PH W206: Maternal and Child Nutrition - Week 6 Reader

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Week 6 – Part A: Child Obesity

This week's content has been organized into two distinct, but related, units, Part A & Part B; make sure you complete both.

Upon completion of this module, you will be able to:

- Describe childhood obesity risks and complications
- Propose an intervention that addresses childhood obesity

Video Resources

1. [Ritchie, LD: Improving Child Nutrition Programs to Reduce Childhood Obesity](#) (5:07) (no transcript)

2. [NPR: Falling Obesity Rates Among Preschoolers Mark Healthful Trend](#) (3:26)

3. [TEDxBerkeley: Karen Sokal-Gutierrez, M.D.](#) (9:57) (no transcript)

Reading & Resources

Required readings:

*Daniels, S.R., Overweight in Children and Adolescents: Pathophysiology, Consequences, Prevention, and Treatment. Circulation. 2005.

*Hesketh et al. Interventions to Prevent Obesity in 0-5 Year Olds: An Updated Systematic Review of the Literature. Obesity. 2010.

*Institute of Medicine: Accelerating Progress in Obesity Prevention, Report Brief.

* = included in this reader

Welcome to Week 6. There are two parts of this module. The first covers childhood obesity, and the second focuses on malnutrition, or food insecurity. We have discussed childhood obesity throughout the course, but this module gives us the opportunity to delve into this increasingly important topic more thoroughly.

According to the CDC, rates of childhood obesity have doubled in children and quadrupled in adolescents over the past 30 years. You may have even heard that for the first time in history, it's predicted that children will have a shorter lifespan than their parents, in part due to the rising obesity epidemic and its associated morbidities.

The issue of childhood obesity has prompted medical professionals, public health advocates, community leaders, and policymakers to identify interventions to reduce and prevent obesity during childhood. We'll review some of these interventions. And again, I'd like you to keep in mind the socioecological model and how a successful intervention may need to engage stakeholders at multiple levels to create and sustain change.

The second part of this module focuses on malnutrition-- or more specifically, food insecurity. Food insecurity is a household-level economic and social condition of limited or uncertain access to adequate food. Food insecurity affects 15% of the US population, or one in seven Americans.

Several federal food programs are designed to address food insecurity. One of these is WIC, which we've covered previously. However, by far, the largest federal food program is the Supplemental Nutrition Assistance Program, or SNAP, the current name for the food stamp program. SNAP also supports women, infants, and children, as well as adolescents, men, and elderly adults. We will discuss how SNAP differs from other federal food programs, as well as what the research suggests about its links with poor diet, obesity, and cardiometabolic outcomes.

Although these two models seem different, it's important to keep in mind that low-income children and families often experience this double burden of food insecurity and obesity. Because of this, attention has been given in recent years to SNAP and WIC as programs that could potentially alleviate food insecurity and promote healthful eating, thereby reducing obesity. Thus the federal food programs may provide unique opportunities for interventions to address childhood obesity in low-income communities.

AUDIE CORNISH, HOST: From NPR News, this is ALL THINGS CONSIDERED. I'm Audie Cornish.

MELISSA BLOCK, HOST: And I'm Melissa Block. The tide may be turning in the fight against childhood obesity. That's according to a new report from the Centers For Disease Control and Prevention. As NPR's Allison Aubrey reports, the study points to small declines in obesity among low-income preschoolers across 18 states.

ALLISON AUBREY, BYLINE: At a time when one in three children in the U.S. is overweight or obese, the suggestion that the epidemic has hit its peak and may be starting to decline, even in a small way, is momentous. Here's CDC director Tom Frieden.

TOM FRIEDEN: This is the first report to show that many states are having decreasing rates of obesity in our youngest children. And we're really encouraged.

AUBREY: There have been hints of a downward trend in childhood obesity for a while now, especially in cities such as New York and Philadelphia, where there have been lots of programs to fight the epidemic head-on. But this new report suggests that the progress is much broader. In states from Georgia to Missouri and New Jersey to South Dakota, obesity rates among young children are down by about one percentage point.

And in 20 more states, Frieden says, there's been a flatlining. Rates are holding steady. This may not sound like much, but after decades of increases, Frieden says this is a big deal.

FRIEDEN: This is some progress. We're beginning to see a tipping point. We're beginning to see the scales tip in a more favorable, more healthy direction.

AUBREY: So what explains this momentum? Well, Frieden points to federal policies. For instance, more access to fresh food for low-income women and children who receive nutrition assistance. And, he says, increases in breastfeeding rates among new moms, which has also been tied to a decreased risk of obesity.

Pediatrician Margaret Desler of Kaiser Permanente, who treats low-income families in Richmond, California, says another factor that may contribute to this downward trend is the change in how pediatricians and patients approach the issue.

She says, 10 years ago, it was hard to talk about weight.

MARGARET DESLER: It was an awkward, embarrassing conversation to have. I think it was painful to be asked about weight.

AUBREY: But that has changed immensely. Whether it's TV shows like "The Biggest Loser" or the megaphone that first lady Michelle Obama has brought to the issue, our culture talks about obesity a lot. Desler says the way Kaiser Pemanente manages obesity prevention has changed, too.

For instance, she now she charts kids' BMIs, or body mass index, at every visit and talks about it with the kids and their families.

DESLER: I will ask questions about nutrition and styles of eating and content of eating and it just opens up communication lines.

AUBREY: And gets families asking the right questions. Pediatrician Tom Robinson of Stanford University says from his point of view, as part of the push towards transparency, it's little things that can help families make healthier choices. For instance, he points to calorie postings on menu boards.

TOM ROBINSON: These small changes can magnify into very large improvements in health.

AUBREY: Now, no one is claiming a victory over childhood obesity. Experts say it's still a very serious epidemic. But certainly there's widespread optimism given the evidence that the tide has begun to turn. Allison Aubrey, NPR News.

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Overweight in Children and Adolescents : Pathophysiology, Consequences, Prevention, and Treatment

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http://circ.ahajournals.org/content/111/15/1999

AHA Scientific Statement

Overweight in Children and Adolescents
Pathophysiology, Consequences, Prevention, and Treatment

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Samuel S. Gidding, MD; Laura L. Hayman, PhD, RN; Shiriki Kumanyika, PhD, MPH, RD;
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Abstract—The prevalence of overweight among children and adolescents has dramatically increased. There may be vulnerable periods for weight gain during childhood and adolescence that also offer opportunities for prevention of overweight. Overweight in children and adolescents can result in a variety of adverse health outcomes, including type 2 diabetes, obstructive sleep apnea, hypertension, dyslipidemia, and the metabolic syndrome. The best approach to this problem is prevention of abnormal weight gain. Several strategies for prevention are presented. In addition, treatment approaches are presented, including behavioral, pharmacological, and surgical treatment. Childhood and adolescent overweight is one of the most important current public health concerns. (*Circulation*. 2005;111:1999-2012.)

Key Words: AHA Scientific Statements ■ cardiovascular diseases ■ obesity ■ nutrition ■ epidemiology

Cardiovascular disease (CVD) is the leading cause of mortality in the United States and is becoming increasingly important as a cause of mortality worldwide.[1] It is increasingly well known that obesity is an important risk factor for CVD in adults.[2] For >75 years, height and weight tables developed by the Metropolitan Life Insurance Company have been used to assess risk and assign costs to insurance policies, a visible example of the now well-established expectation that overweight is associated with a shorter life span.[3] The prevalence and severity of overweight is increasing in children and adolescents. The short- and long-term association with morbid outcomes raises the level of importance for understanding overweight as a major public health concern for children and adolescents. For children in the United States, overweight is defined using Centers for Disease Control and Prevention (CDC) age- and sex-specific nomograms for body mass index (BMI). These nomograms are based on data acquired from sequential evaluations of representative samples of children in the United States performed during the past 4 decades (the National Health and Nutrition Examination Surveys) but exclude more recent surveys from when the population had shifted to higher BMI. A BMI percentile >5th and <85th is considered normal weight for height; the 85th to the 95th percentile is considered at risk for overweight; and ≥95th percentile is defined as overweight. By late adolescence, these percentiles approach those used for adult definitions; the 95th percentile is ≈30 kg/m². A recent report from the Institute of Medicine has specifically used the term "obesity" to characterize BMI ≥95th percentile in children and adolescents.[4] The term obesity was used in this report in part to more effectively convey the seriousness, urgency, and medical nature of this problem. Thus, the terms overweight and obesity are often used interchangeably in pediatric patients.

This scientific statement examines the pathophysiology and epidemiology of overweight in children and adolescents. We present updated information on the adverse outcomes associated with childhood overweight and discuss approaches for the prevention and treatment of overweight in young individuals.[5]

Physiology of Overweight

Obesity results from an imbalance between energy intake and energy expenditure. Excesses in adipose tissue mass also can be viewed as a pathological derangement in the feedback between energy intake and expenditure. In modern times, this excess in adipose tissue fuel storage is considered a disease; however, a better way to view obesity may be as a survival

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advantage that has gone astray. It is important to remember that what is now considered "pathophysiology" was probably advantageous when food was less available and a high level of energy expenditure in the form of physical activity was a way of life.[6]

The development of adipose tissue in the fetus begins in the mid- to late third trimester of pregnancy. Early in life, the ability of adipose tissue stromal cells to differentiate into triglyceride-filled adipocytes is facilitated; however, the view that the number of adipocytes is unchangeable after birth is historical and not supported by recent observations. Critical periods of adipocyte differentiation may include infant feeding, puberty, after the administration of steroids, and by peroxisome proliferator-activated receptor-λ–mediated adipocyte differentiation in adulthood.[7–9] With weight reduction, a decrease in adipocyte volume but not number occurs[10]; however, after suction lipectomy, the failure of adipocyte volume to change suggests that a new program of adipocyte differentiation becomes operational to return fat mass to baseline.[11] Much in the way of additional research is needed to better understand the development and regulation of adipocyte number/volume from fetal to adult life.

Understanding the regulation of energy intake requires differentiating the short-term signals that control hunger, food intake, and satiety, as well as the long-term signals that relate to the defense of energy stores, lean tissue, or both. In short-term regulation, gastrointestinal signals provide important input to the brain. For the most part, hormones released from the stomach and intestine that affect food ingestion are inhibitory.[12] One example is the recently identified polypeptide YY3-36, which is produced by the L cells of the small intestine. When YY3-36 is infused into lean or obese subjects, reductions in food intake by $\approx$30% are seen.[13] Ghrelin is an exception. This peptide is produced by the stomach and proximal small intestine, and its release stimulates food intake. Ghrelin declines after a meal and rises before the next meal. Ghrelin is elevated in Prader-Willi syndrome,[14] which is a genetic form of obesity accompanied by marked hyperphagia. Ghrelin is dramatically reduced after gastric bypass surgery[15]; this fall in ghrelin is a potential explanation for the sustained anorexia and long-term benefit of this operation.

Adipose tissue is critically involved in feedback regulation of energy balance by the production of a number of peptide hormones, and leptin and adiponectin are 2 of the most important. The absence of leptin produces massive obesity, and treatment of leptin-deficient individuals reduces food intake and body weight.[16] In most obese people, however, leptin has little effect on food intake or body weight.[17] Adiponectin is the most abundant hormone from fat cells, increases insulin sensitivity, and appears to be a cytokine that is antiinflammatory.[18] To a large extent, the signals directed by leptin and other adipose tissue–derived peptides are integrated in the hindbrain and mid-brain through various signals (monoamines, neuropeptide-Y, agouti-related peptide, α-melanocyte–stimulating hormone), which in turn send efferent signals for food seeking and modulation of function of various organs, including the pancreas and muscle (glycerol 3-phosphate dehydrogenase), and in rodents, brown adipose tissue (uncoupling proteins).[19] Metabolism of the adrenal steroid in adipose tissue may provide a mechanism for the increase in visceral fat. When the enzyme 11-β-hydroxysteroid dehydrogenase type-1, which converts cortisol to the inactive cortisone in fat cells, is genetically disrupted, mice develop visceral obesity.[20] This pathophysiology may also apply to humans.

Epidemiology of Childhood Overweight

In the United States, the prevalence of childhood overweight tripled between 1980 and 2000.[21] This increase parallels that seen in US adults during the same period and has been the cause of much concern. In Australia, data from 2 national surveys show that the prevalence of overweight almost doubled between 1985 and 1995.[22] Increases in childhood overweight or obesity have also been observed in Canada and the United Kingdom, China, Germany, France, and Finland.[23]

The definition of childhood obesity remains problematic. Almost all definitions use some variant of BMI. BMI is useful for depicting overweight in the population but is an imperfect approximation of excess adiposity.[24] BMI in children varies with age. This in itself makes BMI definitions of overweight for children more complex than definitions for adults, which use a single cutoff value for all ages. Definitions of overweight that use BMI-for-age can be based on a number of different standards that all give slightly different results, and all are essentially statistical, not functional definitions. They are useful tools, but they should not be overinterpreted. The 2000 CDC growth charts can be used clinically to track growth over time despite being based on cross-sectional and not longitudinal data.[25] The statistical percentiles used to designate overweight ($\geq$95th percentile) and at-risk-for-overweight (85th to 95th percentile) are general guidelines for clinicians and others.[26] The 2000 CDC growth charts facilitate the implementation of these cut points. Another international set of reference values is that provided by Cole et al,[27] based on data from 6 countries—the United States, Brazil, the Netherlands, Hong Kong, the United Kingdom, and Singapore. Overall, various definitions of childhood overweight are useful for tracking prevalence and trends, but these should not be confused with clinical diagnoses or functional definitions. This may be particularly true of the "at-risk-for-overweight" category, which was originally intended as a way to identify children who needed further clinical investigation.

Examination of historical standards for defining overweight in children from many countries tells us that the distribution of BMI is becoming increasingly skewed.[28] The lower part of the distribution has shifted relatively little, whereas the upper part has widened substantially. This finding suggests that many children may be more susceptible (genetically or socially) to influence by the changing environment. Within a variety of developed countries, differences in overweight and overweight trends also occur by social class and by ethnic groups, emphasizing the importance of nongenetic variables.[29–31] There is relatively little understanding of these epidemiological variations.

Critical Periods for Abnormal Weight Gain

A life-course approach to chronic disease (eg, obesity) classifies determinants in several different ways. A critical period refers to a specific period of development when an insult has an enduring effect on the structure or function of organs, tissues, and body systems. If not completely deterministic, these periods are often referred to as sensitive rather than critical. Several models have been advanced to explain which early factors are important in assessing later disease.[32] Although some "insults" or events may occur at a particular period of development, they also may accumulate over time. These events may act independently or be correlated through clustering. Intrauterine influences (environmental factors in utero) have emerged as an important area of investigation. Epidemiological studies have demonstrated a direct positive relationship between birth weight and BMI attained in later life.[33] Although these data are limited by the lack of information on potential confounders, the observed associations appear to be robust. Possible explanatory mechanisms include lasting changes in proportions of fat and lean body mass, central nervous system appetite control, and pancreatic structure and function. Other data suggest that rapid weight gain during infancy is also associated with obesity later in childhood, potentially reflecting an interaction of genetic and postnatal environmental factors.[34] In addition, lower birth weight for gestational age has been associated with later risk for more central deposition of fat, which also confers increased cardiovascular risk.[35] This association may be mediated through changes in the hypothalamic pituitary axis, insulin secretion and sensing, or vascular responsiveness. Accumulated research to date suggests that the combination of lower birth weight and higher attained BMI is most strongly associated with later CVD risk.[36]

Several studies suggest that early rebound of the BMI is associated with an increased risk of higher BMI in adulthood; however, this association may not be independent of the level of BMI in early childhood.[36] BMI rebound refers to a period, usually between 4 and 7 years of age, when BMI reaches a nadir and then begins to increase throughout the rest of childhood, adolescence, and young adulthood. A recent study links early rebound of BMI to glucose intolerance and diabetes in adults.[37] Other data suggest that BMI at age 7 or 8 is as good a predictor of obesity as age at BMI rebound. If the age at BMI rebound is shown to be related to future obesity, then this could provide a useful tool to help prevent obesity because it would identify children at risk before the development of obesity. Important areas for research include explicating the mechanisms through which early BMI rebound may lead to these sequelae and whether the BMI at the age of rebound is as important a determinant as the age at which the rebound occurs.

Whereas research attention has focused on determinants and correlates of overweight and obesity in childhood and adolescence, fewer data are available on factors that may be protective against excess weight gain. Several studies have demonstrated that breast-feeding is associated with a lower risk of obesity in childhood and adolescence.[38] The results are not consistent across studies, with some showing no relationship between breast-feeding and later obesity.[39] Potential mechanisms underlying an association between breast-feeding and obesity remain to be clarified. A particular challenge in epidemiological research in this area is accounting for the confounding influence of other behavioral and socioeconomic factors that may underlie both the decision to breast-feed and the risk of later obesity. Given the multiple benefits of breast-feeding that are already known, encouraging breast-feeding for the prevention of obesity carries few risks.

Adolescence, the transitional period that begins with puberty, is marked by dynamic physiological and psychological changes in both boys and girls. Changes that occur in body composition during adolescence have been well characterized and demonstrate sexual divergence. Specifically, in boys, fat-free mass tends to increase, and body fat as a percentage of body weight decreases. In girls, both fat and fat-free mass increase, and fat-free mass as a percentage of body weight decreases.[40] In addition to alterations in total and percentage of body fat during adolescence, patterns of fat distribution also change. Mediated in part by hormonal influences, patterns of fat distribution during this developmental period also demonstrate sexual differences. Pronounced centralization of fat stores with increases in subcutaneous fat and visceral fat in the abdominal region occurs in boys; this pattern is similar but less dramatic for girls.[41] In addition, fat tends to be deposited peripherally in the breasts, hips, and buttocks in girls during this period. Noteworthy is that the risk of becoming overweight during adolescence appears to be higher among girls than it is among boys. Other observations suggest that up to 80% of overweight adolescents will become obese adults. Adolescence has also been emphasized as a critical period for the development and expression of obesity-related comorbidities in both sexes.[42–45]

The original critical periods hypothesis suggested that obesity with onset in adolescence is more likely to persist into or exert its health effects in adulthood.[46] The data on persistence of childhood obesity to obesity in later life are fairly consistent; however, data on incident obesity are lacking. Specifically, studies of adolescent obesity usually have not included measures earlier in childhood, making it impossible to distinguish between obesity present in adolescence and obesity with onset in adolescence. In addition, the extent to which obesity present or incident during adolescence has enduring effects on the contributors to the metabolic syndrome, either independent of or dependent on central adiposity, remains to be clarified.

Obesity present in adolescence has been shown to be associated with increased overall mortality and specifically with increased risk of CVD and diabetes in adult men and women.[47] Controversy exists, however, about whether the increased risks of these diseases are mediated through their effect on adult weight.

Taken together, the available data suggest the need for additional research focused on identifying the factors that contribute to the onset of overweight in childhood and adolescence and factors that contribute to the persistence of overweight beyond these developmental periods. The observed associations of adult obesity and attendant comorbidities with birth weight, rebound of the BMI, and overweight

TABLE 1. Adverse Outcomes in Childhood Obesity

Metabolic
    Type 2 diabetes mellitus
    Metabolic syndrome
Orthopedic
    Slipped capital femoral epiphysis
    Blount's disease
Cardiovascular
    Dyslipidemia
    Hypertension
    Left ventricular hypertrophy
    Atherosclerosis
Psychological
    Depression
    Poor quality of life
Neurological
    Pseudotumor cerebri
Hepatic
    Nonalcoholic fatty liver disease
    Nonalcoholic steatohepatitis
Pulmonary
    Obstructive sleep apnea
    Asthma (exacerbation)
Renal
    Proteinuria

during adolescence suggest that these periods may be critical for targeting prevention efforts.

Comorbidities Related to Overweight in Youth

Overweight is associated with a number of comorbidities in children. Although the amount of information available about youth is less than that about adults, it is clear that children experience many detrimental effects of overweight similar to adults. Table 1 presents comorbid conditions related to overweight that may present during childhood and adolescence.

Metabolic Syndrome

The Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program defined the metabolic syndrome (also known as the insulin-resistance syndrome) as a cluster of traits that include hyperinsulinemia, obesity, hypertension, and hyperlipidemia.[48] It is estimated that 1 million US adolescents meet the ATP III criteria for the metabolic syndrome. The prevalence of the metabolic syndrome in adolescents is 4% overall, but it is 30% to 50% in overweight children.[49,50] Weiss et al[50] found that each half-unit increase in BMI (converted to a z score) was associated with an ≈50% increased risk of metabolic syndrome among overweight children and adolescents.

The metabolic syndrome is believed to be triggered by a combination of genetic factors in combination with environmental factors such as excess calorie intake and reduced levels of physical activity. The primary cause of the syndrome appears to be obesity leading to excess insulin production, which is associated with an increase in blood pressure and dyslipidemia. The effects of increased insulin resistance are multiple and include increased hepatic synthesis of very-low-density lipoprotein, resistance of the action of insulin on lipoprotein lipase in peripheral tissues, enhanced cholesterol synthesis, increased high-density lipoprotein degradation, increased sympathetic activity, proliferation of vascular smooth muscle cells, and increased formation and decreased reduction of plaque. Fat tissue produces adipokines, including leptin, adiponectin, and resistin, in addition to other cytokines (eg, interleukin-6, tumor necrosis factor-α, plasminogen activator inhibitor-1) that are involved in inflammation. Therefore, the pathological consequences of an excessive increase in body fat are broad and involve a number of organ systems.

The metabolic syndrome has a profound effect on CVD risk in youth. Berenson et al[51] evaluated the presence of aortic and coronary atherosclerosis in young individuals who died from accidental causes and found a striking increase in the extent of lesions with obesity and an increasing number of metabolic syndrome risk factors. Data collected by Pankow and colleagues[52] support the claim that the metabolic syndrome has strong associations with CVD risk factors. Although there are limited prospective data evaluating the long-term implications of the metabolic syndrome in youth, the study of Steinberger et al[53] suggests that obesity in youth is associated with hyperinsulinemia, decreased insulin sensitivity, and increased total cholesterol and triglycerides. The correlation between BMI measured at age 13 and BMI measured at age 26 was 0.75 ($P=0.0001$), whereas the correlation between BMI at age 13 and glucose utilization at age 26 was −0.50 ($P=0.0001$).[53] Data such as these suggest that risk factors associated with the metabolic syndrome that are precursors of CVD can begin in childhood but track into adulthood.

Whether excess body weight is the cause or the consequence of excess insulin in youth remains unclear; however, prospective data suggest that the most important risk factor for the metabolic syndrome is the rate of increase in BMI in youth.

