

Position of the American Dietetic Association: Nutrition Guidance for Healthy Children Ages 2 to 11 Years

ABSTRACT

It is the position of the American Dietetic Association that children ages 2 to 11 years should achieve optimal physical and cognitive development, attain a healthy weight, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity. The health status of American children has generally improved during the past 3 decades. However, the number of children who are overweight has more than doubled among 2- to 5-year-old children and more than tripled among 6- to 11-year-old children, which has major health consequences. This increase in childhood overweight has broadened the focus of dietary guidance to address children's overconsumption of energy-dense, nutrient-poor foods and beverages and physical activity patterns. Health promotion will help reduce diet-related risks of chronic degenerative diseases, such as cardiovascular disease, type 2 diabetes, cancer, obesity, and osteoporosis. This position reviews what US children are eating and explores trends in food and nutrient intakes as well as the impact of school meals on children's diets. Dietary recommendations and guidelines and the benefits of physical activity are also discussed. The roles of parents and caregivers in influencing the development of healthful eating behaviors are highlighted. Specific recommendations and sources of nutrition messages to improve the nutritional well-being of children are provided for food and nutrition professionals.

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POSITION STATEMENT

It is the position of the American Dietetic Association that children ages 2 to

11 years should achieve optimal physical and cognitive development, attain a healthy weight, enjoy food, and reduce the risk of chronic disease through appropriate eating habits and participation in regular physical activity.

The health status of children in the United States has improved in some areas during the past 3 decades, as evidenced by lower rates of infant mortality and declines in nutrient-deficiency diseases of the past (1). However, despite the reduction in childhood nutrient deficiencies, the number of children who are overweight has increased dramatically since the 1970s. The most recent prevalence estimates from the National Health and Nutrition Examination Survey 2003-2004 indicate that 33.6% of individuals aged 2 to 19 years were at risk of overweight and 17.1% were overweight compared to 28.2% and 13.9% in 1999-2000, respectively (2). As a consequence, dietary guidance for children has broadened from an earlier focus on issues of underconsumption and nutrient deficiencies to overconsumption and decreased energy expended in physical activity. The attainment of optimal health through improved diet and an increase in physical activity will promote decreases in chronic diseases (3,4). Because children younger than 2 years of age have unique nutritional requirements and concerns, this position focuses primarily on healthy children aged 2 to 11 years. Children with special health care needs may be at increased risk for nutrition-related problems related to their conditions and, therefore, require additional guidance and modifications of these recommendations (5).

Healthful eating habits in childhood help to prevent chronic undernutrition and growth retardation as well as acute child nutrition problems, such as iron-deficiency anemia and dental caries. Although chronic

undernutrition is now rare in the United States, it is estimated that nearly 12.1% of all US households (22.7 million adults and 12.4 million children) were food insecure at some time during 2005 (6). Households with children reported food insecurity about double the rate for households without children (15.6% vs 8.5%). Food insecurity has profound effects on children's emotional, behavioral, and cognitive development. Concerns about food insecurity may be alleviated to some extent by the availability of feeding programs in schools and nutrition assistance programs (7). These programs increase the probability that children will eat breakfast and/or lunch and thus improve their nutritional (8) and educational status (9).

There is a pressing need for US children to achieve healthful eating and physical activity patterns that reduce risk of chronic, long-term health problems, such as obesity, coronary heart disease, type 2 diabetes, stroke, cancer, and osteoporosis. Childhood adiposity, in and of itself, negatively influences adult mortality and morbidity. Children who are overweight are more likely than normal-weight children to become obese adults (10).

Critical nutrition concerns about US children include excessive intakes of dietary fat, especially saturated fats, and inadequate intakes of foods rich in calcium, fiber, vitamin E, folate, iron, magnesium, and potassium. High intakes of saturated fat have been associated with increased plasma total and low-density lipoprotein cholesterol in childhood and can ultimately increase the risk of cardiovascular disease. Failure to meet calcium requirements in combination with a sedentary lifestyle in childhood can impede the achievement of maximal skeletal growth and bone mineralization, thereby increasing the diet-related risk of developing osteoporosis later in life (4,11). The im-

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portant role of dietary fiber in decreasing the risk of several chronic diseases, including heart disease, obesity, diabetes, and colon cancer (4), has been recognized by health organizations (4,12). Diets high in fiber also tend to contain less fat, cholesterol, and energy than diets low in fiber.

