

Position of the Academy of Nutrition and Dietetics: Nutrition Guidance for Healthy Children Ages 2 to 11 Years

ABSTRACT

It is the position of the Academy of Nutrition and Dietetics that children ages 2 to 11 years should achieve optimal physical and cognitive development, maintain healthy weights, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity. Rapid increases in the prevalence of childhood obesity during the 1980s and 1990s focused attention on young children's overconsumption of energy-dense, nutrient-poor foods and beverages and lack of physical activity. While recent data suggest a stabilization of obesity rates, several public health concerns remain. These include the most effective ways to promote healthy weights, the number of children living in food insecurity, the under-consumption of key nutrients, and the early development of diet-related risks for chronic diseases, such as cardiovascular disease, type 2 diabetes, cancer, obesity, and osteoporosis. This Position Paper reviews what children 2 to 11 years old in the United States are reportedly eating, explores trends in food and nutrient intakes, and examines the impact of federal nutrition programs on child nutrition. Current dietary recommendations and guidelines for physical activity are also discussed. The roles of parents and caregivers in influencing the development of life-long healthy eating behaviors are highlighted. The Academy of Nutrition and Dietetics works with other allied health and food industry professionals to translate dietary recommendations and guidelines into positive, practical health messages. Specific recommendations and sources of science-based nutrition messages to improve the nutritional well-being of children are provided for food and nutrition practitioners.

J Acad Nutr Diet. 2014;114:1257-1276.

POSITION STATEMENT

It is the position of the Academy of Nutrition and Dietetics that children ages 2 to 11 years should achieve optimal physical and cognitive development, maintain healthy weights, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity.

IN 2011, THERE WERE 73.9 MILLION children living in the United States, with similar numbers of children in three age groups: 0 to 5 years (24.3 million), 6 to 11 years (24.6 million), and 12 to 17 years (25.1 million). Children made up 24% of the total US population and are projected to remain a fairly stable percentage through 2050. Racial and ethnic diversity has grown among young Americans. By 2050, US children are projected to be 39% Hispanic (up from 24% in 2011); 36% white, non-Hispanic (down from 53% in 2011); 15% black; 13% non-Hispanic black; and 6% Asian (up from 4% in 2011). Children who identify with two or more race

groups are projected to make up 5% of all US children by 2050 (up from 4% in 2011).¹

The nutrition and health status of young Americans has received increasing attention as "upstream" determinants of our nation's health.² Recognizing that the early (birth to 6 years) and middle (ages 6 through 12) stages of child development provide the physical and cognitive foundation for health, learning, and well-being throughout the lifespan, Healthy People 2020 added several new objectives that are directly linked to child nutrition. These high-priority issues and actions are called Leading Health Indicators and include total vegetable intake for individuals 2 years and older and children and adolescents who are considered obese.³ The 2010 Dietary Guidelines for Americans (DGA), the

White House Task Force on Childhood Obesity Report, and the Let's Move initiative have focused research, policy, clinical, and public health attention on raising a healthier generation of American children, especially in terms of weight status.⁴

The prevalence of childhood obesity increased rapidly during the 1980s and 1990s, doubling or tripling in some age groups. Recent National Health and Nutrition Examination Survey (NHANES) data indicate that the rapid increases have not continued and rates have stabilized.⁵ In 2009-2010, 16.9% of US children and adolescents were obese (defined as body mass index [BMI]-for-age \geq 95th percentile), with prevalence rates higher among teens than preschool-aged children and higher among boys than girls. Overall, there was no significant change in obesity

2212-2672/\$36.00

<http://dx.doi.org/10.1016/j.jand.2014.06.001>

prevalence in NHANES measurements from 2007-2008 to 2009-2010. Stable and decreasing obesity rates have been confirmed in other national and local surveys, including the Centers for Disease Control and Prevention's 2012 Pediatric Nutrition Surveillance Report,⁶ data from school districts in Philadelphia, PA,⁷ and Anchorage, AK,⁸ and among young children in Massachusetts.⁹ A 2013 Centers for Disease Control and Prevention report confirmed small but significant declines in obesity rates among low-income preschoolers in 19 of 43 US states/territories.¹⁰

Energy balance—energy intake and expenditure to achieve normal growth and maintain a healthy body weight—is just one of many reasons to ensure healthful eating habits¹¹ in children 2 to 11 years. Age-appropriate energy and nutrient intakes are essential to support normal growth and development and to prevent acute nutrition problems, such as iron-deficiency anemia and dental caries. Healthy eating and physical activity patterns can also help to promote learning and academic success^{12,13} and to reduce the risk of chronic diseases, including cardiovascular disease, type 2 diabetes, cancer, obesity, and osteoporosis.¹⁴

Multiple surveys suggest that American children do not consume the types and amounts of foods that are consistent with dietary recommendations.¹⁵⁻¹⁷ According to the DGA,¹⁸ while children's intakes of solid fats and added sugars (SoFAS) exceed guidelines, many are not meeting the recommended intake for the nutrients of public health concern (calcium, dietary fiber, potassium, and vitamin D), whole grains, vegetables, fruits, and dairy foods.

While underweight, chronic malnutrition, and severe nutrient deficiencies are rare among children in the United States, there is a growing recognition that food insecurity can have profound and long-lasting effects on young children.¹⁹ The fact that nearly 16 million children are estimated to live in food-insecure households²⁰ underscores the need for access to nutrition and feeding programs in child care²¹ and for comprehensive school nutrition services.²²

Numerous environmental factors, including family, child care, schools, and advertising, can influence the eating habits of young children. These settings provide multiple opportunities for registered dietitian nutritionists

(RDNs); dietetic technicians, registered (DTRs); and other food and nutrition practitioners to provide information, education, counseling, and coaching for children 2 to 11 and their caregivers.

Because children younger than 2 years of age and adolescents have unique nutritional requirements and concerns, this Position Paper focuses primarily on healthy children aged 2 to 11 years. Children with special health care needs may be at increased risk for nutrition problems related to their conditions and, therefore, require additional guidance and modifications of these recommendations.²³

DIET QUALITY FOR HEALTH PROMOTION AND DISEASE PREVENTION

There is a pressing need for US children to achieve healthy eating and physical activity patterns that optimize normal growth and development, promote cognition and academic performance, and reduce the risk of future health problems.⁴ Current childhood nutrition concerns include energy balance, excessive intakes of dietary fats, saturated fats, sugar, and sodium, and inadequate intakes of foods rich in calcium, potassium, vitamin D, and dietary fiber, including dairy foods, vegetables, fruits, seafood, and whole grains.¹⁸ It has been suggested that major gains in public health would be made if children's diets in the United States were more in line with the DGA and if physical activity levels were increased.⁴ Healthful eating habits for young children can best be achieved by moderate consumption of a varied diet that includes a variety of nutrient-dense foods among and within the major food groups, as illustrated by MyPlate for children in the US Department of Agriculture's (USDA's) Eat Right to Play Hard materials²⁴ (see Figure 1). As defined by the DGA,¹⁸ "Nutrient-dense foods and beverages provide vitamins, minerals, and other substances that may have positive health effects with relatively few calories.... Nutrient-dense foods and beverages are lean or low in solid fats, and minimize or exclude added solid fats, sugars, starches, and sodium. Ideally, they also are in forms that retain naturally occurring components, such as dietary fiber."

Prevention of chronic disease has been explored through the Academy

of Nutrition and Dietetics Evidence Analysis Process. In this process, an expert work group identified questions related to child nutrition (ages 2 to 11 years) and a systematic review of the literature was performed. The level of evidence provided the basis for a rating for each statement and a conclusion statement. For more information about the Evidence Analysis Process, including inclusion and exclusion criteria, abstracts of the articles used, and evidence summaries, visit the Evidence Analysis Library (EAL) at: <http://andevidencelibrary.com>.

EAL Question: What Is the Role of Childhood Nutrition in the Prevention of Obesity?

EAL Conclusion Statement. Eleven studies (5 randomized controlled trials, 3 nonrandomized controlled trials, and 3 meta-analyses) met inclusion criteria for this question. Five controlled trials found that school-based interventions utilizing a variety of methods were effective in improving markers of obesity in children. One meta-analysis found that nutrition and physical activity interventions in school-based settings can result in substantial reductions in weight. One meta-analysis found no significant changes between children who received school-based obesity interventions and those who did not.

Two controlled trials found that interventions delivered in community or home settings, utilizing a variety of methods, were effective in improving markers of obesity in children.

One controlled trial and one meta-analysis examined specific interventions for child obesity. Presentation of appropriate portion sizes may discourage overconsumption at meals. One meta-analysis found no association between consumption of sugar-sweetened beverages and BMI.

