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COMBATING CHILDHOOD OBESITY:

CHANGING OUR ENVIRONMENT

by

Anna Mitchell

A literature review submitted in partial fulfillment  
of the requirements for the degree

of

MASTER OF DIETETIC ADMINISTRATION

In

Nutrition and Food Sciences

UTAH STATE UNIVERSITY

Logan, UT

2007

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## ABSTRACT

Combating Childhood Obesity:  
Changing Our Environment

by

Anna Mitchell, Master of Dietetic Administration

Utah State University, 2007

Major Professor: Noreen Schvaneveldt  
Department: Nutrition and Food Sciences

A review of literature was conducted to identify risk factors and prevention strategies for childhood obesity. Factors contributing to childhood obesity include poor food choices, physical inactivity, and genetics. Complications of obesity include respiratory, musculoskeletal, cardiovascular, and endocrine diseases, cancer, gallbladder disease, poor health status, depression, low self-esteem, and social withdrawal. Since childhood obesity, largely due to the environment that children live in today, is increasing in the United States, strategies must be implemented that will contribute to the prevention of childhood obesity. Changes that promote a healthy environment must involve all aspects of society to ensure that the prevention of childhood obesity will be more successful.

(44 pages)

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I would also like to thank my family, friends and colleagues for their patience and support as I completed this thesis.

## LIST OF FIGURES

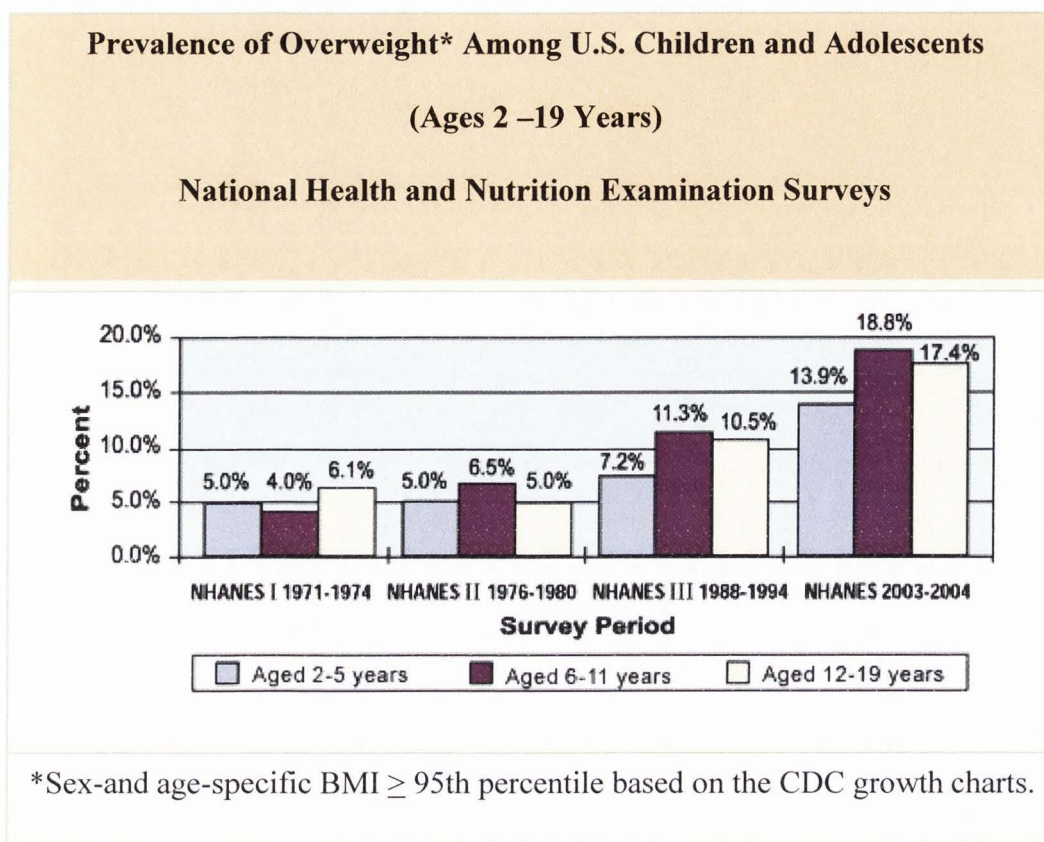
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## INTRODUCTION TO CHILDHOOD OBESITY

The population of the United States is experiencing increased obesity. The trend in increasing weight of children in the United States is of great concern. The prevention of childhood obesity requires nutrition education, healthy food choices, and physical activity, and these interventions need to be incorporated in school and home environments. This will require the cooperation of schools, communities, and families nationwide. Changing children's perceptions about food and physical activity will likely decrease the prevalence of childhood obesity.

