



Promoting Healthy Nutrition

Theme **5**PROMOTING
HEALTHY NUTRITION

INTRODUCTION

Infancy, childhood, and adolescence are marked by rapid physical growth and development, and every child's and adolescent's health and development depends on good nutrition. Any disruption in appropriate nutrient intake may have lasting effects on growth potential and developmental achievement. Physical growth, developmental requirements, nutrition needs, and feeding patterns vary significantly in each stage of growth and development.

The dramatic increase in pediatric overweight and obesity in recent years has increased health care professionals' and parents' attention to nutrition. Along with regular physical activity, a balanced and nutritious diet is essential to prevent pediatric overweight conditions. Therefore, health care professionals are encouraged to review this Bright Futures theme in concert with the Promoting Physical Activity and Promoting Healthy Weight themes.

Key Food and Nutrition Considerations

Food and nutrition behaviors are influenced by myriad environmental and cultural forces. Health care professionals should keep these forces in mind as they work with patients and families. Three issues of particular importance are discussed here.

Culture and Food

All people belong to some kind of cultural group. Culture influences the way people look at the world, how they interact with others, and how they expect others to behave. To meet the challenge of providing nutrition supervision to diverse populations, health care professionals must learn to respect and appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. They also need to understand how their own cultures influence their attitudes and behaviors, and the resulting implications for nutrition counseling. Sharing food experiences, asking questions, observing the food choices people make, and working with the community are important ways for health care professionals to learn about and appreciate the food and nutrition traditions of other cultures.¹

Culture influences how people prepare food, how they use seasonings, and how often they eat certain foods.

These behaviors can differ from region to region and family to family, though some traditions exist across cultures. For example, staple,



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or core, foods form the foundation of the diet in all cultures. Staple foods, such as rice or beans, are typically bland, relatively inexpensive, easy to prepare, an important source of calories, and an indispensable part of the diet.

Acculturation, which is the adoption of the beliefs, values, attitudes, and behaviors of a dominant, or mainstream, culture, can be a significant influence on a person's food choices. Acculturation may involve altering traditional eating behaviors to make them similar to those of the dominant culture. These changes can be grouped into 3 categories: (1) the addition of new foods, (2) the substitution of foods, and (3) the rejection of foods. People add new foods to their diets for several reasons, including increased economic status and food availability (especially if the food is not readily available in the person's homeland). Substitution may occur because new foods are more convenient to prepare, more affordable, or better liked than traditional ones. Children and adolescents, in particular, may reject traditional foods because eating them makes them feel different from the mainstream.

Culture also influences nonnutritive aspects of food practices, and any nutritional information and guidance should take these preferences and practices into account. Some ethnic practices related to diet and nutrition may focus more on the food's texture, appearance, flavor, or aroma, or on beliefs related to the complementary nature of the food items, rather than on specific nutritional value. For many people, certain foods are closely linked to strong feelings of being cared for and nurtured by their families or are a reflection of religious practices. People from virtually all cultures use food during celebrations.

In many cultures, people believe that food promotes health, cures disease, or has other medicinal qualities. In addition, many people believe that foods can help maintain a

balance in the body that is important to health. For example, many Chinese believe that health and disease are related to the balance between "yin" and "yang" forces in the body. Diseases caused by yin forces are treated with yang foods to restore balance, and vice versa. In Puerto Rico, foods are classified as hot or cold (which may not reflect the actual temperature or spiciness of foods), and people believe that maintaining a balance between these 2 types of foods is important to health.

Health care professionals can provide effective nutrition guidance by being sensitive to cultural beliefs that categorize foods in ways other than the Western scientific model, by exploring such beliefs, and by incorporating them into their guidance. When discussing their food choices, patients and their parents may respond by saying what they think the health care professional wants to hear. Health care professionals can encourage people to be more candid about their food choices by asking open-ended, nonjudgmental questions that reflect their knowledge of, and sensitivity to, these issues.

Two issues illustrate the challenges of providing nutrition supervision to people from diverse cultural backgrounds. The first, lactose intolerance, highlights the medical aspects involved. The second, attitudes toward body weight, highlights the deep-seated emotional and attitudinal aspects that are often involved.

LACTOSE INTOLERANCE

Lactose intolerance is common in people of non-European ancestry. People who are lactose intolerant may experience cramps and diarrhea when they eat moderate to large amounts of foods that contain lactose, such as milk and other dairy products. Children and adolescents may be able to avoid symptoms by consuming small servings of milk throughout the day, by consuming lactose-reduced milk, or by taking lactase tablets or

drops with milk. Cheese and yogurt are often better tolerated than milk because they contain less lactose. For people who cannot tolerate any milk or dairy products in their diet, health care professionals can suggest other sources of calcium, such as dark green, leafy vegetables or canned salmon, and calcium-fortified foods, such as orange juice, tofu, or bread.

ATTITUDES ABOUT BODY WEIGHT

People from different cultures can view body weight differently. Keeping a child from being underweight can be very important to people from cultures in which poverty or insufficient food supplies are common. Families may not recognize that their child is overweight according to body mass index (BMI) tables or may view excess weight as healthy. In these cases, the families may be offended if a health care professional refers to their child as overweight or obese. (For more information on this topic, see the Promoting Healthy Weight theme.)

Food Insecurity and Hunger

Hunger describes the personal sensation that results from a lack of food and is typically felt as unpleasant or painful. Involuntary hunger results from not being able to obtain enough food and excludes hunger related to voluntary dieting, religious fasting, or the personal choice to skip a meal.

Food insecurity for a family means limited or uncertain availability of nutritionally adequate and safe foods, or the uncertain ability to acquire appropriate foods in socially acceptable ways. In contrast, food-secure households have access to sufficient food for a healthy lifestyle at all times. Twelve percent of American households were food insecure for at least part of 2004.² (The remaining families were food secure throughout the entire year of 2004.) The prevalence of food insecurity has increased steadily since 1998.³

Food insecurity may occur with or without hunger. In its most severe presentation, this problem is associated with hunger and is an indication of a serious nutritional problem and family predicament. Food insecurity without hunger is associated with increased nutritional risk.

An important deleterious effect of food insecurity is that it forces people to buy and consume less-expensive foods, which are often less nutrient dense, but more calorically dense and higher in fat than more expensive foods. As a result, the nutritional quality of the diet declines. (For more information on this topic, see the Promoting Healthy Weight theme.)

The problems of food insecurity and hunger may be difficult to detect in the primary pediatric health care setting. If disorders of growth, both underweight and overweight, are noted, health care professionals should ask about food security. Options for referral and community support are available for each developmental stage. For example, local lactation specialists or other knowledgeable health care professionals, such as *doulas* or *promotoras*, can provide follow-up care after a new mother is discharged from the hospital, and they can consult by phone or schedule visits to a hospital-based lactation clinic. Health maintenance organizations and community hospitals also are a source of infant nutrition education. The US Department of Agriculture (USDA) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) offers a food package for women who are pregnant or postpartum, women who are breastfeeding their baby, and for infants and children up to 5 years of age. Health departments offer educational services through WIC and other programs in which public health nurses or nutritionists visit families at home.

Families also may qualify for programs such as the USDA Food Stamp Program. A community food shelf or pantry can provide

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additional food for needy families. For school-aged children and adolescents, community services expand to include free school breakfast and lunch programs and, ideally, nutritious and appealing school food services. For adolescent parents, school programs can focus on the importance of prenatal nutrition to ensure the quality of nutrition.