Minimal research was identified in this age group regarding prevention of obesity. Additional research is needed to determine the effectiveness of specific interventions to prevent obesity.

Grade III = Limited.²⁵

EAL Question: What Is the Role of Childhood Nutrition in the Prevention of Cardiovascular Disease?

EAL Conclusion Statement. Three studies (one randomized controlled trial



Figure 1. Eat Healthy Play Hard mini-poster. Available at: www.fns.usda.gov/sites/default/files/eatsmartminiposter.pdf.

and two nonrandomized controlled trials) found that interventions including school-based programs and individualized dietary counseling were effective in reducing risk factors for cardiovascular disease, especially in girls. Effective interventions included both nutrition and physical activity components, as well as a strong emphasis on parental involvement in the intervention. The studies demonstrated improvements in nutrition knowledge, blood pressure, weight, and BMI. Additional research is needed to determine the optimal methods for preventing cardiovascular disease in children.

Grade III = Limited.²⁵

EAL Question: What Is the Role of Childhood Nutrition in the Prevention of Type 2 Diabetes?

EAL Conclusion Statement. Three studies (two randomized controlled trials and one nonrandomized controlled trial) found that childhood nutrition interventions resulted in improvements in one or more of the following risk factors for type 2 diabetes: glycemic control, BMI, body composition, and nutrition-

and physical activity-related behaviors. Interventions were delivered through school- and community-based programs and encompassed nutrition education, physical activity, and development of skills for self-management of health behaviors. Additional research is needed about the prevention of type 2 diabetes in children, as well as the long-term effects of childhood interventions on adult diabetes prevention.

Grade III = Limited.²⁵

Additional evidence analysis questions, including those related to diet quality and child nutrition are listed in Figure 2.

CHILDREN'S CURRENT FOOD AND NUTRIENT INTAKE

The nutrient intake of children ages 2 to 11 years in the United States continues to fall short of the recommendations outlined in the Dietary Reference Intakes (DRIs), which provide specific recommendations for children 1 to 3 years and 4 to 8 years, and for males and females 9 to 13 years.²⁶ The shortfalls have been documented in overall

diet quality in the total population, as well as for specific nutrients and age groups.

Children older than the age of 2 years are included in the Healthy Eating Index (HEI), a tool designed to measure compliance with the diet-related recommendations of the DGA. Because the HEI assesses dietary intakes on the basis of density rather than the absolute amounts of foods consumed, it assesses the quality of the mix of foods rather than specific quantities.²⁷ A 2013 comparison of NHANES data from 2001-2002 and 2007-2008 indicated that HEI scores were below the maximum possible score for all components, except for Total Protein Foods. According to this analysis, the overall diet quality of Americans, including children 2 to 11 years, did not improve overall between 2001-2002 and 2007-2008.¹⁷

The downward trend in reported energy intake among children and adolescents aged 2 to 19 between NHANES data collected in 1999-2000 and 2009-2010²⁸ may help to explain the observed stabilization of BMIs in these age groups

Topic	Question Link to Conclusion Statement
Child nutrition and school-based programs	In school-based programs, what is the effectiveness of altering physical activity patterns as a part of an intervention program to address childhood overweight? http://bit.ly/1hsJv6Y
	In school-based programs, what is the effectiveness of nutrition education as a part of an intervention program to address childhood overweight? http://bit.ly/1cbNapC
	In school-based programs, what is the effectiveness of combined nutrition education and physical activity interventions to address childhood overweight? http://bit.ly/1cbNd4Z
Child nutrition and sodium	What evidence demonstrates a relationship between sodium intake and blood pressure in children? http://bit.ly/1ekmqQC
	What evidence demonstrates a correlation between children's sodium intake and the incidence of hypertension? http://bit.ly/1aQ6Gai
Child nutrition and fluoride	What are the effects of fluoride exposure (intake) on the renal system at different levels (among different age groups)? http://bit.ly/1hsJQqq
	What is the evidence for a relationship between exposure to high levels of fluoride in drinking water and IQ in children? http://bit.ly/1hTkXoG
	What are estimates of fluoride exposure in US children? http://bit.ly/1mS7ikP

Figure 2. Selected Evidence Analysis Library (EAL) questions related to pediatric nutrition.

during this time period. Trends in protein, carbohydrate, and fat intakes as percentages of total energy were inconsistent during this time. The percent of energy from saturated fat in 2009-2010 was above the 10% recommended in the 2010 DGA, with US children and adolescents consuming between 11% and 12% energy from saturated fat. Trends in total energy intake, along with total fat, sodium, sugar, calcium, and fiber are summarized in Table 1.

A 2013 review of trends in the dietary intake of US children 2 to 6 years old, using five national representative surveys (ie, Continuing Survey of Food Intakes by Individuals 1994-1996 and the What We Eat In America, NHANES 2003-2004 through 2009-2010), suggested an increase in the proportion of

foods that are significant sources of solid fat, added sugar, and sodium between 1989 and 2008.¹⁶ The predominant changes in preschool children's per capita consumption were increased intake of savory snacks, pizza/calzones, mixed Mexican dishes, sweet snacks, candy, and fruit juices. The only positive change reported was a small increase in fruit intake.

A more recent review indicated decreases in the consumption of SoFAS among US children and adolescents; however, mean intakes continued to exceed recommended limits.²⁹ Using the same five national surveys mentioned, this analysis found that daily intake of energy from SoFAS among US 2- to 18-year-olds decreased from 1994 to 2010. Declines were

primarily detected in the most recent surveys, with solid fats representing a greater proportion of total energy intake than added sugars.

The sodium intake of children 2 to 11 years in the United States has remained relatively unchanged in national representative samples from 1994 through 2008.³⁰ Sodium intake increased as energy intake increased. NHANES data from 2007-2008 showed a mean intake of 2,230 mg/day for children ages 2 to 5 years and 2,933 mg/day for children ages 6 to 11. An analysis of estimated usual intake of sodium and energy (NHANES 2003-2008) described a mean intake of 3,260 mg/day for children in the 8- to 12-year range.³¹ The 2010 DGA recommendations for children older than age 2

Table 1. Mean daily intake (energy and other nutrients) of children ages 2 to 11 years^a

	1999/2000	2001/2002	2003/2004	2005/2006	2007/2008	2009/2010
Total energy (kcal)	1,860	1,854	1,956	1,811	1,752	1,732
Total fat (g)	68	67	72	67	65	62
Sodium (mg)	2,925	2,834	2,901	2,751	2,622	2,696
Sugar (g)	—	137	140	126	122	118
Calcium (mg)	870	965	1,023	968	969	1,041
Fiber (g)	11.9	11.7	12.2	12.1	12.0	13.1

^aData adapted from reference 96.

years are <2,300 mg/day,¹⁸ and 2012 World Health Organization guidelines suggest a maximum of 2 g/day (2,000 mg), with downward adjustments for lower energy intake at younger ages.³²

In addition to the overconsumption of energy, SoFAS, and sodium, the 2010 DGA recognized four nutrients of public health concern, based on the low population intakes of dietary fiber, calcium, vitamin D, and potassium.¹⁸ Many children ages 2 to 11 consume inadequate amounts of these nutrients, according to recent analysis of NHANES data as summarized:

- **Fiber:** Daily intakes of fiber are estimated to be less than recommended with intakes for girls (2 to 11 years) in the range of 10 to 12 g/day and boys (2 to 11 years) consuming 11 to 14 g/day. Recommendations for fiber intake range from 19 g to 38 g/day (14 g/1,000 kcal), depending on age and energy intake.^{33,34}
- **Calcium:** While the mean calcium intake of younger children and boys meets or exceeds the Adequate Intake (AI), only 15% of females 9 to 13 consumed the AI, even with supplementation, according to NHANES 2005-2006 data.³⁵ This analysis also suggested a decrease in an adequate intake for females 4 to 8 years, as well as significantly decreased intakes during adolescence. The AI for calcium is 500 mg/day for 1- to 3-year-olds, 800 mg/day for 4 to 8 year olds, and 1,300 mg/day for 9- to 13-year-olds.²⁶
- **Vitamin D:** NHANES data from 2005-2006 indicated that most children ages 2 to 11 met AI recommendations for vitamin D, primarily from fortified milk and other dairy products.³⁵ Since then, the AI for vitamin D has increased to 10 µg/day (600 IU/day); intakes of children 2 to 13 years of age ranged from 5.0 to 8.4 µg/day.²⁶
- **Potassium:** According to NHANES 2009-2012, mean intakes of potassium fall far below the AI of 4,700 mg for all children, with 2- to 5-year-old (2,071 mg) and 6- to 11-year-old (2,172 mg) children consuming less than half of this amount.³⁶

A detailed analysis, using recent nationally representative data (NHANES 2003-2006), of the intake of children 2 to 18 years confirmed that many foods/food groupings consumed by this age group were energy dense and nutrient poor.¹⁵ The top ranked food/food group sources of energy and nutrients were:

- Energy: milk and cake/cookies/quick bread/pastry/pie
- Protein: milk and poultry
- Total carbohydrate: soft drinks/soda and yeast bread/rolls
- Total sugars: soft drinks/soda and yeast breads/rolls
- Added sugars: soft drinks/soda and candy/sugar/sugary foods
- Dietary fiber: fruit and yeast bread/rolls
- Total fat: cheese and crackers/popcorn/pretzels/chips
- Saturated fatty acids: cheese and milk
- Cholesterol: eggs and poultry
- Vitamin D: milk and milk drinks
- Calcium: milk and cheese
- Potassium: milk and fruit juice
- Sodium: salt added during processing or cooking and yeast bread and rolls.