Type 2 Diabetes Mellitus

Concomitant with the rise in the prevalence of overweight and the metabolic syndrome has been a dramatic increase in type 2 diabetes mellitus in youth.[44] Type 2 diabetes mellitus had been primarily a disease of adulthood; however, type 2 diabetes now occurs in adolescents typically with a BMI >30 kg/m^2, a level that would be considered obese even by adult standards. The prevalence of type 2 diabetes mellitus in US adolescents, according to NHANES III, is 4.1 in 1000 individuals, more than double the prevalence of type 1 diabetes mellitus (1.7 in 1000 individuals). This is a particular concern with regard to risk for CVD. The National Cholesterol Education Program has identified diabetes in adults as a coronary artery disease risk equivalent.[48] This leads to the recommendation that adults with diabetes receive aggressive therapy including lipid lowering to prevent cardiovascular

morbidity and mortality. It is not currently known whether the level of risk for adolescents with type 2 diabetes mellitus is equivalent to that for adults. It is also not known whether adolescents typically have a prolonged period of asymptomatic hyperglycemia as is often observed in adults. If adolescents with type 2 diabetes mellitus do have risk for CVD that is similar to that in adults, then it means that they may experience adverse cardiovascular outcomes in the third or fourth decade of life if appropriate intervention to lower risk is not provided.

Inflammation

The association of obesity and inflammation is well recognized in adults. Data on this association in youth are also emerging. In general, inflammation occurs through the activation of the mononuclear phagocytes, which leads to the upregulation of interleukin-1, an upstream regulator with many downstream effects. In the liver, upregulation of interleukin-1 leads to an increase in acute-phase reactants, such as C-reactive protein. Inflammation also increases oxidant stresses, common in obesity, in which free radicals are generated in excess of the ability to detoxify them. This may lead to vascular damage over time. Insulin resistance is a proinflammatory condition, increasing tumor necrosis factor-α and other cytokine production. Inflammation may be an important mechanism for the development of medical complications of obesity, including CVD.

Cardiovascular Abnormalities

It is well recognized that CVD causes a substantial proportion of excess mortality in overweight individuals, as first observed in the London Bus Drivers' study in 1956.[54,55] What remains less clear is whether obesity is a completely independent risk factor or whether it works through other risk factors. The Muscatine study[56,57] and the Bogalusa study[51] have shown convincingly that obesity during childhood and adolescence is a determinant of a number of cardiovascular risk factors, including atherogenic dyslipidemia (increased triglycerides, lowered high-density lipoprotein), hypertension, left ventricular hypertrophy, obstructive sleep apnea, and atherosclerosis.

Adult blood pressure is an important risk factor for CVD. Overweight is associated with blood pressure elevation in both children and adults. In the Muscatine and Bogalusa studies, increased BMI consistently has been shown to be associated with higher blood pressure.[56,58] In the Muscatine study, adult blood pressure was related to the change in BMI from childhood to adulthood.[57]

Increased left ventricular mass is a strong independent predictor of coronary heart disease, stroke, and sudden death in adults. Left ventricular hypertrophy has also been related to overweight in children. It has been shown that lean body mass, fat mass, and systolic blood pressure were independently associated with left ventricular mass in children and adolescents.[59] Moreover, in children and adolescents with essential hypertension, elevated BMI was associated with severe left ventricular hypertrophy.[60]

Obstructive sleep apnea is an emerging cardiovascular risk factor in adults. Obstructive sleep apnea is also associated with obesity in children and adults. Amin et al[61] showed that increased BMI was related to an increased risk of obstructive sleep apnea in children and adolescents. They also showed that obstructive sleep apnea was associated with increased left ventricular mass index in a pediatric population.

There has been concern that overweight may contribute to the development of atherosclerosis. In the Bogalusa study, the relationship of antemortem CVD risk factors to the presence of atherosclerotic lesions was evaluated.[51] The researchers found that a higher BMI was associated with more extensive fatty streaks in the coronary arteries in 15- to 24-year-old men and with more extensive raised lesions in 15- to 24- and 25- to 34-year-old men. This effect of BMI was independent and not explained by other CVD risk factors. Berenson et al[51] also demonstrated that the presence of multiple risk factors, including obesity, is associated with an increased risk of atherosclerosis. This may reflect the influence of clustering of risk factors in the metabolic syndrome.[51] Mahoney et al[62] evaluated the presence of coronary artery calcium in young adults who had been studied as children in the Muscatine study. In the age group 29 to 37 years old, the prevalence of coronary artery calcification was 31% in men and 10% in women. The factors that were associated with coronary artery calcium included weight in childhood, BMI in young adulthood, and BMI at the time of the study, with odds ratios ranging from 3.0 to 6.1. In the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) study of premature atherosclerosis, BMI >30 kg/m^2, increased panniculus thickness, and abnormal glucose tolerance were associated with advanced lesions at young ages.[63]

Psychosocial Abnormalities

There is little information about the relationship between psychosocial factors and obesity in youth. The causal pathways by which psychological disturbances exert influence on body weight are unclear, although the association is likely to be complex rather than simple.[64] The best-studied area is depression. In a study by Pine et al,[65] adults who had been diagnosed with clinically defined major depression during their youth had a greater BMI than adults who did not suffer from depression during their youth (26 versus 24 kg/m^2 at 10 to 15 years of follow-up). Other studies have confirmed the association between depression and subsequent obesity. Goodman et al[66] examined 9374 adolescents in grades 7 to 12 and found that elevated BMI was related to depression at 1 year of follow-up. The depression scores were highest in the children with the greatest increase in BMI.[66] Other studies have supported the premise that psychopathology is associated with obesity in children.[67]

The development of overweight also may be related to subsequent psychosocial difficulties. One of the primary mediators of the psychopathological relations with obesity is compromised peer relationships.[68] Overweight children have fewer friends, and social network mapping suggests that normal-weight children have more relationships with a central network of children, whereas overweight children appear to have more isolated and peripheral relationships. In addition to having fewer friends, being teased about weight is another important mediator of psychosocial distress. Teasing over-

TABLE 2.   Medical Evaluation of a Child or an Adolescent Who Is Overweight

Evaluation of growth: Normal growth makes metabolic or genetic form of overweight less likely
History of sleep-disordered breathing (eg, snoring, nocturnal irregular breathing, diurnal somnolence)
History of irregular menstrual periods, acne, and hirsutism in adolescent girls (evidence of polycystic ovary syndrome)
Blood pressure measurement (with attention to proper cuff size)
Physical assessment for orthopedic abnormalities
Fasting lipoprotein profile
Fasting glucose, insulin
Liver enzymes
Consider if evaluation suggests an abnormality
Glucose tolerance test
Sleep study
Echocardiographic evaluation of left ventricular mass, structure and function, and right-sided abnormalities related to increased pulmonary artery pressure
Hemoglobin A_{1c}

weight youth has been shown to be associated with an increase in both their suicidal ideation and number of suicide attempts.[69]

Understanding the connections between psychopathology and obesity remains an important goal for those studying the pathogenesis and treatment of obesity in both adolescents and adults.

Medical Evaluation of Comorbidities

When an overweight child or adolescent is evaluated for medical reasons, it is important to consider potential comorbidities. A recommended approach to this evaluation is presented in Table 2. This approach should help guide clinicians in identifying medical problems that may require attention in addition to the treatment of overweight.

Prevention of Overweight

Potential interventions for obesity in youth span a continuum from preventing the development of obesity to treating established obesity and its complications. Treatment of obese children, discussed in the next section, can be a strategy for preventing adult obesity. Here, obesity prevention refers to avoiding the occurrence of obesity during childhood and adolescence. Obesity prevention includes both population-oriented and individual-oriented approaches, with an emphasis on population-oriented approaches. Population approaches focus on environmental and policy change (upstream approaches) that have the broadest reach and the lowest intensity and cost and are critical for reaching the least-advantaged population segments (Figure). Treatment interventions (downstream approaches) are individually oriented, usually delivered in specialty care, primary care, and health systems, and are more familiar to health professionals than is population-oriented intervention. Treatment approaches are important and appropriate for children who are already overweight. Individually oriented prevention approaches that
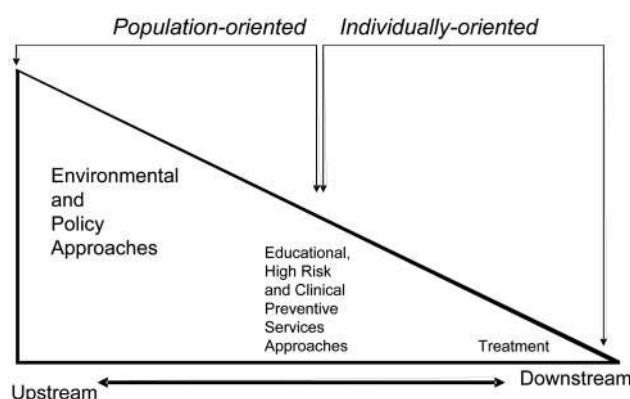
Relative emphasis on population-oriented and individually oriented interventions along the prevention-to-treatment continuum.

focus on children at high risk of becoming overweight resemble treatment approaches in their process and delivery setting. The middle of the continuum in the Figure reflects this overlap between high-risk prevention and treatment approaches. Individually oriented prevention strategies may be highly intensive, costly, and have low reach in terms of the numbers that can potentially be served.

Whereas formal treatment for overweight children and adolescents is delivered almost exclusively in medical settings, the settings in which preventive interventions function extend from medical settings to families and communities. Settings for preventive interventions include schools and other group childcare settings such as day care and Head Start services, maternal and child healthcare clinics, and the Supplemental Nutrition Program for Women, Infants and Children (WIC) programs.

Prevention programs are more likely to be successful if they are based in theory. Although a theoretical orientation does not guarantee success, the absence of a theoretical model tends to lead to interventions that miss opportunities and interferes with the ability to translate specific approaches into general principles. A range of theories is relevant, from those addressing social and community change to those concerned with family functioning to individual cognitive and behavioral processes[70]; however, several concepts are common across many of the models underlying successful interventions. First, the interventions must be designed with specific knowledge of the target audience and the best way to engage them in the process of change, whether the audience is individuals, families, organizations, or governments. This approach includes identifying the specific issues, social and cultural values, and incentives and disincentives that are most salient to the audience in question; factors that will increase the probability that the individual or group will pay attention to, participate in, and be motivated by the change process; exposure to models and practical experiences with regard to the actions relevant to change; and facilitators and barriers to change in the relevant structural and social environments and in the interactions among individuals, systems, and groups.

Identification of relevant differences among subgroups within the population helps to guide the nature of the intervention. "Tailoring" is a deliberate attempt to account for

important individual or subgroup variables when developing program messages or intervention strategies. According to Rakowski, the process of tailoring involves identifying "focal points" for intervention—the interaction of behavior, population, and setting relevant to a given situation.[71] One example of a focal point would be dinnertime (setting) reliance on quick food options (behavior) of working parents of children in day care (population or audience). At an environmental level, a focal point might be policy decisions (behavior) of city legislators (population or audience) related to ensuring safety on school playgrounds (setting). Many elements of tailoring are related to cultural variables—for example, culturally influenced attitudes toward breast-feeding (behavioral) among African American teenage mothers (population) who are clients of a New York City WIC program (setting). Needs assessment and process evaluation to identify elements of these focal points are critical in the development of effective intervention approaches. Defining an initial focal point is one stage of tailoring; the second stage involves further tailoring to individuals within this focal point on the basis of additional variables (eg, household composition in the above example for parents, and regulatory orientation in the above example for policy makers). The definition of the focal points themselves may change as the heterogeneity within population groups becomes evident (eg, recognizing differences in attitudes about breast-feeding between US-born and Caribbean- or African-born mothers or between primiparous and multiparous mothers).

Population-Specific Approaches

For a public health approach, the most desirable prevention goal is to prevent children with a normal, desirable BMI (<85th percentile) from becoming at risk of overweight or overweight. Other levels of prevention also apply to a lesser degree: primary prevention, aimed at preventing at-risk-of-overweight children from becoming overweight (BMI ≥95th percentile), and secondary prevention, aimed at the treatment of overweight children to reduce comorbidities, reduce the severity of the problem, and normalize weight, if possible. Success is most likely to occur if appropriate prevention strategies and interventions are initiated throughout the life course, beginning in infancy. Strategies tailored to children in ethnic minority populations with a disproportionate risk of becoming obese are also needed.

Infants

Both initiation and duration of breast-feeding may reduce the risk of later overweight,[38] in addition to the other benefits of breast-feeding; however, not all studies have found breast-feeding to be protective against the future development of obesity.[39] Breast-feeding is ideal nutrition and sufficient to support optimal growth and development for approximately the first 6 months after birth. Only 64% of mothers initiate breast-feeding, and the number of mothers who are still breast-feeding decreases to 29% by 6 months; only 17% of infants 4 to 6 months of age are still exclusively breast-fed.[72] Rates of initiation and duration are even lower among African American women.

Promoting breast-feeding is a promising prevention strategy given its potential protective effect on later obesity and overall benefits for nutrition. Such efforts require more attention to the incentives and barriers that affect rates of breast-feeding by different subgroups within the population, including the social and environmental variables that support or discourage women's decisions to breast-feed. For example, cultural norms that discourage breast-feeding in public or workplace policies that do not permit women who return to work after childbearing to pump or store breast milk in clean and comfortable circumstances represent significant barriers to the duration of breast-feeding.

Toddlers

Early childhood is a time of rapid growth, development, and learning. Reasons to emphasize prevention in early childhood include adipocyte physiology, adiposity rebound, and the limited potential for reversing metabolic changes associated with overweight. Findings from the Healthy Start Preschool Study suggest that a reasonable goal for preschool interventions would be to aim toward weight gains of 2.5 lb/in (1.0 kg/2 cm) of growth. This rate of gain from preschool age (3 to 4 years) onward predicted desirable weight at 8 to 9 years of age, whereas a gain of 5 lb/in (1.8 kg/2 cm) predicted overweight at elementary school age.[73] Strategies to achieve an optimal rate of pounds gained per inch might help families and children acquire the critical life skills to enable them to better balance energy intake (diet) with energy expenditure (physical activity). Goals are to work toward establishing healthy environments at home, at school, and in the community that encourage families and children to practice and maintain the life skills that are conducive to maintaining a healthy weight.

The important role of parenting skills and teacher training in helping young children learn and practice healthful behaviors has increasingly been recognized. Behavior targets include increasing consumption of fruits and vegetables ("5-a-day"), increasing consumption of fiber-containing grain products, switching from full-fat to 1% or fat-free dairy products after 2 years of age, preparing and eating family meals at home, increasing daily physical activity (eg, active play 1 h/d), and limiting sedentary time (eg, watching television ≤2 h/d).

School-Age Children and Adolescents

Most efforts to prevent obesity among school-age children and adolescents have been implemented in school settings. There is ample evidence that theory-based interventions that include classroom curricula, physical education curricula, changes in school meals, vending machines, and cafeterias, and after-school programs, can increase physical activity and improve dietary patterns in children and adolescents.[74,75] Many of these interventions have not successfully changed weight and body fat, however. Further research is needed to evaluate the specific reasons for this lack of change in body weight, including insufficient duration of the intervention and lack of consistent lifestyle changes outside school.

Additional attention paid to applying theoretical models to develop interventions that are more relevant and motivating to children has produced a growing body of theory-based

interventions in schools that have successfully reduced weight gain and obesity. Two successful recent studies emphasized reducing television, videotape/DVD, and video game use.[76] These interventions addressed school, family, peer, and cultural influences to maximize program adoption and implementation and to allow a sufficient "dose" of the intervention to be received by the participating schoolchildren. The underlying theoretical models prompted interventions that addressed changes in schools as a whole and administrator and teacher behaviors, in addition to the children's behaviors themselves. There are also successful examples of physical education interventions that have resulted in reductions in weight and fat gain by replacing the standard physical education curricula with higher-intensity or more motivating activities, specifically endurance training[77] and popular dance.[78] In contrast, increasing the duration and frequency of the standard physical education curricula alone has not resulted in changes in fitness or body composition.

Exposure to various media may be important in considering population-based prevention efforts. For example, a substantial proportion of the advertising on children's television promotes food, and there is a direct relationship between television viewing and obesity.[79] Furthermore, reducing television viewing has reduced weight gain and the prevalence of obesity in experimental trials.[76,80] It has been hypothesized that television promotes obesity through the consumption of food while watching television, the consumption of foods advertised on television, or reduced physical activity.[79,81,82] Food advertising has become a particularly controversial issue. The Kaiser Family Foundation recently suggested that the relationship between television viewing and overweight in childhood was mediated by the effect of televised food advertising directed at children,[83] and the American Psychological Association called for a ban on all televised advertising directed at children <8 years old.[84] The conclusions of all of the bodies that reviewed this literature, however, have not been consistent.[85] Despite supporting evidence, there is insufficient causal evidence to definitively link advertising directly with childhood obesity.[4]

Children in Ethnic Minority Populations

The challenge of obesity prevention includes the need to develop tailored strategies that are well matched to the social and cultural contexts of children in ethnic minority populations with a high risk of obesity.[86] Eating, activity, and perceptions of weight and health are strongly influenced by cultural norms and culturally influenced attitudes and values. The relevant variables can be considered from programmatic, child, familial, and environmental perspectives that are then each specified along multiple related dimensions such as ethnic identification and related cultural attitudes, beliefs, and values; family and household characteristics; and socioeconomic status variables. Theoretical guidance to inform systematic approaches to developing culturally specific prevention strategies is available but not yet fully used or developed in relation to the specifics of obesity prevention.[86]

Culturally adapted obesity prevention studies in ethnic minority populations identify strategies that deserve further testing.[78,87] Culturally specific programming tends to shift control to the client population and challenges providers to acknowledge their own personal and professional cultural concepts and biases. A fundamental issue is whether the social and familial relationships and cultural practices that define patterns of daily living in the client population are viewed as targets for change, as difficulties to be overcome, or as positive forces that can be leveraged in favor of the programmatic goals. Other important issues are the respective roles of those from inside versus outside the communities of interest and the ability to sustain over the long term programs that are well received and effective in the short term.

Adaptation to ethnically based cultural perspectives is not the only consideration for effective health interventions. As discussed previously, any program should be otherwise theoretically sound. In addition, cultural factors related to obesity prevention are not solely defined along ethnic lines. Cultural variation related to age, generation, and gender is highly relevant to obesity-related norms, attitudes, and practices. The cultural context for obesity prevention also includes mainstream cultural forces such as media that are targeted differently to different demographic groups.

Setting-Specific Approaches

Setting-specific approaches target institutions that provide access to groups of children. Potential childhood obesity prevention settings include schools, Head Start programs, and other centers where preschoolers participate in groups; homes, where preschool children are cared for by parents and other caregivers; healthcare settings, where growth and weight status are routinely monitored; industries that develop television programs and other media, print books, and toys for preschoolers; and community and government programs and policies that affect families with young children. Typical interventions in physical settings are based on individual behavioral theories and designed to enhance motivation and teach behavior-change skills in large groups. In group settings, hands-on experiences with food or activity are often provided on site. Interventions in health care that teach providers effective counseling or deliver additional services can be effective, but there are significant barriers to implementation in such settings. Overall, a strength of setting-specific approaches is the ability to intervene in the setting itself—in other words, to consider the setting as an environment in which policies and practices can be changed to enable targeted behaviors and discourage competing behaviors. The key limitations of setting-specific approaches are that they reach a limited portion of the population and they do not coordinate strategies or messages across settings.

Community-wide approaches include coordinated interventions in multiple settings and may include mass media components. An underlying concept is that behavior-change interventions in multiple sectors, reaching many segments of the population, are needed to create population change. The effectiveness of community-wide interventions is not well established, however.

Environmental and policy approaches are based on the concept that education and motivational interventions will be more effective in social and physical environments where healthful choices are the easier choices. Relevant environ-

TABLE 3.   Weight Management and Treatment Goals Based on BMI Percentile and Health Status

BMI Status	Classification	Treatment Goal
<85th percentile	Normal weight for height	Maintain BMI percentile to prevent obesity
85th–95th percentile	At risk for overweight	Maintain BMI with aging to reduce BMI to <85th percentile; if BMI >25 kg/m^2, weight maintenance
≥95th percentile	Overweight	Weight maintenance (younger children) or gradual weight loss (adolescents) to reduce BMI percentile
≥30 kg/m^2	Adult obesity cut point	Gradual weight loss (1–2 kg/mo) to achieve healthier BMI
≥95th percentile and comorbidity present*	Overweight with comorbidity	Gradual weight loss (1–2 kg/mo) to achieve healthier BMI; assess need for additional treatment of associated conditions

See Table 2.

ments include physical (what is available and promoted; eg, food choices in homes, fast food advertisements on television, opportunities for or barriers to physical activity); economic (financial factors; eg, the price of soda versus water, subsidies to sugar farmers); policy (rules; eg, school food service standards, regulations on marketing that targets young children); and sociocultural (attitudes, perceptions, beliefs, and values such as fast food, everyday food, personal responsibility, and the ethos of governments).[88]

Treatment of Overweight

The principal strategies for the treatment of overweight in children are similar to those for adults (dietary modification and increased physical activity), with treatment goals based on age, severity of obesity, and the results of risk factor assessment. With its emphasis on acute short-term interventions, contemporary healthcare delivery is often not well suited to meet the long-term needs of overweight children and their families. Support for family-based nutrition and behavior-management programs to teach long-term self-management skills is lacking. Guidelines for the treatment of overweight in children are based on age, degree of overweight, and presence of associated comorbidities (Table 3). For children with BMI >85th percentile, there are 3 potential goals for weight management depending on age and the level of BMI: (1) slowed rate of weight gain to achieve BMI maintenance, (2) weight maintenance to improve BMI with increasing height, and/or (3) gradual weight loss at a rate of 1 to 2 kg/mo to improve BMI. Very young children (2 to 4 years old) who are overweight will achieve reductions in BMI percentile by achieving a rate of weight gain <1 kg/2 cm of linear growth. Older children (≥4 years old) who are at risk for overweight (BMI 85th to 95th percentile) or who are overweight (BMI ≥95th percentile) without comorbidities may achieve BMI percentile reductions to <85th percentile with BMI maintenance or more rapidly with weight maintenance during linear growth. Children classified as overweight (BMI ≥95% percentile) with comorbidities require an individualized approach based on the severity of comorbidities and a consideration of the importance of weight loss in conjunction with other treatment modalities. When weight loss is necessary, slow weight loss is recommended for several reasons: (1) The goal is achievable and, with success, provides positive feedback for children who often have low self-esteem, (2) slow weight loss requires a substantial decrease in calorie intake for children who are still growing

and who often have been gaining 20 to 40 lb/y, and (3) the diet adapted to meet a gradual weight loss goal is more easily sustained over a long period. Older adolescents who have completed linear growth and have a BMI ≥30 kg/m^2 require more aggressive weight loss similar to that for adults to reduce their long-term risk.[89] Occasionally, physically fit children have increased BMI secondary to increased lean body mass as opposed to fat mass; these children do not need to reduce BMI percentile to the same target goal as children with greater fat mass.

Guiding Principles

Five guiding principles are important for the treatment of overweight. These guiding principles can be summarized as follows:

1. Establish individual treatment goals and approaches based on the child's age, degree of overweight, and presence of comorbidities.
2. Involve the family or major caregivers in the treatment.
3. Provide assessment and monitoring frequently.
4. Consider behavioral, psychological, and social correlates of weight gain in the treatment plan.
5. Provide recommendations for dietary changes and increases in physical activity that can be implemented within the family environment and that foster optimal health, growth, and development.