Partnerships With the Community

Partnerships among health care professionals, families, and communities are essential to ensure that infants and children have good nutrition and that parents receive guidance on infant and child nutrition and feeding. (For more information on this topic, see the [Promoting Community Relationships and Resources](#) theme.) Health care professionals can have a tremendous impact on decisions about feeding the family because they provide an opportunity for parents to discuss, reflect on, and decide on options that best suit their circumstances. As part of their guidance, health care professionals also can identify and contact community resources that help parents at each stage of their children's development. As a result of considerable media attention to the problem of overweight and obesity, the public has become increasingly aware of the importance of healthful eating and adequate physical activity. Communities have responded by creating educational programs that provide nutritious school lunches, access to affordable nutritious foods, and safe neighborhood opportunities for play and exercise. Health care professionals can help families learn about and participate in these opportunities. These resources are particularly important for families with limited or no literacy skills and for those with limited English proficiency.

Essential Components of Nutrition

The following essential components of nutrition are useful constructs for discussing nutrition from birth to young adulthood:

- **Nutrition for appropriate growth**—Provide adequate energy and essential nutrients to ensure appropriate growth and prevent overweight or obesity.
- **Nutrition and development of feeding and eating skills**—Choose feedings that provide all the essential nutrients and support the development of appropriate feeding and eating skills.
- **Healthy feeding and eating habits**—Establish a positive, nurturing environment and healthy patterns of feeding and eating to promote healthy eating habits that are built on variety, balance, and moderation.
- **Healthy eating relationships**—Promote healthy adult-child feeding relationships and social and emotional development.
- **Nutrition for children and youth with special health care needs**—Recognize special nutrient demands or supplemental needs for vitamins or minerals related to a child's specific and special health condition and provide these nutrition components in an effective and family-centered manner.

Promoting Nutritional Health: Preconception and the Prenatal Period

In deciding to become parents, a couple may examine many issues of lifestyle and health because they recognize that their nutrition and physical activity beliefs, habits, and practices affect not only their own health but also the health of their family and children. Obesity, smoking, alcohol, and substance use affect the family as well. Pregnant women and women who may become pregnant should be encouraged to follow a nutritious diet. Adequate intakes of certain nutrients, such as folic acid, are important even before conception.

Folic Acid

Neural tube defects are among the most common birth defects contributing to infant mortality and serious disability. Women of childbearing age can substantially reduce their risk of having babies with certain congenital malformations, including spina bifida, by taking appropriate amounts of folic acid before and during early pregnancy. Current guidelines suggest that all women of childbearing age take a daily multivitamin or multivitamin-mineral supplement containing 400 µg of folic acid.⁴⁻⁷ Women who have given birth previously to a child with a neural tube defect, or those who have a history of insulin-dependent diabetes or a seizure disorder and are taking antimetabolites or anti-epileptic drugs (eg, carbamazepine or valproic acid), require higher dosages of folate. The appropriate folic acid dosages continue to evolve. The most current recommendations are available from the Centers for Disease Control and Prevention (CDC).⁴

Promoting Nutritional Health: Infancy— Birth to 11 Months

Physical growth, developmental achievements, nutrition needs, and feeding patterns vary significantly in each stage of infancy. During the first 2 to 6 weeks of life, the infant primarily feeds, sleeps, and grows. The most rapid growth occurs in early infancy, between birth and 6 months of age. In middle infancy, from 6 to 9 months of age, and late infancy, from 9 to 12 months of age, rapid growth continues, but at a slower pace. By late infancy, mastery of purposeful activity complements physical maturity, and loss of newborn reflexes allows him to progress from a diet of breast milk or formula to feeding with an increasingly wide variety of flavors, textures, and foods.

Feeding practices and routines serve as the foundation for much of child and family development, as parents build many important skills. These skills include identifying, assessing, and responding to infant cues, promoting reciprocity, and building the infant's feeding and pre-speech skills. When feeding their infant, parents clarify and strengthen their sense of what it means to be a parent. They gain a sense of responsibility by caring for an infant, experience frustration when they cannot easily interpret their infant's cues, and further develop their ability to negotiate and solve problems through their interactions with the infant.

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Nutrition for Growth

The infant's diet must provide adequate energy and essential nutrients for appropriate growth. Conversely, growth is an important indicator of nutritional adequacy. Although newborns may lose up to 10% of their body weight in the first week of life, they usually regain their birth weight by 7 days after birth. By the time they are 4 to 6 months old, infants typically have doubled their birth weight, gaining about 4 to 7 ounces per



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week. Infants typically triple their birth weight by 1 year of age, gaining about 3 to 5 ounces per week from 6 to 12 months of age.

Infants grow approximately 1 inch per month from birth to age 6 months, but the rate of growth slows from 6 to 12 months of age when infants gain about one half inch per month. Infants usually increase their length by 50% in the first year.

Infants who are fed on demand usually consume the amount they need to grow well. Growth of exclusively breastfed infants during the first 6 months exceeds that of other infants, but formula-fed infants gain more rapidly during the remainder of the first year.⁸⁻¹⁰ The significance of this difference to future growth or risk of overweight is uncertain. Infants' growth depends on nutrition, perinatal history, and genetic factors (such as parental height, genetic syndromes, or disorders), and other physical factors.

The growth of head circumference up to 2 years of age is so closely related to growth in body length that head circumference measurements do not yield more information about a child's nutritional status than body length measures. After 2 years of age, head circumference grows so slowly that it is a poor indicator of actual malnutrition. However, in an older child, head circumference may be a good indicator of malnutrition that occurred during the first 2 years of life. Head circumference is not a good indicator of nutritional status, but it remains important in screening for microcephaly and macrocephaly because these abnormalities are not nutritional in origin.

CALORIC NEEDS

To meet growth demands, all infants require a high intake of calories and adequate intakes of fat, protein, vitamins, and minerals. Breast milk and formula provide 40% to 50% of energy from fat to meet the infant's growth and development demands. Fats

should not be restricted in the first 2 years of life. Vitamin and mineral needs, with the exception of vitamin D, usually are supplied if the infant is breastfed or if the infant receives an adequate volume of correctly prepared formula. After 6 months of age, complementary foods (solids) aid the development of appropriate feeding and eating skills for all infants and provide additional nutrients to meet the dietary reference intakes (DRIs) for breastfed infants.

VITAMIN AND MINERAL SUPPLEMENTS

A major concern in infancy is the adverse effect of early iron deficiency on psychomotor development. Iron deficiency can result in cognitive and motor deficits,¹¹ some of which may be reversible with iron therapy.¹² However, a recent Cochrane Review on the subject concluded that there is no clear evidence that treating young children with anemia secondary to iron deficiency will improve psychomotor development.¹³ Thus, *prevention* is extraordinarily important. During the first year of life, the infants at highest risk of iron deficiency are those born prematurely, those fed formula that is not iron fortified, and those who are exclusively breastfed without iron supplements. Infants who receive only breast milk are at risk for iron deficiency by 6 months of age, and risk subsequent iron-deficiency anemia.¹⁴⁻¹⁵ It is judicious to begin iron supplements of 1 mg/kg/d after 4 months of age if infants are not receiving iron-fortified complementary foods.¹⁶ Red meat is a better source of iron than iron-fortified cereals for older infants. Infants who receive at least 500 mL (17 oz) of iron-fortified formula do not need additional iron supplementation.

The American Academy of Pediatrics (AAP) currently recommends vitamin D supplementation (400 IU per day) for breastfed infants beginning in the first few days of life.¹⁷ Breastfed infants whose mothers are vegans or vitamin B₁₂ deficient need supplements of vitamin B₁₂.