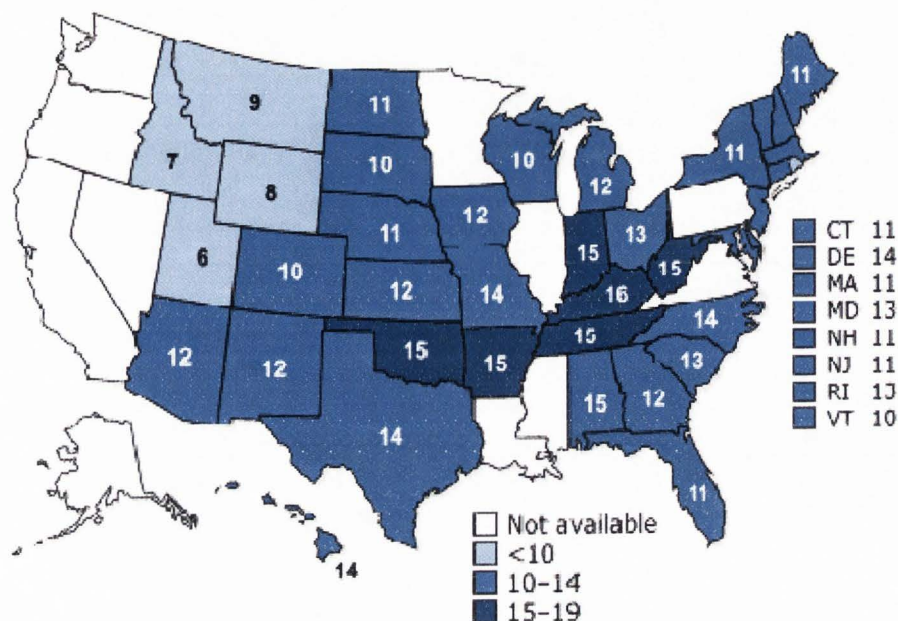
In 2002, the World Health Organization (WHO) declared that obesity was a pandemic threat to public health (1). Childhood obesity is defined by the Centers for Disease Control and Prevention (CDC) body mass index (BMI) sex- and age-specific growth charts. Normal weight is classified as  $\geq 5^{\text{th}}$  and  $<85^{\text{th}}$  percentile, at risk for overweight is classified as  $\geq 85^{\text{th}}$  and  $<95^{\text{th}}$  percentile, and overweight is classified as  $>95^{\text{th}}$  percentile (2). Seventy percent of obese adolescents become obese adults (3). The highest rates of childhood obesity are observed in developed countries, including the United States (3). According to the CDC, in the United States the prevalence of childhood obesity has more than doubled for children ages six to eleven years from 7% in 1980 to 18.8% in 2004 (4). For children twelve to nineteen years of age, prevalence more than tripled, increasing from 5% in 1980 to 17.1% in 2004 (4). The following figure is a compilation of the results from the last four National Health and Nutrition Examination Survey (NHANES) studies that illustrate the trend in rising obesity among American youth (5).





**Figure 1.** The rise in childhood obesity as shown by four NHANES studies (5).

Childhood obesity is prevalent in the United States; young children, adolescents, all ethnic groups, and all socioeconomic levels are affected (6). Childhood obesity and overweight is more prevalent in minorities such as Hispanics and African Americans (7). The Youth Risk Behavior Surveillance Survey was designed to determine certain risks among American high school students, with data from 40 states (8). Data was collected by survey questions students answered. It included determining the distribution of overweight ( $\geq$  95<sup>th</sup> percentile) among American high school students (8). Of the information available, Oklahoma, Arkansas, Tennessee, Kentucky, West Virginia, and Indiana had the highest percentage of overweight high school students at 15-19% (8).



**Figure 2.** Percentage of overweight high school students — selected United States, Youth Risk Behavior Survey, 2005 (8)

### RISKS ASSOCIATED WITH CHILDHOOD OBESITY

Obesity is associated with various physical, mental, emotional, and social risk factors. Physical risk factors of obesity can be categorized according to respiratory, musculoskeletal, cardiovascular, and endocrine consequences (9). Cancer, especially hormone-related and large-bowel cancers, joint pain, gallbladder disease and poor health status are also related to obesity (1,2,4,9). Mental, emotional, and social factors are higher in individuals who are overweight; they are also more likely to develop low self-esteem and depression and to withdraw from their peers (10). In addition, overweight and obese youth with poor nutrition habits are more likely to miss school due to illness (11).

Weight loss may reverse complications associated with overweight and obesity. In children, the first markers of childhood obesity include hypertension, hypercholesterolemia, and glucose intolerance (1).

Although previously considered an adult onset disease associated with high body weight, type 2 diabetes is becoming more common among children and adolescents. It has been estimated that one out of every three children born in the United States in 2000 will develop diabetes sometime during their lifetime (4). A study reviewed by Dehghan et al. (3) followed overweight children for 40 to 55 years and found that they were more likely to develop cardiovascular and gastrointestinal diseases compared to those who were at a healthy weight (3). Of the overweight children, an estimated 61% had at least one risk factor for cardiovascular disease, such as hypertension or hypercholesterolemia (12). A person is 70% more likely to have a co-morbid condition with a BMI above 27 (13). Furthermore, life expectancy may be reduced by an estimated seven years due to obesity (1).

Overweight children are five to seven times more likely to develop adult obesity, and all of its co-morbidities than their normal weight peers (7). Obese adults who were overweight as children are often more severely obese than those who were normal weight as children and became obese in adulthood (12). Adult obesity is associated with increased mortality and morbidity; however, prevention is much easier if initiated in childhood (1). The risk for adult obesity is higher in children with obese parents (7). Fiore et al. (7) found that children with two non-obese parents were less likely to become obese than those children who had one or more obese parents (7). Children with two obese parents have an 80% chance of becoming obese (14).

## FACTORS LEADING TO CHILDHOOD OBESITY

Obesity involves genetic, metabolic, physiologic, environmental, psychological, behavioral, and social-cultural factors (3,6,9,15). Most often, obesity is linked to environmental factors over which individuals have control, such as physical activity and the food consumed (3). The risk for obesity is also affected by energy imbalance. Food intake and physical activity, which also affects weight, are influenced by all aspects of society including families, communities, health care providers, faith-based institutions, businesses, government agencies, the media, and schools. Understanding the etiology of childhood obesity and how to treat it requires determining the influences on food choices and levels of physical activity in children.

### **Energy Imbalance**

Obesity is due to energy imbalance; more calories are consumed than are expended (10). Weight maintenance takes place by correcting these energy imbalances. People who are good at counterbalancing this energy imbalance by eating less or exercising more, are better able to maintain their weight. For many people however, there is a slow upward trend in weight (10). Even a small amount of excess energy can lead to significant weight gain over time, thus contributing to the obesity epidemic (3).

Bray et al. (10) conducted a study in which they placed healthy men in respiration calorimeters (10). They then manipulated the subjects' food intake and exercise to try to achieve energy balance (10). However, they were unable to get any closer to energy balance than 50 kcal/day. The imbalance usually ranged from 50-150 kcal/day, which, in theory, could lead to a 5.5-16.5 pound weight gain over one year (10). As reviewed by

Dehghan et al. (3), NHANES reported that calorie intake in children has increased from 1970-2000 (3). Yet, total fat consumption has decreased from 37% to 32% (3). It appears that despite a reduction in total fat consumption, calorie intake has still increased, and children's weight has continued to rise. Simply stated, obesity develops over time when energy intake exceeds expenditure. Ultimately, weight gain is due to energy imbalance. It is food choices, amount of physical activity, and media and technology that influence energy balance.

