers and other resources are a neglected resource, and are therefore ineffective when in reality they can be active agents for positive health changes in children.
Epstein, et al (2001) performed a study involving non-obese children at a high risk of becoming obese due to their obese parents. It was a familial approach to prevention of childhood obesity. This parent focused approach to obesity prevention helped parents to modify their own eating behaviors and also those of their children. One group reduced high energy, fat, and sugar intake while another group increased fruit and vegetable intake. Though the reduction method is sufficient for prevention in normal weight children, intake of fruits and vegetables is an altogether better method overall, and it has shown to help parents in 12% overweight reduction as well. The parents reported a more positive attitude overall, too. In relation to effects on children, researchers found through both parental and child questionnaire, that if obese parents can alter their own eating habits, it might also teach their children healthy eating habits. Children reported a higher level of willingness to follow healthier eating habits after seeing parents eat balanced foods. Therefore, alterations to parental food smart habits and healthy selections can prevent non-obese children of obese parents from becoming obese. The program taught parents about reinforcing healthy behaviors in their children, and these efforts were successful in all levels of prevention (Epstein et al, 2001).

Another study follows the efficacy of parental problem solving training of those parents simultaneously enrolled in a behavioral weight reaction program targeted towards obese children. This means that parents learned skills related to pre-planning, goal setting, self-assessment, and self-reward and were also enrolled in a program that helped them to apply these acquired skills in relation to dietary behaviors. The group that received problem solving training lost significantly more weight and had a more significant decreased BMI and percent overweight level during the eight week trial than
the groups that received either only the problem solving training or were only enrolled in behavioral weight reduction programming. However, these changes did not affect the overall level of their children’s BMIs. These differences were documented at 3 and 6 months, and again the group that received both conditions maintained these differences while the groups that only received one condition did not create or maintain any weight loss. Only parents in the training condition increased their problem solving skills, and eventually at a 24-month follow-up children showed increased weight loss correlated with increased parental problem solving skills. This study simply showed that training leads to an increase in parental problem solving behaviors and skills, in this case related to dietary habits, and these lifestyle changes based on skill acquisition can eventually affect children by association and influence. Thus, it is concluded that parental problem solving training is a desirable addition to a behavioral weight loss program for children (Graves et al, 1998).

One identified community program was created as part of California’s branch of a national supplemental nutritional program created for women, infants, and children (WIC). It added special classes aiming to combat pediatric obesity. The organization performed an evaluation on the efficacy of their program in relation to staff-participant relations. Upon realization that most staffers were overweight themselves and felt uncomfortable discussing obesity and weight management, the program implemented a staff training intervention where they learned to appropriately approach the issue and were also encouraged to participate in more beneficial behaviors themselves. Surveys completed before and after the intervention indicate that staff felt more comfortable helping obese children in their efforts to lose weight after completing training. It also
showed that since staff belonged to similar socioeconomic status and cultural background, the program was ideal for the influence of peer modeling. This means that as a result of becoming aware of their unhealthy behaviors and beginning to alter them, the staffers became more positive and more effective peer models. Having staff undergo training in order to understand healthy behaviors leads to a more positive outcome when trying to prevent and reduce childhood obesity. Educating and challenging leaders of obesity prevention programs to become influencers by example is very important and makes a program more successful, especially when the targets of such programs are impressionable children (Crawford, 2004). This study demonstrates the importance and power of role models in creating any type of behaviors in children and adolescents. This can be applied to all areas of influence, dietary and exercise habits included.

Even though strategies in the home and community are not as homogeneous and controllable, they seem to be effective as a result of the individualized attention and intense level of intervention. Intervention is also a team effort in the home and community, where the overweight individual is comfortable with the persons working closely with him or her in seeking weight reduction and health benefits. If properly employed, these types of interventions positively affect everyone, including adults guiding the children.

