

During 2003-2004, approximately 17% of children aged 2-19 were considered overweight in the United States (National Center for Health Statistics, 2006). This growing epidemic begins early in life, influenced by prenatal, genetic, family, and environmental factors. A recent study of American 2-4 year olds demonstrated that toddlers who had been overweight were more than 5 times as likely to be classified as overweight at 12 years (Nader et al., 2006). Because obesity in childhood is a key predictor of obesity in adulthood (Welch, 2005), understanding the causes of obesity as well as developing prevention and nutrition programs focused on the pre-school years are paramount.

Overweight among children 2-5 years: US, 1999-2002			
Race/Ethnicity	Gender		
	All	Male	Female
All	10.3%	9.9%	10.7%
Mexican-American	13.1%	14.1%	12.2%
Non-Hispanic Black	8.8%	8.0%	9.6%
Non-Hispanic White	8.6%	8.2%	9.1%

(National Health and Nutrition Examination Survey, n.d.)

Obesity Defined

Obesity is defined as excess body fat. Adiposity is the medical term for the measure of body fat amount (Hodges, 2003). Highly accurate, but expensive ways to measure adiposity include MRI, bioelectrical impedance, and underwater weighing. Less expensive and commonly used methods of measuring adiposity include skinfold thickness, body fat distribution, and weight-height indexes, such as body-mass index

(BMI). Internationally, the BMI is used most often to diagnose obesity in adults and children. For adults, the BMI is calculated by using the following formula (Center for Disease Control, 2006):

$$\diamond \text{ Weight (lb)} / [\text{Height (in)}]^2 \times 703$$

The resulting score places a person into one of four weight status categories: underweight, normal, overweight, or obese.

BMI for Adults (21+)	
BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

(Center For Disease Control, 2006)

For 2-20 year olds, the BMI is calculated using the adult formula. However, weight status is determined using percentile ranges because of children's highly variable growth patterns. The child's BMI score is compared with age and gender specific growth charts provided by the Center for Disease Control. In children, the term "overweight" is synonymous with "obesity."

BMI for Children (2-20 years)	
Weight status category	Percentile range
Underweight	Less than the 5 th percentile
Healthy weight	5 th percentile to less than the 85 th percentile
At risk of overweight	85 th to less than the 95 th percentile
Overweight	Equal to or greater than the 95 th percentile

(Center for Disease Control, 2006)

Fat Cell Development, Obesity, and Health Risks

Though BMI is the most common assessment of weight status category, it does not distinguish between muscle tissue and fatty tissue, also known as adipose tissue. There are two types of adipose tissue: brown and white. Brown adipose tissue is found in infants and generates heat to help regulate temperature. White adipose tissue stores excess energy and consists of two distinct types of tissue. The first type, subcutaneous, is found directly below the skin and helps heat the body. The second type, intra-abdominal, produces hormonal chemicals, called adipokines. Excess intra-abdominal tissue is associated with the development of fat cells and obesity (Shephard, 2006).

Adipose tissue consists of fat cells, or adipocytes. Fat cells perform several functions within the body, including “pumping out vital energy-producing fatty acids, storing fatty acids for future use, and secreting hormones to help regulate body weight” (Bliss, 2006). In obese people, fat cells within adipose tissue are forced to grow in size until they reach their maximum size, break down, and die. Though new fat cells form, the white blood cells, as part of the immune system, appear to gorge on the leftover dead cells, emitting “potentially dangerous amounts of inflammatory chemicals” (Bliss, 2006). This surge of chemicals may contribute to complications like arthritis, diabetes, and heart problems. In obese children, common medical conditions include hypertension, type-2 diabetes, pulmonary complications such as asthma, abnormal growth patterns, psychosocial issues, and musculoskeletal problems (National Institute for Health Care Management, 2003).

Obesity Prevention in Early Childhood

Obesity prevention is a pressing need as health care costs rise in the treatment of its complications. Today, most obesity prevention programs target children who are considered high-risk. For example, those who already qualify as obese or those who have obese parents. Prevention programs include many interventions, from breastfeeding to nutrition programs.