The analysis also identified principal sources of energy that were also major sources of nutrients, including milk and milk drinks, poultry, and beef.

Several other studies, reported in the following sections on eating patterns, confirm these results and reiterate the recommendations summarized in the report on HEI-2010 results¹⁷:

“HEI-2010 scores can be improved by increasing intake of fruits; vegetables, especially dark-green vegetables and peas and beans; and fat-free or low-fat milk; substituting whole-grain for refined-grain products and seafood for some meat and poultry; choosing more nutrient-dense forms of foods, that is, foods low in solid fats and free of added sugars; and reducing sodium intake. Such changes would provide substantial health benefits for Americans. Supporting these changes will require comprehensive approaches that engage every segment of society (ie, individuals, families, schools, industry, government, and nongovernmental organizations) and reshape the

environment so that the healthy choices become the easy, accessible, and desirable choices for everyone.”

Eating Patterns of Children

Eating patterns and nutrient intake are affected by numerous factors, including eating occasions outside the home, portion sizes, beverage consumption, food selected (eg, vegetarian choices), and meal patterns and frequency.

Meals at Home and Away from Home.

Energy intake and portion sizes consumed both at home and away from home increased significantly since 1977, and there have been changes to food patterns, foods consumed, and their contribution to energy intake.^{37,38}

Portion sizes and energy content of foods commonly consumed by children—soft/fruit drinks, salty snacks, desserts, french fries, burgers, pizzas, Mexican fast foods, and hot dogs—has increased^{39,40}; however, only pizza and soft drinks have had an effect on overall energy intake.³⁹ Soft drink intake increased about 100 mL and pizza intake increased by about 41 g (140 calories) between 1977-1978 and 2003-2006.

The once-traditional pattern of the family having dinner together at the table has changed, with fewer families eating meals together. However, children who eat meals with their families at home have better diet quality than those who do not, and they are also more likely to have healthy body weights.⁴¹ Children tended to have higher intakes of fruits and vegetables and were more likely to eat breakfast when at least three meals per week were shared family meals.⁴¹ The home environment is important to children's intakes. Parental modeling and intake, availability of food at home, and family rules affect children's intakes.⁴²⁻⁴⁴

Daily energy intake away from home increased from 23.4% in 1977 to 33.9% in 2006. Where this food comes from has shifted, by 2006 fast food was the largest contributor to foods prepared away from home, providing 13% of total intake and surpassing the contribution of foods eaten at school. Food from the home supply that is eaten away from home has increased significantly as well. Looking at food consumption trends between 1994 and 2006, intake

from foods eaten at home did not change. However, foods eaten at home but prepared away from home increased. The main contributor to this increase was fast food, which provided 3.5% of children's energy intake in 1994 and 6.1% in 2006.³⁷ Foods available outside the home tend to be higher in energy and fat compared with foods eaten at home.^{45,46} Fast foods contribute few servings of fruit, vegetables, whole grains, and dairy foods to the diets of children.⁴⁶⁻⁴⁸ Children consuming fast food had higher intakes of energy, fat, saturated fat, and sugar than those who did not. Fast-food and full-service restaurant use was associated with decreased milk intake and increased intake of sugar-sweetened beverages.⁴⁶ Overall, children who consumed fast food had poorer diet quality than children who did not.⁴⁹

Portion Sizes. Although larger portion sizes appear to increase adults' energy intake, data for children is less conclusive.^{50,51} Several studies have shown that providing children with larger food portions can lead to significant increases in food and energy intakes.⁵² Children 3 to 5 years of age consumed more of the entrée and less of "other" foods (including fruits and vegetables) when larger entrée portions were served, resulting in an increased energy intake.⁵² Some children consumed less when allowed to serve themselves than when the entrée was served on individual plates,⁵³ while for others, allowing self-serve did not reduce energy intake.⁵⁴ Plate/dishware and serving utensil size also affected self-served portions and intake; larger dishes were associated with larger portions and intakes in children.⁵⁵

Beverage Consumption. Beverage consumption patterns of children have changed markedly over the past half-century. The number of children who consume milk decreased from 84% to 85% (1976-1980 and 1988-1994) to 77% (2001-2006), although intake of flavored milk increased. Fruit juice consumption increased to >50%, compared with approximately 30% in older surveys. The amount of juice consumed was generally greater than the American Academy of Pediatrics, American Heart Association, and DGA recommendations of 4 to 6 oz/day, with 1-year-old children consuming

10 to 12 oz/day.⁵⁶ The proportion of children drinking reduced-fat or fat-free milk has doubled since the late 1970s, and by 1994 these milk types were consumed more frequently than whole milk. Soft drink consumption has increased from 7 fl oz/day (1976-1980) to 7.9 fl oz/day (2001-2006), contributing about 5% of total energy intake.⁵⁶

Intake of soft drinks and other sugar-sweetened beverages are associated with greater energy intakes and decreased fruit and vegetable intake among children who drink medium and high amounts. For 2- to 5-year-olds, sugar-sweetened beverage intake is negatively associated with milk consumption.⁵⁷ Between 1989 and 2008, intake of sugar-sweetened beverages increased (from 130 to 212 kcal/day) among 6- to 11-year-olds, while intake of milk and 100% fruit/vegetable juice declined (from 210 to 133 kcal/day).⁵⁸

Vegetarian/Vegan Diets. A 2010 Harris poll noted that 3% of US youth (8 to 18 years of age) indicated they never eat meat, poultry, and fish/seafood, and about one third of those children also do not eat dairy, eggs, and honey.⁵⁹ A 2009 Academy Position Paper notes that protein intakes of vegetarian children (including those who follow lacto-ovo and vegan food patterns) are generally adequate to meet recommendations.⁶⁰ Growth of lacto-ovo vegetarian children is similar to non-vegetarians; however, there are no data about the growth pattern of vegans. Lower intakes of cholesterol, saturated fat, and total fat, and higher intakes of fiber, have been noted among vegetarian children and adolescents.⁶⁰ Detailed analysis of vegetarian intake patterns in the US pediatric population is currently not available. Research is needed to further the understanding of vegetarian diets, including prevalence, types, and effects on nutritional status.

Meal Patterns and Meal Frequency. NHANES data (1999-2006) indicate that approximately 20% of children skipped breakfast.⁶¹ Children who skip breakfast tended to consume less energy and fewer nutrients than those who ate breakfast.⁶² Although the data are mixed, there seems to be a positive association between habitual breakfast frequency and school performance.⁶³⁻⁶⁵ Studies also indicate that

children who went to school without breakfast were more likely to experience performance deficits than those who ate breakfast⁶⁴ or those who ate school breakfast.⁶⁵

Nationally representative surveys of food intake in US children show large increases in snacking; the number of eating occasions increased from 3.9 per day (1977-1978) to 5.1 per day (2005-2010).³⁸ More than 27% of children's daily energy intake came from snacks, with the largest increases in salty snacks and candy. Desserts and sweetened beverages remained the major sources of energy from snacks.³⁹ Although energy intake at each eating occasion has declined for most groups, this decrease was offset by the increased number of eating occasions. Overall energy intake increased by 108 kcal/day between 1977-1978 and 2005-2010, with a small decline between 1994-1998 and 2005-2010.³⁸

DEVELOPMENT OF EATING HABITS

Influence of Parents and Family

Numerous environmental and personal factors influence dietary behaviors. In the case of children, parents exert a powerful influence, providing both genes and eating environments.^{43,66,67} Young children are especially dependent on parents and other caregivers to provide food that will promote optimal health, growth, and development. Child feeding practices determine the availability of various foods, the portion sizes that children are offered, the frequency of eating occasions, and the social contexts in which eating occurs.