**Focus of intervention**

*Behavioral Modification*

Some programs use behavioral modification to teach and employ a skill set aimed at losing weight and becoming healthy. These programs follow a construct first presented by Bandura. Bandura’s social cognitive theory indicates that thoughtful
motivation, planning, self-efficacy, and action can all be used as stimulation of behavior change. In the Planet Health program discussed previously as a part of the school based programs, researchers taught children behavioral modification techniques and measured their effectiveness of skills through personal journaling. This showed that through acquisition of behavioral skills, an individual can incite self-motivation, self-efficacy (a belief he or she has a certain ability to accomplish something), pre-planning, and thoughtful action. Cultural, communal, and social environments also influence self-efficacy and behaviors. Goal setting, self-monitoring, and stimulus control are based on social cognitive theory. If targeted at obesity, they can facilitate contributions to healthier lifestyles and aid in obesity prevention or reduction. These techniques can incite behaviors necessary for weight loss and or control (Budd and Volpe, 2006).

The SPARKS program was also discussed previously, and it used behavioral therapy as a mean for intervention. Although extrinsic rewards such as prizes of pencils, water bottles, and other school supplies were used as motivation in the beginning of the implementation, the prizes were replace with newsletters giving recognition and encouraging parent-child interaction about participation in the program. Eventually rewards were phased into intrinsic self-rewards and parental praise as the program progressed. Aside from the physical activities such as team sports and aerobic exercises previously listed, the course also included 30-minute weekly classroom sessions teaching behavioral therapy whose aim was imparting goals, self-monitoring abilities, education, and skills related to health maintenance. Ultimately after two years, the program led to an increase in physical fitness, showing an average 32% increase of performance on the
overall physical fitness test involving sit-ups, pull-ups, flexibility, and a mile run (Sallis et al, 1997).

Later, Schwartz, et al (2007) examined the efficiency of pediatrician and dietician obesity intervention based on in office motivational interviewing. Children from ages 3 to 7 were placed into one of three groups- control, minimal, or intensive. Of course, in the control group, the children received no motivational interviewing from any source; they were simply seen by physicians and told practical measures to follow, like healthy diet and exercise. In the minimal group, children and parents received a motivational interview session with a physician; in the intensive group, patients and their parents received motivational interviewing from a physician and a dietician. In the minimal group, the physician was not trained in specific capacity to effect a child’s weight management concerns, but in the intensive group, counsel was offered by a physician not specializing in juvenile weight management as well as a specialist dietician who understands and knows about childhood weight management. In motivational interviewing, the physician (and registered dietician-counselor, in some cases) conducts patient centered counseling seeking to elicit intrinsic motivation for behavior modifications. Through this type of counseling, patients should begin to understand and adjust their defiance towards positive changes. In this case, therapy would aim to help a client to understand why he or she was actively choosing to eat unhealthy foods and forego healthy foods while also avoiding physical exercise. Then, hopefully, the patient would be able to adjust his or her behaviors to include choosing fewer innutritious foods and more nutritious foods while also increasing his or her exercise routines. Motivational interviewing is a therapy that aims to help the patient discover his or her personal
motivation for change through highlighting his need for change. The goal then becomes to help the patient discover his or her own solution as well, with the idea that if a treatment plan is personally selected, a person is more likely to follow through with the efforts necessary to complete the treatment. Motivational interviewing is used successfully as a treatment for adult obesity, but it is still undergoing study as a method for treatment in children. In the aforementioned study, children underwent motivational interviewing. Within each group, even the control group who was not given motivational therapy but was seen by a physician, there was a decrease in BMI% at the 6-month follow-up. While it seems to show promise as a treatment the results were insignificant between groups. Perhaps the children are too young for this to be a truly effective intervention, but more likely, the insignificance in results between groups seems to come from the overall success of any intervention at all. Because every group, even the control group who was affected by the physician’s influence, showed improvements, the differences between effectiveness of intervention type was inconsequential (Schwartz et al, 2007).