Breast-feeding interventions

Breastfeeding “affects (the) intake of calories and protein, insulin secretion, and modulation of fat deposition and adipocyte development” (Owen, Martin, Whincup, Smith, & Cook, 2005, p. 1375). Research establishes that breastfeeding provides many benefits to children, such as lower cholesterol, fewer allergies, and improved neural development. Current research also suggests that breastfeeding is protective against obesity, but the strength of the connection is not yet clear and may be affected by other factors like race, income, smoking, and mother’s weight.

Arenz, Rückerl, Koletzko, and von Kries (2004) found a small, but consistent protective effect against obesity in breast-fed children when examining multiple scientific studies involving 69,000 children. Another recent study examined the effects of breastfeeding on the obesity level of 4 year-old American low-income children of various ethnicities (Grummer-Strawn & Mei, 2004). They found higher levels of obesity in the children who were breastfed for one month or less. In fact, there appeared to be little to no protection from obesity for children breastfed for 3 months or less, while breastfeeding for 6 months or more offered the strongest benefits. These results were observed in the Caucasian children, but did not carryover to the African-American or Hispanic children in this study. Further research must be done to examine cultural differences in breastfeeding and regular feeding patterns.

Behavior modification/support interventions

Programs focused on changing the behavior of overweight children and supporting their families can be implemented during individual counseling, in school situations, and/or in governmental policy changes.

These programs typically utilize a social learning theory approach, or the modification of individual, behavioral, and environmental factors that are found to be associated with a risk for obesity. While these often improve the health of those involved, they do not always create a measurable difference in BMI score.

Dietary interventions

Dietary-based programs are designed to reduce total energy intake by including low-calorie foods, increasing fresh foods, especially vegetables, and reducing energy-dense, poor-nutrient foods like desserts. In the late 1990's, the United States Department of Agriculture created a food pyramid designed to improve the diets of 2-6 year olds. "The Dietary Guidelines for Americans suggest that fat in preschoolers' diets be gradually reduced from their current levels (34% of total calories) to the level recommended for most people (no more than 30% of total calories) by about 5 years of age" (Center for Nutrition Policy and Practice, n.d.).

Physical activity interventions

Physical activity interventions commonly apply two objectives. First, the level of moderate to vigorous physical activity is increased. Second, sedentary activities, such as watching television, are reduced. Research suggests that a "consistent reduction of daily sedentary time may be as or more important than short periods of vigorous activity for maintenance of long-term energy balance" (Caballero, 2004, p. 91). In a study of a low-income pre-school population, children with a television in their bedroom were more likely to be classified overweight than children without a television in their room (Dennison et al., as cited in NIHCM Foundation, 2003).

Comprehensive nutrition and health education interventions

These programs are designed to improve knowledge and behaviors involved in making food choices and lifestyle choices. Several programs have recently been designed specifically for pre-school age children, some of which are described below:

- *San Antonio Food Bank Nutrition Program*
This program is described elsewhere in the November 2006 Distribution Committee Notebook

- *Food Friends and Fun Moves Obesity Prevention Pilot Project*
This program in progress at Colorado State University focuses on healthy food choices, variety in diet, and increased physical activity for low-income, minority children enrolled in Head Start programs (Administration for Children and Families, 2006).
- *Healthy Start*
This organization's mission is to "provide early educational solutions in the fight against childhood obesity while promoting positive healthy lifestyle choices that affect a myriad of healthy outcomes" (Healthy Start, n.d.). Their system includes three programs focused on wellness behaviors, physical activity/motor skills, and healthy eating for 3-5 year olds. The website indicates that the curriculum has been implemented in many states, including Texas.
- *Nutrition Education Aimed at Toddlers (NEAT)*
Based at Michigan State University, this program works to identify barriers to healthy eating in toddlers enrolled in Early Head Start programs. The program has two sections, nutrition lessons and reinforcing activities focused on food safety, food variety, mealtime behavior, and preparing food for toddlers (Nutrition Education Aimed at Toddlers, 2006).
- *Healthy and Ready to Learn*
A research based pilot project led by the University of Texas at San Antonio Child and Adolescent Policy Research Institute. The project will encompass 150 families in the Edgewood School District who are participating in the City of Can Antonio Early On School Readiness Project. The Project will focus on Child Activities, Family Education, and Child Care Teacher Training.

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