### **Food Choices**

The types of food and beverages children are consuming influence energy imbalance. Children need specific quantities of nutrients to support optimal growth and development (6). Sometimes the food choices children make do not provide adequate nutrients. Today, food is an indicator of lifestyle instead of solely a means of nourishment. Food products are often high in fat and sugar.

According to CDC, a staggering 80% of children in the United States do not consume five or more fruits and vegetables per day (4). Utah follows the national trend with only 20% of youth consuming the minimum of five fruits and vegetables per day (16). These are being replaced by energy-dense foods. The USDA Health Eating Index found that among adolescents ages 11-14, less than half met the recommendations for grains, fruits, vegetables, milk, meat, total fat, saturated fat, and sodium (17).

Today, energy dense, nutrient poor foods and drinks are readily available. The risk of overweight and obesity increases when an individual consumes more energy-

dense foods. Those who consume fast food, high-fat, high-sugar foods, and larger portion sizes are more likely to consume excess calories (18).

High dietary fat intake is another risk factor for obesity. High fat foods are often appealing. Furthermore, they can be relatively inexpensive, thus making those foods more accessible. The Leeds Fat Study, as reviewed by Bray et al. (10), found that individuals who consumed high amounts of fat were more often obese (10).

The food industry also contributes to the obesity epidemic. Frequent dining out has been linked with an increase in obesity (15). When dining out in the United States, people tend to consume foods higher in fat and sugar and lower in fiber. They are also less likely to choose fruits, vegetables, and dairy products. Also, restaurants frequently offer large portions, often twice as much as is needed. Large portion sizes have led to Americans passively overeating. Evidence has shown that when more food is offered, more food is eaten (10). The increase in portion sizes in the last few decades coincides with the increase in weight among Americans (18).

Another contributor to obesity is energy-dense soda containing high fructose corn syrup (HFCS). Each 12 ounce soda provides as much as 165 calories, and a 32 ounce soda provides as much as 465 calories. From 1970-2000 there has been an increase in the consumption of HFCS (10). Soft drink consumption has doubled in adolescent females between 1978 and 1998, and tripled in adolescent males (8). HFCS is not only contained in soda, but in reconstituted juices and other foods as well. The rise in obesity has been attributed to HFCS because the increase in consumption coincides with the increase obesity (18).

Harnack et al. (19) determined that soft drink consumption increases as a child approaches adulthood (19). Adolescents in the United States consume an estimated 15 teaspoons of sugar, or 240 calories, from soda daily (18). Bray et al. (10) cited two studies that demonstrate the effect that soda consumption has on weight (10). The Planet Health Study measured body mass index (BMI) in relation to soft drink consumption over a two-year period. This study found that those children who consumed the highest amount of soda at the beginning of the study had the highest increase in BMI at the end of two years (10). In another study, children who drank soda over a 10-week period gained weight, while children who drank the same amount of artificially sweetened beverages lost weight. The consumption of one 12 ounce can of sugar-sweetened soda a day (150 calories, 40-50g sugar), with no offsetting of calories, can lead to a 15 pound weight gain in one year (18). "The literature suggests that sugar in liquid form is more 'obesigenic' than other forms of sugar," because drinking calories does not seem to impact appetite as much as "chewing" calories (15). Individuals who drink energy-dense sodas often do not decrease their solid food consumption to offset the additional calories (18). Increased soda consumption is associated with an increased risk of becoming overweight; however, increased diet soda consumption is negatively associated with childhood obesity (18).

Harnack et al. (19) found that soda consumption is negatively associated with intake of calcium, Vitamin A, Vitamin C, riboflavin, folate, and phosphorus (19). This implies that soda may be replacing milk and juice as the preferred beverages, where these nutrients can be found. The increase in the incidence of type 2 diabetes also coincides with the increase in consumption of soda (18). Schools can help by banning soda from

schools and replacing them with healthier options like water, but not sugar-sweetened fruit drinks.

Increased snacking is thought to be one of the factors contributing to obesity in children. Children's snacks are often high in calories, fat, and sugar. Snacks contribute approximately 20-42% of the total daily calories for children (20). Sullivan et al. (20) found that providing children with low-fat snacks after school improved the overall quality of their total daily intake (20). It was found that the participants consumed more protein, calcium, and iron, and less fat (20). Changing the types of snacks children receive is an easy, realistic, and inexpensive way to positively influence intake.

### **Physical Inactivity**

Activity among U. S. children has declined in the last twenty years (13). In addition, total physical activity declines with age among adolescents and continues to decline into adulthood (13,17). Changes in technology, transportation, mechanization, work habits, and entertainment have led to decreased physical activity. Energy expenditure has decreased due to advances in technology that make many tasks less labor intensive and less time consuming. The steady decline in physical activity among children and the increase in sedentary activities such as watching television, playing video games, and surfing the Internet has been linked to obesity (1,3,6). Physical inactivity is predictive of a higher body weight (10). Long periods of inactivity reduce the likelihood that a child will engage in physical activity and will directly influence the risk of obesity (15).



Many schools have reduced the amount of time children spend at recess and have also minimized the number of physical education (PE) classes students are required to take in school. Only 22.6% of Utah youth have a daily PE class, while 61.3% have a PE class that meets one or more times during the week (16). Not only has physical activity has declined at school, it has also declined at home. Many parents may feel that it is unsafe to allow their children to play outside. In addition, it is often easier to occupy children with sedentary activities that hold their attention so parents or caregivers can complete daily tasks. It is clear that the current physical activity levels of children today are not adequate to help prevent obesity.

### **Media and Technology**

With the advancement of technology, television, computer time, and video games often consume a large amount of children's free time. The risk for becoming overweight is 40% to 50% higher for youth that spend more than 2 hours per day watching television (15). Nineteen percent of youth in Utah watch more than three hours of television on a typical school day (16).