Another study compared the adolescent obesity reduction between the uses of multi component behavioral intervention with the typical care of a physician’s counsel. A questionnaire assessed each individual participating in the Healthy Habits intervention, and a computer program generated individualized plans. The adolescents were individually guided through their personalized plans. Besides encouragement to increase activity level as well as encouragement to increase healthy food consumption, the personalized plans included identification of strategies and training of behavioral skills like recording intake of food and expenditure of energy through exercise, recording
weight weekly, environmental awareness and control in challenging food situations, and establishing appropriate self-rewards. While the adolescents were left under independent control of their own adherence to their plans, the progress of these participants was monitored by weekly scripted phone interviews addressing behaviors and resulting weight loss. Behavioral skills taught for and used in weight control include self-monitoring by documenting dietary choices, physical activities, and regularly weighing. Also, behavioral skills may include preplanning for potentially risky situations, goal setting, and self-rewarding (such as allowing one’s self to play a video game for 20 minutes after an hour of exercise), only upon accomplishment of goals. Other components of behavioral skills include problem solving and stimulus control.

Developmental tailoring aids in the independence of the child based initiative. This means the adolescent monitors him or herself, he or she has exclusive phone contact with an adult involved with collecting information for the study, and his or her parents are only given infrequent mailings. Adolescents are encouraged to independently take the initiative to seek adults in gaining assistance for meeting their diet and exercise goals. The Healthy Habits group that was given individualized behavioral and developmental training showed a point decrease in raw BMI score at the end of the 4-month treatment and short-term (but varying length of time for each individual) follow-up while the group receiving only traditional physician recommendations showed a 2 point increase of BMI score. The Healthy Habits group showed sustained behavioral skill use in respect to dietary and activity choices based on self-reporting and parental reporting. Behavioral skill employment has also been associated with weight reduction in other health interventions. The group receiving behavioral intervention showed an outcome of
moderate BMI reduction, while the group receiving traditional treatment showed an increase of BMI, but the overall attitude and self-reported health of those in the intervention group showed qualitative improvement (Saelens et al, 2002).

Studies have consistently shown a more positive result from behavior modification when compared to no treatment. While clinically based family behavior therapy has shown efficacy in the sustained reduction of familial obesity, interventions have not become cost effective or easily propagated.

*Activity: Decreased Sedentary Behaviors and Increased Physical Activity*

First, it is important to make the distinction between sedentary behavior reduction and physical activity increase. Both are contributors of childhood weight reduction, though the two are different issues (Sahota et al, 2001). Sedentary activities include things such as watching television, using the computer, and playing videogames. Physical activities could range from leisurely free play to monitored exercise programs or structured and organized sports (Vuegelters and Fitzgerald, 2005). The two approach methods affect different results because, for example, programs focusing on a decrease of time spent in sedentary activity do not automatically scare away those children who do not enjoy physical activity, as would a program focused solely on increasing physical activity levels. Considering that children who do participate in a high frequency of sedentary behavior are at a great risk for becoming obese or they are more likely already obese, it may aid in non-reinforcement for those behaviors for those children. By encouraging a reduction in sedentary behaviors, children may be inspired to participate in more leisurely physical activity at their own will. Drawing the focus away from a social
pressure to perform can make a positive difference for some children, especially ones who are already obese or at risk for obesity.

Physical action has been evidenced to reduce blood pressure and body fat as well as improve lipoprotein profile. However, its effect is lower on body composition, including shape and size (Bar-Or et al, 1998). Previous studies have confirmed the possibilities that high levels of physical activity may be enough to prevent childhood obesity. When provided with encouragement and opportunity, children will generally not resist becoming physically active. Free play is a great way to motivate children to expend energy without much stress. While frequent intermittent active free play is highly recommended, it is also necessary to involve structured, rigorous, and adult monitored activities. Encouraging active play has been effective in decreasing obesity in 5-8 year old girls. In order to increase physical activity in children, there must be safe and sufficient outdoor and indoor spaces in which they can be active; this requires policy changes, school efforts, and community planning (Sothern, 2001).