Fluoride supplementation is not indicated until after the eruption of teeth, which usually occurs at approximately 6 months of age. At that time, the pediatric health care professional or dentist will evaluate the need for fluoride supplementation based on the child's risk for dental caries and total fluoride exposure. Adequate calcium intake is not an issue in infants who receive enough breast milk or formula. (For more information on this topic, see the Promoting Oral Health theme.)

Developing Healthy Feeding and Eating Skills

Feedings should be planned to provide all the essential nutrients and support the development of appropriate feeding and eating skills.

BREASTFEEDING

Breastfeeding is recommended for infants during at least the first year of life because of its benefits to infant nutrition, gastrointestinal function, host defense, neurodevelopment, and psychological well-being (Box 1). Breastfeeding, with a restricted maternal diet during pregnancy and lactation, may reduce the incidence of atopic illness, such as allergy or eczema, in infants who have strong family histories of these illnesses. Immediately after delivery, early and frequent physical contact, rooming-in, and exclusion of commercial formula samples enhance the duration of breastfeeding. The AAP Section on Breastfeeding recommends exclusive breastfeeding for about 6 months to maximize its benefits.¹⁸ However, after a review of all available evidence, the AAP Committee on Nutrition recommends exclusive breastfeeding for 4 to 6 months.¹²

Because the decision to breastfeed is often made before, or early in, pregnancy, the prenatal visit offers an important opportunity to promote breastfeeding. Parents often are aware of the benefits of breastfeeding, but lack confidence in their ability to successfully breastfeed their infant. They may have

questions about breastfeeding and its nutritional adequacy, their ability to know if the infant is drinking enough milk, the mother's ability to produce enough milk to satisfy the infant's hunger, or whether the mother should breastfeed if she smokes or has an underlying health condition. Mothers also express concerns about their need to return to work or school within 6 to 8 weeks after the baby's birth, or the competing needs of other children and family members. Prenatal and postpartum counseling can address these issues and also prolong the duration of breastfeeding.¹⁹

Parents also may raise concerns about maternal medication usage, or maternal or infant illness, and the advisability of breastfeeding. Decisions regarding the appropriateness of breastfeeding in these situations are best made on an individual basis with a health care professional. Under most circumstances, mothers can continue to breastfeed their infants or supply breast milk if the infant is unable to breastfeed directly, but a few contraindications to breastfeeding do exist. Medications taken by the mother should be individually evaluated to determine whether they can be used safely when breastfeeding. Few prescription and nonprescription medications are contraindicated for the mother who breastfeeds her baby.²⁰

Cultural factors may influence breastfeeding initiation and success. Parents need practical support for breastfeeding, as well as culturally based information and guidance. A solid knowledge of the parents' culture and community will help health care professionals give parents the support, appropriate education, and guidance they need to be successful in breastfeeding their infant. (For more information on this topic, see the Promoting Community Relationships and Resources theme.)

FORMULA FEEDING

For infants who are not breastfed, iron-fortified infant formula is the recommended

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BOX 1**Benefits of Breastfeeding**

Breast milk is uniquely suited to the needs of the newborn and growing infant and provides many benefits for general health, growth, and development.

Benefits to the infant

- Breastfeeding provides ideal nutrition and promotes the best possible growth and development.
- Breastfeeding significantly decreases the incidence of diarrhea, lower respiratory tract infection, otitis media, bacteremia, bacterial meningitis, botulism, and urinary tract infection.
- Breastfeeding may be protective against Crohn's disease, lymphoma, and certain genotypes of type 1 diabetes mellitus, and delay the onset of certain allergies.¹²
- Breastfeeding lowers the risk of obesity in some populations.
- Breastfeeding promotes healthy neurologic development.
- Breastfeeding can reduce the incidence of atopic illness, such as allergy or eczema.²¹
- Breastfeeding promotes close mother-infant connection.

Benefits to the mother

- Breastfeeding increases levels of oxytocin, which results in less postpartum bleeding and more rapid uterine involution.
- Lactating women have an earlier return to pre-pregnancy weight, delayed resumption of ovulation with increased child spacing, improved postpartum bone remineralization, and reduced risk of ovarian cancer and premenopausal breast cancer.
- Lactational amenorrhea causes less menstrual blood loss over the months after delivery.

Benefits to the family

- Breastfeeding has no associated costs and requires no equipment or preparation.
- It is easy to travel with a breastfed baby because no special equipment or supplies are necessary.

Benefits to the community

- Breastfeeding reduces health care costs and employee absenteeism because of reduced childhood illness.
- Breastfeeding reduces parent absence from work and lost income.

Sources

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substitute during the first year of life.¹² Cow's milk, goat's milk, soy beverages (not soy formula), and low-iron formulas should not be used during the first year. Reduced-fat (2%), low-fat (1%), fat-free (skim), and soy milk are not recommended for infants during the first 2 years.

Health care professionals should counsel parents to avoid propping the bottle or letting their infant feed alone. This precaution will minimize the risk of choking, ear infections, early childhood caries, insufficient intake, and the missed opportunity for enhancing the parent-child relationship. To prevent early childhood caries, parents should be instructed not to put the infant to bed with a bottle or sippy cup that contains milk, juices, soda, or other sweetened liquids. (For more information on this topic, see the [Promoting Oral Health](#) theme.) Fruit juices are not needed in the infant diet during the first 6 months, but, if they are given, they should be fed by cup, not a bottle. Cereal or other foods should not be added to infant formula unless instructed by a health care professional.

A variety of specialized infant formulas have been developed for infants who cannot tolerate milk protein or lactose (eg, soy formulas, protein hydrolysates, and amino acid formulas). Health care professionals should supervise infants with milk intolerance. Intolerance to cow's milk-based formulas,

manifested by loose stools, spitting up, or vomiting, may prompt a change to soy formula, but there is little evidence to support this practice. Soy formulas may be recommended for a vegetarian lifestyle, transient lactase deficiency, and galactosemia. Soy formula should not be used for premature infants, cow's milk protein-induced enterocolitis, or the prevention of colic or allergy.¹²

FREQUENCY AND AMOUNT OF FEEDINGS

In the first months of life, breastfed infants usually feed 8 to 12 times in 24 hours (ie, approximately every 2 to 3 hours). Parents should be taught to recognize and respond to early feeding cues. As infants grow older, they typically are satisfied by larger feedings less frequently.

No recommendations exist for maximum volumes of formula at any one feeding, only for meeting total energy and fluid needs. Parents should offer 2 ounces of infant formula every 2 to 3 hours in the first week of life. If the infant still seems hungry, parents can provide more until the infant indicates that he is full. As the infant grows, a larger amount of formula should be given, and the infant should feed until he indicates that he is full. Satiety cues include turning away from the nipple, falling asleep, and spitting up milk. A newborn at the 50th percentile will consume an average of 20 oz of formula per day; the amount of formula ranges from 16 to 24 oz per day.

When he begins to sleep for longer periods at night (4 to 5 hours at about 2 months of age), the formula-fed infant will still need to feed 6 to 8 times in 24 hours. A 4-month-old infant will consume an average of 31 ounces of formula per day without complementary foods with a range of 26 to 36 oz per day. However, his intake fluctuates from day to day and week to week. During growth spurts, intake volume increases but will fall back to lesser volumes.

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The American Academy of Pediatrics recommends exclusive breastfeeding for a minimum of 4 months, but preferably for 6 months.

Infants 6 months and older generally consume 24 to 32 ounces per day, but larger infants may take as much as 42 ounces of formula per day in addition to complementary foods. Over time, the increasing volume of complementary foods is accompanied by a decreasing volume of milk.