The Kaiser Family Foundation recently found that only 15% of all food advertisements aimed at children involved people engaged in physical activity and 34% of all food advertisements targeting children and adolescents are for candy and snacks (21). Television advertising affects children's food choices, knowledge about food, and both direct and indirect food purchasing decisions (6). The choices children make regarding food and physical activity are greatly influenced by their exposure to food and physical activity-related messages in the media (6). Commercials can increase children's

requests for advertised foods, which are often snack foods, candy, and soda. In addition, children tend to consume foods that are high in fat, salt, and sugar while watching television. Also, half of all advertisements shown during children's shows are for food (21). When watching television, children ages 8-12 are exposed to the most food advertisements, an average of 21 per day, or more than 7600 food advertisements per year (21). However, children can watch a high amount of television and still be physically active. The risk of obesity becomes greater when, in addition to watching a lot of television, children are inactive the rest of the day as well.

### **Genetics**

Genetics may account for less than 10% of cases of obesity (7). Genetic factors that may play a role in obesity include leptin deficiency and medical conditions such as hypothyroidism and growth hormone deficiency (3). The thyroid gland releases hormones that help control metabolism (22). When those hormones are not released, one of the effects is weight gain (22). Children with growth hormone deficiency typically have a greater amount of abdominal adipose tissue (23). Leptin, a hormone produced in adipose tissue, is released in the blood according to the amount of adipose tissue in the body. Consequently, more leptin is secreted in the presence of more adipose tissue. Individuals who are leptin-deficient are often obese. But, when they are injected with leptin, their food intake falls and their body weights normalize (10). Because obesity has risen in the last thirty years among U.S. children, it is most likely that the environment in which children live is a greater factor than genetics in contributing to childhood obesity

(15). Yet, while genetics are not easy to manipulate, positive changes can be made to the environment.

## CHILDHOOD OBESITY PREVENTION WITHIN ALL ENVIRONMENTS

Prevention is key to controlling the increase in childhood obesity. Prevention begins with weight maintenance for those who are considered to be at a healthy weight. For those individuals who are overweight or obese, weight loss and management of comorbidities is warranted. The combination of healthy eating habits and physical activity is the most effective way to lose weight and maintain weight loss. Several studies have shown that it is easier to lose weight in childhood than it is in adulthood (24). Because it is more difficult to lose excess body weight, the focus should be on preventing weight gain in childhood.

All sectors of society need to be involved in order to prevent childhood obesity. Koplan et al. (6) offered recommendations in ten areas that will help the United States combat childhood obesity (6). These areas include national priority, industry, nutrition labeling, advertising and marketing, multi-media and public relations campaigns, community programs, built environment, health care, schools, and the home (6). The environment of a child includes family, peers, school, community, and society, including media, advertising and social norms (15). Bray et al. (10) referred to the environment in which American children live as a "toxic" environment because of the large portion sizes, easy access to foods of low nutritional value, and the reduced emphasis on physical

activity (10). "Children are strongly influenced by the food and physical-activity related decisions made by their families, schools, and communities" (6). There is a need to make changes to the environment now to help prevent obesity in the future. Changes, discussed below, can be made in the areas of media, school, home, and community environments.

### Media

Because children often do not know how to distinguish between good information and persuasive advertising, the Committee on Prevention of Obesity in Children and Youth recommends that guidelines be put in place for advertising regarding food, beverages, and sedentary entertainment aimed at children (6). The media can be an effective tool for delivering messages about healthy eating and physical activity. The CDC and U.S. Department of Health and Human Service's campaign, "VERB™: it's what you do," is an excellent example of how the media can be used to promote physical activity among youth (25). Advertisements, which show children engaged in different types of physical activity, are aimed at children ages 9-13 using the word "verb" to promote action (25). The Ad Council currently has a series of commercials aimed at children that promote weight loss through physical activity and eating healthy foods (26). This advertisement campaign is an extension of Small Step Obesity Prevention, a larger obesity prevention program, which continues to receive donations of time and services from the media (26). Magazines and educational materials can send positive messages to children about physical activity by depicting children engaged in different types of activities (27).

### School Environment

In the United States in 2000, 53.2 million children were enrolled in public and private schools (6). Because so many children attend school annually, school is an ideal place to teach children about the principles of good nutrition and physical activity and how to incorporate them into a healthy lifestyle. Schools need to provide adequate recess time and a variety of team sports in which children can participate (1). Schools can promote physical activity by encouraging students to walk or ride their bikes to school by providing safe transit routes and making physical education classes mandatory. However, children who are overweight are often conscious about their bodies and prefer not to play sports as a result (1). PE teachers can provide activities such as walking, tag, or Frisbee that encourage activity.

Recommendations for regular physical activity are designed to help children maintain a healthy body weight. FITT (frequency, intensity, time, type of activity) is an acronym that can help create physical activity recommendations (27). Recommendations state that children should engage in sixty minutes of physical activity per day (27). This can be achieved by several sessions of 10 to 15 minutes of activity. By developing specific goals for physical activity, including time, place, type of activity, and duration, children are more likely to be successful with increasing daily physical activity.

It is recommended that children receive about 50% of their total daily exercise at school (28). Only 8% of elementary schools and 6% of middle and high schools have PE classes every day; most hold PE classes only three times per week (28). Frequency and

availability of PE classes decline as students progress from elementary to middle school to high school.

### **Nutrition and Physical Education**

“Well-designed, well-implemented school programs can effectively promote physical activity, healthy eating, and reductions in television viewing” (12). Over 95% of children in the United States are enrolled in school (12). This is an advantage because children are a captive audience while in school, making the school system a natural place to teach children about good nutrition and help them establish physical activity habits.

Nutrition education should be integrated in school curriculum. It should be reinforced through food choices available in the school, including in the cafeteria, vending machines, fundraisers selling food, school book stores, and in health and physical education classes (29). Team Nutrition is a USDA program that schools can implement to involve schools, parents, students and the community in nutrition education (30). It is designed to help improve school lunches and “to promote the health and education” of school children nationwide (30). The goal of Team Nutrition is to promote good nutrition habits and physical activity by providing education based on the Dietary Guidelines for Americans and Food Guide Pyramid (30).