Given these findings, 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 *Dietary Guidelines for Americans 2005* (2005 Dietary Guidelines) (4) and if physical activity levels were increased (4). Healthful eating habits for elementary children can best be achieved by moderate consumption of a varied diet (3,4) that includes a variety of nutrient-dense foods among and within the major food groups, as illustrated by the US Department of Agriculture's (USDA's) MyPyramid for Kids (13).

TRENDS IN DIETARY INTAKE

Data on trends in mean energy intake continue to be inconsistent. One national study showed that mean energy intake for children ages 1 to 19 years changed very little from 1971 to 2002 (14,15). In contrast, data from another national study showed that mean energy intake increased significantly from 1977 to 1996 in children ages 2 to 18 years (16). The increase in mean energy intake in the later study may reflect increases in portion sizes (16), which result in increased energy intake (17). Energy intake and portion sizes consumed both at home and away from home have increased significantly between 1977 and 1998 (18). The large increases in energy intake were reflected in the shift of energy intake from home to away-from-home sources, with more than a doubling of the energy consumed at fast-food establishments and restaurants. At the same time there have been important changes in the foods consumed. The energy content from salty snacks, soft drinks, fruit drinks, pizza, and French fries has increased, all of which are foods commonly consumed by children (16). Beverages contributed 20% to 24% to energy intake across all age groups (15).

The relative proportion of energy from macronutrients has changed (14,15). National surveys indicate

that the average percentage of energy from total fat and saturated fat decreased from 1971 to 2000. Total fat decreased from 36% to 33% and saturated fat decreased from 13% to 11%. Despite these decreases, only about 38% of the population 2 years and older met the guideline of $\leq 30\%$ of energy from total fat and 41% met the guideline of $\leq 10\%$ of energy from saturated fat (14,15). The percentage of energy from carbohydrates increased from 42% to 50% and percentage of energy from protein was relatively stable at 14% to 15%. Mean dietary cholesterol intakes declined between the 1970s and 1994 and leveled off between 1994 and 2000. Mean sodium intakes among 6 to 11 year olds increased from 2,393 mg in 1971 to 3,255 mg in 2000 (14).

Trends in children's food choices coincide with trends in both nutrient intakes and the national food supply. Cross-sectional data (19) showed an overall decline in the total amount of milk, vegetables, soups, breads, grains, and eggs consumed from 1973 to 1994 and an increase in the consumption of fruits, fruit juices, sweetened beverages, poultry, and cheese (20). While the percentage of total fat from milk, as well as from fats/oils, pork, mixed meats (ie, combination dishes including meat), eggs, and desserts decreased, the percentage of fat from poultry, cheese, and snacks increased. The increase in carbohydrate intake among 2- to 17-year-olds came primarily from increased intakes of grain mixtures (pizza, pasta, Mexican dishes, and other dough-based dishes) and beverages (particularly soft drinks).

CURRENT DIET QUALITY AND FOOD AND NUTRIENT INTAKE

The Healthy Eating Index is used to assess diet quality. The Healthy Eating Index score for children ages 2 to 9 years determined that most children's diets "needed improvement" or were "poor" (21). The percentage of children's diets that were reported to "need improvement" or were "poor" ranged from 64% to 88% (21).

The macronutrient composition of children's diets is similar to that of young adults. What may be different, however, are the types of foods consumed and their contribution to intakes of specific nutrients (22). Life-styles and eating behaviors, which

change throughout the life cycle, influence the types of foods consumed. For example, as children get older, the percentage consuming fruits/fruit juices, vegetables, breads/grains, and milk decreased (22). Similarly, studies have shown regional and ethnic variations in types of foods consumed and their contribution to the diet, yet the macronutrient composition of children's diets remain unchanged (23).

Average dietary fiber intake among children ages 3 to 5 years and 6 to 11 years is 11.4 g/day and 13.1 g/day, respectively (24). In one study, top food sources of dietary fiber in children 2 to 5 years of age were low-fiber fruits; soy and legumes; high-fiber, ready-to-eat cereals; high-fat, grain-based mixed dishes such as pizza; and high-fat, salty snacks—all contributing up to 36% of the total dietary fiber in the diets (25).

Results of an analysis of national food intake data on school-aged children identified five nutrients most likely to be consumed in amounts low enough to be of concern: vitamin E, calcium, magnesium, potassium, and fiber (26). The percentages of children with usual nutrient intakes below the Estimated Average Requirement tended to increase with age and were more pronounced for females than males.