For the newborn, hunger cues include rooting, sucking, and hand movements. In young infants, hunger cues may include hand-to-mouth movements and lip smacking. Smiling, cooing, or gazing at the parent during feeding can indicate that the infant wants more food. For older infants, hunger cues can include crying, excited arm and leg movements, opening mouth and moving forward as the spoon approaches, and swiping food toward the mouth. Crying is considered a late feeding cue and usually interferes with feeding as the infant becomes distressed and is less likely to eat well.

Infants can signal that they are full by becoming fussy during feeding, slowing the pace of eating, turning away, stopping sucking, or spitting out or refusing the nipple. Other satiety cues include refusing the spoon, batting the spoon away, and closing the mouth as the spoon approaches. As with all feeding interactions, parents should observe the infant's verbal and nonverbal cues and respond appropriately. If a food is rejected, parents should move on and try it again later rather than forcing the infant to eat or finish foods.

INTRODUCING COMPLEMENTARY FOODS

Complementary foods, commonly referred to as solids, include any foods or beverages besides human milk or formula. The AAP Committee on Nutrition states that complementary foods can be introduced in infants' diets between 4 and 6 months of age and when the infant is developmentally ready.¹² The AAP recommends exclusive breastfeeding for a minimum of 4 months, but preferably for 6 months. During the second 6 months of

life, complementary foods are an addition to, not a replacement for, breast milk or infant formula.

Parents need practical guidance when they begin to introduce complementary foods. The health care professional should work with each family to determine the best time to start this exciting new phase. Infants differ in their readiness to accept complementary foods. Counseling parents on the normal progression of the development of feeding and eating skills, and the infant's related ability to safely eat, will help them succeed in and enjoy the new experience.

Waiting until the infant is developmentally ready to begin eating complementary foods makes that process, and the later transition to table foods, easier. Signs that an infant is ready to begin semisolids (pureed foods) include fading of the extrusion reflex (the tongue-thrust reflex that pushes food out of the mouth) and elevating the tongue to move pureed food forward and backward in mouth (which usually occurs between 4 and 6 months of age). An increased demand for breastfeeding that continues for a few days, is not affected by increased breastfeeding, and is unrelated to illness, teething, or changes in routine also may be a sign of readiness for complementary foods. At this stage, the infant sits with arm support and has good head and neck control. The infant can indicate his desire for food by opening his mouth and leaning forward and can indicate disinterest or satiety by leaning back and turning away.

When the infant is able to sit independently and tries to grasp foods with his palms, he is ready to progress to thicker pureed foods and soft, mashed foods without lumps. He also can begin to sip from a small cup. When the infant crawls and pulls to stand, he also begins to use his jaw and tongue to mash food, plays with a spoon at mealtime (but does not use it for self-feeding yet), and tries to hold a cup independently. At this stage, he

is able to progress to ground or soft, mashed foods with small, soft, noticeable lumps (eg, finely chopped meat or poultry). At about 7 to 9 months of age, the infant learns to put objects in his mouth and will try to feed himself. At this age, the infant has developed a pincer grasp (the ability to pick up objects between thumb and forefinger). Any food the infant can pick up can be considered a finger food. Foods that dissolve easily, such as crackers or dry cereal, are good choices, but foods that can cause choking, such as popcorn, grapes, raw carrots, nuts, hard candies, and hot dogs, should be avoided.

Evidence for introducing complementary foods in a specific sequence or at any specific rate is not available. The general recommendation is that the first solid foods should be single-ingredient foods and should be introduced one at a time at 2- to 7-day intervals. The order in which solid foods are introduced is not critical as long as essential nutrients that complement breast milk or formula are provided. Pureed meats and iron-fortified cereals provide many of these nutrients for both breastfed and formula-fed infants. After the infant has accepted these new foods, parents can gradually introduce other pureed foods or soft fruits and vegetables 2 to 3 times per day and allow him to control how much he eats. Parents also can offer store-bought or home-prepared baby food and soft table foods, such as mashed potatoes or bananas. Breastfed infants are exposed to a variety of flavors through their mother's breast milk; thus, dietary variety is important not just for infants, but for their mothers as well. Mixing cereal with breast milk enhances acceptance of cereal by the breastfed infant.²³ Repeated exposures to foods enhances acceptance by both breastfed and formula-fed infants.²⁴

A nutritious and balanced diet for the older infant includes appropriate amounts of breast milk or formula and complementary

foods to ensure intake of all essential nutrients and to foster appropriate growth. By the end of the first year, the infant should be introduced to healthful foods, such as fruits, vegetables, whole grains, and lean meats. Foods that are high in calories, fat, and sugar, and low in essential nutrients, such as sweetened drinks, sodas, chips, and french fries, should be avoided.

Because of their high sugar and calorie content and lack of nutrients, parents should avoid giving their infants and young children carbonated soda and fruit drinks. In addition, parents should allow no more than 4 to 6 ounces of 100% fruit juice daily. Because 100% fruit juice is considered nutritious, parents may not recognize the need to limit consumption. However, fruit juice is high in calories and sugar. Consuming large quantities can contribute to pediatric overweight and obesity, diarrhea, and early childhood caries.²⁵

To establish habits of eating food in moderation, infants should be allowed to stop eating at the earliest sign of unwillingness and not urged to consume more. Parents should allow the infant to control the amount of milk, formula, or complementary foods consumed based on his hunger and satiety cues. Breastfeeding can aid in establishing habits of eating in moderation because the breastfed infant has more control over the amount consumed at a feeding. Parents who feed their infant formula should be warned against encouraging the infant to finish the bottle when satiety cues are demonstrated.

Eating nutritious foods and avoiding foods that provide calories without nutrients help establish habits of eating in moderation. Furthermore, establishing regular mealtimes and snack times and avoiding continuous feeding, or "grazing," will help prevent both overweight and underweight.

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Infants with a strong family history of food allergy (ie, those whose parents or siblings have or had significant allergies) may benefit from breastfeeding, particularly with regard to the development of cow's milk allergy

HANDLING FEEDING AND EATING PROBLEMS

Parents frequently have concerns and questions about infant feeding and eating issues, and an important aspect of health supervision during this developmental stage is helping parents distinguish normal infant feeding behaviors from feeding or eating problems.

Food Sensitivities and Allergies

Food allergy or hypersensitivity is a form of food intolerance characterized by reproducible symptoms with each exposure to the offending food and an abnormal immunologic reaction to the food. Symptoms and disorders, such as irritability, hyperactivity, gastrointestinal discomfort, and asthma, have been attributed to food allergies, but true food allergies are rare. Food hypersensitivity reactions occur in 2% to 8% of infants and children younger than 3 years. Food allergy can result in symptoms affecting the gastrointestinal tract (eg, vomiting, cramps, or diarrhea), skin (eg, eczema or hives), and respiratory tract (eg, asthma), or it can result in generalized, life-threatening allergic reactions (ie, anaphylaxis). Hyperactivity is not considered a manifestation of food allergy.

Approximately 2.5% of infants will experience an allergic reaction to cow's milk in the first 3 years of life, 1.5% will have a reaction to eggs, and 0.6% will have a reaction to peanuts.¹² The most common foods associated with allergic reactions in young children are cow's milk, eggs, peanuts, soy, and wheat. Tree nuts, fish, and shellfish become more common causes of food allergy in adolescents and adults.²⁶ Infants who are exclusively breastfed may react to these or other food proteins that reach breast milk from the mother's diet.