An initial trial of a five-week course designed to integrate education of the Food Guide Pyramid and the Physical Activity Pyramid into the curriculum was conducted in a rural mid-Atlantic middle school (17). Students were required to enroll in a health and physical education course which presented information over eighteen lessons. Behavioral changes were not noted over this short time period, but students’ nutrition

knowledge increased. It was concluded that if nutrition and physical education began at an early age and continued over time, then reinforcement of healthy behaviors would be more likely.

### **School Health Report Cards**

Some school districts are combating childhood obesity by sending school health report cards home that include the child's fitness data and body mass index (BMI) based on CDC's growth charts. Clinically, BMI is the traditional method for determining whether a patient is overweight or obese. BMI is not a good measure for children because it does not take into account pubescence. At one point, a child may gain more weight than is desirable for his/her height but then have a growth spurt that normalizes his/her BMI (31). BMI is also not as accurate because it fails to distinguish between lean body mass and adipose tissue. Thus, for those individuals who are very muscular, BMI is an inaccurate measure for determining adiposity. However, because it is the easiest and quickest method available to measure adiposity it is used most often (3).

Scheier et al. (31) found that BMI incorrectly identified 17% of adolescents with a healthy percentage of fat as overweight (31). In addition, adolescents that appeared to be at a healthy weight and were identified as such by BMI, actually had a high percentage of adipose tissue. BMI does not account for gender, age, or ethnicity. Also, it does not differentiate between excess fat, muscle, or bone. Children of different ethnicities, with the same BMI, have different percentages of body fat (31). With the label of a BMI, parents may feel compelled to put their children on a restrictive diet, which can potentially lead to disordered eating (32). BMI as an indicator of overweight and obesity

is best used in conjunction with other measurements such as height, weight, and percent body fat. These measurements should be tracked and assessed over time and used under the supervision of a physician.

School health report cards serve to inform parents about their child's health status. The letters sent to parents typically advise parents to discuss the results of the health report card with their physician (32). Report cards regarding each child's health and fitness level have been proven to have a positive effect in the prevention of obesity (3). Parents become more aware of their child's health and have the option of becoming more involved in their child's decisions about food and physical activity. School health report cards should be screening tools only, not diagnostic tools. The diagnosis should be left up to the physician.

Gail Frank, PhD, RD (32), a spokesperson for the American Dietetic Association (ADA), stated that school health report cards are "good, bad, and urgent." They are good because they help parents become more aware of their child's weight status. They can be bad because children may be labeled based on their BMIs. And, school health report cards are urgent because this is a point in time where parents can intervene before their children develop chronic complications. If children are labeled according to BMI, they may decide to follow a restrictive calorie diet, which can lead to stunted growth and possibly disordered eating (31).

The report cards do not accurately measure a child's health status, unless they are used as an annual measurement and trends can be observed over time. In order for health report cards to make a significant impact, the school environment must also be equipped to help meet the goal of reducing and preventing childhood obesity. If used correctly by



both school personnel and parents, school health report cards can have a positive effect on childhood obesity.

### **School Food**

School districts have specific nutrition guidelines they must follow in order to receive federal reimbursement for participation in the National School Lunch Program and the School Breakfast Program. Children's dietary guidelines should follow the newly developed Food Guide Pyramid for children and those recommended by the American Heart Association (79,80). School lunches are required to provide 30% of total daily energy requirements (28). Meal programs like the National School Lunch Program and the School Breakfast Program improve academic, behavioral, emotional, and social functioning. They help children consume nutrients necessary for their overall health. Children who participate in these programs are more likely to consume vegetables, milk and dairy products, and other high protein foods (11). School foodservice offers these programs, but they have a difficult time competing with some of the other choices available from snack bars, vending machines, school stores, and in some cases, restaurants.

Schools offer many "competitive foods," most of which are of low nutritional value (6). Competitive foods include any foods sold in competition with the United States Department of Agriculture (USDA) school meals. They are categorized as foods of minimal nutritional value (FMNV) and any other food that is offered for sale during lunch hours. FMNV offer less than 5% of protein, niacin, riboflavin, thiamin, calcium, iron, and vitamins A and C and they cannot be sold in the foodservice area during the

meal period. Other foods offered for individual sale include ala carte sales, second helpings, and other foods and beverages purchased from vending machines, school stores, and snack bars (11). Ninety eight percent of Utah high schools sold competitive foods and beverages to children in the year 2000 (28). Likewise, 74% of middle schools and 43% of elementary schools also sold competitive foods and beverages to students (28). These food items were mostly of poor nutritional quality (28). Federal legislation has been passed to address some of these food-related problems in schools.

### **Federal Legislation**

Because of the increasing prevalence of childhood obesity in the United States, policymakers rank it as a “critical health threat” (6). In 2001, the U.S. Surgeon General issued a call to action to prevent and decrease overweight and obesity. This call to action, however, only provided general principles instead of specific solutions to the problem (35). Smith (36) stated that even if the U.S. Surgeon General proposed a solution that would directly address the problem of obesity, it would be opposed by a large portion of the population because they would consider it to be overly intrusive.

According to the Committee on the Prevention of Obesity in Children and Youth, obesity prevention will require “an evidence-based public health approach” to ensure that the expected outcomes are achieved (6). Programs to prevent childhood obesity should focus on more than just weight. They should also focus on health and nutrition status, taking into account the proper growth and development of children.

In June of 2004, the U.S. Senate passed the Child Nutrition and Women Infants and Children (WIC) Reauthorization Act of 2004 (37). This bill requires all schools

participating in the National School Lunch Program and School Breakfast program to create wellness policies by June 30, 2006 (37). It requires schools to offer more nutritious food choices, limit non-nutritious competitive foods, include nutrition education in the classroom and increase physical activity (37). Policies should include guidelines concerning (37):

- Goals for nutrition education, physical education and other school based activities to promote wellness;
- Nutrition guidelines for all food available on the school campus;
- School meals must, at a minimum, meet USDA guidelines;
- A plan for developing, implementing, and monitoring the policy with at least one person at the district in charge of assuring their district is meeting all of the guidelines;
- Involvement of parents, students, school foodservice personnel, the school board, school administrators, and the public in the development of the district's wellness policy.