Children <85th percentile with no other health risk factors should be screened (weight, height, and BMI percentile calculated and plotted) every year. Identification of risk for overweight before adolescence is encouraged so that health habits can be improved at a stage of increased parental influence and control. Treatment of overweight should rarely be instituted before 2 years of age because of the rapid growth and development that occurs during these early years and lower correlation with overweight in later years. As more is learned about the prevention of overweight, however, the focus on these early years of life may become critical. Importantly, primary care providers should assess diet and activity habits at annual well-child visits; this should be routinely integrated into the overall care plan.

Family involvement is critical in the treatment of childhood overweight. If treatment is initiated when a family is not ready to support the program, then success is unlikely. The treatment planned should also take into consideration long-term management with the continued assessment of the child

for adequate growth and development because overweight is a long-term problem.

Dietary Management

Age-specific dietary modification is the cornerstone of treatment. The major goals in dietary management are to provide appropriate calorie intake, provide optimum nutrition for the maintenance of health and normal growth, and to help the child develop and sustain healthful eating habits. The most recent Dietary Reference Intakes recommend a fat intake of 30% to 40% kcal in children 1 to 3 years old, with a reduction to 25% to 35% in children 4 to 18 years old (compared with 20% to 35% in adults); a carbohydrate intake of 45% to 65% kcal in all children and adults; and protein intakes of 5% to 20% kcal in children 1 to 3 years old with gradual increase to 10% to 30% kcal in children 4 to 18 years old (compared with 10% to 35% kcal in adults).[90]

Assessment begins with an understanding of the child's dietary pattern before any modifications are imposed. Estimated energy requirements vary throughout childhood and reflect large increments with a range of 570 to 3152 kcal/d for boys and 520 to 2368 kcal for girls from age 3 months to 16 years.[84] In addition, caloric needs may vary widely even for children of the same age because of normal differences in size. Thus, individualizing the calorie-intake recommendation and monitoring weight change are essential. Healthcare professionals must help parents or caregivers recognize and prevent overeating. Additional dietary recommendations should include providing adequate nutrition by offering a variety of foods that are low in saturated fat (<10% kcal), total fat (≈30% kcal), and cholesterol (<300 mg/d); promoting age-appropriate serving sizes including ≥5 servings of fruit and vegetables, ≥3 servings of milk or dairy products, and ≥6 servings of whole-grain and grain products per day; consuming adequate amounts of dietary fiber (age in years + 5 g/d). Limiting the intake of salt (<6 g/d) and sugar to follow recommended healthier lifelong dietary habits is also important.[91]

Because it is difficult for parents to judge calorie intake and energy expenditure on a regular basis, it is necessary to help parents guide the diet and physical activity patterns of their children. Counseling and recommendations must be made within the context of the family's culture, living environment, and socioeconomic status. Most dietary strategies for weight loss emphasize balance, variety, and adequacy of the overall eating pattern. Appropriate food portion sizes are recommended for children[92] at varying ages to guide appropriate intake and are critical in the education process. Dietary recommendations also emphasize reducing the number of meals eaten outside the home, planning for healthy snacks, offering healthier, low-calorie food choices (especially fruit and vegetables), and structuring eating times and places for family meals. Involving children in meal planning, shopping, gardening, and preparation of food has been promoted, along with including all caregivers (including grandparents) in helping the child to adhere to recommended consumption patterns and healthier food choices.

Physical Activity

Most reports of successful weight loss and maintenance emphasize the importance of incorporating regular physical activity into treatment programs.[89] Children are similar to adults in that regular exercise provides additional health benefits for overweight individuals, including prevention of future risk acquisition, improved insulin sensitivity, blood pressure reduction, and improved socialization through group participation in activities.[93] Regular physical activity is critical for the prevention of abnormal weight gain and weight maintenance. The current recommendation for the amount of physical activity is 30 to 60 minutes of regular exercise daily. "Working up a sweat" during the activity suggests adequate effort expended. These recommendations apply to children of normal weight as well as to children who are overweight.

Young children should not and many adolescents will not exercise simply to lose or maintain weight. Recommended activities must be enjoyable and congruent with the child's and family's lifestyle and be rewarding independent of the health benefit. Activities such as playing hopscotch, riding bicycles, skating, walking the dog, participating in marching band, jumping rope with friends, dancing, climbing, weight-lifting structured to improve endurance, training during the off-season, and gardening may be more easily integrated into a child or teen's lifestyle than would be simply recommending participation on organized sports teams (these often do not provide sufficient exercise). A complementary approach is to restrict sedentary free-time activities to <2 h/d.[94]

Fitness levels vary significantly among overweight individuals. Whereas one child may not be able to walk several blocks without becoming short of breath, another may be adept at playing sports. Other variables also influence the recommendation for a child's physical activity and exercise program. Some may have easy access to recreational areas and play and exercise equipment, whereas others may not be allowed out of the house for safety reasons. Parental supervision and availability for participation vary greatly and must be considered.

Pharmacological Treatment

Data supporting the use of pharmacological therapy for pediatric overweight are limited and inconclusive.[95] Sibutramine has been studied in a randomized controlled trial of severe obesity. It has been shown to be efficacious as compared with behavior therapy alone, but it may be associated with side effects including increases in heart rate and blood pressure.[96] Orlistat is approved for use in adolescence. The efficacy of orlistat has not been tested extensively in young patients. Orlistat is associated with gastrointestinal side effects and requires fat-soluble vitamin supplementation and monitoring.[97,98] For rare genetic and metabolic disorders, pharmacological treatment may be useful. For example, recombinant leptin is useful in hereditary leptin deficiency. Octreotide may be useful in hypothalamic obesity.[99] Metformin, used to treat type 2 diabetes mellitus, has been used in insulin-resistant children and adolescents who are overweight, but long-term efficacy and safety are unknown.[100]

Surgical Treatment

Surgical approaches to treat severe adolescent obesity are being undertaken by several centers.[101] Indications used include a BMI >40 kg/m^2 and severe associated comorbidities, such as obstructive sleep apnea, type 2 diabetes mellitus, and pseudotumor cerebri. More severe elevation of BMI (>50 kg/m^2) may be an indication for surgical treatment in the presence of less severe comorbidities such as hypertension and dyslipidemia, particularly if the degree of overweight hinders performing the activities of daily living. An experienced team approach including comprehensive medical and psychological evaluation is critical both for selection of appropriate candidates and for postoperative care that is sophisticated and often intense.[102] Weight loss goals and reduction of morbidity are often achieved with gastric bypass surgery. The rates of short-term mortality appear to be low, but significant complications can occur. Intermediate and long-term outcomes, including information on malabsorption of critical nutrients, are unknown. Overall, surgical therapy should be reserved for full-grown adolescents with the severest obesity-related morbidity, offered only by experienced multidisciplinary teams, and presented to families with appropriate informed consent procedures.

Healthcare Delivery Systems

Obesity treatment and prevention require a long-term care model.[103] Substantial changes in the current healthcare delivery system are needed to accommodate the needs of long-term weight management for children as they grow. Children are at risk for not receiving appropriate intervention when physical growth and maturation occur simultaneously and when important lifelong nutrition and physical activity habits are formed. Emphasis should be placed on self-management, in which the child and his or her family (rather than the healthcare provider) set the goal. It is important that children and patients in treatment understand the implications of their choices through a problem-solving approach and that strategies be tailored to individual needs. The effectiveness of this long-term care model is also dependent on a comprehensive team approach that targets the individual, the family, and the many environmental influences affecting the child's behaviors.

Summary

The prevalence and severity of childhood overweight have been increasing dramatically. Childhood overweight is one of our most critical public health problems that threatens to ultimately reverse the favorable trends in cardiovascular morbidity and mortality that have occurred during the past half-century. Immediate action must be initiated to prevent excess weight gain and to treat those children and adolescents who are already overweight. Children and adolescents at risk of developing obesity and its complications must be identified and interventions begun. Strategies must be developed that involve families, the healthcare system, healthcare insurers, government agencies, the school system, the food and entertainment industries, and public health professionals. Support for research on the development and testing of interventions to prevent and treat overweight in young members of our population is needed to provide a strong evidence base for programs and policies.

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Interventions to Prevent Obesity in 0–5 Year Olds: An Updated Systematic Review of the Literature

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The small number and recency of the early childhood obesity-prevention literature identified in a previous review of interventions to prevent obesity, promote healthy eating, physical activity, and/or reduce sedentary behaviors in 0–5 year olds suggests this is a new and developing research area. The current review was conducted to provide an update of the rapidly emerging evidence in this area and to assess the quality of studies reported. Ten electronic databases were searched to identify literature published from January 1995 to August 2008. Inclusion criteria: interventions reporting child anthropometric, diet, physical activity, or sedentary behavior outcomes and focusing on children aged 0–5 years of age. Exclusion criteria: focusing on breastfeeding, eating disorders, obesity treatment, malnutrition, or school-based interventions. Two reviewers independently extracted data and assessed study quality. Twenty-three studies met all criteria. Most were conducted in preschool/childcare ($n = 9$) or home settings ($n = 8$). Approximately half targeted socioeconomically disadvantaged children ($n = 12$) and three quarters were published from 2003 onward ($n = 17$). The interventions varied widely although most were multifaceted in their approach. While study design and quality varied most studies reported their interventions were feasible and acceptable, although impact on behaviors that contribute to obesity were not achieved by all. Early childhood obesity-prevention interventions represent a rapidly growing research area. Current evidence suggests that behaviors that contribute to obesity can be positively impacted in a range of settings and provides important insights into the most effective strategies for promoting healthy weight from early childhood.

INTRODUCTION

The prevalence of obesity is high and increasing in all age groups and most countries worldwide (1,2), with these trends being observed from early in life (3). Behaviors that contribute to obesity, including high-energy dense food consumption (4) and frequent sedentary behavior (5–7), are also prevalent during early childhood (0–5 years of age). Evidence regarding physical activity levels in young children remains inconclusive (8) which is likely due to issues of measurement. Declining diet quality (9), increasing sedentary behavior (10), and decreasing physical activity levels across childhood (11) suggest these obesity-promoting behaviors observed early in life persist.

Given these trends, early intervention to positively impact weight and behaviors that contribute to obesity is vitally important. In 2006, these authors (12) conducted a systematic review of the literature to assess the effectiveness of interventions designed to prevent obesity, promote healthy eating, promote physical activity, and/or reduce sedentary behaviors in 0–5 year olds. The aim was to capture a broad range of research with potential to have positive impact, regardless of study design. Nine studies were identified, predominantly published since 2003. The small number and recency of the early childhood

obesity-prevention literature suggests this is a new and developing research area. A number of reviews of obesity prevention during early childhood have been published in recent years (13–17), all with differing inclusion criteria and predominantly focusing on the preschool age group. The current review was conducted to provide an update of the emerging evidence in this area and to assess the quality of studies reported. The inclusion in this review of a broad range of study designs enables a comprehensive overview of the obesity-prevention literature. The incorporation of a published (18) study quality assessment tool aims to assist with comparison of disparate study designs.

METHODS AND PROCEDURES

The search strategy employed for this review involved the following stages: (i) identification of reviews of childhood obesity prevention and interventions that targeted behaviors that contribute to obesity. Reviews were hand searched to identify relevant publications and identify key researchers and research programs from which additional publications were identified; (ii) key informants were contacted to identify any new or emerging literature; (iii) systematic searches of 10 electronic databases were conducted: Academic Search Premier, Cumulative Index to Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, Communication, Global Health, Health Source: Nursing/Academic, Medline, Psycharticles, PsychINFO, Psychology, and Behavioral Sciences

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Collection. The search strategy involved the keywords: (intervention studies OR communications media OR early intervention OR primary prevention OR health education) combined with each of (overweight), (child nutrition OR diet OR feeding behavior OR feeding behaviour), (physical activity OR play OR exercise), and (television OR sedentary OR inactivity). Inclusion criteria were: peer-reviewed; English-language; published January 1995–August 2008 (regardless of when intervention itself was conducted); reporting an intervention aiming to positively impact weight and/or behaviors that contribute to obesity; reporting child anthropometric, diet, physical activity, or sedentary behavior outcomes; intervention targeting children aged 0–5 years of age. Exclusion criteria were: focusing on breastfeeding, eating disorders, obesity treatment, malnutrition, or elementary school-based interventions.

All abstracts identified from the literature searches were screened by one author for potential inclusion suitability; 96 abstracts were judged to be potentially relevant and copies of full articles were retrieved. Assessment by both authors deemed 23 of these papers met all inclusion criteria and were therefore included in this review with data extracted independently by both authors.

A six-component rating scale (18) was used to assess study quality. This tool assesses selection bias, study design, confounders, blinding, data collection methods, and withdrawals and dropouts. A rating of weak, moderate, or strong is given for each component assessed based on specific criteria. Where a component is not described a rating of weak is given, except for blinding where a moderate rating is given if blinding is not described. A global study rating is derived of weak (two or more weak ratings from the six components), moderate (less than four strong ratings and one weak rating), or strong (four strong ratings with no weak ratings). Both authors independently assessed study quality; any discrepancies in component ratings were discussed and resolved.

RESULTS

The 23 included studies were delivered through a variety of settings: preschool/childcare, home, group, primary care, and mixed settings. Approximately two-thirds involved multifaceted interventions ($n = 14$) and a similar proportion were conducted in the United States ($n = 15$). Just over half of the studies targeted socioeconomically disadvantaged families ($n = 12$) and three quarters were published from 2003 onward ($n = 17$). Design, methodological rigor and effectiveness varied substantially (see **Table 1**).

Description of key studies

Nine of the 23 studies were described in our previous review paper (12). Summaries of the remaining 14 studies appear below, grouped by setting. Details of all 23 studies, including a rating of methodological rigor (18), are provided in **Table 1**. Only three studies received a strong methodological rating, all conducted within the preschool/childcare setting. Of the remaining 20 studies, 14 were rated as moderate and 6 were rated as methodologically weak.

Preschool/childcare-based studies. The preschool/childcare setting was the most commonly targeted setting for interventions involving young children. Despite diverse study designs, populations and targeted outcomes, one-third of these studies achieved clear success in modifying their respective outcomes of interest (reduced fat intake (19), increased physical activity (20), and reduced sedentary behavior (5), respectively). A further third (21–23) showed some evidence of success on some outcomes. Unlike studies reported in other settings, the methodological

quality of these studies was generally high (strong or moderate rating). However, inconsistencies within the preschool and childcare setting (e.g., structured vs. unstructured, sessional vs. long-day), makes generalizability difficult. Two studies (5,21) conducted in the preschool/childcare setting were described in our previous review (12), a further seven are described below.

Alhassan and colleagues' (24) pilot randomized controlled trial (RCT) aimed to increase daily physical activity in 3–5-year-old low-income Latino children by increasing outdoor free-play time in their structured preschool setting. Intervention group children ($n = 18$) received double the usual amount of outdoor free-play time (4×30-min sessions) for two consecutive days. Children in the control group ($n = 15$) received their usual 2×30-min sessions. Children in both groups (59% response) wore accelerometers for 4 days, 2 days before the intervention and the two intervention days. Baseline physical activity levels between groups were similar with all children spending >90% of their time being sedentary. No between group differences were found for changes in average activity counts, percent of time spent in sedentary, light, or moderate-to-vigorous physical activity for the total day, during school hours or during the after school/evening period.

A cluster-RCT (Hip-Hop to Health Jr.) aiming to prevent obesity in minority 3–5 year olds delivered an identical intervention to two separate cohorts. Results for the first cohort, of predominantly African-American children (21) indicated lower BMI increases in the intervention group at both 1- and 2-year follow-ups and were reported in our previous review (12). Results for the second cohort, of predominantly Latino children, are described here (25). Twelve Head Start preschools servicing predominantly Latino children were randomly allocated to a weight control intervention or general health programme (control group). The weight control intervention ($n = 202$) involved three 40-min sessions/week for 14 weeks comprising 20-min healthy eating or physical activity education and 20-min aerobic physical activity. Parents received weekly homework and newsletters containing complementary dietary and physical activity information, and were offered twice weekly aerobics classes. The control group ($n = 199$) received a general health programme involving 20-min general health education once per week for 14 weeks and parents received a weekly general health newsletter. While response rate was not reported, postintervention (14 weeks) retention was 97%, with 86% and 85% completing 1- and 2-year follow-up assessments, respectively. At baseline, control group children had higher mean BMI z-scores ($P = 0.02$) and a greater proportion were Latino (89 vs. 73%, $P < 0.001$). No differences in BMI, dietary, physical activity, or television viewing outcomes were observed between groups at postintervention, 1- or 2-year follow-ups.

Mo-Suwan and colleagues (22) aimed to reduce obesity prevalence in preschool children by implementing an exercise program. This cluster-RCT involved second year kindergarten classes from two preschools. Classes were randomly allocated to the control or intervention condition. Control group children ($n = 145$) received their regular physical activity program. Children in the intervention group ($n = 147$; 75%

Table 1 Summary of studies: focus, design, sample, quality assessment, and outcome

Study	Focus				Design	N	Age at commencement	Duration	Follow-ups	Quality[a]	Outcome[b]
	Anthro	Diet	PA	SB							
Preschool/childcare settings											
Alhassan et al. (24)			X		Pilot-RCT	32	3–5 Years	2 Days	0	2	0
Dennison et al.[c] (5)				X	Cluster-RCT	176	2.5–5.5 Years	6 Months	6 Months	2	+
Fitzgibbon et al.[c] (21)	X	X	X		Cluster-RCT	409	3–5 Years	14 Weeks	1 and 2 Years	2	?
Fitzgibbon et al. (25)	X	X	X		Cluster-RCT	401	3–5 Years	14 Weeks	1 and 2 Years	2	0
Mo-Suwan et al. (22)	X		X		Cluster-RCT	292	Mean 4.5 years	30 Weeks	0	1	?
Reilly et al. (26)	X		X	X	Cluster-RCT	545	Mean 4.5 years	24 Weeks	6 Months	2	0
Specker and Binkley (28)	X		X		RCT	239	3–5 Years	12 Months	6 and 12 Months	2	?
Trost et al. (20)			X		RCT	42	3–5 Years	8 Weeks	0	1	+
Williams et al. (19,30)		X			CCT	≈1,000	2–5 Years	2 Years	0	1	+
Home-based settings											
Cottrell et al. (34)		X	X		Cluster-RCT	50	4–6 Years	4 Weeks	0	3	?
Fitzpatrick et al. (37)		X			CCT	39	Birth	1 Year	0	2	+
Harvey-Berino and Rourke[c] (31)		X	X		RCT	43	9 Months–3 years	16 Weeks	0	2	+
Johnson et al. (35)		X			RCT	232	Birth	1 Year	7 Years	2	?
Sääkslahti et al. (38)			X		RCT	228	4–6 Years	3 Years	0	3	+
Wardle et al.[c] (32)		X			RCT	143	34–38 Months	14 Days	0	2	+
Watt et al. (39)		X			RCT	312	3 Months	9 Months	6 Months	2	0
Worobey et al.[c] (33)		X			Pre/post	60	Mean 27 months	8 Months	0	3	+
Group-settings											
Condrasky et al. (41)		X			CCT	29	Preschool	6 × 2 h	0	3	0
McGarvey et al.[c] (40)		X	X		CCT	336	3 Years	1 Year	1 Year	2	?
Primary care settings											
Johnson et al.[c] (42)			X	X	Interrupted time series	10,204	n/a	6 Months	6 Months	3	?
Talvia et al. (45)		X			RCT	1,062	7 Months	10 Years	0	3	?
Mixed setting											
Horodynski and Stommel[c] (46)		X		X	CCT	135	19 Months	6 Months	0	2	?
Johnston et al. (47)		X		X	CCT	439	Birth (prebirth)	30 Months	0	2	+

Anthro, anthropometry; CCT, controlled clinical trial (nonrandomized); PA, physical activity; RCT, randomized controlled trial; SB, sedentary behavior.
[a]Quality (methodological rigor as assessed by six-component rating scale described in Methods and Procedures section (18)): 1, strong; 2, moderate; 3, weak.
[b]Outcome: +, intervention was beneficial; 0, no effect; ?, unclear; beneficial for some but not all outcomes or participants. [c]Reported in previous review (12).

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response) received an additional 15-min walking and 20-min aerobic dance three times per week for ~30 weeks. Outcomes were assessed at baseline, twice during the intervention, and at the conclusion of the intervention. The prevalence of obesity assessed from two measures of triceps skin-fold thickness decreased in the intervention group (12.2–8.8% ($P = 0.06$) more than in the control group (11.7–9.7%, $P = 0.18$)). No between group differences were found in BMI or weight/height³. However, the likelihood of having an increased BMI slope was lower in intervention than control group girls (odds ratio = 0.32, 95% confidence interval = 0.18, 0.56), but not boys.

Reilly and colleagues (26) aimed to reduce BMI with the Movement and Activity Glasgow Intervention in Children, by increasing physical activity and reducing sedentary behavior in this cluster-RCT. A random sample of 36 preschools were selected from 104 of a possible 124, stratified by type of preschool (school, class, extended day, private sector), size (area and number of children), and area socioeconomic status. Pairs of preschools from the same stratum were randomly selected and randomly allocated to intervention or control group. Two staff from each intervention preschool attended three training sessions on the enhanced physical activity program consisting of three 30-min physical activity sessions per week for 24 weeks. In addition, intervention group families were given information on linking physical play at preschool and home and opportunities for increasing physical activity and reducing television viewing time. Posters on increasing physical activity through walking and play were displayed in preschool centers for 6 weeks. Baseline data was provided from 545 children (47% response). No between group differences in BMI were observed at 6 months (before end of intervention) or 12 months (5–6-months postintervention). Similarly no differences were observed for physical activity assessed by accelerometry on a subsample of 285 children at 6-month follow-up (not assessed at 12 months). Children in the intervention group showed significant improvement in fundamental movement skills at 6 months (not assessed at 12 months).

Multiple papers (23,27,28) report data from a RCT aiming to improve bone mineral content in 3–5 year olds. The intervention involved four arms: (1) calcium supplement plus physical activity ($n = 43$), (2) calcium supplement plus fine motor activity control ($n = 45$), (3) placebo plus physical activity ($n = 45$), and (4) placebo plus fine motor activity control ($n = 45$). Results were reported for the physical activity program independently; arms 1 and 3 results were compared with arms 2 and 4. The physical activity intervention consisted of 30-min of gross motor activity 5 days/week for 12 months involving a 5-min warm up, 20-min jumping, hopping, and skipping activities, and 5-min cool down. Five days per week for 12 months, children in the control group received 30-min of fine motor activity (e.g., art and craft) designed to keep them sitting quietly. Of the 239 children providing baseline data (response rate not reported), 74% provided mid-intervention (6-months) and postintervention (12-months) outcomes; 90% of these completed 6-months and 1-year postintervention

follow-ups ($n = 161$). Children in the intervention group recorded significantly higher physical activity levels, assessed by accelerometry, than control children mid- and postintervention which persisted 6-months postintervention but was not observed 12-months postintervention (6- and 12-month postintervention data collected on subsample of 60 children). No differences in body weight or percent body fat, assessed by dual-energy X-ray absorptiometry, were observed at any time point.