Infants with a strong family history of food allergy (ie, those whose parents or siblings have or had significant allergies) may benefit from breastfeeding, particularly with regard to the development of cow's milk allergy.²⁷ However, another recent review concluded

that 4 months of exclusive breastfeeding did not protect against food allergy at 1 year of age.²² Firm conclusions about the role of breastfeeding in either preventing or delaying the onset of specific food allergies are not possible at this time. In addition, though solid foods should not be introduced before 4 to 6 months of age, there is no convincing evidence that delaying their introduction beyond this period has a significant protective effect on the development of atopic disease, whether infants are fed cow's milk protein formulas or human milk.²¹ Single-ingredient new foods should be introduced one at a time, and the infant should be watched for adverse reactions over several days to a week. For infants who are not at risk of food allergies, no evidence indicates that restriction or avoidance of any food is necessary.

Regurgitation, Spitting Up, and Gastroesophageal Reflux Disease

Regurgitation and spitting up are common concerns for parents. During the first year of life, particularly in the first few months, infants typically have episodes of emesis (vomiting or "wet burps") within the first 1 to 2 hours after feeding. Emesis is related to transient physiologic episodes of lowered esophageal sphincter tone with efflux of gastric contents into the esophagus. Spitting up often occurs because milk has been ingested too rapidly or as a reaction to overfeeding,



inadequate burping, or improper feeding techniques (eg, bottle propped, bottle not adequately tipped up, or shaking formula too vigorously before feeding). Approximately half of infants younger than 3 months spit up or regurgitate one or 2 times a day, with the incidence peaking between the ages of 2 to 4 months. The frequency may increase again when the baby starts solid foods. Spitting up resolves itself in most children by 12 to 24 months of age.

Frequent spitting up or significant vomiting is classified as gastroesophageal reflux (GER) and usually is harmless in infants. The clinical manifestations of gastroesophageal reflux disease (GERD) include vomiting and associated poor weight gain, apparent discomfort with eating, esophagitis, and respiratory disorders.²⁸ The health care professional will need to differentiate these symptoms from pyloric stenosis in some very young babies.

Providing a Nurturing and Healthy Feeding Environment

Infants need a nurturing environment and positive patterns of feeding and eating to promote healthy eating habits and build variety, balance, and moderation. In early infancy, feeding is crucial for developing a parent's responsiveness to an infant's cues of hunger and satiation. The close physical contact during feeding facilitates healthy social and emotional development.

During the first year, feeding the hungry infant helps him develop a sense of trust that his needs will be met. For optimum development, newborns should be fed as soon as possible when they express hunger. Children with special health care needs often have subtle cues that can be difficult for parents to interpret. Parents must be careful observers of the infant's behaviors, so that they can respond to their infant's needs. As infants become more secure in their trust, they can wait longer for feeding. Infants should

develop their feeding skills at their own rate. However, if significant delays occur in the development of these skills, or delays are anticipated (eg, as in the case of some children with special health care needs), a health care professional should assess the infant.

The suck-and-pause sequence in breastfeeding or infant formula feeding and behaviors such as eye contact, open mouth, turning to the parent, and even turning away provide the foundation for the first communication between the infant and parents. Difficulties in early feeding create strong emotions for the parent and can undermine parenting confidence and sense of competency. Thus, feeding difficulties must be addressed in a timely manner.

Over time, parents become more skilled at interpreting their infant's cues and increase their repertoire of successful responses to those cues. As they feed their infant, parents learn how their actions comfort and satisfy. Physical contact during breastfeeding or formula feeding strengthens the psychological bond between the mother and infant and enhances communication because it provides the infant with essential sensory stimulation, including skin and eye contact. A sense of caring and trust evolves, which lays the groundwork for communication patterns throughout life.

A healthy feeding relationship involves a division of responsibility between the parent and the infant. The parent sets an appropriate, safe, and nurturing feeding environment and provides appropriate, healthy foods. The infant decides when and how much to eat. In a healthy infant-parent feeding relationship, responsive parenting involves:

- Responding early and appropriately to hunger and satiety cues
- Recognizing the infant's developmental abilities and feeding skills
- Balancing the infant's need for assistance with encouragement of self-feeding

A healthy feeding relationship involves a division of responsibility between the parent and the infant. The parent sets an appropriate, safe, and nurturing feeding environment and provides appropriate, healthy foods. The infant decides when and how much to eat.

Infants with special health care needs are at increased risk of feeding complications, including failure to thrive, aspiration of food, and gastroesophageal reflux disease. Parents of infants with special health care needs also may need extra emotional support and instruction about special techniques for positioning or special equipment.

- Allowing the infant to initiate and guide feeding interactions

Nutrition for Infants With Special Health Care Needs

Medical problems or other special health care needs can place the infant at nutritional risk. Because this is a time of high caloric need, health care professionals should consider referring the family for specialized medical and nutrition consultation.

Not all infants are able to develop the skills for feeding and eating easily. Approximately 25% of all children have some feeding problems, and 80% of children with a developmental disability have some form of feeding problem.²⁹ Feeding difficulties can lead to problems in the parent-child relationship, as well as growth problems, inadequate nutrition, and significant feeding problems later in childhood. Health care professionals should address the following common concerns expressed by parents:

- Refusing food (infant cereal and purees)
- Difficulty transitioning to textures
- Gagging, choking, or vomiting with feeding
- Poor or inadequate food volume
- Poor or inadequate variety of foods, picky eating, or food jags
- Prolonged feeding time (more than 30 minutes)
- Respiratory symptoms after feeding

Infants with special health care needs are at increased risk of feeding complications, including failure to thrive, aspiration of food, and GERD. Parents of infants with special health care needs also may need extra emotional support and instruction about special techniques for positioning or special equipment. These accommodations can help overcome feeding problems and prevent suboptimal nutrition, poor weight gain, and growth deficiency.

Parents often blame themselves for their infant's feeding problem, yet the difficulty is typically related to the infant's oromotor developmental problem. Children with oromotor delay may retain primitive reflexes like the extrusion reflex and the tonic bite reflex. These behaviors can be mistakenly interpreted as food refusals. Thus, health care professionals should try to identify feeding challenges early and provide resources for evaluation, education, and support. Assessing and treating physical or behavioral feeding difficulties is best accomplished by an interdisciplinary team that may include a neurobehavioral pediatrician, dietitian, occupational therapist, speech pathologist, nurse or nurse practitioner, social worker, and psychologist. Parents should learn the different philosophies, intervention strategies, and approaches of the different programs available, as well as their costs and outcomes, before they make a decision on the best approach for their child and family.

Low birth weight infants need additional iron after the first month of life (2 mg/kg/d) until they reach 1 year of age.¹² They also may need special food (eg, preterm discharge formulas with enhanced nutrients). Infants with sequelae of prematurity, chronic lung or reactive airway disease, short bowel syndrome, cholestasis, GERD, rickets, or chronic heart, kidney, or liver disease have medical and developmental factors that will affect their growth. They may require specialized feedings with nutritional supplements, including fortifiers, vitamins, and minerals. Medication usage also may alter nutritional requirements.

Infants with special health care needs often need increased calories, but may be limited by feeding issues. Because their immune systems may be compromised, most of these infants benefit from breastfeeding (or being fed expressed breast milk). Parents may need to modify breast milk or formula or adapt their feeding techniques to ensure that

infants with the following conditions achieve adequate caloric intakes:

- Prematurity and low birth weight
- Chronic respiratory or congenital heart disease
- Gastrointestinal tract disease
- Renal disease
- Neurologic disorders
- Syndromes and genetic disorders affecting growth potential, such as cystic fibrosis

Promoting Nutritional Health: Early Childhood—1 to 4 Years

Ensuring adequate nutrition during early childhood focuses on promoting normal growth by selecting appropriate amounts and kinds of foods and providing a supportive environment that allows the child to self-regulate food intake. As in all other areas of development, self-regulation of eating and its accompanying independence are major achievements during the early childhood years. Children continue their exposure to new tastes, textures, and eating experiences depending on their own developmental ability, cultural and family practices, and individual nutrient needs.