Physical activity in childhood and good fitness improves many physical and psychological conditions. Based on national recommendations, children should receive at least 30 minutes of moderate to vigorous physical activity each day. Meeting the 30-minute per day recommendation as a child also more likely influences the result of active, physically fit, and health conscious adults. In order to make physical education (PE) really effective in reaching its goal, physical activity should be generalized and applicable outside of school because school hours do not meet the necessary minimum amount of time to allow children to participate in moderate to vigorous physical activity. One way to do this is to teach appropriate activities in PE such as sport skills. A study
performed by Sallis, et al (1997) was designed to improve physical fitness by increasing activity in and out of school through an in school program called Sports, Play, and Active Recreation for Kids (SPARK). The SPARK program was divided into two components: fitness related activity such as aerobics and jogging and also movement skill activities such as team sports. Each student participating in the SPARK program spent time both participating in specifically fitness directed activities and also participating in team sports. Students from seven elementary schools were placed into either a control group or in the SPARK program. Results, based on self-report and physical measurements show that students participating in SPARK increased levels of physical fitness. Also important, this program is sustainable because it had been sustained after two years in all participating schools, including the control schools that were given necessary training to implement the program after the experimental phase. The flaw rests in the fact that while the program is sustainable for children participating, the results for individual children who once participated in the program are not sustained unless they choose to get involved in another activity program or independently maintain exercise levels. Though BMI was not measured, the increase in physical activity is sufficient to assess physical fitness increase in girls, especially because they began in this study with a lower rate of physical activity at baseline, as girls generally tend to experience less physical activity during elementary school. Participating students’ cardiovascular health improved significantly. Teacher training and specialist support can make PE an optimal time to capitalize on positively impacting youth’s health (Sallis et all, 1997).

A large challenge is the societal influence on incentive based sedentary activities (such as playing video games where a high score can be achieved or a next level can be
reached) and over consumption of food, particularly high-energy foods (Bar-Or et al, 1998). TV watching has been frequently and consistently correlated with extreme childhood adiposity. Activities that promote or require sedentary behaviors, like watching television, also prime for eating or overeating, usually unhealthy foods, thereby increasing energy intake. Participation in sedentary activities also compete with the participation in physical activities, thereby reducing activity levels altogether. Children are reinforced by most sedentary activities, especially those struggling with obesity. It can be hypothesized that removing sedentary activities will help in the obesity epidemic. Untargeted sedentary behaviors would include homework and reading, although those are still counted in the hours spent in sedentary behavior. Because activity choice mostly takes place at home, family involvement and support is necessary for this type of treatment. In a study by Epstein, et al (2000) the researchers provided all families with a comprehensive behavioral weight control program, either targeting increase in physical activity or decrease in sedentary activity. Then, researchers compared families receiving the increased physical activities treatment against families in the decreased sedentary activities treatment. Obese participants in the study maintained a 7.8% decrease from initial weights. Though there was a decreased participation in sedentary behaviors in that group, there was an increase in non-targeted sedentary behaviors. For example, there was a decline in television watching but an increase in reported reading levels. That group also showed an increase of physical activity in that group. But overall, after the two-year experimental phase, the two methods of reduced sedentary activities and increased physical activities were both associated with similarly successful weight loss and increases in fitness. Therefore, focusing on decrease of sedentary activity is an available
alternative to only focusing on increasing physical activity. Individual effectiveness is reliant upon what a child prefers. Children without access to enjoyable physical activity will instead simply switch to untargeted behaviors. Reducing access and participation in sedentary activity is only acceptable if a child is provided with adequate replacement of enjoyable and physical activities. Reducing sedentary behavior from any number 20 hours a week down to 20 hours a week has the potential to create a significant decrease in weight and improves health. Further reduction of sedentary behavior to 10 hours a week is not more effective because further decrease does not result in further increase in physical activity. Overall, whether a program is focusing on a decrease of sedentary behaviors or an increase in physical activity there is still an increase in obesity reduction with a comprehensive family focused effort (Epstein et al, 2000).