The recommendations are general and schools can interpret them in a way that best meets their school district's needs. The law leaves the details concerning nutrition and physical activity guidelines in the local wellness policies to each individual school district. This allows school districts to develop policies that are more specific to their local needs. The objectives of the wellness policies are to promote healthy school environments, reduce childhood obesity, and prevent diet-related chronic diseases (37).

The law does not mandate that a nutrition professional be included in the development process, but the process is involved enough that it should include a nutrition

professional (38). In order to develop effective policies, districts have looked to the Dietary Guidelines for Americans for guidance. However, these guidelines are intended to be “a primary source of dietary health information for policymakers, nutrition educators, and health providers” (39). To enable the school districts to use the Dietary Guidelines for Americans in the most effective manner, it is important for the wellness policy committees to employ a nutrition professional to help meet these guidelines (38). Nutrition experts have made recommendations concerning foods that should be offered in vending machines, the number of recesses provided each day, frequency and content of PE classes, and the use of food as a reward for good behavior or good schoolwork and withholding recess as punishment for bad behavior (28).

The downside of the school wellness policies is that they do not offer any suggestions about how to approach the problem of childhood obesity effectively. Also, the wellness policies are only in effect while children are at school. There is no guarantee for continuation of healthy practices at home and in the community. In addition, the government is not tracking those districts that have not developed a wellness policy (36). Furthermore, if they do have a policy, the government is not checking to make sure the districts' wellness policies are meeting the guidelines set by law (36).

The school wellness policies can provide important steps toward preventing and treating childhood obesity. In order to be more effective, school districts should be accountable to the government for the existence and compliance of their policies, and the policies should be reevaluated annually. Currently, the ADA is lobbying Congress to fund the development of an evaluation tool the districts can use to determine the effectiveness of their wellness policies (36). In December 2004, the State Education

Standard published an article that suggested ten ways schools could make a difference in obesity prevention through physical activity and nutrition. These suggestions give the guidelines offered by the WIC Reauthorization Act of 2004 more specific direction and are an excellent guide to base local wellness policies upon (12). These suggestions are as follows (12):

1. Address physical activity and nutrition through a Coordinated School Health Program (CSHP) approach

A CSHP consists of eight components: 1) health education; 2) physical education; 3) health services; 4) nutrition services; 5) counseling, psychological and social services; 6) healthy school environment; 7) health promotion for staff; and 8) family and community involvement.

2. Designate a school health coordinator and maintain an active school health council
3. Assess the school's health policies and programs and plan for improvement
4. Strengthen the school's nutrition and physical activity policies
5. Implement a high-quality health promotion program for school staff
6. Implement a high-quality course of study in health education
7. Implement a high-quality course of study in physical education
8. Increase opportunities for students to engage in physical activity
9. Implement a quality school meals program
10. Ensure that students have appealing, healthy choices in foods and beverages offered outside of the school meals program.

Metos et al. (28) recently analyzed Utah school wellness policies. In Utah, 78% of school districts had completed school wellness policies by the deadline of July 1, 2006 (28). Of those districts that met the deadline, 77% complied with all five of the federal guidelines outlined by the Child Nutrition Reauthorization Act of 2004 (28). Of those districts that did not address all of the categories, the guideline most often missed in the policies was concerning competitive foods in the schools. This one area is essential because limiting the availability of high fat, high sugar foods means that children will consume those foods less often. This guideline alone can have a direct effect on children's weight. Most often, the mandates in the wellness policies were already required for participation in the National School Lunch Program, the Utah State Board of Education, or other policies that were already in place. Most districts did not adopt measures to promote the purchase of healthy foods through pricing or availability of fruits and vegetables. Also, some school districts did not suggest that recess should be a priority as part of the daily schedule in elementary schools. This is frequently addressed in state and national recommendations for children to be able to receive sufficient exercise during the day. The schools that had the highest participation in the free and reduced school lunch program, denoting more low income students, used the strongest language in their policies (28). Because children who come from low income homes are at greater risk for becoming overweight or obese, this suggests that the Utah school districts serving the students at risk have the strongest wellness policies (28).

These local wellness policies have the potential to positively affect the health and well-being of children and will be valuable in the future to the American way of life. The strength and effectiveness of the wellness policies will be the deciding factors as to

whether they will have any effect on diminishing the prevalence of childhood obesity in the United States.

Evaluation is a critical part of any obesity prevention program. This enables school districts to assess the success of their wellness policies. The school wellness policies should be reviewed, reevaluated, and revised annually to assess the outcomes from the policies and incorporate measures to become more effective and produce desired outcomes. Although registered dietitians may not have been included on initial wellness policy committees, they can still contribute by making suggestions for improvement as district wellness policies are reevaluated and revised.

#### Home Environment

Ritchie et al. (15) stated that one of the critical intervention targets for the prevention of childhood overweight is the parent (15). Parents are an important target because they often control the physical and social environments of their children. Parents are responsible for opportunities for recreation, availability of food and children's allowances, which can be spent on energy-dense food or video games (6). The family environment influences children's diet and food-related behaviors and therefore directly affects their weight status (40).

Because parental weight plays such a significant role in the future weight of their children, it is important to involve the entire family when considering how to combat childhood obesity. Fiore et al. (7) found that children whose parents had a higher education, regardless of parental weight, are less likely to become overweight (7).

Furthermore, families whose incomes were above the poverty level were more likely to have healthy BMIs than families who were living at or below the poverty level (7).