Consumption of sweetened dairy products was positively associated with calcium intakes for children (27). Consumption of presweetened cereals increased the likelihood of the children meeting recommendations for the essential shortfall micronutrients calcium, folate, and iron (27). Alternatively, sugar-sweetened beverages, sugars, sweets, and sweetened grains had a negative impact on diet quality. Studies showed a decreased intake of at least one micronutrient with higher levels of added sugar intake (28). Similarly, children who consumed more added sugars also consumed more grains, lean meat, and iron and consumed less vegetables and fruits, dairy, vitamin A, calcium, and folate (28).

A number of studies using data from national surveys suggest that energy-dense, nutrient-poor foods may displace nutrient-dense foods in children's diets (29). The mean amount of reported intake of several micronutrients declined with increasing intake of

low-nutrient-dense foods (29). High intakes of low-nutrient-dense foods were related to higher energy intake and lower amounts of low-nutrient-dense foods. Low-nutrient-dense foods included baked and dairy desserts, sweeteners, salty snacks, and visible/discretionary fat (29).

The food choices of most US children did not meet the recommended food group servings from the Food Guide Pyramid. For children 4 to 13 years of age, 80% to 90% were not consuming the recommended number of servings of fruits and vegetables (30), with only 8% of the population consuming at least one-third of vegetable servings from dark green or deep yellow/orange vegetables (3). Average daily total grain intake was 6.6 servings, whereas daily whole-grain intake was 0.9 servings per day (31). Only 13% consumed an average of two or more servings of whole grains daily. Ready-to-eat cereals, corn and other chips, and yeast breads were found to be the major food sources of whole grains (32). These data emphasize the need for a total-diet approach that encourages the consumption of fruits, vegetables, and whole grains, with an emphasis on lower-fat options.

EATING PATTERNS OF CHILDREN

Eating patterns are changing among children. These eating patterns included increased restaurant food consumption and other eating outside the home, larger portion sizes, shifts in beverage consumption, meal patterns and meal frequency, and school meal participation.

Meals at Home and Away from Home

The traditional pattern of families eating around the table has changed. Fewer families eat meals together. However, children who eat dinner with their families at home have a better quality diet than those who do not (33). Children tended to have higher intakes of fruits and vegetables, vitamins and minerals, and lower intakes of saturated and trans-fatty acids, soft drinks, and fried foods (33).

Fast-food consumption was reported by 42% of children (34) on one or both survey days. The percentage of energy obtained from restaurant/

fast food increased from 4.8% in 1977 to 14.8% in 1996 (16). Foods available outside the home tend to be high in energy and fat compared with foods eaten at home (35). Fast foods contribute few servings of fruit, vegetables, whole grains, and dairy foods to the diets of children (34,36). Children consuming fast food had higher intakes of energy, fat, saturated fat, and sodium and lower intakes of selected vitamins and minerals than those who did not (34,36). Overall, children who consumed fast food had poorer diet quality than children who did not (36).

Portion Sizes

Food portion sizes affect total energy intakes in children. Several studies have shown that providing children with larger food portions can lead to substantial increases in food and energy intakes (16,17,37). In one study, children 3 to 5 years of age consumed 25% more of an entrée and 15% more total energy at lunch when presented with portions that were double an age-appropriate standard size (37). This study also showed that the children consumed 25% less of the entrée when they were allowed to serve themselves than when the entrée was served to them on individual plates.

Trends in Beverage Consumption

The milk consumption patterns of children have changed markedly during the past half century. Between 1977 and 2001, daily milk consumption decreased from 3.46 servings to 2.75 servings in 2- to 18-year-olds (38). The proportion of children drinking reduced-fat or fat-free milk doubled since the late 1970s, and, by 1994, these milk types were consumed more frequently than whole milk. During this same time period, soft drink consumption increased 48% (39). Soft drink consumption has been negatively associated with milk consumption and found to have a dilutional effect on the intakes of many essential micronutrients (40). Furthermore, children's total energy intake was found to be positively associated with soft drink consumption. Other studies have found no association between soft drink consumption and calcium intake among children. Whether milk has simply become less

popular or whether soft drinks have been substituted for milk remains to be determined in longitudinal studies.