Early parental influence is associated with the development of a child's relationship with food later in life.⁶⁸ For example, young-adult eating habits, such as eating all food on the plate, using food as an incentive or threat, eating dessert, and eating regularly scheduled meals were related to the same feeding practices reportedly used by their parents during their childhood.⁶⁹ Consideration of nutrition by young adults when selecting food was related to the memory of their parents talking about nutrition during childhood.⁶⁸

Although children are able to adjust their food intakes across successive meals to regulate energy intake for

24-hour periods,⁷⁰ family feeding practices influence children's responsiveness to energy density and meal size.^{67,71} When parents assume control of food portions or coerce children to eat rather than allow them to focus on their internal cues of hunger, their ability to regulate meal size is diminished. In general, parental control, especially restrictive feeding practices, tends to be associated with overeating and poorer self-regulation of energy intake in preschool-aged children⁷²⁻⁷⁵ and was predictive of overweight.^{72,73,76} This may be problematic among girls with a high BMI and may contribute to the chronic dieting and dietary restraint that has become common among American girls and young women.

Use of a responsive feeding approach, in which the care provider recognizes and responds to the child's hunger and satiety cues, has been incorporated into numerous federal and international food and nutrition programs.⁷⁷ A "nonresponsive feeding" approach (ie, forcing or pressuring a child to eat or restricting food intake, indulgent feeding, or uninvolved feeding) has been associated with overweight and obesity.⁷⁸

In addition to the positive impact on nutrient intake and patterns,^{79,80} family meals may also contribute positively to children's nutrition beliefs and attitudes⁸¹ and have an inverse association with the onset and persistence of overweight.⁸⁰

Studies of the complex relationships between parental feeding practices and children's temperament and personality show that parental feeding practices are a critical factor in children's food intake.^{72,73} Early childhood and the social environment in which children are fed are widely assumed to be critical to the establishment of life-long eating habits. However, the specific processes whereby parents and other adults influence children's eating habits have not been systematically studied. Additional research is needed to assess how a wide range of factors influence parents' use of feeding practices. Research about factors such as child characteristics, parental attitudes, and concerns about child health and weight, socioeconomic factors and ethnicity, and current eating environments will add to understanding and provide insight into potential interventions.^{81,82}

Food Preferences. Despite the oft-repeated adage that "children won't eat what they don't like," children's food preferences are learned through repeated exposure to foods. With a minimum of 8 to 10 exposures to a food, children can overcome their neophobic response and choose to eat the food.⁸³⁻⁸⁵ Parents and other caregivers can provide opportunities for children to enjoy a variety of nutritious foods by regularly exposing them to, and encouraging them to taste, these foods. Children's intake of a new food increased during meals when they observed a teacher enthusiastically consuming that food.⁸⁶ Significant associations have been shown between parental food habits and nutrient intakes and the habits and intakes of their children^{43,69,87-89} and peers.⁹⁰ For example, fruit and vegetable consumption is positively associated with parental modeling and parental intake.⁴³

The Food Environment. Although children seem to possess an innate ability to self-regulate their energy intakes, their food environment affects the extent to which they are able to exercise this ability.^{44,75} Offering large food portions (especially energy-dense, sweet, or salty foods), feeding practices that pressure or restrict eating, or modeling of excessive consumption can all undermine self-regulation in children. As early as the 1950s, recommendations for allowing young children to self-regulate were being made. Ellyn Satter, MSSW, RD, advocates a "Division of Responsibility" approach to feeding children.⁹¹⁻⁹³ These premises, which incorporate principles of responsive feeding,⁷⁷ have now been adopted by many national groups, including the American Academy of Pediatrics and USDA (MyPlate).^{94,95} With this approach, the role of parents and other caregivers in feeding is to provide structured opportunities to eat, developmentally appropriate support, and suitable food and beverage choices, without coercion to eat. Children are responsible for determining whether and how much to eat from what is offered.

INFLUENCE OF ADVERTISING ON CHILDREN'S EATING PATTERNS

The influence of advertising on children's eating patterns is an

increasing concern and the Academy's Evidence Analysis Process has found good evidence that marketing of food and beverage influences the preferences and purchase requests of children.

EAL Question: What Is the Impact of Advertising on Nutrition Choices by Children?

EAL Conclusion Statement. Seven studies (three randomized controlled trials, two nonrandomized controlled trials, and one cross-sectional study) met inclusion criteria for the question. Studies were in substantial agreement that television advertising increases food intake in children, that children prefer the taste of branded foods, that children choose marketed foods whether healthful or not, and that advertising could be used to promote more healthful foods. Two studies found that obese children may be more susceptible to food advertising than normal-weight children. One study found that girls may be more susceptible to food advertising than boys.

Grade I=Good²⁵

As requested by the US Congress for potential regulatory action, the Federal Trade Commission has taken a leadership role in documenting the depth and breadth of food and beverage marketing to children and in assessing progress on recommendations from health and nutrition groups. In December 2012, the Federal Trade Commission published a comprehensive follow-up report to its 2008 publication *Marketing Food to Children and Adolescents: A Review of Industry Expenditures, Activities, and Self-Regulation*, including a detailed assessment of the food industry's self-regulatory group known as the Children's Food and Beverage Advertising Initiative.⁹⁶ While noting that significant improvements still need to be made, the report commended the food and beverage industry on modest and ongoing improvements in the nutrition quality of foods marketing to children. It also acknowledges that the industry, in particular those companies that have signed onto the Children's Food and Beverage Advertising Initiative, has made major strides in self-regulation. The report highlighted the new uniform criteria scheduled to take effect at the end of 2013 and the success of the Alliance for a Healthier Generation

efforts to improve foods and beverages sold in schools.⁹⁷

While also acknowledging the positive actions taken by the food and beverage industry, a 2013 review by the Robert Wood Johnson Foundation found that self-regulation is not likely to result in significant reductions in the marketing of energy-dense and nutrient-poor foods to children and adolescents.^{98,99} Noting that industry can exert significant influence on government efforts to reduce current marketing strategies, the report lists multiple research needs to better understand marketing to children and to develop campaigns for healthy food marketing practices. A 2012 Institute of Medicine (IOM) report also includes recommendations around food marketing practices.¹⁰⁰

LIFESTYLE FACTORS

Several other lifestyle factors have a significant impact on child nutrition. The following question summarizes the results of a systematic review of the literature conducted using the Academy's Evidence Analysis Process.

EAL Question: What Are the Lifestyle Factors That Impact Childhood Nutrition (Screen Time, Exercise, Sleep Hygiene, Coping Skills)?

EAL Conclusion Statement. All 12 studies included in the evidence analysis for this question found significant associations among childhood nutrition and one or more of the following: screen time, exercise, sleep hygiene, and coping skills. Twelve studies (2 meta-analyses, 3 randomized controlled trials, 2 nonrandomized controlled trials, 2 cross-sectional studies, 2 before-and-after studies, and 1 descriptive study) met inclusion criteria for the question.

Grade I = Good.²⁵

Evidence Summary. The following factors were found to impact childhood nutrition:

- Television viewing and exposure to food advertising: Three studies were analyzed and all found positive associations among television viewing and exposure to food advertising, calorie intake, and body fatness

in children. One of the studies found that television viewing time is one factor among several that may influence body fatness among children.

- Exercise: Two studies found that parental modeling of physical activity and healthful behaviors positively impacted children's lifestyle behaviors. Five studies found that a variety of school-based interventions resulted in positive changes in eating and exercise behaviors.
- Sleep hygiene: One study found a strong relationship between sleep duration and overweight/obesity in children and adolescents.
- Coping skills: One school-based intervention was effective in modifying psychosocial factors relating to diet and physical activity. Another school-based intervention resulted in positive changes in media awareness, body size prejudice, self-image, and desirable lifestyle behaviors, especially among girls.

PHYSICAL ACTIVITY

The 2008 Physical Activity Guidelines for Americans include specific guidance for children and adolescents. (The Physical Activity Guidelines are recommendations for children and adolescents ages 6 to 17 years and recognize that physical activity patterns of young children differ from patterns of older children, adolescents, and adults):¹⁰¹

- Children and adolescents should do 60 minutes (1 hour) or more of physical activity daily.
- Aerobic: Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity, and should include vigorous-intensity physical activity at least 3 days a week (eg, running, hopping, skipping, jumping rope, dancing, and bicycling).
- Muscle-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week (eg, playing on playground equipment, climbing trees, and playing tug-of-war).

- Bone-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days of the week (eg, running, jumping rope, basketball, tennis, and hopscotch).
- It is important to encourage young people to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.