Numerous papers (19,29,30) report the Healthy Start Project, a 3-year demonstration project implemented in Head Start preschools for socioeconomically disadvantaged children, with the aim of reducing cardiovascular risk factors in 3–5 year olds. Healthy Start involved a usual care control condition and two intervention conditions and was implemented for 2 years. One intervention condition involved menu modification designed to reduce the total fat and saturated fat content of meals and snacks served at preschool. The second intervention condition involved the menu modification plus a curriculum component whereby children's health education focused primarily on nutrition. Allocation to one of the two intervention conditions was random, however, control group preschools were those who indicated they were unable to make changes to their food service. Sample size is unclear, with reports of the number of children involved differing between papers, from 296 to >1,000. There was a significant decrease in saturated fat from 13.5 to 8.0%, and total fat content from 31 to 25% of daily energy of meals served at intervention preschools, with no change observed in control preschools ($P < 0.001$). Dietary observation found reduction in percent energy from total fat and saturated fat consumed by children in the intervention preschools. Children in both intervention groups demonstrated a significant decrease in total serum cholesterol compared to control group children (−6.0 vs. −0.4 mg/dl) but there was no impact on height to weight ratio.

Trost and colleagues (20) report a RCT aiming to increase preschool children's physical activity at a single childcare center with four classes of children attending an inclusive half-day preschool program for 2½ h on each of 4 days/week. After 2 weeks of baseline assessment, classes were randomized to intervention (20 children) or a usual care control condition (22 children; 88% response). Intervention classes received an 8 week "Move and Learn" program involving integration of physical activity into all aspects of the curriculum. Teachers and staff in the intervention classroom attended a 3-h training session and received a video demonstrating "Move and Learn" activities. During each preschool session teachers selected a minimum of two activities lasting ≥10 min to conduct. Physical activity was monitored by accelerometers and 15 min of direct observation during preschool sessions 2 days a week. Physical activity levels, assessed by accelerometer, were similar between groups for the first 6 weeks of the program. Intervention group children demonstrated significantly higher levels of moderate-to-vigorous intensity physical activity than controls in the final 2 weeks and the final 4 weeks when only classroom time was assessed. Higher levels of moderate-to-vigorous intensity

physical activity were found in intervention group children compared with control group children for the duration of the program using direct observation.

Home-based studies. The home was another common setting for interventions involving young children. While each of the home-based interventions identified involved quite different population groups, interventions, and outcomes of interest, most showed some positive impact on some behaviors that contribute to obesity. Three (31–33) home-based studies were described in our previous review paper (12), a further five are described below.

Cottrell and colleagues (34) aimed to assess the impact of a 4-week physical activity plus dietary information intervention called CARDIAC-Kinder. In a cluster-RCT children were recruited via preschools for this intervention which was delivered in the home setting. The intervention group received a pedometer for themselves and a parent plus a log book to record their daily steps. Parents received information about age-appropriate diet and exercise guidelines for preschool children and ideas on how to increase exercise, particularly steps. Intervention children whose BMI was ≥85th percentile (number not reported) were also given information on ways to reduce caloric intake. Children in the control group received a pedometer for themselves (but not their parent) plus a daily steps log book. Control parents received the same information about age-appropriate diet and exercise guidelines but no information on how to increase exercise. While 437 children (50% response) from rural areas were recruited to receive the intervention, data were available for only 24 intervention and 26 control group children. Higher mean weekly step counts were recorded by intervention children compared with controls, however, differences were only significant in the final week of the intervention (9,815 vs. 7,799 steps). Intervention group children consumed significantly fewer sweets per week than those in the control group but differences were not reported for average weekly intake of fruits, vegetables, meat, or bread.

Seven-year follow-up data are reported (35) for a RCT involving an intervention focusing on parenting skills for first-time parents in disadvantaged areas. The Community Mothers' Programme (36) was delivered by volunteer "community mothers" identified by local public health nurses. Each volunteer supported 5–15 first-time parents via once monthly visits over their child's first year of life, focused on health care, nutritional improvement, and child development. Results immediately postintervention fall outside the scope of this review (published pre-1995) but showed that children in the intervention group ($n = 127$) were significantly more likely to consume appropriately from all food groups than were controls ($n = 105$). In this study, diet was assessed by 24-h recall with intakes categorized as inappropriate when the subject reported eating not enough or too much from a food group when compared to dietary guidelines. The 7-year postintervention follow-up assessed one-third of the original group (38 intervention and 38 control mothers) when children were 8-years old. No significant differences in overall child diets were observed between groups. However,

children in the intervention group performed consistently better, from 11% to 63% better, than control group children for individual food groups. While not significant, intervention group mothers were 12% more likely to limit children's television viewing to 9 PM ($P = 0.09$).

Fitzpatrick and colleagues (37) aimed to assess the Community Mothers' Programme (described above) (36), in a socially marginalized and disadvantaged traveling community. Outcomes for these mothers and children were compared to those of intervention and control families in the original RCT informing this work (36) as recruitment of a concurrent control group was considered unachievable. In comparison to mothers involved in the RCT, these disadvantaged mothers ($n = 39$; response rate not reported) were significantly older and less educated than RCT control but not RCT intervention mothers. Their children were significantly older than children of mothers involved in the RCT, and were not always first-born. Mothers in this study received significantly fewer home visits than did mothers involved in the RCT (mean 8.9 vs. 9.5 visits, respectively). Children in this study scored better than RCT controls for consumption of all food groups, except fruit, and for energy intake. They were also less likely to begin cow's milk before 26 weeks of age.

Sääkslahti and colleagues (38) aimed to influence 4–6-year-old children's physical activity through a 3-year family-based intervention. Families involved in a larger study were randomly selected to participate in this RCT (response rate not reported). The control group ($n = 112$) received no information, while intervention group parents ($n = 116$) attended three annual intensive educational meetings with researchers. Meetings dealt with the importance of sensory integration (thought to occur through children's involvement in physical activity), relations between physical activity, cognitive development and academic achievement, and how and where to find physical activities and venues that children might enjoy. Parents were also provided with printed education materials twice yearly and relevant review articles. In the second year of the intervention, parents were asked to listen to a radio program entitled "The importance of being physically active". Intervention group children attended three annual physical activity demonstration sessions lasting 45–60 min. Attrition was 26% of intervention and 24% of control families. Children's physically activity was assessed using diaries completed by the parents twice yearly over the 3 years. The intervention group spent less time playing indoors ($P = 0.05$) and more time playing outdoors ($P = 0.04$) than the control group. Time spent outdoors increased in both groups over the 3 years, but more strongly in the intervention group. Further, intervention but not control group children spent more time in "high-activity play" (e.g., running, jumping, and other physical exercise) as they grew older ($P < 0.001$).

The Infant Feeding Peer Support Trial (39), a RCT, aimed to improve infant feeding practices to a consecutive birth cohort by providing peer support to low-income mothers. Control group mothers received usual care ($n = 155$) and intervention group mothers ($n = 157$; 82% response) received monthly

home visits from matched peer support volunteers, commencing when their baby was 3 months old until their baby was 12 months of age. Volunteers provided nonjudgmental advice and support and practical assistance on infant feeding practices, particularly weaning. Outcomes were assessed at baseline, postintervention (77% retention), and 6-month follow-up (68% retention). At postintervention and follow-up, no differences between groups were observed in child anthropometric measurements or nutrient intake. Children in the intervention group were more likely to be eating the same foods as the rest of the family and to be eating three meals per day than the control group postintervention, when 12 months of age.

Group-based studies. Two group-based studies were identified, one (40) described in our previous review (12) and one described below. These studies were quite different in setting and focus, but both demonstrated some level of effectiveness. While not utilizing existing social groups per se, both tapped into groups in existing settings thus participants within groups are likely to have been similar to one another and potentially familiar with one another. These studies demonstrate the potential positive benefits of group-based programs.

Condrasky and colleagues' (41) sought to promote healthful eating behaviors by teaching parents and caregivers basic nutrition, food selection, menu planning, and food preparation skills in a nonrandomized controlled trial. The program, Cooking with a Chef, teamed a chef with a nutrition educator. Lessons were conducted in 2-h sessions during the week in late morning blocks and concluded with serving lunch. Although not explicitly reported, it appears there were six sessions covering menu planning, using fruits and vegetables, culinary skills, use of flavors, food labels, and dietary fiber. The intervention group ($n = 15$) comprised a random sample of parents and caregivers of preschool children from a church group. The control group ($n = 14$; response rate not reported) were randomly selected from a different church group. Pre-post intervention comparisons showed the number of daily fruit servings consumed by children in the intervention group increased after the intervention, although this did not reach statistical significance ($P < 0.10$).

Primary care-based studies. Two studies (42) delivered in the primary care setting were described in our previous review (12). Additional results for one of these studies (43,44) have recently been published and are described below. Both studies showed some evidence of positive impact on the outcomes of interest. Despite both being rated as methodologically weak, these results suggest primary care may be a useful setting to initiate interventions during the early childhood period.

Recently published (45) fruit and vegetable intake outcomes from a RCT that recruited families via well-baby clinics and was reported in our previous review (12) are described here. Intervention families ($n = 540$) received individualized and repeated parental dietary counseling focused on the reduction of the child's saturated fat intake with the ultimate aim of reducing coronary heart disease risk factors. Counseling

sessions occurred at 1–3 month intervals from when the child was aged 7 months until 2 years of age and then biannually to 10 years. Once children were aged 7 years, separate dietary counseling sessions were organized for the child and the parents. Control group parents ($n = 522$) were seen biannually until the child was aged 7 years and annually thereafter with limited discussion of diet and no counseling on fat intake. The proportion of energy provided by fruits and vegetables reduced over the 10 years of assessment, although total grams of vegetables increased throughout childhood. Intervention boys, but not girls, consumed significantly more vegetables than controls (mean difference 3.2 g/day; confidence interval 1.5–4.9; $P < 0.001$). Intervention boys also consumed significantly more fruit than controls (mean difference 10.1 g/day; confidence interval 5.3–14.9; $P < 0.001$).

Mixed-setting studies. Studies in which the intervention was delivered across more than one setting were classified as mixed-setting studies. Two such studies were identified, one (46) described in our previous review (12) and one described below. Both studies involved nonrandomized controlled trials, were rated as moderate methodological quality and focused on improving diet and reducing television viewing and showed some evidence of success.

Johnston and colleagues (47) compared usual care (control) from birth with a clinic program known as Healthy Steps for Young Children, implemented with and without an additional antenatal program known as PrePare. The Healthy Steps program consists of risk reduction activities and universal components, including developmental screening, anticipatory guidance, and follow-up services delivered by a Healthy Steps specialist. Services were delivered via home visits, parent-initiated telephone support and parenting classes. The PrePare program was designed to enable the Healthy Steps specialist to also work with the parent during pregnancy. PrePare was delivered as three home visits at 20, 27, and 34 weeks gestation focused on helping parents create a safe, knowing, and welcoming environment for their baby and providing screening and intervention for targeted risk factors such as smoking, depression, and domestic violence. A consecutive sample of 439 pregnant women (80% response rate) were recruited from five primary care clinics. Outcomes were assessed when the child was 30 months old (78% retention). Of importance to this review, parents who received Healthy Steps, when compared to the control group, were significantly less likely to allow their child to watch >1 h of television (34 vs. 50%). There were no dietary or physical activity benefits of combining PrePare with Healthy Steps.

DISCUSSION

This article appraised the peer-reviewed literature published between 1995 and mid-2008 that reported interventions which aimed to support parents and other caregivers to positively influence young children's body weight and/or the obesity-promoting behaviors of dietary intake, physical activity, and sedentary

behaviors. This review aimed to update and extend a previous review conducted by these authors in 2006 (12). It is clear that obesity-prevention interventions focusing on children between the ages of birth and 5 years are gaining increasing attention from researchers, as evidenced by the rapid increase in publications in recent years. Further, it is likely that additional programs targeting young children have or are currently being conducted but have not yet been published in the peer-reviewed literature. In fact, the authors are aware of several studies currently being conducted with this age group (48,49). However, the evidence base remains relatively sparse, particularly when compared to interventions that focus on school-aged children. Given that obesity (3) and behaviors that contribute to obesity (4–6) have been shown to be prevalent during early childhood and to track across childhood (9–11), the importance of early intervention cannot be understated.

While the 23 studies identified in this review varied widely in their objectives, designs, mode, and setting of intervention delivery, there were some common elements to their design. Most studies employed multiple modes of intervention delivery and the majority of studies were conducted in either the home or preschool/childcare settings. While the majority of studies included in this review employed a design to provide the highest level of evidence, the RCT (50), the quality, and reporting of some studies was less than ideal. It should be noted, however, that the quality rating (18) employed in this review precluded well-designed studies from receiving the highest quality rating (strong) if either their response or retention rates fell below 60%, aspects of the study which often fall outside the researchers control. In general, studies conducted in the preschool/childcare setting received the highest quality ratings (all rated as strong or moderate, no studies rated as weak). The structured nature of these settings may make it easier for researchers to apply rigorous methodologies than in the less predictable home-based settings.

While some studies appeared effective, being able to show some level of effectiveness on some behaviors that contribute to obesity in young children, others showed no impact on the outcomes relevant to this review. In particular, many of the studies reported in the preschool/childcare setting showed no evidence of effect on behaviors that contribute to obesity despite, in many cases, strong study designs. Many of the studies implemented in the preschool/childcare environment had a focus on increasing physical activity, and given the very low levels of physical activity typically observed in preschool settings (7) there appears to be great scope for improving physical activity in these settings, despite the limited success reported by the studies reviewed here. While a number of factors may help to explain the lack of findings in these studies, including insufficient sample sizes to detect what may be small but meaningful changes, a notable observation is that most of these preschool/childcare-based studies lacked a parental component. It is possible that during these early childhood years, parental involvement is important and perhaps vital for observable and lasting changes to be effected

in childhood behavior. Further, the preschool settings in which many of these studies were conducted were school-like (e.g., structured curriculum and timetabling, long-day rather than sessional programs). Traditionally, the literature in the area of obesity-prevention interventions has focused upon interventions targeting school-aged children which have been predominantly school-based and demonstrated limited success (51). It is possible that the preschool setting interventions described here are reflective of these school-based studies reported in older children and suffer the same limited success.

Despite the diversity of the study methodologies and intervention designs employed in the studies reviewed, certain common aspects may be useful in the consideration of the most promising strategies by which to support parents and other caregivers to achieve healthy weight outcomes in young children. Interventions which showed evidence of success were designed to impact not only on knowledge but also on skills and competencies suggesting a social behavioral theory underpinning. As discussed above, lack of parental involvement may have limited success suggesting a vital role for parents in facilitating real and sustainable behavior changes during this early childhood period.

Differences in demographic characteristics of participants and settings of studies reported in this review are likely to limit the generalizability of the studies reported. In particular, two-thirds of identified studies were conducted in the United States and may not be generalizable to settings in other countries. Approximately half of the studies targeted socioeconomically disadvantaged families, predominantly through existing infrastructures which, again, may not exist in other countries and which may not be transferable to the wider population. However, there are likely to be points of overlap in population groups and infrastructures which may facilitate transference of interventions to different settings.

A common limitation of the studies reviewed was failure to report data on the cost-effectiveness of the intervention programs evaluated. Given the intensive nature of many of the interventions reported and the small impacts resulting from some interventions, estimates of cost-effectiveness would be beneficial. Similarly, studies did not report the theoretical underpinning of their interventions. Such information could assist in assessing whether particular theoretical frameworks are more likely to lead to the development of successful obesity-prevention interventions. A further observation is that, despite many studies employing a randomized controlled design, most failed to report their studies using the Consolidated Standards of Reporting Trials (CONSORT) guidelines (52). As such it was often difficult to elicit the required information to assess the quality and rigor of the study design and methodologies used.

Another noteworthy observation is that this review found little evidence of continuity in research activities to build and advance the evidence base in this area. There was no evidence of multiple separate studies conducted by the same researchers which attempt to build on lessons learnt from previous

intervention attempts. With the exception of the Community Mothers Programme (35,37), and Hip-Hop to Health Jr. (21,25) there was little evidence of attempts to test generalizability of program success to different population groups. The current approach appears to be piecemeal, and likely reflects the current way research is funded.

The studies reviewed here provide a mixed picture of the ability of intervention programs to change behaviors that contribute to obesity in young children. However, importantly they support the premise that parents and caregivers, even those most at risk of rearing children who will become overweight or obese, are receptive to intervention programs and in some cases can be supported to make positive changes to dietary, physical activity, and sedentary behaviors of their young children. Further workers engaged with socioeconomically disadvantaged groups who are at higher risk for obesity, and those providing childcare and early education services are willing to implement obesity-prevention programs. While the evidence base is growing, there remains an urgent need to build in a substantial and integrated way upon this existing evidence base.

DISCLOSURE
The authors declared no conflict of interest.

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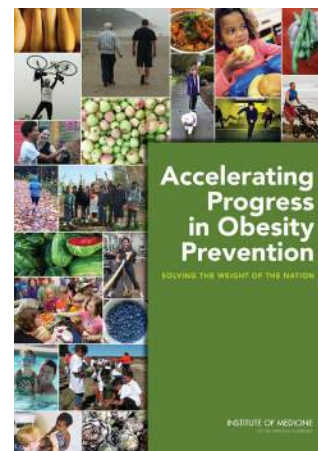
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Accelerating Progress in Obesity Prevention
Solving the Weight of the Nation

Two-thirds of adults and almost one-third of children in the United States are overweight or obese, representing young and old, urban and rural, and majority and minority populations. This epidemic of excess weight is associated with major causes of chronic disease, disability, and death. Obesity-related illness is estimated to carry an annual cost of $190.2 billion.

These staggering human and economic costs, along with the difficulties of treating obesity and the slow progress made in reversing national obesity trends, underscore the urgent need to accelerate progress in obesity prevention. The Robert Wood Johnson Foundation asked the Institute of Medicine (IOM) to identify catalysts to speed progress in obesity prevention. The IOM committee appointed to this task presents its findings in its report, *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*.

> The staggering human and economic costs, along with the difficulties of treating obesity and the slow progress made in reversing national obesity trends, underscore the urgent need to accelerate progress in obesity prevention.

Effective Responses to a Complex Health Problem

The committee evaluated hundreds of prior strategies for their promise in accelerating obesity prevention over the next decade. It mapped how the most promising interacted with, reinforced, or slowed each other's progress. This "systems approach" way of thinking allowed the committee to identify recommendations and understand how they would be important individually and, when implemented collectively, would further strengthen efforts to prevent obesity. The result was the series of goals that follow.

- Make physical activity an integral and routine part of life

- Create food and beverage environments that ensure that healthy food and beverage options are the routine, easy choice

- Transform messages about physical activity and nutrition
- Expand the roles of health care providers, insurers, and employers
- Make schools a national focal point

In addition, the committee identified related recommendations, strategies, and potential implementation actions organized around five critical environments—physical activity, food and beverage, message, health care and work, and school—that urgently need reform in order to accelerate progress (see Detailed Information).

Implementing the Recommendations

The report stresses that, because obesity is such a complex and stubborn problem, a bold, sustained, and comprehensive approach is needed. Action must occur at all levels—individual, family, community, and the broader society—and ongoing assessment of progress is key as efforts move forward (see Figure).

The report emphasizes the need to identify and engage leaders at all levels and across all sectors of society who can act to prevent obesity, and it challenges everyone to assess their assets and identify contributions they can make to create meaningful societal change and accelerate progress in preventing obesity.

Obesity risks are often disproportionate among minority, low-income, less educated, and rural populations, due to inequitable distribution of health promotion resources and community risk factors that contribute to disparities in obesity prevalence. For example, some communities may have no safe places to walk or play, no shops offering affordable, healthy food, and widespread advertisements for unhealthy food and beverages. Because these inequities often result from policy decisions, change will require targeted efforts to promote and support robust, long-term community engagement and civic participation.
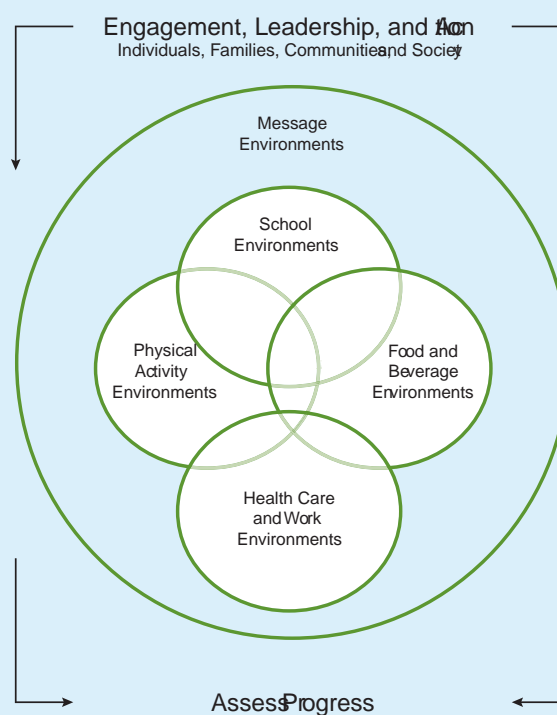
Promoting Physical Activity and Healthy Food Choices

For too many, achieving and maintaining a healthy weight is increasingly limited by complicated and interconnected factors, such as insufficient access to sidewalks and affordable healthy foods and overexposure to advertising that promotes unhealthy foods.

To improve their physical activity, people must be empowered to integrate daily physical activity into their lives, as recommended by the *Physical Activity Guidelines for Americans*, through increased access to places for such activity. And to improve their eating habits, they also must be empowered to make healthy choices through expanded access to healthy, affordable foods, as recommended by the *Dietary Guidelines for Americans*.

Communities, transportation officials, community planners, health professionals, and the government at the local, state, and national levels must prioritize promotion of physical activity by substantially increasing public access to places that allow such activity. In other words, all of

FIGURE: Comprehensive Approach of the Committee

Engagement, Leadership, and Action
Individuals, Families, Communities, and Society

Message Environments

School Environments

Physical Activity Environments

Food and Beverage Environments

Health Care and Work Environments

Assess Progress

these key actors should make physical activity a health priority. The physical and built environments must be improved—for example, converting an unused railroad bed into a walking/running/ biking trail—and community design revamped to ensure access to spaces where the public can engage in physical activity.

Additionally, governments and private sector decision makers need to make concerted efforts to reduce unhealthy food and beverage options while substantially increasing access to healthier food and beverages at competitive prices. The overconsumption of sugar-sweetened beverages must be reduced; calories substantially slashed in meals served to children while the number of affordable, healthier menu options is boosted significantly; and governments need to provide incentives to encourage supermarkets and other food retailers to place stores in underserved areas.

Supporting Obesity Prevention

Other equally important parts of obesity prevention involve changing the message environment, health care, and the workplace. Messages about physical activity and nutrition from all sources must be transformed, and health care professionals and employers should be urged to expand their role in obesity prevention.

Congress, the White House, federal policy makers, and foundations should dedicate substantial funds to develop and implement a sustained national social marketing campaign on physical activity and nutrition. Carefully targeted, cultur-

ally appropriate messages should be aimed at key audiences with clear action items that will result in achieving and maintaining healthy weights.