**Nutritional Influences**

Intake of an excessively high-energy diet contributes to obesity. Therefore, limiting calorie intake or changing the nutrient content of what a child eats may prevent or reduce a child’s problem of obesity. Two methods of targeting nutrition and improved health in children can include the following: 1) reduction of high sugar, fat, and calorie (low nutrient food) intake and 2) increase of vegetable and fruit (high nutrient food) consumption.

One way to affect and employ these changes of reduced low nutrient food consumption and increased high nutrient food consumption is the “traffic light” diet. This guideline system aims not only to influence the reduction of high amounts of energy intake but also to impress the promotion of a balanced healthy diet with an increase of fruit and vegetable intake. In the “traffic light” diet, all foods are categorized based on
their individual calorie content and nutrient density. Green category foods have low calories. Yellow foods have higher calorie content but also higher nutrient levels and are necessary for maintaining a balanced diet. Red foods have an even higher calorie content while containing very low nutrient dense quality. The “traffic light” diet has not been evaluated by measurement on its own as a sole method of obesity treatment; however, adults and parent-monitored children have self-reported success, claiming more positive feelings about choosing better foods, negative feelings when eating associated “red light” foods, and also a higher understanding of what should be considered healthy or unhealthy. Also, when used in combination with other treatments, such as the focus on exercise, this system of food regulation shows up to a 22.7% decrease in percent overweight of participants after six months (Epstein et al, 2000). Also, the system is not a fad-diet that is only practiced for a few months at a time; is allows for a lifestyle adaptation with a set of guidelines rather than a specific allowance, which makes it a sustainable and long-term option.

In one study focusing on nutrition, families were assigned to either a group that was focused on increased fruit and vegetable consumption or a group with a focus on reduced consumption of high sugar, high fat foods. After 12 month, parents in both groups showed a decrease in percentages of overweight, but the increased fruit and vegetable group resulted in a 12% shift while participants in the decreased fat and sugar group showed only a 4% reduction of overall obesity. Their children had reversed but insignificant results, showing 1% and 3% decreases, respectively. However, when administered a Food Habits Questionnaire, parents and children in the increased fruit and vegetable group reported feeling healthier 15.9% more often than those in the decreased
fat and sugar group. Moreover, adults who simply decreased sugar and fat intake also had higher levels of hypertension after completing the one-year study. Both children and adults in the higher intake of fruit and vegetable group also showed a decrease in fat and sugar consumption by 21%, but neither children nor adults in the decreased sugar and fat group showed an increase in fruit and vegetable consumption. This shows that targeting positive intake rather than restricting negative intake actually has a greater effect on change because encouraging positive food (nutrient rich) intake automatically simultaneously discourages negative food (nutrient deficient) intake. Though the reduction method is sufficient for prevention in normal weight children, intake of fruits and vegetables is an altogether better method overall for both obese and non-obese children, and it will help parents to reduce overweight as well (Epstein et al, 2001).