A 2012 mid-course Physical Activity Guidelines report on Strategies to Increase Physical Activity Among Youth noted that fewer than half of children meet the recommendations for physical activity, and focused on the multiple channels necessary to increase activity and fitness levels.¹⁰² These included specific strategies for schools and preschool/child care settings, changes in the built environment and research gaps. Many state legislatures and local school districts (as part of local wellness policies) have been working to increase physical activity and physical education in schools. In several reports, the American Academy of Pediatrics has reaffirmed that schools and parents play key roles in insuring that children enjoy active lifestyles, and recommended a combination of the following to the meet guidelines: unorganized free play, outdoor activities, structured recreational opportunities, organized athletics and compulsory, quality, and daily physical education classes taught by qualified instructors.^{103,104}

Oral Health

Oral health is a major health and nutrition concern for young children. For 2- to 11-year-olds, the prevalence of dental caries in primary teeth is 42%. For 6- to 8-year-olds, the prevalence of caries in permanent teeth is about 10%, and for 9- to 11-year-olds it is about 31%. Increased use of dental sealants has led to improved caries rates; however, oral health remains a significant problem in the United States.¹⁰⁵

Nutrition and oral health are closely related. A comparison of dietary quality and caries found lower rates of caries among young children who scored highest on the HEL.¹⁰⁶ In addition to preventive oral health in early

childhood, including good oral hygiene, application of fluoride gels, rinses, and varnishes, regular dental cleaning and monitoring by a pediatric dentist, and oral health promotion can include nutrition-related efforts:

- guidelines for selecting foods with low cariogenicity;
- guidance for scheduling meals and snacks to minimize potential for caries; and
- appropriate fluoride intake.

The US Surgeon General's Report on Oral Health identifies assessment and action by nondental providers as critical to improving oral health. Screening (and appropriate referral) and anticipatory guidance are included in these actions.¹⁰⁷

More information about nutrition and oral health can be found in the EAL¹⁰⁸ and in the Academy's position papers "Oral Health and Nutrition"¹⁰⁹ and the "Impact of Fluoride on Health."¹¹⁰

FOOD INSECURITY IN CHILDREN

It is estimated that nearly 49 million US residents, nearly 16 million of them children, live in food-insecure households.²⁰ The USDA's Economic Research Service uses the term *food insecurity* when the food intake of one or more household members was reduced and their eating patterns were disrupted at times during the year because the household lacked money and other resources for food. Rates of food insecurity are substantially higher than the national average for households with incomes near or below the federal poverty line, households with children headed by single women or single men, and black and Hispanic households. Food insecurity was more common in large cities and rural areas than in suburban areas and exurban areas around large cities.^{20,111} Food insecurity has significant effects on children's health, on their emotional, behavioral, and cognitive development, and on the relevant nutrition guidance for their families. Children who are food insecure are more likely to suffer from iron deficiency, asthma, and fatigue, as well as increased stomach-aches, headaches, and colds.⁹⁸ Food insecurity can also contribute to behavior problems at school, poor academic performance, increased suspensions, and lower graduation rates.¹⁹

While the co-existence of food insecurity and obesity—sometimes called the hunger–obesity paradox—has been well-documented in children, the exact nature of the relationship has yet to be determined.¹¹² The association between weight status and participation in food assistance programs has been mixed for children.¹¹³ An analysis of NHANES 2007–2008 data revealed that food assistance program participation (Supplemental Nutrition Assistance Program; Special Supplemental Nutrition Program for Women, Infants, and Children [WIC]; and school meals) was associated with increased body size in food-secure youth, but not food-insecure youth.¹¹⁴ Food and nutrition practitioners in food assistance programs and anti-hunger organizations can play important roles in providing appropriate nutrition education and counseling necessary to improve dietary quality, weight status, and overall health in food insecure households.

NUTRITION PROGRAMS—WIC, CHILD CARE, AND SCHOOL

Federal food programs, administered by the USDA's Food and Nutrition Services, have a significant impact on the nutrition of young children, especially those from low-income families. USDA 2012 participation data reveal the very large numbers of children who are served by these programs¹¹⁵:

- WIC served >8.9 million participants.
- The Child and Adult Care Food Program served >568 million meals in day-care homes and >1.3 billion meals in child-care centers.
- The National School Lunch Program (NSLP) served >31.6 million children daily, with a yearly total of >5.2 billion lunches served (a slight decrease from the previous year).
- The School Breakfast Program (SBP) served >12.8 million children daily, with a yearly total of >1.6 billion breakfasts served (a 5% increase from the previous year).

In addition to these flagship feeding programs, millions of children also participate in other USDA programs (depending on the district or

community), including the After-School Snack, School Supper, Summer Food Service, and Fresh Fruit and Vegetable Program, as well as a variety of Farm-to-School and Preschool initiatives.

WIC Nutrition. WIC, established in 1974, provides food supplementation and nutrition education, as well as health screening and referral to services to pregnant, breastfeeding, postpartum women, infants, and children up to 5 years of age. In order to be certified as a WIC participant by a health professional, families must meet income guidelines and children must be at nutrition risk based on biochemical or anthropometric measurements, a nutrition-related medical condition, dietary deficiencies, or conditions that can lead to risk, such as homelessness. Children age 1 to 5 years made up approximately half of WIC participants.¹¹⁵

WIC is the third largest food and nutrition assistance program in the United States and also the most widely studied in terms of impacts on birth-, nutrition- and health-related outcomes of participants.¹¹⁵ A 2012 literature review of WIC-related research suggested that, overall, WIC participation is associated with improved diets for children, including increased iron density, improved zinc status, reduced fat as a percentage of energy intake, decreased intake of added sugars, and increases in fruit and vegetable servings.¹¹⁶ Results were mixed or inconclusive regarding the effect of WIC participation on total energy intake and outcome measures related to dietary intake.

In 2009, based on the IOM report *WIC Food Packages: Time for a Change*, the USDA revised WIC food packages to align more closely with dietary recommendations and to promote healthy weights in WIC participants.¹¹⁷ The main changes included the addition of fruits and vegetables, more whole-grain products, substitution of lower-fat dairy foods, and reduced juice quantities. Preliminary analyses of both WIC food availability and WIC participant weight status and food intake after the changes indicated positive outcomes on several levels. In Connecticut, introduction of the revised WIC food packages significantly improved the availability and variety of

foods in WIC-authorized and other non-WIC convenience and grocery stores.¹¹⁸ A composite score of healthy food availability increased 39% in lower-income areas and 16% in higher-income neighborhoods, with whole-grain products being responsible for most of the increase. In New York state, a combination of WIC changes and a healthy lifestyle initiative led to improvements in the number of obese 2 to 4 year olds (2.7% decrease) and consumption of low-fat/non-fat dairy (3% increase), as well as steady increases in daily consumption of fruits, vegetables, and whole grains.¹¹⁹

Child Care Nutrition. A 2011 IOM report, *Aligning Dietary Guidance for All*, has also recommended changes in the Child and Adult Care Food Program meal pattern to align with current dietary guidance.¹²⁰ As of mid-2014, the decades-old guidelines are still in force and new patterns have not yet been proposed.¹²¹ The need for improvement in child-care nutrition was highlighted in a 2013 comparison of the foods and beverages offered to preschool children (3 to 5 years old) in child-care centers during 2005-2006 with the HEI-2005.¹²² While all centers met the recommended score for milk and the majority also met the scores for total fruit, the scores for whole fruit and sodium, total vegetables, dark green/orange vegetables, and legumes, total grain, whole grain, oils, and meat/beans were significantly below recommendations. The scores for saturated fat and energy from solid fats and added sugars also suggested the need to decrease the offerings of foods high in these components. Issues related to nutrition in child-care settings is addressed in the 2011 Academy Position Paper.²¹

School Nutrition. The scientific foundation for the current NSLP and SBP meal patterns is outlined in the 2009 IOM report: *School Meals, Building Blocks for Healthy Eating*.¹²³ The report recommended multiple changes to align school meal patterns with the DGA and to address childhood health concerns, including obesity and risks for chronic diseases.

The legislation that funds and regulates current school meals is the 2010 Healthy, Hunger-Free Kids Act (HHFKA),¹²⁴ which includes the

reauthorization of the Child Nutrition Act, as well as funding for other public nutrition assistance programs. This legislation was designed to help end childhood hunger, provide access to healthy food, improve child health, and reduce childhood obesity. The 2010 law gave the USDA the authority to establish new nutrition standards for school meals, as well as provide resources and technical assistance for the implementation of local wellness policies, Farm-to-School programs, and professional standards for school nutrition directors.

With HHFKA funding and recommendations from the IOM report, the USDA published new nutrition standards for the NSLP and SBP in January 2012.¹²⁵ These new USDA school meal pattern regulations follow the IOM recommendations and include significant changes in meal components, serving sizes, and calorie ranges for breakfast and lunch. An interim rule on Smart Snacks in Schools, on healthy foods outside of school meal programs, or competitive foods,¹²⁶ was published in June 2013 with implementation during the 2014-15 school year.