It is urgent for food, beverage, restaurant, and media industries to take voluntary action to improve marketing aimed at children aged 2 to 17. All food and beverages specifically marketed to these children should support a diet that accords with the *Dietary Guidelines for Americans* to prevent obesity and risk factors associated with chronic disease.

Efforts to prevent obesity also need to include to a much greater extent what happens in the workplace and doctors' offices. Health care providers should adopt standards of practice for preventing, screening, diagnosing, and treating overweight and obese patients of all ages to help them achieve and maintain healthy weight and avoid obesity-related complications. Employers should establish, implement, and monitor policy initiatives that support wellness.

Transforming Schools

Schools are uniquely positioned to be a national focal point for obesity prevention because children spend up to half of their waking hours in school and consume between one-third and one-half of their daily calories there.

State education agencies and local school districts should ensure that students—from kindergartners to high school seniors—have adequate opportunities to participate in 60 minutes of physical activity per school day.

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Committee on Accelerating Progress in Obesity Prevention

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Implementing the *Dietary Guidelines for Americans* in schools would increase the consumption of fruit, vegetables, and whole grains; reduce sugar-sweetened beverages, fats, and added sugars; and ensure age-appropriate portions.

Conclusion

The committee's recommendations, when implemented together, could profoundly reshape the environments where people live, work, play, and learn. If leaders across all levels of society are engaged and implement this comprehensive approach within the next decade, physical activity will become an integral and routine part of most people's lives, and adults and children will have opportunities for enjoyable physical movement anywhere they spend time. Healthy foods will become the most visible, attractive, and easy-to-obtain options anywhere food is sold or served. The balance of information in the media that surround us will shift away from sedentary pursuits and unhealthy foods and toward active lifestyles and healthy foods. Patients will leave their health care providers' offices with more knowledge about obesity prevention that can be put into action. Employers will play a pivotal role in increasing physical activity and healthy food options for employees. And schools will become nutrition and wellness centers. The force of each action, compounded by the collective ability to accelerate and strengthen each other's impact, can profoundly improve the nation's health. ॐ

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Week 6 – Part B: Malnutrition

Upon completion of this module, you will be able to:

- Explain the link between malnutrition/food insecurity and obesity
- Understand the federal SNAP program and associations between SNAP participation and dietary behaviors

Video Resources

1. [Dr. Cindy Leung's Household Food Insecurity and SNAP lecture](#) (06:42)

2. [Dr. Cindy Leung's Supplemental Nutrition Assistance Program (SNAP) lecture](#) (10:17)

3. [Christine Berman Lecture on Public Programs and Initiatives](#) (10:54)

4. [Weight of the Nation: Poverty and Obesity](#) (YouTube link) (24:05) (no transcript)

5. [NPR: Food Insecurity, Hunger and Children's Health](#) (NPR link) (4:41) (no transcript)

Reading & Resources

Required readings:

Essentials of Nutrition — Chapter 14.3 - 14.5

*A Short History of SNAP

* = included in this reader

Today's lecture is on household food insecurity and the Supplemental Nutrition Assistance Program, or SNAP, the largest federal food program formally known as the food stamp program. In this lecture, we will discuss the issue of food insecurity and understand how SNAP works to reduce food insecurity and improve the health of its beneficiaries. Food security is defined as a limited or uncertain availability of nutritionally adequate and safe foods, and limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

Food insecurity and hunger are often used interchangeably, but they aren't quite the same thing. Hunger is an individual level physical sensation caused by a lack of food. Food insecurity is the household level social and economic condition of having limited access to food, which can include both the physical aspect of hunger, and coping behaviors to avoid hunger.
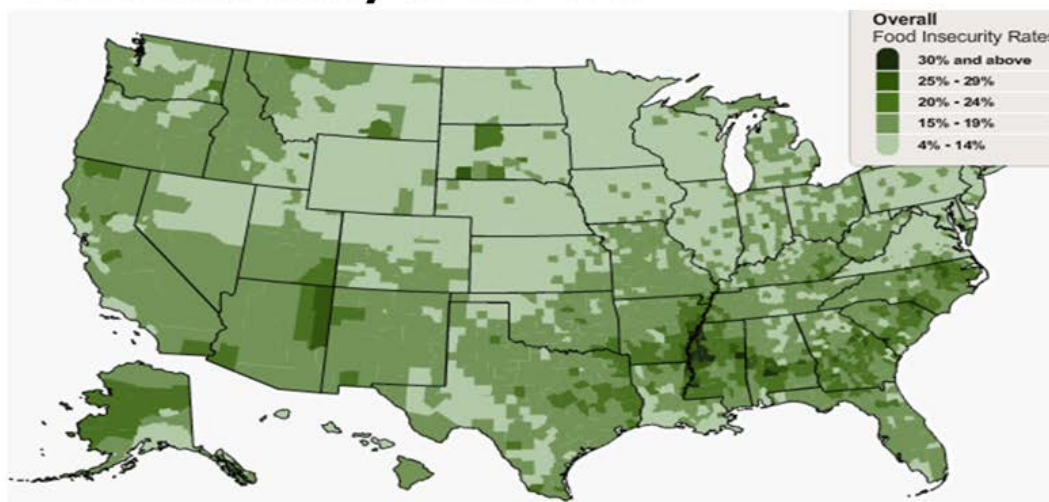
Food Insecurity in the U.S.

- Limited or uncertain availability of nutritionally adequate and safe foods
- Limited or uncertain ability to acquire acceptable foods in socially acceptable ways.
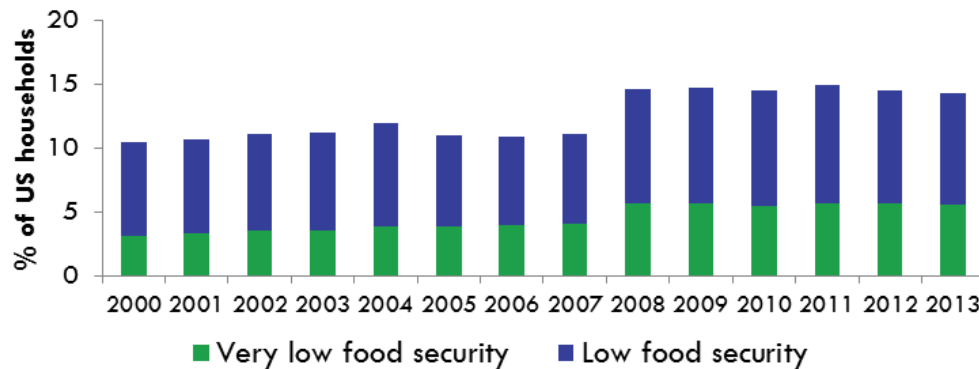
This stacked bar graph here shows the prevalence of food insecurity in US households across the past decade. The blue bar indicates low food security, which occurs when the quality of food is reduced, but not the quantity. The green bar indicates very low food security, which occurs when both the quality and quantity of food is reduced.

Together, low and very low food security are referred to as food insecurity. In this graph you can see that from 2000 to 2007 the prevalence of food insecurity was around 11%, including 4% that experienced very low food security. Then, during the economic recession in 2008, food insecurity increased to almost 15% of US households with a little more than 5% experiencing very low food security. It stayed here ever since.

Food Insecurity in the U.S.

This map shows the distribution of food insecurity in the US. While you might think that food insecurity is clustered in urban and impoverished areas, this map shows the food insecurity occurs in every county in the country.

Measuring Food Insecurity

1. "We worried whether our food would run out before we got money to buy more"
2. "The food that we bought just didn't last and we didn't have money to get more."
3. "We couldn't afford to eat balanced meals."
4. In the last 12 mos, did you or other adults in the HH ever cut the size of your meals or skip meals because there wasn't enough money for food?
   - How often did this happen?
5. In the last 12 mos, did you ever eat less than you felt you should because there wasn't enough money for food?
6. In the last 12 mos, were you ever hungry but didn't eat, because there wasn't enough money for food?
7. In the last 12 mos, did you lose weight because there wasn't enough money for food?
8. In the last 12 mos, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
   - How often did this happen?

Food insecurity refers to 3+ affirmative responses to any of these questions

USDA Household Food Security Survey Module

Food insecurity is measured at the household level using an 18 item scale developed by the USDA. An example of the questions is shown here. The questions are asked in three stages ordered by severity. The mildest question ask about experiencing anxiety related not having enough money for food, food running out before being able to buy more, and not being able to afford balanced meals. Then the questions ask about coping strategies related to not having enough food, including skipping meals, eating less than they felt they should, and losing weight. The most severe questions ask whether children in the household didn't eat for a whole day because there wasn't enough money for food. Food insecurity refers to three or more affirmative responses to any of these questions.

Food insecurity and health

Children

- Low birth weight
- Lower psychosocial and physical function
- Lower mental development
- Anxiety and depression
- Lower academic performance
- School absence
- Iron-deficiency anemia
- Weight outcomes
- Diabetes hospitalization

Adults

- BMI and weight status (women)
- Self-reported poor health
- Systemic inflammation
- Hypertension
- Diabetes and disease management
- Maternal anxiety and depression
- Pregnancy weight gain
- Gestational diabetes

Food security is obviously a significant health issue for children and adults. Although it's correlated with being low income, researchers have found that the consequence of food insecurity exists above and beyond the effects of living in poverty. These are some of the outcomes that have been affected by food insecurity. You will notice that several of these outcomes relate to poor diet. Like we said, part of the definition of food insecurity includes a reduction in the quality and quantity of foods consumed.

Food insecurity and health

Children

- Low birth weight
- Lower psychosocial and physical function
- Lower mental development
- Anxiety and depression
- Lower academic performance
- School absence
- Iron-deficiency anemia
- Weight outcomes?
- Diabetes hospitalization

Adults

- BMI and weight status (women)
- Self-reported poor health
- Systemic inflammation
- Hypertension
- Diabetes and disease management
- Maternal anxiety and depression
- Pregnancy weight gain
- Gestational diabetes

However, another important aspect of food security is the psychological component. In fact, another set of these outcomes relate specifically to higher stress, anxiety, and depression in children and adults who experience food insecurity.

Federal Nutrition Assistance Programs

- **Supplemental Nutrition Assistance Program (SNAP)**
- Women, Infants and Children (WIC)
  - Farmers' Market Nutrition Program
  - Senior Farmers' Market Nutrition Program
- Food Distribution Programs
  - Commodity Supplemental Food Program
  - Food Distribution Program on Indian Reservations
  - The Emergency Food Assistance Program

- Child Nutrition Programs
  - Child and Adult Care Food Program
  - Fresh Fruit and Vegetable Program
  - National School Lunch Program
  - School Breakfast Program
  - Special Milk Program
  - Summer Food Service Program

USDA
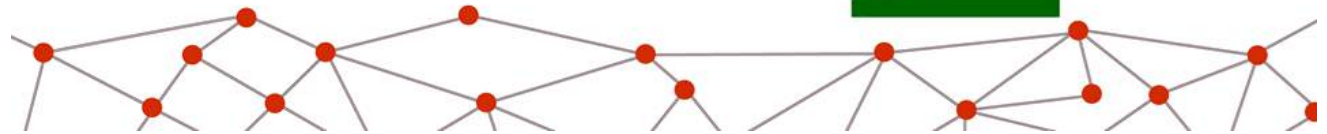
Luckily, we have 15 federal nutrition assistance programs aimed to alleviate food insecurity and improve the health of food-insecure communities. Many of these target specific populations like pregnant women, Infants, and young children, seniors, and school-age children. In fact, we already heard about WIC earlier in the course.

Supplemental Nutrition Assistance Program

- Aims to reduce food insecurity **and improve dietary intake**
  - In FY2014, total budget was $74 billion
  - In FY2014, 46.5 million persons participated
  - ~50% of SNAP beneficiaries are children <18 y
- Eligibility requirements
  - Household income ≤130% federal poverty level
  - <$2000 in countable assets
- No federal limit on how many SNAP benefits are issued nationwide

By far the largest of all these assistance programs is SNAP. SNAP is the current name for the federal food stamp program. As you might already know, the food stamp program started in the 1930s as a way to distribute farm surpluses to those in need of food. This food stamp program has gone through many changes since then. In 2008, the program was renamed the Supplemental Nutrition Assistance Program to help fight stigma and increase the emphasis on nutrition.

SNAP is a federal program administered at the state level. Some states also have their own names for the program. For example, in California the program is called CalFresh. Today, SNAP aims to reduce food insecurity and improve dietary intake and its beneficiaries. At a budget of 74 billion, there are almost 47 million participants in the program. Almost half of them are children. SNAP is an entitlement program, meaning anyone who meets eligibility criteria can access benefits. In general, the requirements are having a household income at or below 130% of the federal poverty level and under $2,000 in other accountable assets.

Because there's no federal limit on how many SNAP benefits are issued, we have seen the program's budget increase in recent years as more and more people have fallen on difficult economic times.

SNAP Participation and Benefits

SNAP: Program Participation and Costs. http://www.fns.usda.gov/pd/SNAPsummary.htm.
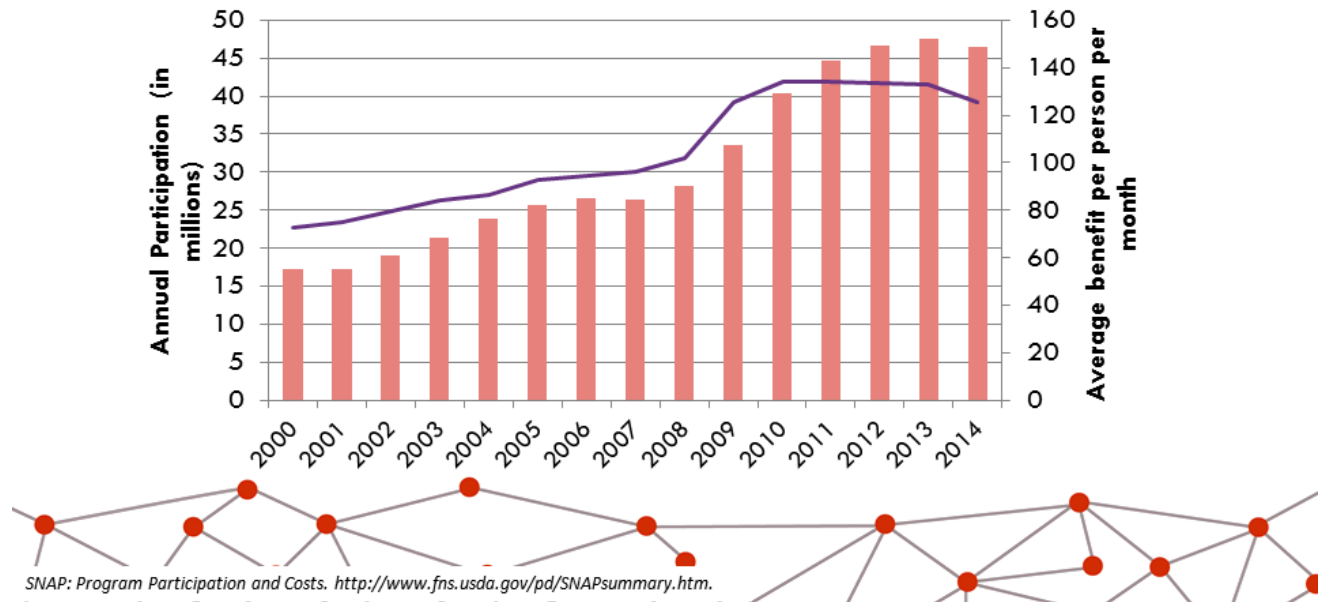
The red bars here show the rise and SNAP participation in the US across the past decade. Part of this increase is due to the economic climate. Another reason is the change in policies that made it easier for eligible persons to access benefits. The purple line shows the average amount in SNAP benefits, which is roughly $125 per person per month.

SNAP benefits are based on the thrifty food plan, the report put forth by the USDA Center for Nutrition Policy and Promotion that shows how to achieve a nutritious diet with limited resources that reflects the current dietary guidelines.

Supplemental Nutrition Assistance Program

- Benefits redeemed at authorized food stores and farmers' markets
  - 82% of SNAP benefits redeemed in supermarkets and superstores in FY2012
  - Minimum benefit = $16
  - Maximum benefit for 4-person HH = $668
- Benefits can be used to purchase most food items
- Every $1 of SNAP benefits generates $1.71 in economic activity

SNAP benefits can only be redeemed at authorized food stores and farmers' markets through an electronic benefit transfer, or EBT card. Although many store types accept EBT, most benefits are redeemed at supermarkets or superstores. SNAP also has a benefit reduction rate, which means that people at the lowest levels of income receive the maximum benefit. People at the highest end of the income cutoff receive the minimum.

SNAP benefits can be used to purchase most food items with the exception of alcohol, dietary supplements, and hot or prepared foods like a rotisserie chicken or a jelly sandwich. SNAP benefits cannot be used to purchase nonfood items found at markets like paper towels, toilet paper, or Saran wrap. It has been estimated that every dollar SNAP benefits generates $1.71 in economic activity. Thus, the more money we invest in SNAP, the larger the stimulus that provides for the economy. For more information about SNAP, visit this link at the USDA.

Welcome to the second part of this lecture on SNAP. We previously discussed the issue of food insecurity and the role of the federal nutrition assistance programs, with a focus on the Supplemental Nutrition Assistance Program or SNAP.

In this lecture, we will focus on SNAP's influence on diet-related health and opportunities for improvement. This topic is close to my heart. And in the following slides, I will be sharing some of my work, as well as the work of my colleagues.
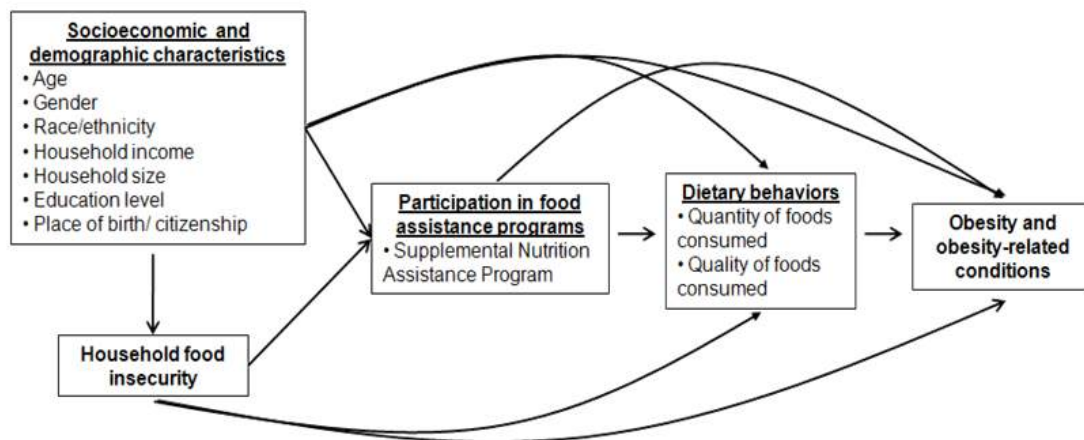
This is a simplified conceptual model on how SNAP affects health. SNAP participation is influenced by household socioeconomic and demographic characteristics and food insecurity levels. Participation in SNAP then influences the dietary behaviors of those in the household, both the quantity and quality of foods consumed. And this has an impact on obesity and obesity-related disease.

From Previous Studies...

Reference	Design	Participants	Outcome	Results
Townsend MS, et al. Food insecurity is positively related to overweight. (2001)	Cross-sectional	4,537 females from the 1994-1996 Continuing Survey of Food Intakes by Individuals	Overweight (BMI >27.3 for women, BMI >27.8 for men)	Women: Food stamp recipients had 38% higher odds of being overweight independent of food security.
Gibson D. FSP participation is positively related to obesity in low income women. (2003)	Longitudinal	6,283 females and 6,403 males aged 14-22 y from National Longitudinal Study of Youth 1979	Obesity (BMI ≥30)	Women: Current FSP participation associated with 9.1% increase in predicted probability of obesity. FSP participation in each previous 5 years associated with 20.5% increase in predicted probability of obesity. Men: No association
Jones SJ et al. Lower risk of overweight in school-aged food insecure girls who participate in food assistance. (2003)	Longitudinal	772 children (5-12 y) from Panel Study of Income Dynamics Child Development Supplement	≥85th percentile of BMI for age	Girls: Food-insecure girls participating in FSP, school breakfast and school lunch had 68% reduced odds of being at risk of overweight compared to nonparticipants. Boys: No association
Gibson D. Long-term FSP participation is differentially related to overweight in young girls and boys. (2004)	Longitudinal	3,831 girls and 4,012 boys (5-18 y) from National Longitudinal Study of Youth 1979 Child Sample	≥95th percentile of BMI for age and sex	Girls (5-11 y): FSP participation during previous 5 years associated with 42.8% increase in probability of overweight. Boys (5-11 y): FSP participation during previous 5 years associated with 28.8% decrease in probability of overweight. No association for older children (12-18 y)
Hofferth SL et al. Poverty, Food Program and Childhood Obesity (2005)	Longitudinal	1,449 children (6-12 y) from Panel Study of Income Dynamics Child Development Supplement	≥95th percentile of BMI for age and sex	Amount of FSP benefits was not associated with child overweight or BMI.
Chen Z et al. Effects of Food Stamp Participation on Body Weight and Obesity (2005)	Cross-sectional	1,039 FSP eligible women from 1994-1996 Continuing Survey of Food Intakes by Individuals (≤130% FPL)	BMI	Women: FSP participation associated with 3.6 kg/m² increase in BMI. Projected health care costs associated with increased incidence of obesity in low-income women attributable to the FSP range from $46-380 million
Jones SJ et al. The modifying effects of FSP participation on the relation between food insecurity and weight change in women (2006)	Longitudinal	5,303 adult women from Panel Study of Income Dynamics 1999 and 2001	Weight change between 1999-2001	Women: Among food-secure women, a $2000 increase in FSP benefits associated with 1-3 kg increase in weight. No association for women who changed food security status. Among food-insecure women, a $2000 increase in FSP benefits associated with 5-8 kg increase in weight.