Consumption of sugary sodas is a large contributory factor in childhood obesity because they are very energy dense, meaning they are very high in calories. Children that drink one soda per day have a 10% higher average energy intake than those children who do not drink sodas every day. Though school or family based programs focus on physical activity and diet alterations, few have shown very effective and permanent results. James, et al (2004) began to think that focusing on one single factor might have a larger impact on the epidemic. Therefore James, et al (2004) decided to evaluate a school based education program for reduction of carbonated drink intake as a method to prevent obesity in children. The participants were 644 children ages 7 to 11 years from six schools. The students’ anthropometric measurements were taken and children logged their soft drink consumption at both baseline and follow-up (12 months). In a randomized controlled trial 325 students were placed in the intervention group and 319
students were placed in the control group. While the control group received no training, the students in the intervention group attended a session in which they heard affirmation of healthy dietary choices and discouragement of sugar consumption. They participated in a discussion about negative impacts of over consumption of sugar and were shown a decayed tooth as a visual for the dental impact sugary drinks have on teeth. They also participated in activities comprised of themes about healthy eating. For instance, students competed in a competition to write the best rap or jingle with a healthy message and created artwork based on healthful living. The intervention group was also provided with verbal praise for their participation in the education sessions concerning negative impacts of sugary beverages, and they were praised for foregoing sodas. Both groups were exposed to promotion of water consumption. Based upon statistical analysis of the returned soda logs and follow up measurements, the program was effective. Both groups showed a significant increase in water consumption, but only the intervention group showed a decrease in soda consumption. After the 12-month experimental period, the percent of overweight children in the control group increased by 7.5% while the percentage of overweight children in the intervention group decreased by 0.2%. The program was simple, restricted to one factor, and included both obese and non-obese children. All of these factors probably contributed to the success of the program. This study suggests that limiting carbonated and sugary beverage intake helps to prevent and, to some degree, treat childhood obesity, so limiting the availability of soda to children in schools and in the home would probably be very effective in helping the prevent more obesity (James et al, 2004). Of a more general importance, the results of this study show
that obesity in children is preventable by removal of specific obseogenic toxicities in the environment.

As another nutritional factor beyond health food selections, mothers may potentially have the ability to influence their children’s risk for obesity from birth. According to a study following breast-fed children and formula-fed children, overweight youth were more likely to have been formula-fed. Breast-fed infants were associated with 13% to 22% lower odds for becoming obese children, so breast-feeding can be linked to risk reduction of childhood obesity. Breast-feeding establishes a healthy habit of feeding from birth that may be continued throughout childhood, which is one explanation for the decreased risk (Mayer-Davis et al, 2006). While these numbers may indicate that breast-feeding is one effort that mothers can take as a preventative measure against childhood obesity, it is important to highlight that other factors may play into the lower related obesity rates. The difference may not come from an actual difference in nutritional value between breast-milk and formula. Rather, the difference may be a result of the lifestyle and attitude differences that tend to exist between breast-feeding and formula-feeding mothers. As a generalization, these lifestyle differences may contribute to the level of involvement a parent will have in her child’s life, including meal selection and food monitoring. Therefore, a mother who breast-feeds as opposed to formula-feeding may continue to actively participate in the child’s eating habits, thereby reducing his or her risk for becoming obese as a child.

**Combination Approaches**

As previously discussed, practicality points to the need for both prevention and treatment. While prevention should be a public health priority, treatment is a public
health necessity (Vuegelers and Fitzgerald, 2005). The ideal program for childhood overweight intervention combines prevention and treatment into one intervention.

In order for school programs to be successful in aiding in the reduction of childhood obesity, supplemental support and resources must be activated. Though schools represent a homogenous environment and are easy to manipulate, school intervention cannot control the problem on their own due to summer, breaks, weekends, and home lifestyles. There must be familial involvement. Also, societal pressure encourages obesogenic activities and food choices while at the same time also creating a demand for maintaining an uncorpulent appearance. For instance, advertising directed towards children often advocates the ingestion of high-sugar, low-nutrient foods or beverages while showing thin children as the consumers in these commercials. Due to the environmental influences such as media involvement or advertising campaigns, it is important and necessary to construct a larger community involvement. Schools must have programs and policy in place, but they must work with the broader health community (Budd and Volpe, 2006). In order to enhance the school-based effort, parental involvement is also critical (Graf et al, 2005).