Eating breakfast every day, or at least most days, is a protective measure children can take to prevent obesity. Fiore et al. (7) found that eating breakfast is the strongest protective factor against developing obesity (7). Many studies have determined that overweight individuals are more likely to skip breakfast than their normal weight counterparts (15). Skipping breakfast tends to lead to a higher BMI. In addition, skipping breakfast is associated with inadequate nutrient intake and lower cognitive function (15). Those children who eat breakfast often perform better in school (15). However, as children age, they tend to eat breakfast less frequently. Ninety-two percent of children ages 6-11 eat breakfast while only 75-78% of adolescents ages 12-19 eat breakfast (41). If it is difficult to get breakfast at home, parents can enroll their children in the School Breakfast Program to ensure they are getting breakfast each school day.

### **Promotion of Physical Activity**

Parents should be actively involved in helping their children make changes toward being more physically active (27). Parents can have a positive effect on their children's physical activity by limiting television and video game time and not allowing televisions in bedrooms (15). The American Academy of Pediatrics currently recommends that children's television and video game time be limited to two hours per day (24). Also, by not allowing children to eat while watching television, they can pay more attention to what and how much they are consuming. Parents can also encourage physical activity through family outings such as camping, hiking, swimming, walking,



and dancing. Other suggestions for incorporating more physical activity into everyday life include walking with friends instead of talking on the phone, bicycling with family, and taking the stairs. By promoting a more active lifestyle when children are young, children will often learn to enjoy exercise and seek out opportunities to be physically active.

According to Kirk et al. (24), lifestyle exercise provides ways to increase physical activity in everyday life, and encourages regular time for active recreation and organized sports (24). Overweight youth can enjoy exercise by learning that it can be enjoyable, that it does not have to be competitive, and that they can go at their own pace. Families can support lifestyle exercise through household chores and family outings such as going on walks, hiking, swimming, and camping.

When safety is a factor preventing children from being more active, other activities can take the place of outdoor play and sedentary activities (27). Working out to exercise videos, dancing to music, or speed cleaning are some options. Families might also consider investing in a stationary bicycle or another piece of exercise equipment. Some adolescents may not participate in physical activity because of the perception that the only kind of activity that is important is organized sports (27).

Bawa (18) provides the following suggestions concerning physical activity for children (18):

1. Limit television, computer, and video game time. Do not allow any of these in bedrooms.
2. Provide children with a variety of physical activities they enjoy.

3. Do not require children to exercise a certain amount of time or to follow a certain exercise program. Encourage them to play outside.
4. Provide opportunities for children to run, jump, and climb in a safe environment.

### **Food Choices**

Breastfeeding is the first line of defense against childhood obesity. Studies have shown that children who are exclusively breastfed during the first three months of life have a lower risk of becoming obese later in life (10). Lower obesity is observed in children who have been breastfed. The benefits and protection of breastfeeding may not only be due to the nutrient composition of breast milk, but also due to the bioactive substances that may favorably impact metabolism, and the process of breastfeeding, which promotes infants' self-regulation of intake (15). As children grow and begin to eat solid foods, they learn what to eat from their parents. Parents should model healthy eating to help reinforce these practices in their children. "Observational learning occurs when young children learn what and how to eat by watching their parents' intake and reactions to foods, which leads them to adopt their standards of eating" (14).

Children have a natural affinity to sweet foods and a natural aversion to bitter foods such as cruciferous vegetables (14). However, it is the familiarity with foods that ultimately determines a child's food preferences (14). Parents have the responsibility to provide healthy foods for their children and limit those foods that are not as healthy. Generally, children cannot eat foods that are not made available to them. Parents influence their child's preferences by the types of foods they offer. Thus, parents have the

opportunity to help their children enjoy foods that are healthy by offering nutrient-dense foods and limiting availability to high sugar, high fat foods.

Parents have control over the setting in which food will be eaten, whether it is in front of the television or at the table. They can also have a great influence on children's physical activity and eating behaviors. Ellyn Satter, a leading expert on the feeding practices of children, stated that the way parents feed their children has an impact on the future weight of their children (42). She emphasizes that parents and children have their separate roles when it comes to feeding. Parents are responsible for what food is served, when it is served, and where it is served (42). Children are responsible for choosing how much and whether to eat the food provided (42).

Parents have an increasing influence on child food preferences as their children approach adulthood. This is likely because children and parents eat the same types of food over time, and children's food preferences form with familiarity of food. Children form positive and negative attitudes toward food based on their experiences (14). For example, when a parent tells their child he cannot have dessert unless he cleans his plate, he will associate negative feelings with eating. But, when a child is offered several different foods at mealtime and is allowed to choose what and how much he eats, he is more likely to have a positive attitude toward food.

Epstein et al. (43) conducted four randomized treatment studies using three groups. In the first group children and their parents reinforced one another toward behavior changes and weight loss (43). In the second group, children reinforced other children to change their behaviors and lose weight. The third group was a nonspecific group that reinforced families who attended education sessions. The first group, with the

parents and children reinforcing one another, was the most successful of the three groups in decreasing the percentage of overweight in children who maintained their weight loss at five and ten years later (-11.2% and -7.5% respectively) (43). The other two groups actually increased the percentage of overweight. Epstein et al. (43) concluded that parental involvement is crucial for the accountability of the child and improves diet adherence and the likelihood that goals are met (43). Adherence to diets, not the diets themselves, is the key to losing weight and maintaining that weight loss (10).

Parents can have a negative influence on their children's choices by either failing to provide healthy food options or being overbearing and forceful about what choices their child makes regarding food and physical activity. When parents make their children eat, or restrict food, children's internal regulators of hunger and satiety are impaired. Being overly restrictive of intake can lead to weight gain in the future (15). Parents can promote healthy eating environments by making healthy foods readily accessible to children by having fruits and vegetables already cut up for snacks and offering water and milk as the main beverages. Simply stated, children should be encouraged to choose foods and beverages lower in fats and sugars and consume more fruits, vegetables, and whole grains. Nutrient-dense foods, such as fruits and vegetables, are protective against childhood obesity (15). Ritchie et al. (15) offered seven guidelines parents can follow to promote a healthier environment for their children as depicted in the following figure (15).