It is too soon to evaluate the effect of the updated nutrition standards for school lunch and breakfast programs, and the competitive foods interim rule has yet to be implemented. There is evidence, however, to suggest that school nutrition programs may be effective in improving the nutrition environment of schools and the health of students. Evaluation examples include:

- The School Nutrition Dietary Assessment Study III¹²⁷ used a nationally representative sample in school year 2004-2005 and found that most schools offered and served SBP breakfasts that met USDA standards. NSLP participants consumed more nutrients at lunch than nonparticipants and were more likely to have adequate usual daily intakes of key nutrients. Compared with lunches of nonparticipants, the average lunches consumed by NSLP participants at all school levels provided significantly greater amounts of protein, vitamin A, vitamin B-12, riboflavin, calcium, phosphorus, and potassium. This pattern of differences is, in large part,

attributable to the fact that NSLP participants were four times as likely as nonparticipants to consume milk at lunch.

- A 2013 USDA report analyzed the same 2005 School Nutrition Dietary Assessment Study III data and found that several factors significantly affected food intake at school.¹²⁸ Those students more likely to eat fruit as well dark green and orange vegetables included younger, female, black and Hispanic children, and those from a Spanish-speaking household. Students were also more likely to have higher intake of dark green vegetables in schools that had no à la carte options or only healthy à la carte options. Picky eaters, as identified by their parents, were less likely to eat almost all food groups, especially dark green vegetables, orange vegetables, and total vegetables.
- A 2013 evaluation of the Fresh Fruit and Vegetable Program (FFVP)¹²⁹ found that participating students consumed more fruits and vegetables than nonparticipating students, but did not have significantly higher energy intakes. FFVP schools also offered more frequent nutrition education and messaging to students and staff.
- Another review of the FFVP in a nationwide sample suggested that FFVP benefits may go beyond the direct provision of fresh produce snacks.¹³⁰ In this analysis, there was a strong association between FFVP participation and availability of fresh fruits at schools lunch meals and having an RDN or a nutritionist on staff, as well as an apparent synergy in the use of other resources, such as USDA Team Nutrition materials.

Because 2004 school-based nutrition and physical activity programs have increased in numbers and scope, starting with the Child Nutrition and WIC Authorization Act of 2004¹³¹ and rising dramatically with the initiation of Let's Move and the HHFKA in 2010.⁴ Most of these programs have focused on preventing or reducing childhood obesity with a combination of nutrition

education and physical activity and/or education. EAL questions from 2009 related to child nutrition and school-based programs are listed in Figure 2.

Established in 2004, the USDA's HealthierUS School Challenge (HUSSC) recognizes schools that have created healthier environments, often with leadership from RDNs and DTRs. In 2010, HUSSC was incorporated into the Let's Move! campaign with monetary incentives for each of four HUSSC award levels.¹³² As of June 2013, there were 6,526 HUSSC-certified schools, and preliminary evidence suggests that these awards may improve student nutrition. A substudy of the comprehensive 2012 School Nutrition Dietary Assessment Study IV found that compared with elementary schools nationwide, HUSSC elementary schools offered raw vegetables and fresh fruit more frequently on lunch menus.¹³³ A smaller 2012 study of HUSSC awardees nationwide also found positive results, including an increase in nutrition education minutes per week.¹³⁴ The Alliance for a Healthier Generation Healthy Schools Program started in 2006 with the Robert Wood Johnson Foundation. In 2012, Alliance for a Healthier Generation and Robert Wood Johnson researchers published an in-depth analysis of the program in >1,300 schools with high rates of childhood obesity and predominantly low-income, African-American, or Hispanic students.¹³⁵ Eighty percent of Healthy Schools Program schools made progress in creating healthier

environments with policies and programs that improved health education, physical education, and 56% improved the nutritional value of the foods served as a part of school lunch and breakfast. Schools made an average of seven to eight changes, including increasing whole grains, reducing the fat content of dairy products, and offering more fruits and vegetables. A smaller, random sample of 21 Healthy Schools Program schools also showed reduced consumption of sugar-sweetened beverages, increased time in physical education, and decreases in mean BMI.⁹⁷

Many other national, regional, and state efforts to create healthier environments for students have extensive reach into schools but have not yet published rigorous evaluation results. Action for Healthy Kids reports a reach of >10 million students in nearly 25,000 schools in 2012, while Fuel Up to Play 60 has enrolled 73,000 schools, involving >11 million students and 26,000 adult program advisors in the same year. Many of these programs (see links in Figure 3) are staffed at local and state levels by Academy of Nutrition and Dietetics members.

A 2013 random survey of parents found widespread support for these efforts.¹³⁶ Nationwide, 90% of parents believed that schools should play either a major or minor role in reducing obesity. Eighty-three percent of the parents surveyed strongly or somewhat favored the updated USDA nutrition standards for school meals,

and 71% strongly or somewhat favored federal standards for the foods that students buy in school outside of mealtime.

Some reports have suggested unintended, potentially negative consequences of school-based programs in terms of increasing concerns about clinical eating disorders, disordered eating patterns, and weight-based victimization of youth.^{137,138} In fall 2011, the majority of parents of children ages 6 to 14 (82%) from a nationally representative sample reported at least one school-based intervention aimed at preventing childhood obesity within their children's schools.¹³⁹ Nearly one third (30%) reported worrisome eating behaviors and physical activity as a result of these programs, while some (7%) parents said that their children had been made to feel bad at school about what or how much they were eating.

A 2010 study found that obese 8- to 11-year-old children, from 10 sites across the United States, were more likely to be bullied as compared with their nonoverweight peers, independent of sex, race, family socioeconomic status, school demographic profile, social skills, or academic achievement.¹⁴⁰ Based on several similar studies, there is also recognition that the stigmatization of obese children and adolescents is pervasive and can have a negative effect on lifestyle behaviors and needs to be considered as school programs and other messaging campaigns are developed and promoted.¹³⁷

Action for Healthy Kids www.actionforhealthykids.org	School wellness policy tool, resource clearinghouse, grant opportunities and links state teams, especially good parent leadership materials and local wellness policy development
Alliance for a Healthier Generation www.healthiergeneration.org	Healthy Schools Program and Healthy Out-of-School Time tools, including Wellness Framework and Six Step Process can be used by anyone registered at site; technical assistance available only to enrolled schools
Chefs Move to School www.chefsmovetoschools.org	Part of Let's Move with a platform for chefs and schools to create partnerships in their communities with the mission of collaboratively educating kids about food and healthy eating
Fuel Up To Play 60 www.fueluptoplay60.com	Student-led program that empowers youth to take charge in making small, everyday changes at school, like enjoying smarter food choices, being active for 60 minutes a day, and making a difference
HealthierUS School Challenge www.fns.usda.gov/tn/healthierus	Recognize those schools participating in the National School Lunch Program that have created healthier school environments through promotion of nutrition and physical activity

Figure 3. National programs to create healthier school environments.

The federal requirement for local wellness policies presents a unique, and mostly untapped, opportunity for parents and community members, including food and nutrition practitioners, to affect positive, sustainable changes in school health environments. First mandated in 2004, local school wellness policies must now meet the updated requirements outlined in the 2010 HHFKA.¹³¹ The new guidelines strengthen local wellness policies and add rules for public input, transparency, and implementation. A 2013 report assessing the progress and potential for local wellness policies highlighted the gaps in policy adoption and implementation.¹⁴⁰ At the beginning of the 2010-2011 school year, virtually all (99%) students nationwide were enrolled in a school district with a wellness policy. While the study noted that the comprehensiveness and strength of wellness policies have improved since the 2006-2007 school year, both aspects remain relatively weak, especially in terms of competitive food and beverage guidelines. The report outlines multiple opportunities for advocates and decision makers, including food and nutrition practitioners, at the national, state, and local levels to strengthen local wellness policies.

In WIC clinics, child-care settings, and schools, health professionals, educators, and parents need to promote

energy balance based on life-long healthful eating and physical activity habits. Families, child-care organizations, schools, health agencies, and communities have a shared responsibility to provide all children with access to high-quality, affordable foods and beverages that are consistent with the 2010 DGA and MyPlate. Specific recommendations and the role of RDNs, DTRs, and other food and nutrition practitioners can be found in four Academy positions: “Benchmarks for Nutrition Programs in Child Care,”²¹ “Comprehensive School Nutrition Services,”²² “Local Support for Nutrition Integrity in Schools,”¹⁴¹ and “Child and Adolescent Nutrition Assistance Programs.”¹⁴²

RECOMMENDATIONS

Dietary Recommendations and Guidelines for Children

In 2002, the IOM’s Food and Nutrition Board released the DRIs for energy, carbohydrates including added sugars, protein, amino acids, fiber, fat, fatty acids, and cholesterol.³⁴ The DRIs updated the Recommended Dietary Allowances published in 1989. Key recommendations for children in the 2 to 11 years age group are summarized in [Figure 4](#).