Meal Patterns and Meal Frequency

Breakfast consumption declined substantially between 1965 and 1991 among children (41). Approximately 10% of children skipped breakfast (Biing-Hwan Lin, PhD, personal communication, June 4, 2003). Of the children who consumed breakfast, 49% ate breakfast at home, and 51% ate breakfast at school. Only 2% of children skipped lunch (42), while the percentage of children consuming a school lunch substantially decreased and the percentage bringing lunch from home increased during this period.

From 1977 to 1996, snacking has increased considerably among children ages 6 to 11 years, increasing from 76% to 91%. Ninety-eight percent of 6- to 18-year-old students reported at least three daily eating occasions, and >50% reported five or more (43). Sixty-six percent of students consumed an afternoon snack, and nearly that percentage consumed an evening snack, yet only 15% consumed a snack in the morning. Approximately 82% of children consumed snacks, which provided 20% of total daily energy intake and 19% of total fat and saturated fat intake (24,43).

IMPACT OF SCHOOL MEALS ON CHILDREN'S DIETS

In 2006, more than 30 million children participated in the National School Lunch Program (NSLP) daily and more than 9.7 million US children participated in the school breakfast programs daily (7). Comprehensive studies have reported on the positive impact of the NSLP and school breakfast programs on child health, dietary intake, and well-being and have identified nutritional areas that needed further improvement (7).

In 1995, Congress mandated that school breakfasts and lunches must meet US Dietary Guidelines (44). As part of USDA's School Meals Initiative for Healthy Children, there has been a strong trend toward lower levels of fat and saturated fat and increased levels of carbohydrate in the

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

- carbohydrates—45% to 65% of total calories
- fat—30% to 40% of energy for 1 to 3 years and 25% to 35% of energy for 4 to 18 years
- protein—5% to 20% for young children and 10% to 30% for older children

Added sugars should not exceed 25% of total calories (to ensure sufficient intake of essential micronutrients). This is a maximum suggested intake and not the amount recommended for achieving a healthful 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 years: 19 g total fiber/day
- children 4 to 8 years: 25 g/day
- boys 9 to 13 years: 31 g/day
- girls 9 to 13 years: 26 g/day

Figure 1. Institute of Medicine Dietary Reference Intakes for children. Data adapted from reference 12: A Report of the Panel on Macronutrients, Subcommittees on Upper Reference Levels of Nutrients and Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes; Food and Nutrition Board; and Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: The National Academies Press; 2005:1357.

lunches offered to students during the 1990s (44). The most recent USDA data indicate that the average school lunch provides about 35% of calories from fat and 12% of calories from saturated fat, as well as more than one-third of the Recommended Dietary Allowances for all targeted nutrients. School breakfasts have shown comparable improvements in relative fat and saturated fat content since 1991-92, with no reduction in overall nutrient content of school breakfasts.

In addition to the school breakfast program and NSLP, many schools also offer à la carte foods and beverages during breakfast or lunch or in after-school programs, as well as in school stores, snack bars, vending machines, and concession stands. Before the advent of Local Wellness Policies in 2006, these foods and beverages rarely met any nutritional standards.

In April 2007, the Institute of Medicine (IOM) released a report on *Nutrient Standards for Foods in Schools: Leading the Way toward Healthier Youth* (45). The standards are directed toward à la carte cafeteria items, products sold in vending machines and at school stores, and other foods and drinks that are available outside of—and therefore compete with—Federally reimbursable school

meals, which already must conform to specific nutrition guidelines.

School Wellness Policy Requirements

To help combat childhood obesity and improve children's overall health and nutrition, the Child Nutrition and WIC Reauthorization Act of 2004 (P.L. 108-265) required each local educational agency receiving funds for USDA Child Nutrition Programs establish a local school wellness policy by the beginning of the 2006-2007 school year (46). With this requirement, the Congress recognized that schools play a critical role in creating a healthful environment for the prevention of childhood obesity and for combating health problems that are associated with poor nutrition and physical inactivity. The minimum requirements of the Federal legislation include:

- goals for nutrition education, physical activity, and other school-based activities that are designed to promote student wellness;
- nutrition guidelines for all foods available on each school campus during the school day with the objectives of promoting student health and reducing childhood obesity;
- ways of measuring how well the

school wellness policy is being implemented; and

- involvement of parents, students, the school food authority, the school board and school administrators, and the public.

Local wellness policy implementation and evaluation provides another avenue for food and nutrition professionals, as well as parents, to affect the nutrition environment for children. Because many children consume a substantial proportion of their meals and calories at school, this policy arena offers an important opportunity to improve children's nutrient intake and eating habits with nutrition education.