1. Provide children with ample access to nutrient-dense foods and beverages, and high-fiber foods, both at meals and snack time.
2. Reduce children's access to high-calorie, nutrient-poor beverages and foods, both at home and when eating away from home.
3. When nutrient-poor foods are available, avoid excessive restriction and use of food as a reward.
4. Encourage children to eat breakfast.
5. Work to find ways to increase fun and achievable physical activity in children.
6. Reduce children's television and video game time.
7. Model healthful eating and physical activity practices for children.

**Figure 3.** Seven guidelines parents can follow to promote a healthier environment for their children (15).

### **Family Meals**

During the time that obesity has increased in the last three decades, changes have occurred that have affected the food environment for children (6). Both parents often work outside the home and work longer hours, so meals are more often eaten outside the home. Fifty-three percent of families do not eat meals together (40).

Eating meals as a family is associated with intake of healthier foods, including more fruits, vegetables, and dairy and less fried foods and soda (40). Also, parents are better able to teach their children good nutrition principles by serving balanced, nutritious meals. Eating meals as a family is also associated with improved language and literacy skills and decreased involvement in risky behaviors (40). As children age and are involved in more extracurricular activities, it becomes increasingly difficult to sit down to a family meal. Yet, it has been found that both parents and children have positive attitudes about family meals (40). Cason (40) suggests parents take advantage of those

positive attitudes and make a goal to have at least four family meals a week. The meals do not always have to be sit-down meals at the home, but can include picnics and barbecues as well. Children can feel more involvement in the meal process by helping to shop for and cook the meals (40).

Discipline and conversation about controversial subjects should be saved for a time other than mealtime (40). Mealtime should be a setting with positive interactions so children have positive feelings associated with mealtime. When children have positive experiences with family meals, they will begin to look forward to mealtime.

In summary, the following are suggestions from Bawa and Kirk et al. (18,24) to parents regarding feeding practices and their child's nutrition (18,24):

1. Breastfeed exclusively and allow the baby to follow his/her natural hunger cues.
2. Offer snacks that are naturally low fat, low calorie, and high fiber.
3. Establish a regular meal and snack pattern.
4. Serve appropriate portions at meals. Allow children to leave food on their plates so they can learn to self-regulate their intake.
5. Limit second helpings to fresh fruits or non-starchy vegetables.
6. Drink more water and other sugar-free beverages to replace sweetened drinks.
7. Always feed children a healthy breakfast.
8. Have all food and drinks be consumed in a designated area - not in front of the television or at the computer.
9. When eating out, select more healthful options or split larger servings to share with other family members or peers.
10. Select lower-fat dairy products.

11. Eat more foods that are baked; broiled; grilled, or boiled, instead of fried
12. Select healthful snacks that include a low-fat protein source along with fresh fruit, vegetables, or whole-grain bread or cereals.
13. Do not use food as a reward. Teach children that there are no “bad” foods, and encourage them to choose a variety of healthy foods.
14. Spend time praising the positive things children do instead of focusing on the negative. Redirect their attention when children make unhealthy food choices by offering them a more healthy option.

#### Community Environment

Communities also play a vital role in preventing childhood obesity. People who have lost weight and maintained that weight loss usually remain physically active (13). Remaining active throughout one’s life contributes to weight loss and aids in weight maintenance (1). Communities can help prevent childhood obesity by providing opportunities for citizens to remain physically active.

Communities need to provide safe play areas so that children can play more freely and parents feel their children are safe (1). The community can help solve the problem of childhood obesity by building sidewalks, playgrounds, and parks, making roads bicycle friendly, and hosting community events that promote physical activity. Communities can also aid in prevention by building civic centers so children have safe places to play and fun activities and sports in which to participate. Other ways to promote physical activity are to establish safe biking routes to school and establish a walking school bus, where parents and children walk together to school.

The medical community also plays a part in preventing childhood obesity.

Physical activity assessment should be part of every well child checkup (27). This can be as simple as asking questions on the preliminary health form filled out by the patient or caregiver so that the physician will be better able to address physical activity and nutrition concerns. When warranted, a physician may provide an exercise prescription. Exercise prescriptions are most effective in patients that are ready to make lifestyle changes (27). It is important to identify the benefits of and barriers to physical activity in children who are not ready to incorporate daily physical activity.

Americans today have easy access to energy-dense foods through fast food restaurants, vending machines and grocery stores. The community can also help by requesting that foods offered at restaurants promote a healthy eating environment. From 1972 to 1995, the number of fast food restaurants increased by 147% (14). "The food, beverage, restaurant, entertainment, leisure, and recreation industries share in the responsibilities for childhood obesity prevention and can be instrumental in supporting this goal" (6). The restaurant industry needs to assist in the prevention of childhood obesity by providing healthier foods and smaller portions. This has already begun with some restaurants offering a choice of fruit and milk in kids' meals in place of French fries and soda. The regulation of food labels and portion sizes that restaurants offer is needed (10). Packaged foods' portion sizes are regulated, but restaurants' portions sizes need more regulation because they are often more than an individual needs and vary from restaurant to restaurant. However, even if better choices are offered, the final decision of portion sizes eaten is the consumer's choice.



## CONCLUSION

The increasing number of obese children in the United States has become a major health concern in the population. Energy imbalance due to poor food choices, physical inactivity, media and technology has played a role in the rise of obesity in America. The prevention of childhood obesity requires effort on the part of families, schools, communities, the media, and the government. Some recent prevention strategies include implementing wellness policies in the schools, increasing opportunities for physical activity, promoting nutrition education and better food choices, and demanding more positive messages in the media. These strategies need to become an integral part of the home and family environment first and then become reinforced in the schools and the community in order for American children to develop lifetime habits of healthful living. These strategies will hopefully reverse the present trend of childhood obesity.

Hopefully, current programs for the prevention of childhood obesity will produce positive results. Expected outcomes for these programs include an increased number of children who engage in increased amounts of physical activity and choose healthier foods, and for the percentage of children in the United States who are overweight or obese to decrease. However, methods of evaluation to determine the success of each program, especially the newly implemented school wellness policies, should be developed and implemented. Once data from evaluations of these programs is available, changes in the programs can be made to make them more effective.

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