Nutrition for Growth

Most infants triple their birth weight within the first year of life and experience a significantly slower rate of weight gain after the first year, which results in a dramatic decrease in appetite and diminished food intake. This diminished intake is compensated for by eating foods with increased caloric density (ie, foods with less water content). Health care professionals can alert parents to this change when the child's height and weight are measured and plotted on the gender- and age-appropriate CDC growth and BMI-for-age charts (for children older than 2 years).

Monitoring growth measures by age allows the health care professional to determine how the child compares to others of

the same age and gender. These measures can be used to signal abnormal growth patterns. Linear growth is used to detect long-term undernutrition. Using weight-for-length until age 2 years, and BMI growth charts after that, allows the health care professional to determine underweight and overweight or obesity and whether the child is maintaining her own growth trajectory. If the child has moved up or down 2 percentile lines on the growth chart since the previous visit, the health care professional should question parents in detail about portion sizes, types of food served, and feeding frequency. Skinfold measurements for this age group are not used unless medically indicated and performed by an adequately trained technician.

As additional table foods are offered, toddlers consume foods similar to those of the entire family. Even in early childhood, dietary preferences and patterns begin to be established, and, all too often, the reported amount of milk consumed decreases significantly, while the intake of juices, fruit drinks, and carbonated sodas increases.³⁰ The Infant and Toddler Study suggests that, in general, young children are getting sufficient intakes of calcium.³¹ However, the shift from milk to juice and soda lowers calcium intake and makes it more difficult for young children to attain the recommended calcium intake (Box 2). Fruit drinks and carbonated sodas are

Monitoring growth measures by age allows the health care professional to determine how the child compares to others of the same age and gender. These measures can be used to signal abnormal growth patterns.

BOX 2

Child Calcium Dietary Reference Intake

Children aged 1 to 3 years: 500 mg/d

Children aged 4 to 8 years: 800 mg/d

Source: Institute of Medicine. Dietary reference intakes for calcium, phosphorous, magnesium, vitamin D, and fluoride. (1997). Washington, DC: National Academies Press. 1997. Available at: <http://www.iom.edu/file.asp?id=21372>. Accessed August 17, 2006.^{32,33}

A basic premise is that nutrient needs should be met primarily by consuming a variety of foods that have beneficial effects on health.

discouraged, and 100% fruit juice is recommended at no more than 4 to 6 ounces daily.²⁵ Overuse may lead to excess energy intake, diarrhea, and dental caries. (For more information on this topic, see the Promoting Healthy Weight and Promoting Oral Health themes.)

A primary safety concern for preschoolers during feeding is choking or inhalation of food. The following foods should be avoided at this stage:

- Peanuts
- Chewing gum
- Popcorn
- Chips
- Round slices of hot dogs or sausages
- Carrot sticks
- Whole grapes
- Hard candy
- Large pieces of raw vegetables or fruit
- Tough meat

To limit the risk of choking, the toddler should sit up while eating. Parents should avoid feeding a young child while in a car because, if the child should begin to choke, pulling over to the side of the road in traffic to dislodge the food is difficult.¹² Furthermore, feeding children while driving contradicts the recommendation to feed children in appropriate locations.

Because few data were available on nutrient adequacy for toddlers and preschoolers, the Institute of Medicine (IOM)³⁴ extrapolated values from studies of infants and adults to establish dietary reference intakes. Translating these nutrient intakes into specific food choices and portions for toddlers has not been clearly defined. However, guidelines suggest offering appropriate nutritious foods spaced into 3 meals, along with 2 or 3 snacks per day.¹² For children older than 2 years, the *Dietary Guidelines for Americans* are the primary sources of dietary guidance.³⁵

Other national health organizations also have developed nutrition policy statements to



promote optimal health and reduce risk for chronic disease, and these statements can be used as well to guide food choices in children older than 2 years.³⁶⁻³⁹ These science-based nutrition guidelines recommend a diet that includes a variety of nutrient-dense foods and beverages from the basic food groups and that limits the intake of saturated and trans fats, cholesterol, added sugars, and salt. A basic premise is that nutrient needs should be met primarily by consuming a variety of foods that have beneficial effects on health. Supplementation with vitamins and minerals is not considered necessary when children are consuming the recommended amounts of healthful foods.⁴⁰ However, health care professionals should not assume that all toddlers are getting the nutrients they need.⁴¹ A significant number of children in the United States live in households with insufficient food.

Developing Healthy Feeding and Eating Skills

Young children often will eat sporadically over one day or several days. Over a period of a week or so, their nutrient and energy intakes balance out. Food jags (ie, favoring only one or 2 foods) and picky eating (eg, refusing to eat certain foods or not wanting foods to touch) are normal behaviors in young children. For most children, these behaviors disappear before school age if parents patiently continue to expose them to a variety of new and familiar foods. As their manipulative skills mature, preschoolers also can successfully help in food preparation, which may help them accept new foods.

Unfortunately, some parents and caregivers become discouraged and frustrated when their toddler seems to concentrate more on exploring food than eating it. This behavior reflects the emerging curiosity and independence associated with early childhood and is normal. Parents and caregivers can foster this newly found, and often assertively expressed, independence while still ensuring adequate nutrition by offering a well-balanced selection of foods and allowing children to choose the types and amounts of foods they want to eat. Parents and caregivers need to understand that recognizing the child's signals of hunger and fullness supports the child's innate ability to self-regulate energy intake and portion size. They also need to understand that a child does not have an innate ability to select only appropriate foods. Food choice remains the responsibility of the caregiver.

Mealtime provides an opportunity for wonderful parent-child interactions. These opportunities exist for the young toddler, who may be fed before the family meal, as well as for the older toddler and preschooler, who may participate in the family routine and sit at the table for a short time. Finger foods should be encouraged because they foster competence, mastery, and self-esteem. Even when the

parent or caregiver is doing the feeding, the child also should be given a spoon. The 12- to 15-month-old toddler should be encouraged to use a spoon. When the child is finished eating, she should be allowed to leave the table and be placed where she can be supervised until the adults have finished their meal.

Nutrition for Children With Special Health Care Needs

Children with special health care needs generally follow similar developmental pathways as children without these challenges when they begin the process of self-feeding. However, the pace of development and the ultimate mastery of tasks will vary depending on the physical, emotional, or cognitive challenges facing the child. Health care professionals should follow children with special health care needs closely, paying particular attention to nutritional intake and physical activity.

The types of nutritional issues most common for children with special health care needs include feeding problems (eg, chewing and swallowing), slow growth, metabolic or gastrointestinal issues, and overweight or obesity. Sometimes children with special health care needs require special feeding techniques, longer periods of time to feed, or special foods (both type and texture), formulas, and feeding approaches (eg, restriction of certain foods). The health care professional can identify these issues and refer the family, as needed, to a registered dietitian or interdisciplinary team for further assessment, intervention, and monitoring.

Food jags (ie, favoring only one or 2 foods) and picky eating (eg, refusing to eat certain foods or not wanting foods to touch) are normal behaviors in young children.

Promoting Nutritional Health: Middle Childhood—5 to 10 Years

To achieve optimal growth and development, children need a variety of nutritious foods that provide sufficient calories, protein, carbohydrates, fat, vitamins, and minerals. By middle childhood, a child needs 3 meals and 2 to 3 healthy snacks per day. As the child's ability to feed himself improves, he can help with meal planning and food preparation, and he can perform tasks related to mealtime.