In schools, health care professionals and educators need to promote energy balance, moderation, and healthful eating patterns that are consistent with current dietary guidelines. Schools and communities have a shared responsibility to provide all students with access to high-quality, affordable foods and beverages that contribute to dietary patterns consistent with the Dietary Reference Intakes (DRIs), 2005 Dietary Guidelines, and MyPyramid, and promote development of lifelong healthful eating habits (4,12,13,47). These recommendations are consistent with the American Dietetic Association's statement on nutrition integrity in school nutrition programs (48).

TRACKING OF NUTRIENT INTAKES IN CHILDREN

Tracking is a term used to indicate the likelihood of a child to remain in a respective rank for nutrient intake in relation to his or her peers. One study found that of preschool children consuming the highest percentage of energy from fat, 57% continued to be high consumers at age 5 to 6 years, and, of those children, 53% remained high consumers at age 7 to 8 years (49).

As children grow into young adults, their average consumption of mixed meats, fruit and fruit juices, desserts, candy, and milk decreased, and consumption of sugar-sweetened beverages, poultry, salty snacks, seafood, cheese, and beef increased (22). More longitudinal studies are needed to confirm whether consistent dietary patterns in childhood are carried into adulthood.

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

	2-3 years	4-8 years	9-13 years
Calories ^c (kcal)	1,000		
Female		1,200	1,600
Male		1,400	1,800
Milk/dairy (c)	2	2	3
Lean meat/beans (oz)	2		5
Female		3	
Male		4	
Fruits ^d (c)	1	1.5	1.5
Female			
Male			
Vegetables ^d (c)	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	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 Tables D1-1 and D1-13 *Report of Dietary Guidelines for Americans Committee (2005)*. www.health.gov/dietaryguidelines/dga2005/report/.

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

^dFor fruits and vegetables, serving sizes are $\frac{1}{3}$ cup for 2 to 3 years of age, and $\frac{1}{2}$ cup for 4 years of age. A 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.

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 (12). The DRIs updated the Recommended Dietary Allowances published in 1989. Key recommendations for children are summarized in Figure 1.

The IOM's Acceptable Macronutrient Distribution Ranges and DRIs provided the foundation for the recommendations in the 2005 Dietary Guidelines targeted to the general public ages 2 years and older (4). The 2005 Dietary Guidelines were also designed to address "shortfall nutrients," noting that, for children, efforts are warranted to promote increased dietary intakes of vitamin E, calcium, magnesium, potassium, and fiber. As part of the key recommendation to consume adequate nutrients within calorie needs, the 2005 Dietary Guidelines made the following specific recommendations for children:

- Food groups to encourage for children: Consume whole-grain products often; at least half the grains should be whole grains. Children 2 to 8 years should consume 2 cups per day fat-free or low-fat milk or equivalent milk products. Children 9 years of age and older should consume 3 cups per day fat-free or low-fat milk or equivalent milk products. Consume a sufficient amount and a variety of fruits and vegetables while staying within energy needs.
- Fats for children: Keep total fat intake between 30% to 35% of calories for children 2 to 3 years of age and between 25% to 35% of calories for children 4 to 18 years of age, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, poultry, lean meats, nuts, and vegetable oils. [Note: It is advisable for children to avoid eating fish with high mercury content and to limit their consumption of fish with moderate mercury content. Current consumer advisories identify species of fish to

limit or avoid in order to reduce exposure to environmental contaminants (50).]

- Sodium for children: The current recommendation for adequate daily sodium intake for 4- to 8-year-olds is 1.2 g/day; for older children the recommendation is 1.5 g/day. Because these intakes are substantially less than current dietary intakes, lowering dietary sodium to the recommended levels may provide future benefits in terms of preventing high blood pressure in children (51).

The 2005 Dietary Guidelines suggest the USDA Food Guide as an example of translating nutrient-focused recommendations into food choices. The Table details the estimated calories and food group servings for children 2 to 13 years.

Historically, the USDA has provided consumers with graphic dietary guidance based on current guidelines. MyPyramid for Kids represents an adaptation directly targeted to children ages 6 to 11 years (13). It was developed to increase the recognition and use of MyPyramid by children, with focused messages and age-appropriate educational materials for homes, classrooms, cafeterias, community settings, and the media. MyPyramid for Kids images and messages have been tested with children ages 6 to 11 years and teachers of grades 1 through 6 to ensure that they communicate the intended content and are appealing to the target audience.