Ver Ploeg M, et al. The vanishing weight gap: trends in obesity among adult food stamp participants (US) (1976-2002)	Cross-sectional	Adults from the 1976-1980, 1988-1994, 1999-2002 National Health and Nutrition Examination Surveys	BMI	Women: Rates of overweight and obesity among moderate- and high-income women have "caught up" to low-income women receiving food stamps from 1976 to 2002.
Ver Ploeg M, et al. US Food assistance programs and trends in children's weight. (2008)	Cross-sectional	Children from the 1976-1980, 1988-1994, 1999-2002 National Health and Nutrition Examination Surveys	≥85th and 95th percentiles of BMI for age and sex	No significant differences over time by FSP participation and children's weight.
Kaushal N. Do food stamps cause obesity?: Evidence from immigrant experience. (2007)	Natural experiment	National Health Interview Survey and Current Population Survey	BMI	FSP participation was not associated with BMI
Baum C. The Effects of Food Stamps on Obesity (2007)	Longitudinal	19,368 male person-years and 17,678 female person-years from the National Longitudinal Survey of Youth 1979	Obesity	Women: FSP participation is positively related to BMI and probability of obesity using various modeling techniques. Men: FSP participation not associated with BMI.
Kim K, et al. Participation in Food Assistance Programs Modifies the Relation of Food Insecurity with Weight and Depression in Elders. (2007)	Longitudinal	9,481 participants from the 1996-2002 Health and Retirement Surveys (HRS) (51-61 y) and 6,354 participants from the 1995-2002 Asset and Health Dynamics Among the Oldest Old (AHEAD) (≥70 y)	BMI	AHEAD – food insecurity associated with higher BMI among FSP nonparticipants; no association among FSP participants.
Meyerhoefer CD, et al. Does Participation in the Food Stamp Program Increase the Prevalence of Obesity and Health Care Spending? (2008)	Instrumental variable	Adult participants from the 2000-2003 Medical Expenditure Panel Survey (MEPS)	BMI, overweight and obesity	Women: FSP participation associated with 6.7% increase in probability of obesity. Women more likely to move from normal or overweight to obese, rather than from normal weight to overweight. Men: No significant effect.
Webb AL et al. FSP participation but not food insecurity is associated with higher adult BMI in MA residents living in low-income neighborhoods (2008)	Cross-sectional	435 adult residents of low-income census tracts in MA	BMI	All: Participation in FSP and any federal nutrition assistance program in past 12 mos associated with 3.0 kg/m² higher adult BMI independent of food security. Long-term: In 77 current FSP participants, participation for ≥6 mos associated with 11.3 kg/m² lower BMI.
Zagorsky JL et al. Does the US Food Stamp Program contribute to adult weight gain? (2009)	Longitudinal	National Longitudinal Study of Youth	BMI	FSP participation related to 1.15 kg/m² higher BMI among all study participants. FSP participation related to 1.24 kg/m² higher BMI among women, 1.96 kg/m² higher BMI among White women, and 1.10 kg/m² higher BMI for Black women. A FSP benefit increase of $1000 per person per year associated with 0.81 kg/m² increase in BMI.

Fan M, et al. Do Food Stamps Contribute to Obesity in Low-Income Women? (2010)	Longitudinal – propensity score matching	National Longitudinal Study of Youth	Obesity	Women: FSP participation not associated with obesity in low-income women.
Jilcott SB et al. FSP participation is associated with fewer meals away from home, yet higher BMI and WC in a nationally representative sample. (2011)	Cross-sectional	945 FSP-eligible individuals (20-65 y) from 2005-2006 National Health and Nutrition Examination Surveys	Meals away from home per week, BMI, waist circumference	Women: FSP participation associated with 2.1 kg/m² higher BMI and 4.48 cm higher WC. Men: No association In subsample of current SNAP participants, more food stamp dollars associated with lower BMI and waist circumference for women.
Jilcott SB et al. Associations between food insecurity, supplemental nutrition assistance program (SNAP) benefits, and BMI among adult females. (2012)	Cross-sectional	202 SNAP participants in eastern NC from Pitt County Department of Social Services	BMI	Mean BMI among women receiving <$150 SNAP benefits per household member per month was significantly greater than mean BMI among women receiving ≥$150 SNAP benefits per household member per month (35.8 vs. 33.1).
Vartanian TP, et al. The effects of childhood SNAP use and neighborhood conditions on adult body mass index. (2012)	Longitudinal	~23,000 participants from the 1968-2005 Panel Study of Income Dynamics	BMI	Advantaged neighborhoods: childhood SNAP participation associated with higher adult BMI Disadvantaged neighborhoods: childhood SNAP participation associated with smaller/modest increase in adult BMI
Han E, et al. Supplemental nutrition assistance program and body weight outcomes: the role of contextual factors. (2012)	Cross-sectional	2,391 women and 1,351 men ≤130% FPL from the 1999, 2001 and 2003 waves of Panel Study of Income Dynamics	BMI, obesity	Women: SNAP participants had 1.31 kg/m² higher BMI than nonparticipants, and 7.3% higher likelihood of obesity. Additional grocery store/supermarket decreased BMI by 0.04 units for SNAP participants. No significant effect for nonparticipants. Men: No effect of SNAP participation and obesity. Additional grocery store/supermarket decreased BMI for SNAP participants and nonparticipants, though effect was larger among participants.
Schmeiser MD. The impact of long-term participation in the supplemental nutrition assistance program on child obesity. (2012)	Instrumental variable	Children (5-18 y) from 1986-2006 waves of National Longitudinal Survey of Youth 1979	BMI percentile	Ages 5-11: SNAP participation reduced BMI percentile and probability of being overweight and obese in boys and girls. Ages 12-18: SNAP participation reduced BMI percentile and probability of being overweight and obese in boys only.
Watt TT, et al. Sugar, stress, and the Suppelemtanl Nutrition Assistance Program: Early Childhood Obesity Risks Among a Clinic-Based Sample of Low-Income Hispanics. (2013)	Cross-sectional	153 Hispanic pregnant women and babies	Weight for length	Infants: SNAP participation associated with 4.5 higher odds of infant overweight. Other significant predictors: maternal daily SSB, maternal sweets, maternal stress.

So how does SNAP affect weight status? This association has been examined in multiple studies and study populations. Here's a snapshot of a few of these studies. As you can see by the sheer volume of these studies, with more than 20 listed on these three slides, a lot of research has been done in this area. But the results are not always consistent.

In Summary…?

"Results indicate that for most program participants – children, nonelderly men, and the elderly – use of food stamp benefits does not increase BMI or the likelihood of being overweight or obese…

However, for nonelderly women, some evidence suggests that participation in the Food Stamp Program may increase BMI and the probability of obesity."

So how do we summarize this body of evidence? This is a quote taken from a USC review of the literature. "Results indicate that for most program participants-- children, nonelderly men, and the elderly-- use of food stamp benefits does not increase BMI or likelihood of being overweight or obese. However, for nonelderly women, some evidence suggests that participation in the Food Stamp Program may increase BMI and the probability of obesity."

This may seem paradoxical at first. But several studies have found increased levels of obesity among food insecure individuals and SNAP participants. This is likely due to our obesogenic food environment, where food is not only plentiful and readily accessible, but also structured so that the cheapest foods are also highest in empty calories and oftentimes the most healthful foods are the most expensive. Over time, consumption of highly processed foods and empty calories not only leads to weight gain, but also higher risk of chronic disease over time.

SNAP, Adiposity and Metabolic Risk Factors
NHANES 2003-2006

	SNAP participants	SNAP nonparticipants	Multivariate-adjusted
BMI (in kg/m²)	N (%)	N (%)	OR (95% CI)
Underweight (BMI <18.5)	15 (2.3)	43 (3.5)	0.58 (0.26, 1.28)
Normal (BMI 18.5 - 24.9)	221 (30.1)	539 (36.9)	Ref.
Overweight (BMI 25.0 - 29.9)	169 (23.7)	457 (33.1)	0.81 (0.59, 1.10)
Obese (BMI ≥30)	295 (44.0)	414 (26.6)	1.58 (1.08, 2.31)
Waist circumference – Men	N (%)	N (%)	OR (95% CI)
Quartile 2 (82.5 – <93.25 cm)	76 (27.1)	178 (24.9)	1.87 (0.93, 3.74)
Quartile 3 (93.25 - <103.8 cm)	73 (26.0)	177 (28.5)	1.79 (0.87, 3.68)
Quartile 4 (≥103.8 cm)	85 (31.9)	168 (24.8)	2.04 (1.15, 3.62)
Waist circumference – Women			
Quartile 2 (81.8-<93.0 cm)	83 (23.4)	192 (30.9)	1.42 (0.70, 2.89)
Quartile 3 (93.0 - <105.75 cm)	95 (22.5)	184 (24.6)	1.33 (0.66, 2.68)
Quartile 4 (≥105.75 cm)	131 (37.3)	143 (18.1)	2.95 (1.51, 5.77)

Leung CW, Willett WC, Ding EL. Low-income Supplemental Nutrition Assistance Program participation is related to adiposity and metabolic risk factors. Am J Clin Nutr 2012.

We examined SNAP participation in relation to adiposity and cardiometabolic risk factors using data from the National Health and Nutrition Examination Surveys or NHANES. NHANES is an ongoing, national representative health survey conducted by the CDC, that collects detailed health and nutrition information from children and adults. In NHANES, trained staff measure the height and weight of all study participants, as well as many other health indicators.

In this analysis, we restricted the study population to adults with incomes eligible for SNAP. So we are comparing self-reported SNAP participants to income-eligible nonparticipants. We found that SNAP participation was significantly associated with a 58% higher odds of obesity and two to three times higher odds of being in the top quartile of waist circumference, after adjusting for socio-demographic differences and food insecurity.

SNAP, Adiposity, and Metabolic Risk Factors
NHANES 2003-2006

	Multivariate-adj. PR (95% CI)	Multivariate + BMI PR (95% CI)
Elevated waist circumference	1.14 (0.99, 1.31)	0.99 (0.88, 1.10)
Elevated fasting triglycerides	1.71 (1.33, 2.20)	1.67 (1.28, 2.18)
Lower HDL cholesterol	1.23 (1.08, 1.41)	1.16 (1.00 1.36)
Elevated blood pressure	0.93 (0.73, 1.19)	0.90 (0.68, 1.18)
Elevated fasting glucose (≥100 mg/dL)	1.18 (0.90, 1.55)	1.08 (0.81, 1.45)
Elevated fasting glucose (≥110 mg/dL)	1.63 (1.05, 2.52)	1.49 (0.90, 2.47)
Metabolic syndrome	1.50 (1.18, 1.89)	1.28 (0.95, 1.72)

We also extended our analysis to the risk factors that comprise the metabolic syndrome. The metabolic syndrome is a cluster of conditions that increase risk of heart disease, diabetes, and stroke. These include an elevated waist circumference, elevated fasting triglycerides, lower HDL cholesterol, elevated blood pressure, and elevated fasting glucose. Generally having three or more of these risk factors meets the definition for the metabolic syndrome.

When we look at SNAP participation, we found that it was significantly associated with higher prevalence of elevated fasting triglycerides, lower HDL cholesterol, elevated fasting glucose, and the metabolic syndrome. Because many of these associations may be mediated by BMI, we further adjusted for BMI and found that some of these associations persisted. This suggests SNAP participants may be at risk for worse cardiometabolic health than nonparticipants. However, it's important to note that this analysis is cross-sectional and we are not making any claims that SNAP participation causes poor health. Our results simply show that SNAP participants are more vulnerable to poor health than low-income nonparticipants and this may be due to multiple factors.
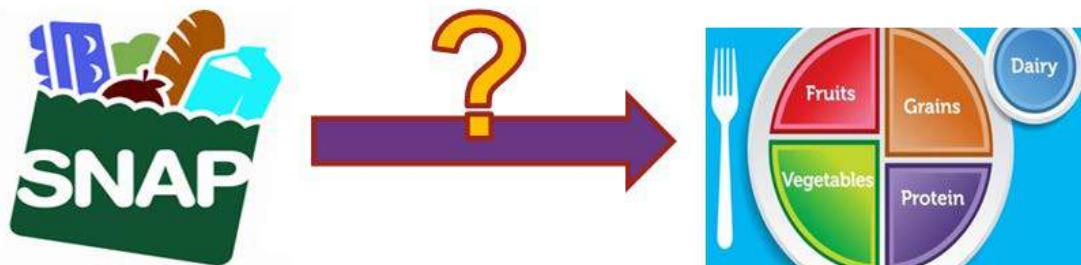
Given this observed association with obesity, it's natural to wonder how dietary intake differs between SNAP participants and income-eligible nonparticipants.

SNAP and Dietary Intake: Adults
NHANES 1999-2008

Servings/day	SNAP nonparticipants		SNAP participants		Multivariate-adjusted
	Mean ± SE	% Meeting Guideline	Mean ± SE	% Meeting Guideline	Relative Difference (95% CI)
Whole grains	0.9 ± 0.1	5%	0.5 ± 0.1	2%	0.61 (0.43, 0.85)
Refined grains	5.1 ± 0.1	85%	4.6 ± 0.1	78%	1.07 (0.88, 1.30)
Fruits	1.1 ± 0.1	3%	0.7 ± 0.1	1%	0.80 (0.59, 1.08)
100% fruit juice	0.5 ± 0.0	-	0.6 ± 0.1	-	1.44 (1.00, 2.07)
Vegetables	1.2 ± 0.1	0%	0.9 ± 0.1	0%	0.76 (0.55, 1.06)
Potatoes – week	2.7 ± 0.1	-	2.9 ± 0.2	-	1.56 (1.18, 2.06)
Fish/shellfish – week	2.2 ± 0.1	39%	1.6 ± 0.1	23%	0.96 (0.76, 1.21)
Red meat – week	4.0 ± 0.2	-	3.9 ± 0.2	-	1.46 (1.04, 2.06)
Processed meat - week	2.4 ± 0.1	56%	2.5 ± 0.2	53%	1.17 (0.75, 1.81)
Sugary beverages (all)	2.5 ± 0.1	23%	2.9 ± 0.2	18%	1.21 (0.86, 1.70)
Sugary beverages (women)	2.0 ± 0.1	30%	2.8 ± 0.2	18%	1.61 (1.03, 2.52)

Using data from NHANES, we conducted a comprehensive dietary analysis of low income adults by SNAP participation. In looking at the middle columns, you can see that very few low income adults consume the recommended amounts of whole grains, fruits, vegetables, fish, and nuts, seeds, and legumes. Conversely, many low income adults consumed levels of refined grains, processed meats, and sugar-sweetened beverages that exceeded recommended limits. This was true for both SNAP participants and nonparticipants.

But then we compared the two groups and we found significant differences. Even after accounting for differences in socio-demographic characteristics and food insecurity, SNAP participants ate fewer servings of whole grains and more servings of fruit juice, white potatoes, red meat, and processed meat. Women on SNAP also consumed significantly more sugar-sweetened beverages.

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SNAP and Dietary Intake: Children
NHANES 1999-2008

Servings/day	SNAP nonparticipants		SNAP participants		Multivariate-adjusted
	Mean	% Meeting Guideline	Mean	% Meeting Guideline	Relative Difference (95% CI)
Whole grains	0.6	1.3	0.5	0.8	0.89 (0.59, 1.33)
Refined grains	5.7	97.0	5.6	96.3	1.05 (0.95, 1.16)
Fruits	1.0	10.0	0.8	7.2	0.98 (0.64, 1.49)
100% Fruit Juice	1.2	-	1.1	-	1.04 (0.68, 1.59)
Vegetables	0.7	0	0.7	0	1.23 (0.73, 2.07)
Fish/shellfish — week	0.5	0	0.4	0	1.00 (0.81, 1.22)
Nuts, seeds, legumes — week	2.1	13.4	1.4	7.0	0.81 (0.65, 1.00)
Processed meat - week	2.4	44.4	2.8	40.0	1.44 (1.09, 1.91)
High-fat dairy	1.3	-	1.4	-	1.47 (1.07, 2.01)
Sugary beverages	2.5	7.8	2.3	7.0	1.43 (1.08, 1.89)

Leung CW, Willett WC. Associations of FSP with Dietary Quality and Obesity in Children. Pediatrics 2012.

We found very similar results for low income children. Again, looking at the middle column, you can see that regardless of SNAP participation status, very few low income children consumed the recommended amounts of whole grains, fruits, vegetables, fish, and nuts, seeds, and legumes. But most low income children consumed levels of refined grains, processed meats, and sugar-sweetened beverages that were beyond the recommended limits.

In comparing children receiving SNAP to children not receiving SNAP, we also found significant differences. After adjusting for differences in household demographics and food insecurity, children on SNAP ate fewer servings of nuts, seeds, and legumes and more servings of processed meats, high-fat dairy, and sugar-sweetened beverages compared to children not receiving SNAP.

In summary, what these last two slides demonstrate is that all low income children and adults consume diets of poor quality. However, children and adults receiving SNAP appear to have slightly lower diet quality than their nonparticipant counterparts.

RESEARCH
Qualitative Research

.eat
right.

A Qualitative Study of Diverse Experts' Views about Barriers and Strategies to Improve the Diets and Health of Supplemental Nutrition Assistance Program (SNAP) Beneficiaries

Cindy W. Leung, ScD, MPH; Elena E. Hoffnagle; Ana C. Lindsay, DDS, DrPH; Hayley E. Lofink, PhD, MSc; Vanessa A. Hoffman, MPH, RD; Sophie Turrell; Walter C. Willett, MD, DrPH; Susan J. Blumenthal, MD, MPA

ABSTRACT
The Supplemental Nutrition Assistance Program (SNAP), the largest federal food assistance program, currently serves 44.7 million Americans with a budget of $75 billion in 2011. This study engaged leading experts for in-depth, semi-structured interviews to explore their opinions concerning the existing challenges and barriers to eating nutritiously in SNAP. Experts also proposed strategies for improving nutritional status among SNAP recipients. Twenty-seven individuals were interviewed from advocacy, government, industry, and research organizations. Interviews were recorded, transcribed, coded, and analyzed for thematic content. The high cost of nutrient-rich foods, inadequate SNAP benefits, limited access to purchasing healthy foods, and environmental factors associated with poverty were identified as barriers that influence nutrition among low-income households in the United States. Six themes emerged among respondents from diverse sectors about how to address these challenges, including providing SNAP participants with incentives to purchase nutrient-rich food consistent with the 2010 Dietary Guidelines for Americans, restricting the purchase of nutrient-poor foods and beverages with program benefits, modifying the frequency of SNAP benefit distribution, enhancing nutrition education, improving the SNAP retailer environment, and increasing state and federal level coordination and consistency of program implementation. Given the recent dramatic increase in SNAP enrollment, policymakers must address existing barriers as well as consider new strategies to improve nutrition policies

Given what we know about SNAP participants, my colleagues and I have started to think about how we can use this large and critically important program to improve the nutritional status of SNAP participants. This has led to a series of studies to identify the opinions of program participants and stakeholders on this issue.

One of these was a qualitative study of 27 SNAP experts to brainstorm innovative strategies to eating more nutritiously in SNAP. These experts came from various fields, including advocacy, government, industry, and research organizations.

Results

Strategies to improve the nutritional status of SNAP participants:

1. Provide incentives to purchase nutrient-rich foods (e.g. fruits and vegetables)
2. Restrict the purchase of nutrient-poor foods and beverages (e.g. soda) with SNAP benefits
3. Modify the frequency of SNAP benefit distribution
4. Enhance the nutrition education program
5. Improve the SNAP retailer environment
6. Increase state- and federal-level coordination of all nutrition assistance programs

They came up with a list of six strategies to improve the nutritional impact of SNAP. Some of these we'll cover in more detail.

Strategy: Incentives

- Provide financial incentives for purchasing healthy foods (e.g. USDA-funded MA Healthy Incentives Pilot).

"What we found is that in the [farmers'] markets where they had the doubling incentive dollars (if they spent at least $5, they would get an additional $5), the traffic increased and it has not plateaued. It has continued to increase. … I think the incentive brought people there and even without the incentive, they kept coming back."

(Academia/Research)

One of these strategies was to provide financial incentives for purchasing healthy foods, specifically fruits and vegetables. This was the basis for a pilot study at Massachusetts called the Healthy Incentives Pilot.

This SNAP expert from academia described another similar project that doubled the amount of SNAP benefits that could be spent at farmers' markets. What we found is that in the farmers' markets, where they had the doubling incentive dollars, the traffic increased and it has not plateaued. It has continued to increase. The incentives brought people there. And even without the incentive, they kept coming back.

Strategy: Restrictions

- Restrict SNAP participants' ability to purchase nutrient-poor foods and beverages with SNAP benefits.

"This is supplemental nutrition…[SNAP] is using tax dollars so the government has a right to make restrictions. I see no reason why the Dietary Guidelines shouldn't come into play here. And if [participants] have discretionary income beyond that to spend on sodas and chips, that's fine."

(Industry)

Another strategy was to restrict the ability to purchase nutrient-poor foods, specifically sugar-sweetened beverages, with SNAP benefits. This SNAP expert for the industry said, "This is supplemental nutrition. SNAP is using tax dollars so the government has a right to make restrictions. I see no reason why the dietary guidelines shouldn't come into play here. And if participants have discretionary income beyond that to spend on sodas and chips, that's fine."

Strategy: Frequency of benefits

- Biweekly distribution to address cyclical eating patterns and provide SNAP participants with greater flexibility.

"It would be better for SNAP beneficiaries to access their benefits twice a month. Now, a lot of families get their benefits at the beginning [of the month]…and they go to the supermarket and buy a lot of food. They're not buying fruits and vegetables; they're buying processed foods that will last a month. That's not very healthy."
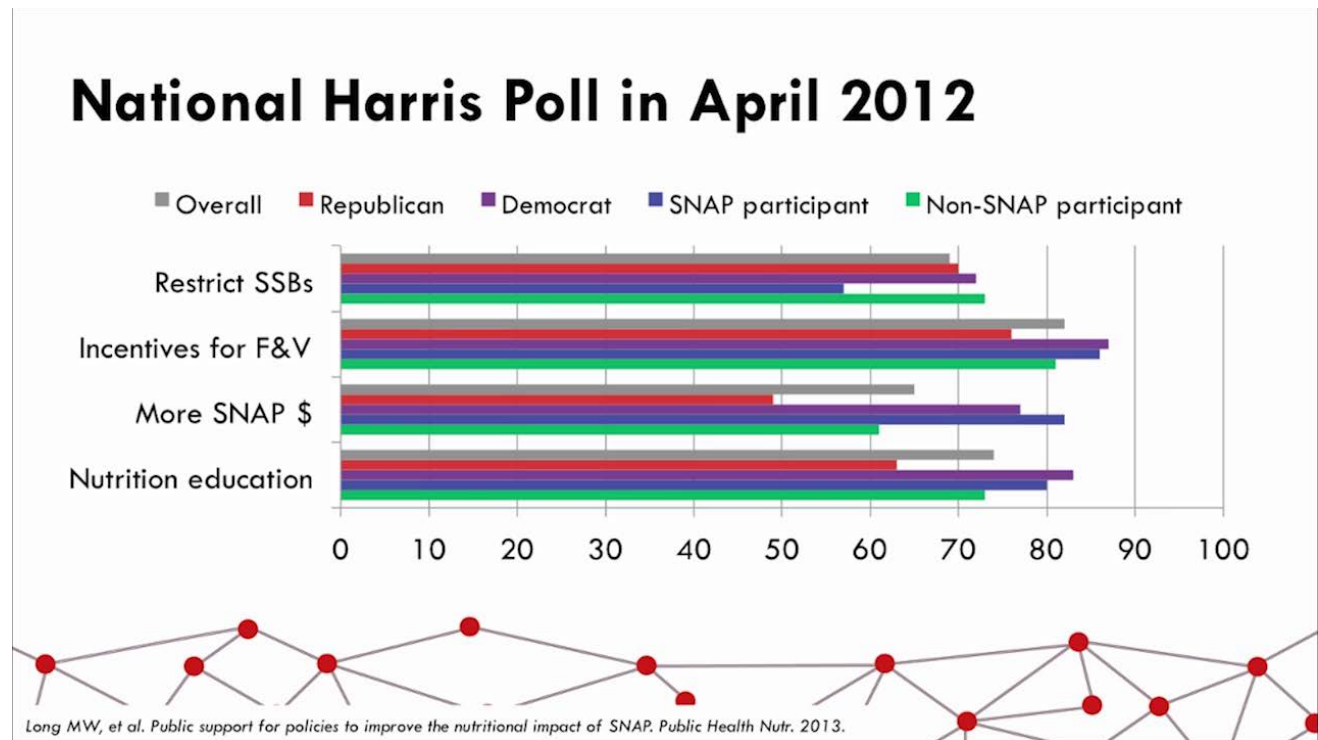
(Academia/Research)

Another strategy was to modify the distribution of benefits. Benefits are currently distributed once per month. Some advocates argue that this creates a cyclical eating pattern, where one might binge eat when benefits are given at the beginning of the month and food is plentiful. And restrict food intake at the end of the month, when the household food supply is depleted.