Performing these tasks enables the child to contribute to the family and can boost his self-esteem. The USDA MyPyramid for Kids, which is based on the *Dietary Guidelines for Americans*, provides an easy reference on food intake and physical activity recommendations for children aged 6 to 11 years.⁴²

Nutrition for Growth

Middle childhood is characterized by a slow, steady rate of physical growth. Plotting the child's BMI from 2 years of age into middle childhood allows the health care professional to note any increasing percentile changes and provide early intervention as needed to prevent childhood obesity.

CALCIUM

Calcium intake continues to be a concern during middle childhood. Nutritional intake studies indicate that few school-aged children receive adequate calcium intake. Calcium is a critical nutrient for bone health, and a higher incidence of fractures is reported in children who do not get adequate amounts of calcium. Consumption of large amounts of juice, soft drinks, or sport drinks suggests inadequate intake of milk. Children need 3 to 4 servings of calcium-rich foods per day (Box 3). One 8-ounce glass of milk provides approximately 300 mg of calcium. Health care professionals should, therefore, encourage parents to provide water, low-fat milk, and no more than 4 to 6 ounces of 100% fruit juice daily for their children to drink.

BOX 3

Child Calcium Dietary Reference Intake

Children aged 4 to 8 years: 800 mg/d

Children aged 9 to 18 years: 1,300 mg/d

Source: Institute of Medicine. Dietary reference intakes for calcium, phosphorous, magnesium, vitamin D, and fluoride. (1997). Washington, DC: National Academies Press. 1997. Available at: <http://www.iom.edu/file.asp?id=21372>. Accessed August 17, 2006.³²

Developing Healthy Eating Habits

Parents and other family members continue to have the most influence on children's eating behaviors and attitudes toward foods. Parents need to make sure that nutritious foods are available and decide when to serve them; however, children should decide how much to eat. During this period, when children may be missing several teeth, it can be difficult for them to chew certain foods (eg, meat). Offering foods that are easy to eat can alleviate this problem.

Health care professionals should try to determine whether families have access to, and can afford, nutritious foods. They also should discuss families' perceptions of which foods are nutritious and their cultural beliefs about foods. Families should eat together in a pleasant environment (without the TV), allowing time for social interaction. Participation in regular family meals is positively associated with appropriate intakes of energy, protein, calcium, and many micronutrients, and can reinforce the development of healthy eating patterns.⁴³

During middle childhood, mealtimes take on social significance, and children become increasingly influenced by outside sources (eg, their peers and the media) regarding

Parents need to make sure that nutritious foods are available and decide when to serve them; however, children should decide how much to eat.

eating behaviors and attitudes toward foods. In addition, they eat a growing number of meals away from home and may have expanding options for nonnutritious foods. Their eagerness to eat certain foods and to participate in nutrition programs (eg, National School Lunch programs) may be based on what their friends are doing. However, some children can have difficulty in adapting to school lunch programs. This difficulty can be because the foods are different from those at home, the foods may not conform to cultural and religious practices, they have less time to eat than they are accustomed to, or they may have difficulty serving their own plates.

Nutrition for Children With Special Health Care Needs

Dietary needs of children with special health care concerns that can affect their ability to maintain a healthy weight should be addressed with the family. Health care professionals should be aware of medications that can affect appetite, leading to weight loss or weight gain. The children may be making food choices at school, and parents may need help guiding them to make healthy choices, depending on their particular needs. Children with special health care needs can have significant nutritional challenges, leading to underweight or overweight. These challenges can be the result of behavioral disturbances or because children may need assistance with feeding. When weight gain is desired, nutritious high-calorie foods are preferred over calorie-dense “junk food.” Some children may require gastrostomy tubes and funduplications. Overweight and obesity are risks when physical activity is limited by a special health care need. Health care professionals should be aware of these challenges and be prepared to seek assistance in monitoring and facilitating appropriate nutrition.

Promoting Nutritional Health: Adolescence—11 to 21 Years

Adolescence is one of the most dynamic periods of human development. The increased rate of growth that occurs during these years is second only to that occurring in the first year of life. Nutrition and physical activity can affect adolescents’ energy levels and influence growth and body composition, and the changes associated with puberty can influence adolescents’ satisfaction with their appearance. Health supervision visits provide an opportunity for health care professionals to discuss healthy eating and physical activity behaviors with adolescents and their parents. (For more information on this topic, see the Promoting Physical Activity theme.)

Nutrition for Growth

As for the earlier stages of childhood, the adolescent’s diet should follow the *Dietary Guidelines for Americans* and the complementary recommendations of other national health organizations.^{35,39} All of these recommendations emphasize a variety of nutrient-dense foods and beverages from the basic food groups and moderation in saturated and trans fats, cholesterol, added sugars, and salt. They also emphasize meeting recommended intakes within energy needs and maintaining a healthy body weight by balancing calories from foods and beverages with calories expended through physical activity.³⁵

These recommendations direct that nutrient needs should be met primarily by consuming a variety of healthful foods. In certain cases, fortified foods and dietary supplements may be useful sources of one or more nutrients that otherwise might not be consumed in the recommended amounts. However, although they are recommended in some cases, dietary supplements cannot replace a healthy diet.

For many adolescents, intake of certain vitamins (ie, folate, vitamin B₆, and vitamin A)

Adolescence is one of the most dynamic periods of human development. The increased rate of growth that occurs during these years is second only to that occurring in the first year of life.

BOX 4**Current Recommendations for Selected Nutrients****Folate**

The Institute of Medicine recommends that, to reduce the risk of giving birth to an infant with neural tube defects, female adolescents who are capable of becoming pregnant should take 400 µg of folate per day from fortified foods, a supplement, or both, in addition to consuming folate-containing foods from a varied diet.³⁴

Iron

The body's need for iron increases dramatically during adolescence, primarily because of rapid growth. Adolescent boys require increased amounts of iron to manufacture myoglobin for expanding muscle mass, and hemoglobin for expansion of blood volume. Although adolescent girls generally have less muscular development than adolescent boys, they have a greater risk for iron-deficiency anemia because of blood lost through menstruation. Iron-deficiency anemia in adolescents may be caused by inadequate dietary intake of iron, which results from low-calorie and extremely restrictive diets, periods of accelerated iron demand, and increased iron losses. The current Dietary Reference Intakes for iron are¹²:

- Females and males aged 9 to 13 years: 8 mg/d
- Females aged 14 to 18 years: 15 mg/d
- Males aged 14 to 18 years: 11 mg/d

Calcium

Adequate calcium intake is essential for peak bone mass development during adolescence, a period when 45% of the total permanent adult skeleton is formed. Calcium requirements increase with the growth of lean body mass and the skeleton. Therefore, requirements are greater during puberty and adolescence than in childhood or adulthood. The current calcium DRIs for children and adolescents are³²:

- Children and adolescents aged 9 to 18 years: 1,300 mg/d
- Adolescents aged 19 years and older: 1,000 mg of calcium per day

Sources: Kleinman RE, ed. *Pediatric Nutrition Handbook*. 5th ed. Elk Grove Village, IL: American Academy of Pediatrics, Committee on Nutrition; 2004¹²; Institute of Medicine. Dietary reference intakes for calcium, phosphorous, magnesium, vitamin D, and fluoride. Washington, DC: National Academies Press; 1997³²; Institute of Medicine. Dietary reference intakes for thiamin, riboflavin, vitamin B₆, folate, vitamin B₁₂, pantothenic acid, biotin, and choline. Washington, DC: National Academies Press. 1998;8:196-305.³⁴ A summary table of the DRIs is available at: <http://www.iom.edu/file.asp?id=21372>. Accessed August 17, 2006.³²

and minerals (ie, iron, calcium, and zinc) is inadequate, particularly among adolescents from families with low incomes and among adolescent girls. Box 4 provides current recommendations for several nutrients of particular concern for adolescents, including folate, iron, and calcium.