PHYSICAL ACTIVITY

For the first time ever, the 2005 Dietary Guidelines incorporated a separate chapter and specific guidelines for physical activity (30). This included a key recommendation for children to engage in at least 60 minutes of physical activity on most, preferably all, days of the week. The importance of 60 minutes of physical activity for promoting well-being and preventing overweight in children was reaffirmed by the American Academy of Pediatrics in 2006. The American Academy of Pediatrics noted both 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, daily physical education classes taught by qualified instructors. According to the Centers for Disease Control and Prevention less than half of older children currently meet of the recommendation for 60 minutes of daily physical activity. Several state legislatures and many local school districts (as part of local wellness policies) have begun to increase physical activity and physical education in schools.

ROLE OF PARENTS AND CAREGIVERS IN DEVELOPMENT OF HEALTHFUL EATING

Numerous environmental and personal factors influence dietary behaviors. In the case of children, parents exert a powerful influence, providing both genes and eating environments (52). 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 development of a child's relationship with food later in life (53). 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 (54). Consideration of nutrition by young adults when selecting food was related to the memory of their parents talking about nutrition during childhood (53).

Parents can influence children's dietary practices in many areas: availability and accessibility of foods; meal structure and environment; adult food modeling; food socialization practices; and food-related parenting styles. 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 and continue to be marginally

understood. Additional research is needed to assess how a wide range of factors influence parents' use of feeding practices, including child characteristics, parental attitudes and concerns about child health and weight, socioeconomic factors and ethnicity, and current eating environments (55).

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 will overcome their neophobic response and develop an increased preference for that food (56). Thus, 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 novel food increased during meals when they observed a teacher enthusiastically consuming that food (57). Strong associations have been shown between parental food habits and nutrient intakes and the habits and intakes of their children (58).

Although children are able to adjust their food intake across successive meals to regulate energy intake for 24-hour periods (59), family feeding practices influence children's responsiveness to energy density and meal size (60). When parents assume control of food portions or coerce children to eat rather than allowing 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-age children (61,62). This may be especially problematic among girls with a high body mass index and can contribute to the chronic dieting and dietary restraint that has become common among American girls and young women.

There is a growing consensus regarding the importance of family mealtimes to a long list of factors affecting children's nutrition, health, and overall well-being. Research has shown positive associations between family meal frequency and nutritional intake among children and teens (33). Family meals may also contribute positively to children's nu-

trition beliefs and attitudes (55), as well as to the onset and persistence of overweight in elementary school children (63).

Although children seem to possess an innate ability to self-regulate their energy intake, their food environment affects the extent to which they are able to exercise this ability. Offering large food portions (especially of high-calorie, sweet, or salty foods), feeding practices that pressure or restrict eating, or modeling of excessive consumption can all undermine self-regulation in children. Perhaps the best advice regarding child-feeding practices continues to be the division of responsibility between adult and child advocated by Satter (64). According to this division, the role of parents and other caregivers in feeding is to provide positive structure, age-appropriate support, and healthful food and beverage choices. Children are responsible for whether and how much to eat from what adults provide.

INFLUENCE OF ADVERTISING ON CHILDREN'S EATING PATTERNS

The influence of advertising on children's eating patterns is an increasing concern. In 2005, the IOM released a comprehensive review of the scientific evidence on the influence of food marketing on diets and diet-related health of children (65). The committee concluded that there was moderate evidence that television advertising influenced the usual dietary intake of children ages 2 to 5 years and weak evidence for children ages 6 to 11 years. However, there was strong evidence that marketing of food and beverages did influence the preferences and purchase requests of children. Several important gaps in the existing research relating marketing to diet were identified. The report also provides recommendations to guide the development and implementation of effective advertising and marketing strategies that provide more healthful food choices to children.

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 lat-

Action for Healthy Kids
www.actionforhealthykids.org/

Division of Nutrition, Physical Activity and Obesity
www.cdc.gov/nccddp/dnpa/

Healthy Youth!
www.cdc.gov/HealthyYouth/

Children's Nutrition Research Center
www.kidsnutrition.org/

Food and Nutrition Service—Nutrition Education Resources
www.fns.usda.gov/fns/nutrition.htm

Fruits & Veggies—More Matters
www.fruitsandveggiesmatter.gov/

Healthy Weight for Kids Initiative
www.adaf.org/cps/rde/xchg/adaf/hs.xsl/8465_ENU_HTML.htm