Strategy: Improve retailer environment

- Require stricter criteria to become approved SNAP vendors.
- Provide incentives to small SNAP vendors to sell healthy foods.
  - Incentives to move unhealthy foods to back of the store
  - Provide refrigeration units to sell fruits and vegetables
  - Encourage collaborations between stores for buying fruits and vegetables at lower wholesale prices

One more strategy was to improve the retailer food environment. The current guidelines to become a SNAP-approved vendor are to carry items in four staple food groups, meats, grains, produce, and dairy. These requirements could be fulfilled by foods like hot dogs, macaroni and cheese, ice cream, and lemons. But the proposed strategy would be to require stricter criteria to become an approved SNAP vendor and providing incentives to small SNAP vendors, like convenience stores and corner markets, to sell healthier foods.

National Harris Poll in April 2012

Long MW, et al. Public support for policies to improve the nutritional impact of SNAP. Public Health Nutr. 2013.

Public support for these policies was assessed in a national Harris poll in 2012. There are significant differences in support by political affiliation. For example, Democrats were, in general, more likely to support these policies than Republicans. In most cases, the majority within each group supported each of these policies.

Another important group is SNAP participants. In this study, the respondents reported whether they were currently receiving SNAP benefits. Stratified analyses show that the large majority of SNAP participants believe that restricting the purchase of sugary beverages with program benefits, providing incentives for fruits and vegetables, providing more SNAP benefits in total, and providing more nutrition education would help improve the nutritional impact of SNAP.

Conclusion

- SNAP has the potential to influence the dietary intake of 1 of 7 Americans
    - SNAP participants are most vulnerable to poor nutrition and obesity

- These strategies can strengthen SNAP so this critical program can continue to **alleviate food insecurity,** but also, **promote good nutrition** for its participants.
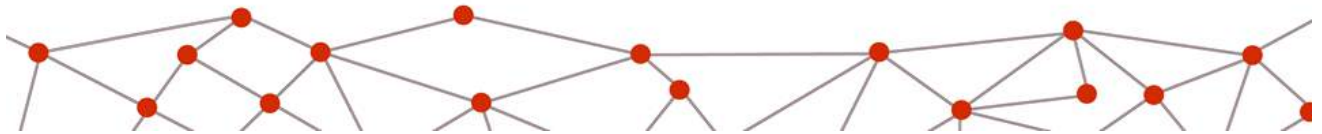
In conclusion, SNAP has the potential to influence the dietary intake of one out of seven Americans. The evidence suggests that SNAP participants are the most vulnerable to poor nutrition, obesity, and diet-related chronic disease. Policy proposals, such as the ones suggested, should be rigorously tested in pilot studies for feasibility and efficacy. And can be used to strengthen SNAP so that this critical program can both alleviate food insecurity and promote good nutrition for all of its participants.

Federal Programs Addressing Nutrition for Preschoolers

- WIC
- EFNEP/SNAP-Ed
- Head Start
- CACFP

Flickr.com Photo by USDAgov
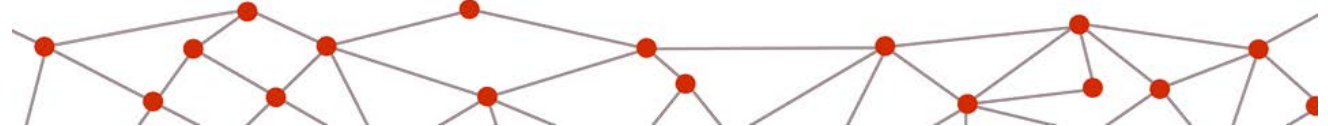
The fourth module of the preschool nutrition section of this course describes the public programs and initiatives that are of particular relevance to young children. Besides SNAP, or the Supplemental Nutrition Assistance Program, also called food stamps in previous years, the federal food assistance and nutrition education programs that most affect preschool age children are WIC, EFNEP and SNAP-Ed, Head Start, and CACFP. Let's look a bit more into each of these, and we'll look at WIC first.

WIC

Special Supplemental Nutrition Program for Women, Infants and Children (USDA)

- Targets pregnant, postpartum, breastfeeding women, infants and children to age 5
- Nutritious foods
- Nutrition education
- Breastfeeding promotion and support
- Health and social service referrals
- Eligibility: ≤ 185% US Poverty Income Guidelines
- Eligibility: medical or dietary risk factor
- Includes Farmers Market Nutrition Program

CALIFORNIA
WIC
WOMEN, INFANTS & CHILDREN
California Department of Public Health (cdph.ca.gov
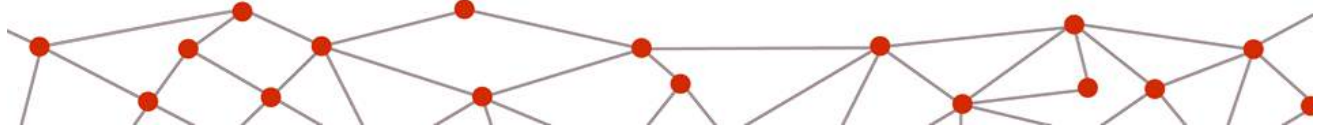
Also called the Special Supplemental Nutrition Program for Women, Infants, and Children, WIC is a USDA program targeting nutritionally vulnerable pregnant, postpartum, or breastfeeding women, infants, and children up to age five. Note that WIC is not an entitlement program, and caseload for each state depends on its allocations. So the cutoff age for children can and has been lowered if necessary to accommodate the pregnant and breastfeeding women and infants.

WIC offers packages of nutritious foods, nutrition education, and referrals for health or social services. Eligibility is determined by income and the presence of a nutritional risk factor. That nutritional risk factor could be something as simple as not meeting the dietary guidelines, which is so common amongst Americans that it would be unusual for a mom to be refused entry into the program.

WIC

The new food package adheres more closely to the 2005 Dietary Guidelines. Food packages vary slightly by state; this is Texas WIC's package for breastfeeding women.

TexasWIC.org

This picture shows an example of a WIC package with the 2009 revisions. It is so much improved over previous years when packages contained way more juice and high fat dairy products and didn't offer much in the way of fruits and vegetables and whole grains. Not all moms were pleased with the revised package, though, and some even left the program during the early years of the roll out.

WIC

Final Rule: Food Package Revisions

•Maintain "new" package offerings

•30% increase in fruit and vegetable voucher

•Yogurt as a partial substitute for milk

•Expanded whole grain options, e.g. pasta

•Older infants can get fresh F & V

•Increased flexibility for states in meeting participants' cultural needs

•And. . .

USDA 3/04/2014

In the past couple of weeks, USDA published its final rule regarding the food packages and included some additional benefits in response to feedback during the interim years. These include even more fruits and vegetables, yogurt as a partial substitute for milk, more whole grains, more choice for older infants, and more flexibility for the states in meeting client needs.

EFNEP/SNAP-Ed

- EFNEP (USDA) provides interactive, peer-led nutrition education to primarily limited-resource adults and youth through land grant universities.

- SNAP-Ed (USDA) provides nutrition education to SNAP participants and SNAP-eligible individuals through contracts with entities such as Extension offices, food banks, community collaboratives.

- The Healthy, Hunger-Free Kids Act (2010) established SNAP-Ed as the National Education and Obesity Prevention Grant Program.
  - Interventions may address individual, community, environmental policy levels

USDA has some lesser known nutrition education programs. Among them EFNEP for the Expanded Food and Nutrition Education Program, and SNAP-Ed.

These two programs serve similar populations and may even be implemented by the same agencies. You'll find EFNEP housed in cooperative extension offices, and SNAP-Ed may also be carried out by these agencies. But states can issue grants to other entities as well. For example, school districts or health corporations. The requirements for grant recipients are quite strict, but it's remarkable that USDA has allowed an environmental and policy oriented interventions to receive funding through SNAP-Ed, not just what we usually consider nutrition education. That one to one stuff.

USDA Core Messages:

USDA is encouraging consistent messaging across all of its nutrition programs with its emotion-based CORE MESSAGES...

- Enjoy each other while enjoying family meals.*
- Feed their independent spirit. *
- Think beyond a single meal. Keep in mind what your child eats over time.
- Sometimes new foods take time.
- Patience works better than pressure.

- Let them learn by serving themselves.
- Make meals and memories together.
- Cook together. Eat together. Talk together. Make mealtime a family time.
- They learn by watching you.
- They take their lead form you.

USDA/ENS Child Feeding Messages for Mothers of Preschoolers 5/19/2012 * New 2013
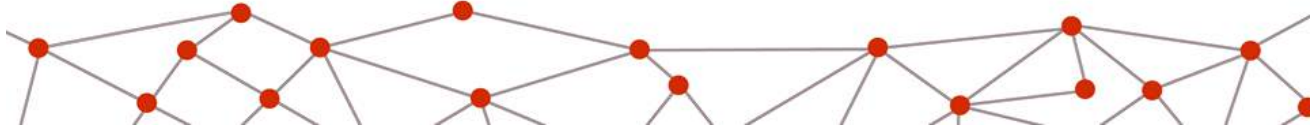
USDA has recently begun implementing core messages in its nutrition programs. The messages target fruit and vegetable consumption. Moms eating with their children and getting them involved in food preparation more often, and mom's allowing their children to decide what and how much to eat. During the initial round of focus groups, moms responded positively to most of the messages but they just couldn't accept any suggestions that they allow their children to decide how much to eat of what was given to them.

Head Start

A Comprehensive School Readiness Program

- Education
- Health
- Nutrition
- Mental Health
- Social Services
- Parent Involvement
- Shared Governance

North Carolina Department of Health and Human Services, ncchildcare.nc.gov

Head Start

- Serves over 1 million children every year
- Funding directly from federal (DHHS) to local entities and their "delegate" agencies
- Early Head Start: Prenatal to age 3
- Head Start: Age 3 – Kindergarten
- At least 90% of families must have income at or below the federal poverty line
- 10% slots can be reserved for children with disabilities or other special considerations
- Full-day, party-day, full-year, party-year, home visiting options

Head Start is a Department of Health and Human Services program that addresses much more than nutrition, but it has a very strong nutrition component to it. It started as a comprehensive school readiness program that includes all of the factors shown here. Each area being regulated by federal law. Head Start and Early Head Start serve over a million children every year in a variety of program options. The vast majority of these children qualify by virtue of their family incomes being at or below the federal poverty line. However, once they enter the program, their parents incomes may rise due to the availability of at least some child care, or also, it could be programming aimed at helping them prepare for employment.
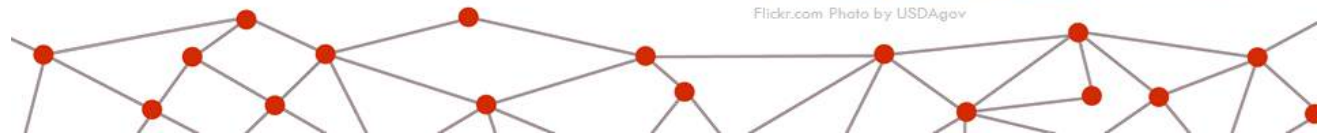
Head Start

Nutrition Services

- Assessment and Intervention
- Staff Training
- Parent Education
  Nutrition Education for Children
  (integrated into the core curriculum)
- Food Service
- Community Involvement
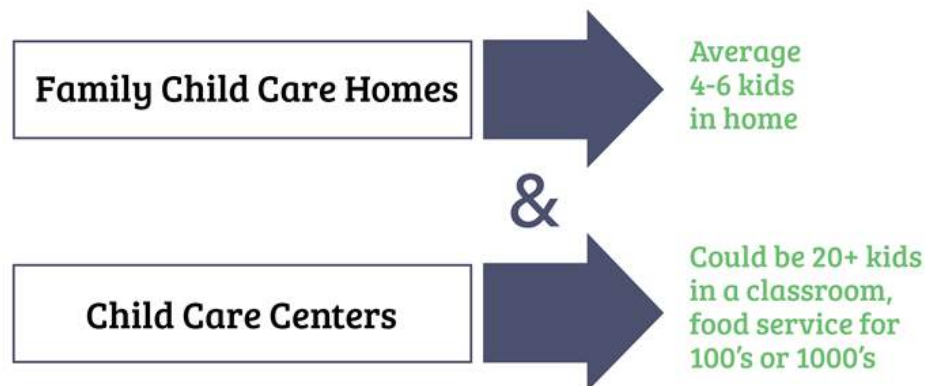- Program Planning and Evaluation

Flickr.com Photo by USDAgov

I can assure you that being a Head Start nutritionist is a huge, albeit gratifying, job. CACFP, or the Child and Adult Care Food Program, affects preschoolers and licensed child care centers and family day care homes. These child care centers could include Head Start, as well as some after school kids and adults in non-residential day programs.

CACFP

- USDA pays for nutritious meals and snacks for eligible children who are enrolled at participating **Child Care Centers & Family Day Care Homes (FDCH)**
- Up to two meals and a snack that meet USDA nutritional standards
- Most CACFP participants are preschool-aged children.
- Reimbursement levels are based either on the poverty status of the area or of the enrolled children.
- Also **afterschool programs, homeless shelters, adult day care** for the elderly.
- Required paperwork, meal pattern, training, monitoring

CACFP provides payment for meals on a per meal basis. This is a simple reimbursement not on a cost basis. It also gives child care providers some needed training and opens the doors to nutrition education resources for them. The accountability and paperwork in this program is quite strenuous and a bit of a deterrent to some people joining the program. Note that most participants on the program are preschool children. Centers and homes usually won't bother to sign up for CACFP unless a significant number of children qualify for free or reduced price meals, making the reimbursement worth all of the extra documentation that they must fulfill.

Family Child Care Homes → Average 4-6 kids in home

&

Child Care Centers → Could be 20+ kids in a classroom, food service for 100's or 1000's

Some people have asked, what is the difference between a family child care home and a child care center? So I'll describe that for you here. Family child care homes or family day care homes are businesses for a provider and offer more of a family experience with a smaller group of children being cared for in the provider's home. While center based care is more what you might think of as institutional, they're larger classrooms but they can still be very warm places. And these can be for profit or nonprofit, with two or three teachers for classrooms of 20 to 25 children depending on the local licensing requirements.

CACFP

How successful is CACFP at reaching the young kids who are entitled to it?

- Number of child care centers = 119,550*
  On CACFP = 53, 572**
- Number of family child care homes = 231, 705*
  On CACFP = 132, 297**

*NACCRRA. Child Care in America: 2011 State Fact Sheets.
**FRAC. Child and Adult Care Food Program: Participation Trends 2012. (For 2011)

- Studies show that children in CACFP receive meals that are nutritionally superior to those served to children in child care settings without CACFP.
- Higher intakes of key nutrients, fewer servings of fats and sweets, than children in non-participating care.

*Food Research and Action Center
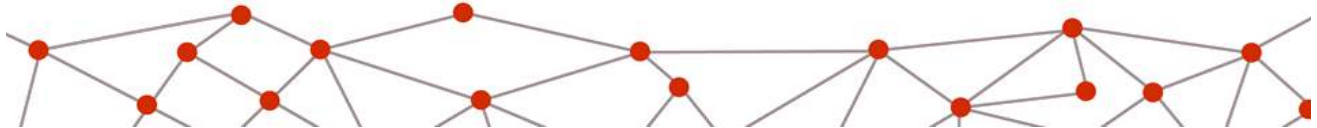
Is CACFP reaching the kids who could benefit? That's a common question to ask. These figures demonstrate that there's a large gap for both centers and family child care homes, primarily on account of the administrative hassles. Occasionally, though, the child care provider isn't aware of CACFP, and so some anti-hunger organizations especially are stepping up their efforts to let providers know of the benefits and to assure them that the hassle is worth it.

We can also ask, how well does CACFP support good nutrition. Some studies have shown that the quality of diets for participating children is higher. There hasn't been a lot of this research of late, but studies have shown that kids in CACFP received nutritionally superior meals, and they also have higher intakes of key nutrients, pure servings of fats and sweets than children in nonparticipating care.
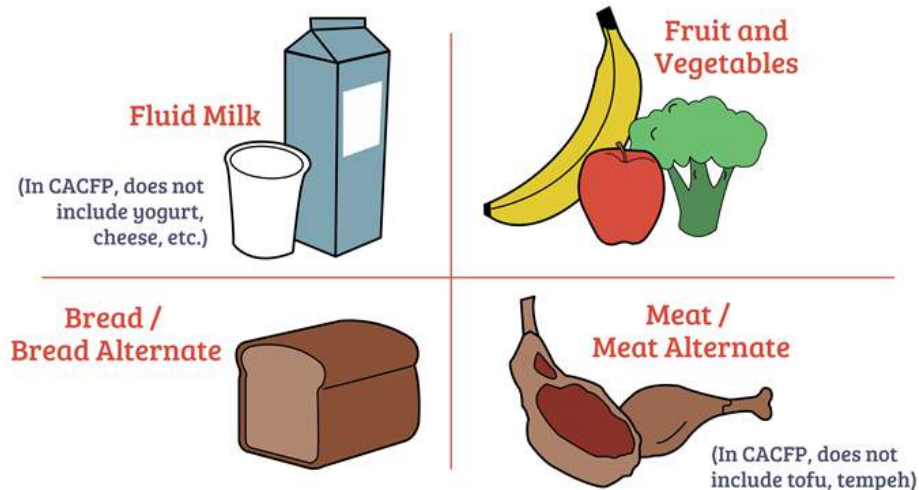
Nutrition Issues in Child Care

- Young children typically consume ½ to ¾ of their daily energy while in full-time child care.
- Children in child care are more likely to be obese –
  Maher, et al, Pediatrics 2008 Aug
- Vulnerability to food-borne illness and allergy issues in group care.
- Dietary quality of meals served in some child care settings needs improvement.
- Challenge to create healthy meals with limited time and resources.
- Early childhood is an important period for developing dietary behaviors and preferences.
- Child care providers can influence kids food habits.
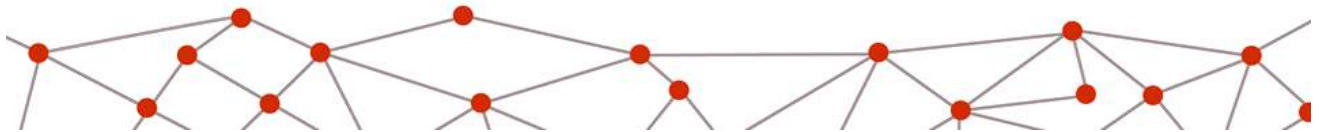
Let's talk about some nutrition concerns in child care. So why is it so important? Well, many kids receive most of their food for the day in a child care setting. This could be especially true in the case of kids who are from food insecure homes. Group care brings up food safety and allergy issues that may not concern a mom just dealing with her own child. And then there's some data suggesting that children in child care are more likely to be obese, but it's not really clear why that is. Certainly, many researchers have found that child care meals can use some improvement, and we know that it's a challenge and money and time can be tight. Since child care providers spend so much time at the table, or at least we hope they do, with the kids, they can have a very strong influence on their eating habits.

CACFP Meal Components

Fluid Milk

(In CACFP, does not include yogurt, cheese, etc.)

Fruit and Vegetables

Bread / Bread Alternate

Meat / Meat Alternate

(In CACFP, does not include tofu, tempeh)

In order to qualify for reimbursement under the child and adult care food program, providers must serve a meal or snack meeting certain component requirements and in amounts appropriate to the meal and age of the child. You can see the component requirements in this figure here. The meal patterns can be downloaded from the internet on the USDA website. Now, you'll note that the CACFP component figure looks a lot like MyPlate but it doesn't quite match up, which is sometimes confusing to people.

For example, in CACFP, liquid milk is required as a separate component at meals and has its own quarter of this circle. Whereas in MyPlate, the dairy group is split off into what looks like a cup and includes cheese and yogurt. In CACFP, some soy foods like tofu and tempeh have not yet qualified for meal reimbursement. But in MyPlate, they would be considered a part of the protein group. Fruit and vegetable serving sizes would need to be increased if we were going to make half this plate fruits and vegetables. Nothing prohibits providers from serving more at this point, but cost or children's food refusals could be a disincentive.

National Initiatives

Let's Move! Childcare

Child care settings can do a lot to help children learn about food. Some teachers do regular food tasting activities with the kids and many do cooking projects. There are ample resources available for cooking projects beyond cookies and muffins, and some teachers and providers are coming along, but there's definitely room for improvement. Old habits die hard, and you'll see cookies weekly in some places.

National Initiatives

Let's Move! Child Care Goals (from infancy through preschool)

•**1. Physical Activity:** Provide 1-2 hours of physical activity throught th day, including outside play when possible.

•**2. Screen Time:** No screen time for children under 2 years. For children age 2 and older, strive to limit screen time to no more than 30 minutes per week during child care, and work with parents and caregivers to ensure children have no more than 1-2 hours of quality screen time per day (as recommended by the American Academy of Pediatrics).

•**3. Food: Serve** fruits or vegetables at eery meal, eat meals family-style whenever possible, and don't serve fried foods.

•   **4. Beverages:** Provide access to water during meals and throughout the day, and don't serve sugar-sweetened drinks. For children age 2 or older, serve low-fat (1%) or non-fat milk, and no more than one 4 to 6 ounce serving of 100% juice per day.

•   **5. Infant Feeding:** For mothers who want to continue breastfeeding, provide their milk to their infants and welcome them to breastfeed during the child care day. Support all new parents' decisions about infant feeding.

In case you've been a communications blackout for the past few years, you've probably heard of the Let's Move campaign spearheaded by First Lady Michelle Obama to address the childhood obesity crisis. It has many components, and one of them is child care. The objectives addressing diet call for family-style meals with lots of fruits and vegetables and no fried food. They also call for cutting out the sugar sweetened beverages and using low fat milk and limited juice and lots of water.

National Initiatives

What is Farm to Preschool?

- Farm to School:

  Connects local food producers and processors with the school cafeteria or kitchen

  Food – and garden-based education in the classroom, lunchroom, and community

- Ages 0-5

- Childcare centers, preschool, Head Start, daycare centers, in-home care

The little sister of Farm to School is Farm to Preschool, and that's working to get more fresh, local produce into preschool menus and more gardens into classrooms. Kids respond very positively to school gardens. Most of the focus in funding has been on elementary schools, but increasing attention is being placed on preschool gardens.