The IOM Acceptable Macronutrient Distribution Ranges and DRIs provided the foundation for the dietary

guidelines targeted to the general public ages 2 years and older. The four main integrated findings used in the food plans and recommendations of the 2010 DGA Advisory Committee report apply to healthy children 2 to 11 years, as well as to their parents and the adults who care for them.¹⁸

1. Reduce the incidence and prevalence of overweight and obesity of the US population by reducing overall calorie intake and increasing physical activity.
2. Shift food intake patterns to a more plant-based diet that emphasizes vegetables, cooked dry beans and peas, fruits, whole grains, nuts, and seeds. In addition, increase the intake of seafood and fat-free and low-fat milk and milk products, and consume only moderate amounts of lean meats, poultry, and eggs.
3. Significantly reduce intake of foods containing added sugars and solid fats because these dietary components contribute excess calories and few, if any, nutrients. In addition, reduce sodium intake and lower intake of refined grains, especially refined grains that are coupled with added sugar, solid fat, and sodium.
4. Meet the 2008 Physical Activity Guidelines for Americans.

These findings form the basis of [Table 2](#), which details the estimated energy and food group servings for children 2 to 13 years.

The 2010 DGA Advisory Committee report also called for an urgent need to focus on child nutrition with “any and all systems based strategies.”¹⁸ The specific areas included:

- Improve foods sold and served in schools, including school breakfast, lunch, and afterschool meals and competitive foods, for all age groups of children, from preschool through high school.
- Increase comprehensive health, nutrition, and physical education programs and curricula in US schools and preschools, including food preparation, food safety, cooking, and physical education classes and improved quality of recess.

Acceptable macronutrient distribution ranges as a percent of energy intake for carbohydrate, fat, and protein:

- Carbohydrates—45% to 65% of total energy
- Fat—30% to 40% of energy for 1 to 3 y and 25% to 35% of energy for 4 to 18 y
- Protein—5% to 20% for young children and 10% to 30% for older children

Added sugars should not exceed 25% of total energy (to ensure sufficient intake of essential micronutrients). This is a maximum suggested intake and not the amount recommended for achieving a healthy diet.

Consumption of saturated fat, *trans*-fatty acids, and cholesterol should be as low as possible while maintaining a nutritionally adequate diet.

Adequate intake for total fiber:

- Children 1 to 3 y: 19 g total fiber/day
- Children 4 to 8 y: 25 g/day
- Boys 9 to 13 y: 31 g/day
- Girls 9 to 13 y: 26 g/day

Figure 4. Dietary Reference Intakes. Key recommendations for children. Data adapted from reference 34.

Table 2. Daily estimated energy intake and recommended servings^a for children^b, by age and sex

	2 to 3 y	4 to 8 y	9 to 13 y
Calories^c (kcal)	1,000		
Female		1,200	1,600
Male		1,400	1,800
Milk/dairy (cups)	2	2	3
Lean meat/beans (oz)	2		5
Female		3	
Male		4	
Fruits^d (cups)	1	1.5	1.5
Female			
Male			
Vegetables^d (cups)	1		
Female		1	2
Male		1.5	2.5
Grains^e (oz)	3		
Female		4	5
Male		5	6
Oils (g)	14	17-18	20-22
Discretionary calories (kcal)	154	163-173	181-190

^aNutrient and energy contributions from each group are calculated according to the nutrient-dense forms of food in each group (eg, lean meats, fat-free milk, low-fat dairy products, and fruit/vegetables with no added fats or sugars).

^bAdapted from reference 18.

^cEnergy estimates are based on a sedentary lifestyle. Increased physical activity will require additional energy: by 0 to 200 kcal/day if moderately physically active and by 200 to 400 kcal/day if very physically active.

^dA variety of vegetables should be selected from the vegetable subgroups (dark green, deep yellow, legumes, and starchy) during the week.

^eHalf of all grains should be whole grains.

- Increase safe routes to schools and community recreational areas to encourage active transportation and physical activity.
- Remove sugar-sweetened beverages and high-calorie snacks from schools, recreation facilities, and other places where children gather.
- Increase awareness and promote action around reducing screen time (television and computer or game modules) and removing televisions from children's bedrooms.
- Develop and enforce effective policies regarding marketing of food and beverage products to children.
- Develop affordable summer programs that support children's health.

Historically, the USDA has provided consumers with graphic dietary guidance based on current guidelines, now represented by the MyPlate icon.⁹⁴ The MyPlate resources have been expanded by the USDA for a wide variety of age groups and materials, including 10-tips nutrition tip series, sample food plans, menus, recipes, and videos, as well as the MyPlate SuperTracker for tracking and analyzing food intake and activity levels.¹⁴³ While many of the MyPlate resources apply to families with young children, MyPlate Kid's Place provides links to resources designed specifically for older children, parents, and educators.¹⁴⁴ There are child-focused messages and age-appropriate educational materials for homes, classrooms, cafeterias, and community settings, as well as online games, videos, songs, and activity sheets.

In addition, the 2012 IOM report, "Accelerating Progress in Obesity Prevention" made three recommendations that are applicable to children¹⁰⁰:

- integrate physical activity every day in every way;
- make healthy foods and beverages available everywhere; and
- strengthen schools as the heart of health.

Consumer Messaging and Resources

Effective communication of nutrition guidance to children, parents, and caregivers is both a science and an art. While obviously reflecting the latest evidence-based information, nutrition messages must be culturally sensitive and age appropriate, as well as engaging and fun for children. In this electronic age, science-based nutrition messages, delivered by members of the Academy of Nutrition and Dietetics, can be found in every social media channel from the web to smartphone applications.

In addition to providing key nutrition facts, effective consumer messaging must include behavioral strategies that enhance self-efficacy in both children and adults. Children need to develop the confidence that they can successfully choose and enjoy healthful eating and physical activity. Parents and other caregivers need positive guidance on effective feeding practices that promote healthy eating in today's complex food environment.⁶⁶

Numerous resources exist for communicating science-based nutrition messages directly to children, as well as to their families and caregivers, through a variety of traditional and new media channels. Figure 5 lists a few of the most extensive sources of child nutrition information. Two of these are particularly important for members of the Academy of Nutrition and Dietetics:

- Kids Eat Right, a joint initiative from the Academy of Nutrition and Dietetics and Academy of Nutrition and Dietetics Foundation, is designed to educate families, communities, and policy makers about the importance of quality nutrition. The two-tiered campaign provides

Core Nutrition Messages (USDA^a)

www.fns.usda.gov/core-nutrition

- Tips, guidance, and communication tools designed specifically for moms and kids in populations served by WIC^b; the Supplemental Nutrition Assistance Program; Child Nutrition; and other federal nutrition assistance programs.

Kids Eat Right (Academy of Nutrition and Dietetics and its Foundation)

www.eatright.org/kids

- Comprehensive science-based resources for families on eating right, cooking healthy, and shopping smart, with tips, recipes, videos, and in-depth information.

Let's Move (The White House with US Departments of Education, Agriculture, Interior, and Health and Human Services)

www.letsmove.gov

- Provides link to many government and private efforts to support campaign for healthier generation of kids with tips, recipes, and information for families, schools, and communities.

Let's Move Child Care (The Nemours Foundation)

www.healthykidshealthyfuture.org

- Tools, tips, and resources for child care based on five goals: (1) get kids moving; (2) reduce screen time; (3) make nutrition fun; (4) offer healthier beverages; and (5) infant feeding.

MyPlate Kid's Place (USDA)

www.choosemyplate.gov/kids

- Games, activity sheets, videos, songs, and recipes for kids, plus science-based resources for parents and educators, including tips sheets on nutrition and activity topics.

Team Nutrition (USDA)

www.fns.usda.gov/fns/nutrition.htm

- Toolkits, recipes, and other resources to support nutrition education in USDA Child Nutrition programs, including schools meals, CACFP^c, and WIC.

We Can: Ways to Enhance Nutrition and Physical Activity (National Institutes of Health)

www.nhlbi.nih.gov/health/public/heart/obesity/wecan

- An educational campaign focused on helping children aged 8 to 13 years eat right, get active, and reduce screen time, with toolkits and materials for communities and faith-based leaders.