Dietary excess of total fat, saturated fat, cholesterol, sodium, and sugar is common in both genders and in all income and racial and ethnic groups. Other nutrition-related concerns for adolescents include low intakes of fruits, vegetables, and calcium-rich foods, and high soft-drink consumption. Diets that are low in fruits and vegetables and high in saturated fats constitute a significant risk factor for obesity and other health problems.⁴⁴ Only 21% of adolescents report eating 5 or more servings of fruits and vegetables per day,⁴⁵ and only 62% report eating a lower-fat diet with no more than 2 daily servings of food that are typically high in fat content. Adolescent girls (71%) are significantly more likely than adolescent boys (55%) to report eating this lower-fat diet.⁴⁶ Adolescents also may engage in unsafe weight-loss methods, and some experience iron-deficiency anemia (for girls), eating disorders, hyperlipidemia, or obesity. Hunger and insufficient food resources are sometimes a concern among adolescents from families with low incomes. In addition, nutritional problems can result from pregnancy, disabilities, emotional trauma, chronic health conditions, or substance abuse.

ASSESSING THE ADOLESCENT DIET

Evaluating the dietary intake of an adolescent is a fundamental component of ongoing health supervision. It is, therefore, useful for the health care professional to gather quantitative and qualitative data about foods and beverages consumed (both common and unusual), eating patterns, attitudes about foods and eating, and other issues, such as cultural patterns and taboos associated with food.

Although good eating behaviors are an important component of a healthy lifestyle, the US Preventive Services Task Force has concluded that insufficient scientific evidence exists to recommend for or against behavioral counseling in primary care settings to promote a healthy diet.⁴⁷ Most intervention studies of adolescents have focused on nonclinical settings (eg, schools) or have used physiologic outcomes, such as cholesterol level or weight, rather than more comprehensive measures of a healthy diet.⁴⁷ However, because nutrition has such an important impact on well-being and longevity, nutritional counseling is included in preventive health care.

Developing Healthy Eating Habits

Developing an identity and becoming an independent young adult are central to adolescence. Adolescents may use foods to establish individuality and express identity. They usually are interested in new foods, including those from different cultures and ethnic groups, and may adopt certain eating behaviors (eg, vegetarianism) to explore various lifestyles or to show concern for the environment. Parents can have a major influence on adolescents' eating behaviors by providing a variety of nutritious foods at home and by making family mealtimes a priority.⁴⁸ Parents

Developing an identity and becoming an independent young adult are central to adolescence. Adolescents may use foods to establish individuality and express identity.



Family meals also can promote the development of healthy eating patterns that may continue into adulthood and can protect against the inadequate dietary intake reported by many adolescents.

also can be positive role models by practicing healthy eating behaviors themselves.

As adolescents strive for independence, they begin to spend large amounts of time outside the home. Parents can encourage adolescents to choose nutritious foods when eating away from home.¹ Many adolescents walk or drive to neighborhood stores and fast-food restaurants and purchase foods with their own money. This situation can be especially problematic for adolescents from families with low incomes or adolescents who live in neighborhoods with many fast-food restaurants and with no grocery stores or with stores that do not sell affordable nutritious foods.

Although eating together as a family is a challenge for many adolescents and their families coping with school demands, after-school activities, and work schedules, the frequency of family meals has many positive associations. Having meals together is positively associated with intake of fruits, vegetables, grains, and calcium-rich foods, and negatively associated with soft-drink consumption. Frequency of family meals also is positively associated with more appropriate intake of energy, protein, iron, folate, fiber, and vitamins A, C, E, and B₆.⁴³ Family meals also can promote the development of healthy eating patterns that may continue into adulthood and can protect against the inadequate dietary intake reported by many adolescents.^{43,49}

BODY IMAGE AND EATING DISORDERS

The physical changes that are associated with puberty can affect adolescents' satisfaction with their appearance. For some adolescent boys, the increased height, weight, and muscular development that come with physical maturation can lead to a positive body image. However, for many adolescent girls, puberty-related changes (in particular, the normal increase in body fat) may result in weight concerns. The social pressure to be

thin and the stigma of being overweight can lead to unhealthy eating behaviors and a poor body image.¹ Adolescents may attempt to lose weight or avoid gaining weight by eating smaller amounts of food, foods with fewer calories, or foods low in fat. They also may forego eating for many hours; engage in excessive physical activity; take diet pills, powders, or liquids without a physician's advice; and vomit or take laxatives. Fad diets that recommend unusual and, sometimes, inadequate or unbalanced dietary patterns promise the loss of several pounds a week over a short period of time. Virtually no evidence is available about their efficacy and safety in adolescents, making such regimens a poor choice for adolescents who want to lose weight and who may underestimate the health risks associated with them.¹²

Unhealthy eating behaviors and preoccupation with body size can lead to life-threatening eating disorders (eg, anorexia nervosa or bulimia nervosa). Although eating disorders are more prevalent among adolescent girls (prevalence is 1% to 2%) than among adolescent boys, they occur in both genders across socioeconomic and racial and ethnic groups and are now seen in children (aged 10 to 12 years) as well. Major medical complications of eating disorders include cardiac arrhythmia, dehydration and electrolyte imbalances, delayed growth and development, endocrine disturbances (eg, menstrual dysfunction or hypothermia), gastrointestinal problems, oral health problems (eg, enamel demineralization or salivary dysfunction), osteopenia, osteoporosis, and protein and calorie malnutrition and its consequences. Estimates of mortality that result from anorexia nervosa vary considerably from the average estimate of 5% to 8% to as high as 20%.⁵⁰ Death may be due to cardiac arrhythmia (irregular heartbeat), acute cardiovascular failure, gastric hemorrhaging, or suicide. Bulimia nervosa can damage teeth and cause enlargement of the parotid gland.

ATHLETICS AND PERFORMANCE-ENHANCING SUBSTANCES

Adolescents who engage in competitive sports can be vulnerable to nutrition misinformation and unsafe practices that promise to enhance performance. Inadequate nutritional intake and unsafe weight control methods can adversely affect performance and endurance, jeopardize health, and undermine the benefits of training. Health supervision includes the promotion of healthy eating and weight management strategies to enhance performance and endurance while ensuring optimal growth and development.^{51,52}

Nutrition for Youth With Special Health Care Needs

As with earlier age groups, youth with special health care needs are at increased risk for nutrition-related health problems for the following reasons¹:

- Physical disorders or disabilities can affect their capacity to consume, digest, or absorb nutrients.
- Biochemical imbalances can be caused by long-term medications or internal metabolic disturbances.
- Psychological stress that results from a chronic condition or physical disorder can affect appetite and food intake.
- Environmental factors are often controlled by parents, who may influence access to, and acceptance of, food.

The energy and nutrient requirements of adolescents with special health care needs vary according to their individual metabolic rate, activity level, and medical status. Once a desired energy level has been achieved, the adolescent should be routinely monitored to ensure adequate nutrition for growth and development and to make adjustments for periods of stress and illness.

The energy and nutrient requirements of adolescents with special health care needs vary according to their individual metabolic rate, activity level, and medical status.



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