**A Short History of SNAP (click to view online)**

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The idea for the first FSP is credited to various people, most notably Secretary of Agriculture Henry Wallace and the program's first Administrator Milo Perkins. The program operated by permitting people on relief to buy orange stamps equal to their normal food expenditures; for every $1 worth of orange stamps purchased, 50 cents worth of blue stamps were received. Orange stamps could be used to buy any food; blue stamps could only be used to buy food determined by the Department to be surplus.

Over the course of nearly 4 years, the first FSP reached approximately 20 million people at one time or another in nearly half of the counties in the U.S.--peak participation was 4 million--at a total cost of $262 million. The first recipient was Mabel McFiggin of Rochester, New York; the first retailer to redeem the stamps was Joseph Mutolo; and the first retailer caught violating the program was Nick Salzano in October 1939. The program ended "since the conditions that brought the program into being--unmarketable food surpluses and widespread unemployment--no longer existed."

Pilot Food Stamp Program - May 29, 1961-1964

The 18 years between the end of the first FSP and the inception of the next were filled with studies, reports, and legislative proposals.

Prominent Senators actively associated with attempts to enact an FSP during this period were: Aiken, La Follette, Humphrey, Kefauver, and Symington. From 1954 on, Congresswoman Leonor K. Sullivan strove unceasingly to pass food stamp program legislation. On Sept. 21, 1959, P.L. 86-341 authorized the Secretary of Agriculture to operate a food stamp system through Jan. 31, 1962.

The Eisenhower Administration never used the authority. However, in fulfillment of a campaign promise made in West Virginia, President Kennedy's first Executive Order called for expanded food distribution and, on Feb. 2, 1961, he announced that food stamp pilot programs would be initiated. The pilot programs would retain the requirement that the food stamps be purchased, but eliminated the concept of special stamps for surplus foods. A Department spokesman
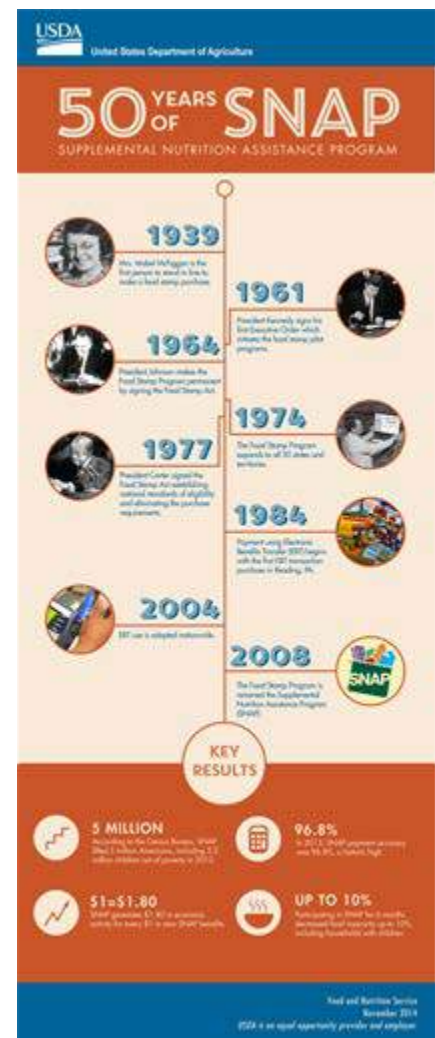
indicated the emphasis would be on increasing the consumption of perishables. Isabelle Kelley, who was part of the four-person team that designed the new program, became its first director and the first woman in USDA to head an action program.

Mr. and Mrs. Alderson Muncy of Paynesville, West Virginia, were the first food stamp recipients on May 29, 1961. They purchased $95 in food stamps for their 15-person household. In the first food stamp transaction, they bought a can of pork and beans at Henderson's Supermarket. By January 1964, the pilot programs had expanded from eight areas to 43 (40 counties, Detroit, St. Louis, and Pittsburgh) in 22 States with 380,000 participants.

> *"...the Department of Agriculture seemed bent on outlining a possible food stamp plan of such scope and magnitude, involving some 25 million persons, as to make the whole idea seem ridiculous and tear food stamp plans to smithereens."*
>
> (Congresswoman Leonor K. Sullivan)

Food Stamp Act of 1964 - August 31, 1964

On Jan. 31, 1964, President Johnson requested Congress to pass legislation making the FSP permanent. Secretary Orville Freeman submitted proposed legislation to establish a permanent FSP on April 17, 1964. The bill eventually passed by Congress was H.R. 10222, introduced by Congresswoman Sullivan. Among the official purposes of the Food Stamp Act of 1964 were strengthening the agricultural economy and providing improved levels of nutrition among low-income households; however, the practical purpose was to bring the pilot FSP under Congressional control and to enact the regulations into law. The major provisions were:

- the State Plan of Operation requirement and development of eligibility standards by States;
- the requirement that recipients purchase their food stamps, paying an amount commensurate with their normal expenditures for food and receiving an amount of food stamps representing an opportunity more nearly to obtain a low-cost nutritionally adequate diet;
- the eligibility for purchase with food stamps of all items intended for human consumption except alcoholic beverages and imported foods (the House version would have prohibited the purchase of soft drinks, luxury foods, and luxury frozen foods);
- prohibitions against discrimination on bases of race, religious creed, national origin, or political beliefs;
- the division of responsibilities between States (certification and issuance) and the Federal Government (funding of benefits and authorization of retailers and wholesalers), with shared responsibility for funding costs of administration; and

- appropriations for the first year limited to $75 million; for the second year, to $100 million; and, for the third year, to $200 million.

The Department estimated that participation in a national FSP would eventually reach 4 million, at a cost of $360 million annually.

Program Expansion - FSP Participation Milestones in the 1960s and Early 1970s.

In April 1965, participation topped half a million. (Actual participation was 561,261 people.) Participation topped 1 million in March 1966, 2 million in October 1967, 3 million in February 1969, 4 million in February 1970, 5 million one month later in March 1970, 6 million two months later in May 1970, 10 million in February 1971, and 15 million in October 1974. Rapid increases in participation during this period were primarily due to geographic expansion.

Major Legislative Changes - Early 1970s

The early 1970s were a period of growth in participation; concern about the cost of providing food stamp benefits; and questions about administration, primarily timely certification. It was during this time that the issue was framed that would dominate food stamp legislation ever after: How to balance program access with program accountability? Three major pieces of legislation shaped this period leading up to massive reform to follow:

P.L. 91-671 (Jan. 11, 1971) established uniform national standards of eligibility and work requirements; required that allotments be equivalent to the cost of a nutritionally adequate diet; limited households' purchase requirements to 30 percent of their income; instituted an outreach requirement; authorized the Department to pay 62.5 percent of specific administrative costs incurred by States; expanded the FSP to Guam, Puerto Rico, and the Virgin Islands of the United States; and provided $1.75 billion appropriations for Fiscal Year 1971.

Agriculture and Consumer Protection Act of 1973 (P.L. 93-86, Aug. 10, 1973) required States to expand the program to every political jurisdiction before July 1, 1974; expanded the program to drug addicts and alcoholics in treatment and rehabilitation centers; established semi-annual allotment adjustments, SSI cash-out, and bi-monthly issuance; introduced statutory complexity in the income definition (by including in-kind payments and providing an accompanying exception); and required the Department to establish temporary eligibility standards for disasters. This legislation also added a new category of eligible purchases with SNAP benefits - seeds and plants which produce food for human consumption.

P.L. 93-347 (July 12, 1974) authorized the Department to pay 50 percent of all States' costs for administering the program and established the requirement for efficient and effective administration by the States.

1974 Nationwide Program

In accordance with P.L. 93-86, the FSP began operating Nationwide on July 1, 1974. (The program was not fully implemented in Puerto Rico until Nov. 1, 1974.) Participation for July 1974 was almost 14 million.

The Food Stamp Act of 1977

Both the outgoing Republican Administration and the new Democratic Administration offered Congress proposed legislation to reform the FSP in 1977. The Republican bill stressed targeting benefits to the neediest, simplifying administration, and tightening controls on the program; the Democratic bill focused on increasing access to those most in need and simplifying and streamlining a complicated and cumbersome process that delayed benefit delivery as well as reducing errors, and curbing abuse. The chief force for the Democratic Administration was Robert Greenstein, Administrator of FNS; on the Hill, major players were Senators McGovern, Javits, Humphrey, and Dole and Congressmen Foley and Richmond. Amidst all the themes, the one that became the rallying cry for FSP reform was "EPR"--eliminate the purchase requirement--because of the barrier to participation the purchase requirement represented. The bill that became the law--S. 275--did eliminate the purchase requirement. It also:

- eliminated categorical eligibility;
- established statutory income eligibility guidelines at the poverty line;
- established 10 categories of excluded income;
- reduced the number of deductions used to calculate net income and established a standard deduction to take the place of eliminated deductions;
- established the fair market value (FMV) test for evaluating vehicles as resources;
- raised the general resource limit to $1,750;
- penalized households whose heads voluntarily quit jobs;
- restricted eligibility for students and aliens;
- eliminated the requirement that households must have cooking facilities;
- replaced store due bills with cash change up to 99 cents;
- established the principle that stores must sell a substantial amount of staple foods if they are to be authorized;
- established the ground rules for Indian Tribal Organization administration of the FSP on reservations; and
- introduced demonstration project authority.

In addition to EPR, the Food Stamp Act of 1977 included several access provisions:

- using mail, telephone, or home visits for certification;
- requirements for outreach, bilingual personnel and materials, and nutrition education materials;
- recipients' right to submit applications the first day they attempt to do so;
- 30-day processing standard and inception of the concept of expedited service;
- SSI joint processing and coordination with AFDC;
- notice, recertification, and retroactive benefit protections; and
- a requirement for States to develop a disaster plan.

The integrity provisions of the new program included fraud disqualifications, enhanced Federal funding for States' anti-fraud activities, and financial incentives for low error rates.

EPR was implemented Jan. 1, 1979. Participation that month increased 1.5 million over the preceding month.

Interesting fact:

The House Report for the 1977 legislation points out that the changes in the Food Stamp Program are needed without reference to upcoming welfare reform since "the path to welfare reform is, indeed, rocky...."

Cutbacks of the Early 1980s

The large and expensive FSP came under close scrutiny of both the Executive Branch and Congress in the early 1980s. Major legislation in 1981 and 1982 enacted cutbacks including:

- addition of a gross income eligibility test in addition to the net income test for most households;
- temporary freeze on adjustments of the shelter deduction cap and the standard deduction and constraints on future adjustments;
- annual adjustments in food stamp allotments rather than semi-annual;
- consideration of non-elderly parents who live with their children and non-elderly siblings who live together as one household;
- required periodic reporting and retrospective budgeting;
- prohibition against using Federal funds for outreach;
- replacing the FSP in Puerto Rico with a block grant for nutrition assistance;
- counting retirement accounts as resources;
- State option to require job search of applicants as well as participants; and
- increased disqualification periods for voluntary quitters.

The Mid- to Late 1980s

Recognition of the severe domestic hunger problem in the latter half of the 1980s led to incremental improvements in the FSP in 1985 and 1987, such as elimination of sales tax on food stamp purchases, reinstitution of categorical eligibility, increased resource limit for most households ($2,000), eligibility for the homeless, and expanded nutrition education. The Hunger Prevention Act of 1988 and the Mickey Leland Memorial Domestic Hunger Relief Act in 1990 foretold the improvements that would be coming. The 1988 and 1990 legislation accomplished the following:

- increasing benefits by applying a multiplication factor to Thrifty Food Plan costs;
- making outreach an optional activity for States;
- excluding advance earned income tax credits as income;
- simplifying procedures for calculating medical deductions;
- instituting periodic adjustments of the minimum benefit;
- authorizing nutrition education grants;
- establishing severe penalties for violations by individuals or participating firms; and
- establishing EBT as an issuance alternative.

Throughout this era, significant players were principally various committee chairmen: Congressmen Leland, Hall, Foley, Panetta, and de la Garza and Senator Leahy.

Development of Electronic Benefit Transfer (EBT): 1988-2004

Public Law 100-435, the Hunger Prevention Act of 1988 was signed into law September 19, 1988 and permitted one or more pilot projects to test whether the use of benefit cards or other automated or electronic benefit delivery systems could enhance the efficiency and effectiveness of program operations for both program administrators and recipients. Following this initiative, Public Law 101-624, the Mickey Leland Memorial Domestic Hunger Relief Act of November 28, 1990 established EBT as an issuance alternative and permitted the Department to continue to conduct EBT demonstration projects.

On August 10, 1993 the Conference Report on Public Law 103-66, the Omnibus Budget Reconciliation Act of 1993, included a managers statement strongly urging the Secretary to encourage State agencies to develop and establish EBT systems. This was followed by Public Law 104-193, the Personal Responsibility and Work Opportunity Reconciliation Act of August 22, 1996 which mandated that States implement EBT systems before October 1, 2002, unless USDA waived the requirement because a State faced unusual barriers to implementation.

A national standard of interoperability and portability applicable to electronic food stamp benefit transactions was established by Public Law 106-171, the Electronic Benefit Transfer Interoperability and Portability Act of 2000 on February 11, 2000 and Public Law 107-171, the Farm Security and Rural Investment Act of 2002 of May 13, 2002 required USDA to submit a report not later than October 1, 2003 to the House and Senate Agriculture Committees describing the status of EBT systems in each State. This act also allows group homes and institutions to redeem EBT benefits directly through banks in areas where EBT has been implemented rather than going through authorized wholesalers or other retailers.

Electronic Benefit Transfer (EBT) is an electronic system that allows a recipient to authorize transfer of their government benefits from a Federal account to a retailer account to pay for products received. EBT is used in all 50 States, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam. State food stamp agencies work with contractors to procure their own EBT systems for delivery of Food Stamp and other state-administered benefit programs.

In EBT systems, food stamp recipients apply for their benefits in the usual way, by filling out a form at their local food stamp office. Once eligibility and level of benefits have been determined, an account is established in the participant's name, and food stamp benefits are deposited electronically in the account each month. A plastic card, similar to a bank card, is issued and a personal identification number (PIN) is assigned or chosen by the recipient to give access to the account. Recipients are offered the opportunity to change the PIN number at any time, and are offered ongoing training if they have any problems accessing the system.

EBT eliminates the cumbersome processes required by the paper food stamp system. By eliminating paper coupons which could be lost, sold or stolen, EBT may help cut back on food stamp fraud. EBT creates an electronic record of each food stamp transaction, making it easier to identify and document instances where food benefits are exchanged for cash, drugs, or other illegal goods.

All States are using EBT as an alternative for SNAP issuance and, in some cases, for other programs such as USDA's Special Supplemental Nutrition Program for Women, Infants and Children (WIC); and the Temporary Assistance to Needy Families (TANF) program, the Federal block-grant program operated by the Department of Health and Human Services. As of July 2004, all 50 States, the District of Columbia, the Virgin Islands, and Guam operated state-wide, city-wide, and territory-wide EBT systems to issue SNAP benefits.

In Puerto Rico, the Supplemental Nutrition Assistance Program, was replaced in 1982 by a block grant program, called the Nutrition Assistance Program. Puerto Rico is not interoperable with other States.

1993 Mickey Leland Childhood Hunger Relief Act

By 1993, major changes in food stamp benefits had arrived. The final legislation provided for $2.8 billion in benefit increases over Fiscal Years 1984-1988. Leon Panetta, in his new role as OMB Director, played a major role as did Senator Leahy. Substantive changes included:

- eliminating the shelter deduction cap beginning Jan. 1, 1997;
- providing a deduction for legally binding child support payments made to nonhousehold members;
- raising the cap on the dependent care deduction from $160 to $200 for children under 2 years old and $175 for all other dependents;
- improving employment and training (E&T) dependent care reimbursements;
- increasing the FMV test for vehicles to $4,550 on Sept. 1, 1994 and $4,600 on Oct. 1, 1995, then annually adjusting the value from $5,000 on Oct. 1, 1996;
- mandating asset accumulation demonstration projects; and
- simplifying the household definition.

Later Participation Milestones

In December 1979, participation finally surpassed 20 million. In March 1994, participation hit a new high of 28 million.

The Personal Responsibility and Work Opportunities Reconciliation Act of 1996

The mid-1990s was a period of welfare reform. Many States had waivers of the rules for the cash welfare program, Aid to Families with Dependent Children (AFDC) before major welfare reform legislation was enacted in 1996. The Personal Responsibility and Work Opportunities Reconciliation Act of 1996 (PRWORA) removed the entitlement of recipients to AFDC and replaced that with a new block grant to states called Temporary Assistance to Needy Families (TANF).

Although the FSP was reauthorized in the 1996 Farm Bill, major changes to the program were enacted through PRWORA. Among them were:

- eliminating eligibility of most legal immigrants to food stamps;
- placing a time limit on food stamp receipt of three out of 36 months for able-bodied adults without dependents (ABAWDs) who are not working at least 20 hours a week or participating in a work program;
- reduction in maximum allotments by setting them at 100 percent of the change in the Thrifty Food Plan (TFP) from 103 percent of the change in the TFP;
- freezing the standard deduction, the vehicle limit, and the minimum benefit;
- setting the shelter cap at graduated specified levels up to $300 by fiscal year 2001, and permitting States to make use of the standard utility allowance mandatory;

- revising provisions for disqualification, including comparable disqualification with other means-tested programs; and
- requiring States to implement EBT before Oct. 1, 2002.

The Balanced Budget Act of 1997 (BBA) and the Agricultural Research, Education and Extension Act of 1998 (AREERA) made some changes to these provisions, most significantly:

- additional Employment and Training (E&T) funds targeted toward providing work program opportunities for ABAWDs;
- allowing States to exempt up to 15 percent of the estimated number of ABAWDs who would otherwise be ineligible;
- restoring eligibility for certain elderly, disabled and child immigrants who resided in the United States when PRWORA was enacted; and
- cutting administrative funding for States to account for certain administrative costs that previously had been allocated to the AFDC program and now were required to be allocated to the Food Stamp Program.

The fiscal year 2001 agriculture appropriations bill included two significant changes to the FSP. The legislation increased the excess shelter cap to $340 in fiscal year 2001 and then indexed the cap to changes in the Consumer Price Index for All Consumers each year beginning in fiscal year 2002. The legislation also allowed States to use the vehicle limit they use in a TANF assistance program, if it would be result in a lower attribution of resources for the household. To date, only two States have not taken advantage of this option.

Early 2000s - The Farm Bill of 2002

Participation declined throughout the late 1990s, even more so than expected based on the changes in PRWORA and falling unemployment. Program access and simplification of program rules were a major focus of proposed legislation and of major regulations promulgated by the Department. In May 2002, the Food Security and Rural Investment Act of 2002 was enacted, including reauthorization of the Food Stamp Program. Major changes to the FSP included:

- restoration of eligibility for food stamps to qualified aliens who have been in the United States at least five years;
- restoration of eligibility for immigrants receiving certain disability payments and for children, regardless of how long they have been in the country;
- adjusting the standard deduction to vary by household size and indexed each year for inflation;
- reforming the quality control (QC) system by basing financial sanctions on consecutive years of high error rate;
- replacing enhanced funding for States with low error rates with a performance bonus system based on several different measures of performance;

- providing States with several options to simplify the program, including aligning the definition of income and/or resources to that used in TANF or Medicaid, adopting a simplified reporting system, and providing transitional benefits for clients leaving TANF;
- cutting E&T funding while eliminating the requirements of targeting those funds toward ABAWDs; and
- eliminating the cost neutrality requirement for EBT systems.

Food stamp participation increased from about 17.2 million in fiscal year 2000 to 26 million people in July 2006. The rate of payment accuracy in the FSP improved 34 percent between FY2000 and FY2004 and the 94.12 percent overall payment accuracy rate was the highest achieved since the inception of the program. USDA awarded $48 million to 24 States for their exemplary administration of the program in fiscal year (FY) 2005.

This improvement in payment accuracy is a result of strong partnerships with States administering the program as well as implementation of program simplifications and policy options provided in the 2002 Farm Bill. These options which include aligning the definition of income and/or resources to that used in TANF or Medicaid, adopting a simplified reporting system, and providing transitional benefits for clients leaving TANF, were well received by State agencies. Forty-one of these have aligned income and 36 have aligned resource exclusions to those used in TANF or Medicaid. 47 States have adopted simplified reporting which has reduced the program error rate.

The Department continues to work with States to implement the various provisions of the 2002 Farm Bill, through guidance and regulations.

Late 2000s - The Farm Bill of 2008

By August 2008, participation had reached an all-time (non-disaster) high of 29 million people per month. The participation increases occurred at a time when eligibility for food stamp benefits expanded as a result of the 2002 Farm Bill. Moreover, there was a consistent focus on outreach and improved access to FSP benefits. Some of the most recent increase in participation may be caused by the current economic slowdown and the recent rise in unemployment rates. During this time, payment accuracy continued to improve and the program set a new payment error rate record for fiscal year 2007 of 5.64.

The 2008 farm bill (H.R. 2419, the Food, Conservation, and Energy Act of 2008) was enacted May 22, 2008 through an override of the President's veto. The new law increased the commitment to Federal food assistance programs by more than $10 billion over the next 10 years. In efforts to fight stigma, the law changed the name of the Federal program to the Supplemental Nutrition Assistance Program or SNAP as of Oct. 1, 2008, and changed the name

of the Food Stamp Act of 1977 to the Food and Nutrition Act of 2008. States maintained flexibility to name the program on their own but were encouraged to change the name to SNAP or another alternate name. In fact, more than ten States had already changed the names of their programs by this time.

Significantly, the 2008 Farm Bill also institutionalized priorities that FNS had focused on for many years including strengthening integrity; simplifying administration; maintaining State flexibility; improving health through nutrition education; and improving access.

Benefits were augmented for most households on Oct. 1, 2008, due to the increase in the minimum benefit and standard deduction and elimination of the cap on the deduction for child care expenses. The new law also expanded eligibility by indexing the asset limits to inflation and excluding combat pay, and most retirement and education accounts as countable resources. The law modernized the program by acknowledging EBT as the standard issuance vehicle and de-obligating coupons one year from enactment. The Farm Bill also provided $20 million in mandatory funding for a project to test point-of-purchase incentives for healthful foods and authorized appropriations for other similar projects.

Other important changes included:

- Extended simplified reporting to all households
- Extended of transitional benefits to those leaving a State-funded cash assistance program
- Allowed use of E&T funds for job retention expenses
- Clarified the E&T volunteers are not subject to a participation limit
- Stipulated that State agencies must issue monthly benefit allotments to individuals in one lump sum unless a benefit correction is necessary
- Sets standards for expungement of benefits and for moving benefits off line
- Clarified that interchange fees may not apply to EBT transactions
- Required USDA to set standards for major changes in program design
- Required USDA to require proper testing as a condition of Federal financial participation in State automation systems.
- Allowed USDA to prohibit State agencies from collecting claims from a household and to assert a claim against a State in cases of major systems failure
- Offered States the option of implementing a telephonic signature process
- Codified regulations regarding bilingual access, civil rights requirements and nutrition education

- Allowed for disqualification for clients who intentionally obtain cash by purchasing and then discarding a product to obtain the deposit or intentionally sells food purchased with SNAP benefits
- Gave USDA more flexibility in setting disqualification periods and fines for certain retailer violations.