One important influence on whether or not a child is actively participating in some effort to lose weight is whether or not parents acknowledge or realize that their children are overweight. Some schools have initiated a health report card that tells parents about the health and fitness of their children. Parents who receive these report cards are two times more likely to acknowledge the obesity of their child, and then they have a higher likelihood of taking action (Denghan et al, 2005).
Though it is a major factor in the improvement of health, exercise alone is not sufficient to solve obesity in children. Though the differences may not be immediately visible, a combination of diet and exercise is more effective for long-term improvements, and results are mostly sustainable (Epstein, 1995). Accompaniment of low-calorie diets incites more changes in body size than physical activity alone (Bar-Or et al, 1998). Younger groups need guidance and are more easily influenced, thus they respond well to school manipulations. However, older age groups are more independent, so they can be self-motivated and can self-monitor. They are more receptive to the methods of behavioral modification.

**Discussion**

Clearly the most comprehensive approaches are most effective. Those programs that target the most behaviors in most venues are going to bring about the greatest change. Flodmark, et al (2005) also identified that there is not one particular characterization or factor of an intervention that makes one specifically more effective than another. A combination of many factors, including appropriate methods for the target group, influences the success. An interesting detail noted upon evaluation of the literature is that a focus on decreased sedentary behaviors and increase of healthier food intake further reduce and sustain lower obesity rates in children than a focus on increasing physical activity and reducing unhealthy food intake. Sometimes restricting a certain activity or restricting a certain food may have an inverse effect of encouraging a child to want the restricted food or to participate in the restricted activity. It seems that targeting increased consumption and decreased activity actually produce more fruitful results. By creating conditions that seem more favorable to the participant, he or she is...
encouraged to remain involved and committed to the treatment. While ultimately the reversed methods of increasing fruit and vegetable intake and decreasing sedentary activity target the same objectives as the traditional interventions of increasing exercise and decreasing fatty intake, the focus on socially “easier” methods tends to brings about more positive results. These interventions are less intimidating to overweight children and also create resulting physical activity and decrease of unhealthy diet without struggling solely to achieve those goals.

Pediatric treatment efforts have individually been relatively successful, suggesting that if many small endeavors are affecting change in individualized programs, that a difference should be seen globally. It could therefore be concluded that weight is often regained after the treatment program is completed. Since changes in weight take a while, most results are seen after a 6-month or 12-month treatment or follow-up. Results at as little as 2-months may not have time to create significant impact. The best results are seen after a sustained treatment of 24-months, but it seems that if the treatment is completed in 12-months and discontinued, the 24-month follow-up will show a decrease in previous improvement. To the best estimate of the presented research, follow-up to programs has only been conducted as far as twenty-four months beyond treatment implementation. Based on rates of obese individuals in those programs, there is a substantial recidivism rate if the program does not incite a sustainable lifestyle modification. This may indicate a need for more of these programs, but more aptly, this indicates a need for a different approach. It seems that small programs are not the most effective means for enacting global wide improvements in the childhood obesity epidemic.
Changing the culture to promote healthy activities and food choices through availability, accessibility, and advertising are necessary to the fight against childhood obesity. If a cultural and societal attitude for healthfulness can be created, it might affect a real significant change. Promotion of healthy diet and physical activity through the use of mainstream media campaigns and political action will likely have a more powerful effect throughout all of society. Alternately, if children advertising “red light” foods were depicted as obese, a child’s desire to eat that food may be lowered. A parallel can be drawn between the public health concern of childhood obesity and the public health concern of smoking (Flodmark et al, 2005). Like smoking elimination, gradual and long-range massive public interventions and education may ultimately promote a different attitude and more effective, positive results.

Conversely, an alternate consideration to the implementation of these obesity reduction programs is the potentially negative effects they may have on children, especially in adolescence. It is likely that incentives focused on reducing obesity alone may have hyper-correcting results such as depression or eating disorders. Positively, none of the studies cited here have immediately resulted in such problems (Flodmark et al, 2005). However, long-term effects may be the cause of some nutritional psychopathology like anorexia nervosa, bulimia, anxiety, depression, or low self-esteem later in life. Moving the focus from losing weight toward becoming healthy could help with rates of eating disorders and self-esteem issues later in life. If society establishes a correct and healthy attitude about weight and body image, children will likely keep this positive attitude throughout adolescence and into adulthood.
References