Yale Rudd Center for Food Policy and Obesity

www.yaleruddcenter.org/what_we_do.aspx?id=10

- Rudd Center aims to stop the weight stigma through research, education, and advocacy with young people, families, teachers, employers, and health care professionals.

^aUSDA=US Department of Agriculture.

^bWIC=Special Supplemental Nutrition Program for Women, Infants, and Children.

^cCACFP= Child and Adult Care Food Program.

resources for the public and for Academy members:

- The Kids Eat Right consumer website covers how to cook healthy, eat right, and shop smart for all ages from infancy through adolescence.
- Kids Eat Right social media channels extend website messages through photo, video, and print, using the latest technologies as they develop.
- Kids Eat Right campaign volunteers can access grants, toolkits, and other resources for use in their communities and practice settings.
- The Family Nutrition and Physical Activity Screening Tool, a research-based survey, summarizes factors influencing children's risk for becoming overweight.¹⁴⁵
- USDA Team Nutrition resources, produced at the federal and state level, are cataloged in the Team Nutrition library.¹⁴⁶ Several MyPlate curricula will be of special interest to food and nutrition practitioners working with children aged 2 to 11 years in child care, schools, and community settings:
 - Grow It, Try It, Like It! Pre-school Fun with Fruits and Vegetables¹⁴⁷ is a garden-themed nutrition education kit for child-care center staff.
 - Serving Up MyPlate: A Yummy Curriculum²⁴ is a collection of materials for grades 1 to 6 that can be used both in the classroom and community.
 - The Great Garden Detective Adventure is standards-based gardening nutrition curriculum for grades 3 and 4.¹⁴⁸
 - Dig In! Standards-Based Nutrition Education from the Ground Up¹⁴⁹ offers 10 inquiry-based lessons that engage 5th- and 6th-graders.

Appropriate, low-cost resources may also be available from state departments of education and health; university extension programs at the local and state level; health care providers, institutions, and coalitions; agricultural producer groups and food

Figure 5. Resources for communicating science-based nutrition messages directly to children, families, and caregivers.

Communication channel	Strategies
Social and traditional media	<ul style="list-style-type: none"> • Share Kids Eat Right¹⁵⁰ and other positive science-based messages on Facebook, Twitter, Tumblr, and new channels as they develop • Utilize Kids Eat Right and other science-based guidance to write articles on child nutrition for websites, magazines, newspapers, and other print media • Serve as nutrition experts for interviews about child nutrition in electronic and print media
Clinical practice	<ul style="list-style-type: none"> • Communicate principles of the 2010 Dietary Guidelines for Americans¹⁸ (DGA) and MyPlate⁹⁴ to clients and families, as appropriate, in counseling sessions and on nutrition care plans • Support the institutional availability of foods and beverages that contribute to dietary patterns consistent with the DGA, MyPlate, and other recommendations • Promote use of positive science-based messages with other health care providers and provide access to resources to practitioners who communicate these messages to families
Public health	<ul style="list-style-type: none"> • Write articles about the use of positive science-based messages for staff and agency newsletters and/or offer in-services or other opportunities for discussion • Make MyPlate resources available to clients and other consumers • Participate in interdisciplinary and/or interagency activities to promote science-based nutrition guidance and positive food experiences to children and their families
Child care and schools	<ul style="list-style-type: none"> • Provide MyPlate messages and resources to educators and other staff for use in classrooms and with families • Utilize Kids Eat Right materials and other MyPlate messages on menus, web pages, and other communication channels • Conduct classroom lessons and food experiences for children, staff, and families
Policy (local/state/national)	<ul style="list-style-type: none"> • Serve on local committees and coalitions, such as school wellness councils, to provide age-appropriate nutrition policy recommendations for children and families • Provide DGA information, MyPlate resources, and policy recommendations to statewide coalitions, agencies, and organizations that serve young children and their families • Comment on federal, state, and local policies, rules, and regulations as opportunities arise and respond to Academy of Nutrition and Dietetics' action alerts as appropriate

Figure 6. Suggested strategies for message communication channels.

manufacturers; and others, including commercial companies. Food and nutrition practitioners should review all materials thoroughly before use in order to ensure accuracy and appropriateness for the target audience. [Figure 6](#) provides some suggested strategies for a variety of message communication channels.

CONCLUSIONS

Many American children ages 2 to 11 years do not meet the minimum

recommendations for the fruit, vegetable, grain, or dairy groups and exceed those for total and saturated fats. Other child nutrition concerns include energy balance and high intakes of sugar and sodium. One tool for helping the public meet the DGA is the USDA's MyPlate.⁹⁴ Key messages of the DGA are to encourage Americans to maintain calorie balance and focus on nutrient-dense foods and beverages. In addition to providing the key messages, there is a need to incorporate behavioral

strategies that build on enhancing self-efficacy and self-esteem in children.

Children need to develop confidence that they can successfully change their eating and physical activity patterns. Parents and other caregivers need education about mealtime behaviors that promote the adoption of healthier eating behaviors early in life. The ongoing need for nutrition intervention and education with children, their parents, and caregivers can and should be met by RDNs and DTRs who have the training and skills to meet those needs.

Food and nutrition practitioners should take an active role in promoting dietary recommendations and guidelines for children aged 2 to 11 years. The Academy has partnered with many health professional organizations and food and beverage industries to translate dietary recommendations and guidelines into achievable and healthful messages for all children in the United States.

Future research should examine ways to individualize recommendations for optimal nutrition. For example, some research has shown differences in eating patterns (eg, portion sizes, number of eating opportunities, amount eaten at meals and snacks) of children from different ethnic and education groups.³⁸ A better understanding of this dynamic can enable food and nutrition practitioners to individualize messages and recommendations.

Recommendations for Food and Nutrition Practitioners

Recommendations for food and nutrition practitioners are summarized as follows:

- Support and promote the DGA for children.
- Support and promote use of the USDA's MyPlate⁹⁴ as a guide for meeting dietary recommendations with use of the Eat Smart To Play Hard for Kids¹⁴⁶ (Figure 1).
- Support and promote healthful dietary patterns, taking into consideration regional and cultural differences, especially for the growing Hispanic population.
- Utilize Kids Eat Right resources¹⁵⁰ and the Family Nutrition and Physical Activity Screening Tool¹⁴⁵ with families in clinical and public health settings.
- Promote positive body image, work to stop weight stigmatization, and support anti-bullying efforts by including weight-related bullying programming.
- Support and promote implementation of the DGA in schools by strengthening nutrition education and promotion in school nutrition programs, including an integrated nutrition education curricula designed to

This Academy Position Paper includes the authors' independent review of the literature in addition to systematic review conducted using the Academy's Evidence Analysis Process and information from the Academy EAL. Topics from the EAL are clearly delineated. The use of an evidence-based approach provides important added benefits to earlier review methods. The major advantage of the approach is the more rigorous standardization of review criteria, which minimizes the likelihood of reviewer bias and increases the ease with which disparate articles may be compared. For a detailed description of the methods used in the Evidence Analysis Process, access the Academy's Evidence Analysis Process at www.andevidencelibrary.com/eaprocess.

Conclusion Statements are assigned a grade by an expert work group based on the systematic analysis and evaluation of the supporting research evidence.

Grade I = Good;

Grade II = Fair;

Grade III = Limited;

Grade IV = Expert Opinion Only; and

Grade V = Not Assignable (because there is no evidence to support or refute the conclusion).

See grade definitions at www.andevidencelibrary.com.

teach students how to make informed dietary selections based on balance, variety, and moderation using a total diet approach.¹¹

- Support the availability of foods and beverages that contribute to dietary patterns consistent with federal nutrition and dietary guidelines throughout the day on the school premises.
- Develop and implement programs for educating parents and caregivers on how to foster healthful lifestyles in home, child-care, and school environments, based on positive feeding relationships, a responsive feeding approach, and regular family/family-style mealtimes.
- Foster communication by building partnerships across health and other related disciplines and professional organizations.
- Provide education about strategies that can be used to promote healthier eating habits among children to physicians, child nutrition personnel, and other health care providers.
- Advocate for the need to increase federal and state funding of

individual-based and population-based intervention programs designed to implement the DGA.

- Advocate for access to nutrition services provided by pediatric RDN addressing unmet needs, including issues related availability and payment.
- Support more research to determine the barriers for complying with the DGA and to identify various mechanisms to motivate individuals to change their eating and exercise behaviors.
- Conduct more clinical trials to determine the efficacy of the DGA, as a whole diet and physical activity approach, on health-related outcomes.
- Support science-based public policy, legislation, and community policies designed to improve dietary guidance for healthy children.

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We thank the reviewers for their many constructive comments and suggestions. The reviewers were not asked to endorse this position or the supporting paper.