Kidnetic.com Leader's Guide: Healthy Eating & Active Living
 Ideas & Activities for Kids & Families
<http://ific.org/kidnetic/leadersguide.cfm>

Kids Health
www.kidshealth.org/

MyPyramid for Kids
www.mypyramid.gov/kids/index.html

Powerful Bones. Powerful Girls.
www.cdc.gov/powerfulbones/

We Can: Ways to Enhance Nutrition and Physical Activity
www.nhlbi.nih.gov/health/public/heart/obesity/wecan/

Figure 2. Resources for communicating science-based nutrition messages directly to children, families, and caregivers.

est evidence-based information, nutrition messages must be culturally sensitive and age appropriate, as well as engaging and fun for children.

In addition to providing key nutrition facts, effective consumer messaging should 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 guidance regarding alternatives to traditional feeding practices, which may promote overeating and weight gain in today's food environment (52).

Numerous resources exist for communicating science-based nutrition messages directly to children, as well as to their families and caregivers. In addition to the Web sites listed in Figure 2, appropriate, low-cost resources may 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 manufacturers; and others, including commercial companies. Food and nutrition professionals should review all materials thoroughly prior to use in order to ensure accuracy and appropriateness for the target audience.

CONCLUSION

Most American children do not meet the MyPyramid recommendations for fruit, grain, and dairy groups. In addition, the majority of children do not meet the 2005 Dietary Guidelines recommendations (14,15) for total and saturated fats. One tool for helping the public meet the 2005 Dietary Guidelines is the USDA's MyPyramid (13,47) for kids, which is based on actual eating patterns of this group (Figure 3) (13). Key messages of the 2005 Dietary Guidelines are to encourage most Americans to eat fewer calories, be more active, and make

wiser food choices. 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 to be educated on mealtime behaviors that promote adoption of more healthful eating behaviors early in life. The ongoing need for nutrition intervention and education with children and their parents and caregivers can and should be met by food and nutrition professionals who have the training and skills to meet those needs.

Food and nutrition professionals can take an active role in promoting dietary recommendations and guidelines for children after the age of 2 years. The American Dietetic Association has joined forces with many other health professional organizations as well as the food and beverage industries to work toward translating dietary recommendations and guidelines into achievable and healthful messages for all children in the United States.

Recommendations for Food and Nutrition Professionals

- Support and promote the 2005 Dietary Guidelines for healthy children after the age of 2 years.
- Support and promote use of the USDA's MyPyramid Plan as a guide for meeting dietary recommendations (13) with use of the MyPyramid for Kids (Figure 2).
- Support and promote healthful dietary patterns among diverse ethnic groups, taking into consideration regional and cultural differences.
- Support and promote implementation of the 2005 Dietary Guidelines in school meals by strengthening nutrition education and promotion in school nutrition programs, including implementation of integrated nutrition education curricula designed to teach students how to make informed dietary selections based on balance, variety, and moderation and the fundamental premise that all foods can fit into a healthful diet.
- Support the availability of foods and beverages that contribute to di-

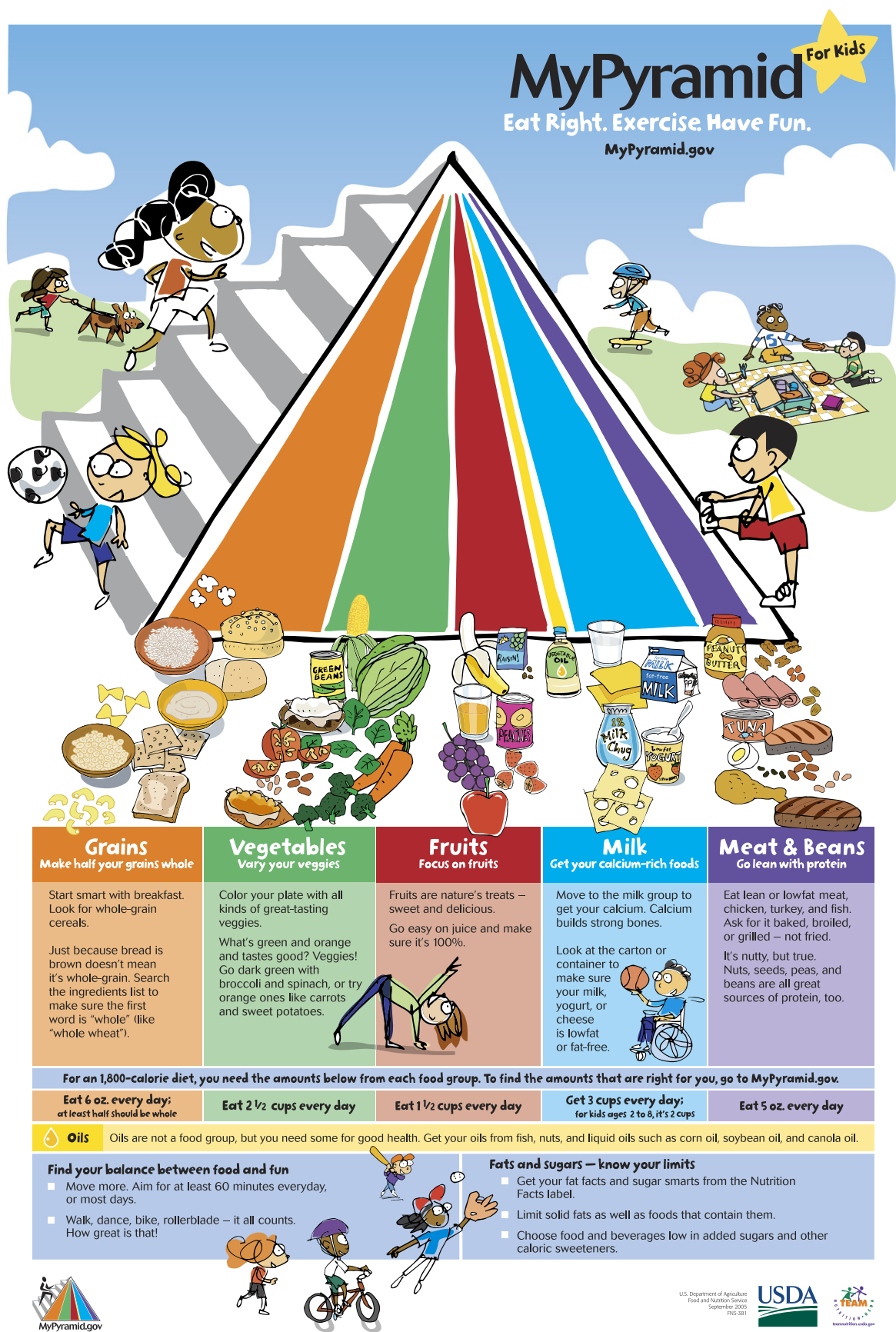


Figure 3. US Department of Agriculture's MyPyramid for Kids.

etary 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 and regular family/family-style mealtimes.
- Foster communication by building partnerships across health-related disciplines and professional organizations.
- Conduct effective nutrition education training programs for physicians, child nutrition personnel, and other health care providers on strategies that can be used with children that promote more healthful eating habits.
- Advocate for the need to increase Federal and state funding of individual-based and population-based intervention programs designed to implement 2005 Dietary Guidelines.
- Support more research to determine the barriers for complying with the 2005 Dietary Guidelines 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 2005 Dietary Guidelines, 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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Authors: Theresa A. Nicklas, PhD; Dayle Hayes, MS, RD.

Reviewers: Public Healthy/Community Nutrition Dietetics Practice Group (Cynthia Taft Bayerl, MS, RD, Nutrition and PA Unit, Massachusetts Department of Public Health, Boston, MA); Sharon Denny, MS, RD (ADA Knowledge Center, Chicago, IL); Pediatric Nutrition Dietetic Practice Group (Keli Hawthorne, MS, RD, Baylor College of Medicine, Children's Nutrition Research Center, Houston, TX); Stacey Krawczyk, MS, RD (Illinois NET Consultant, Champaign, IL); Louise Lapeze, MS, RD (Child Nutrition Division Food Nutrition Service/US Department of Agriculture, Baton Rouge, LA); Reed Mangels, PhD, RD (The Vegetarian Resource Group, Baltimore, MD); Catherine M. McDonald, PhD, RD, CSP (Primary Children's Medical Center, Salt Lake City, UT); Esther Myers, PhD, RD, FADA (ADA Scientific Affairs, Chicago, IL); Jennifer A. Weber, MPH, RD (ADA Government Relations, Washington, DC).

Association Positions Committee Workgroup: Katrina A. Holt, MPH, MS, RD (chair); Debe L. Nagy Nero, MS, RD; Shirley Ekvall, PhD, RD (content advisor).

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