

# Promoting Healthy Nutrition

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 during each stage of growth and development.

The dramatic rise in pediatric overweight and obesity in recent years has increased health care professionals' and parents' level of attention to nutrition. Along with regular physical activity, a

balanced and nutritious diet offered in a supportive feeding environment is essential to prevent pediatric overweight. 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. Four issues of particular importance are discussed here.

### The Feeding Environment

The feeding and eating experience strongly affects an infant's, child's, and adolescent's physical, social, emotional, and cognitive development. The experience includes the foods selected and the environment within which food is offered. The relationship between the caregiver and the child reflects a dynamic process that is initiated during infancy and extends into adolescence.

In principle, the infant or child provides cues (expressing hunger) to the parent to begin the process. The caregiver responds by selecting and providing age-appropriate food. They continue to interact throughout the process until the infant or child provides satiety cues to the caregiver.

In reality, multiple issues affect the relationship. A host of psychosocial, economic, and other factors influence a parent's choice of foods and the style used to feed. Factors include how the caregiver was fed as a child and his or her current knowledge, skills, and attitudes. Caregivers have limited control over foods eaten away from home or prepared elsewhere to be consumed at home, among other





things. Adult interactions can be helpful or harmful as children try new foods, learn to self-regulate food intake, develop self-help skills, and fine-tune internal self-control over how much food to eat.

Recent evidence suggests decreasing quality in a child's diet with advancing age. Children aged 2 to 5 years are more likely to consume 3 meals a day, beginning with breakfast, while adolescent girls, young adult men, and those with lower incomes are least likely to have breakfast or consume 3 daily meals. Many young children consume recommended amounts of fruit and dairy, but that intake drops as they reach school age and beyond.<sup>1</sup> The reasons for this decline in diet quality are subjects for future study, but clinicians note that when children are young, parents and caregivers are highly motivated to provide healthy food and have significant control over what their children consume. With advancing age, however, children and adolescents increasingly make their own food choices and are influenced by the outside food environment.

### **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, among, and across cultural groups. Health care professionals 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.<sup>2</sup>

Culture influences which foods people select to eat, 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, although some traditions exist across cultures. For example, staple, 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 for various reasons, including improved 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. Cultural flavor preferences may be adopted in utero as well as through breastfeeding and influence the dietary preferences for complementary foods when they are added at around 6 months of age.<sup>3</sup> 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 foods can help maintain a balance in the body that is important to health. For example, many Chinese persons 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 two 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 about 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. When discussing calcium intake, health care professionals need to be sensitive to the fact that people may be lactose

intolerant. 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, health care professionals can suggest a combination of other sources of calcium. A vitamin D supplement also may be needed.

### Attitudes About Body Weight

People from different cultures can view body weight differently. Keeping a child from having 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 has 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 having overweight or obesity. (*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 uncertain ability to acquire appropriate foods in socially acceptable ways. In 2014, 19.2% of households with infants, children, and adolescents younger than 18 years were food insecure.<sup>4</sup>



Food insecurity may occur with or without hunger. At its most extreme, 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 lower in nutritional value but more calorically dense than more expensive foods. As a result, the nutritional quality of the diet declines.<sup>5</sup> (*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. Living with adult smokers is an independent risk factor for frequency and severity of food insecurity.<sup>6</sup> If disorders of growth, either underweight and overweight, are noted, health care professionals should consider food insecurity. 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, promotoras, or home visitors, 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 care facilities, community health teams, and community hospitals also are sources of infant nutrition education. The US Department of Agriculture (USDA) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)<sup>7</sup> offers a food package for women who are pregnant or postpartum, women who are breastfeeding their infant, and 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. Additionally, early care and education programs, which include home visiting and child care, create opportunities to educate parents

and families on nutrition, cooking, and healthy eating habits.

Another source of support for families experiencing food insecurity is programs such as the USDA Supplemental Nutrition Assistance Program (the program formerly known as Food Stamps).<sup>8</sup> A community food bank or pantry can provide additional food for families needing assistance. For young children, some child care settings are eligible for reimbursement from the USDA Child and Adult Care Food Program.<sup>9</sup> For school-aged children and for adolescents, community services expand to include free and reduced-cost school breakfast and lunch programs and, ideally, school food services that offer healthy and appealing food choices. For adolescents, some school programs focus on the importance of pre-conceptual nutrition to ensure good 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 Lifelong Health for Families and Communities theme.*) Health care professionals can have a tremendous effect 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 refer parents to community resources that help at each stage of a child's development. Because of considerable media attention to the problem of overweight and obesity, the public has become increasingly aware of the importance of healthy eating and regular 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 take advantage of 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 through 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 foods that provide essential nutrients and support the development of age-appropriate feeding and eating skills.
- **Healthy feeding and eating habits.** Establish a positive, nurturing environment and healthy patterns of feeding and eating to promote 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 specific nutrient demands or supplemental needs for vitamins or minerals related to a child's special health condition and provide these nutritional components.

### 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 not only affect their own health but will now also affect the health of their family and child. Obesity, smoking, alcohol

consumption, and substance use affect the family as well as the individual. Women who are pregnant or who may become pregnant should be encouraged to follow a nutritious diet, abstain from alcohol, and take a daily prenatal vitamin and iron supplement to help ensure their health and that of a developing fetus. They also are encouraged to quit smoking during and after pregnancy and avoid all secondhand smoke exposure. Both active and maternal smoking and maternal secondhand tobacco smoke exposure have been shown to reduce birth weight. Many health care professionals recommend the continued use of prenatal vitamin supplements during lactation. Adequate intakes of certain nutrients, such as folic acid, omega-3 fatty acids, and choline, are important before conception as well as during lactation.

#### Folic Acid

Neural tube defects are among the most common birth defects contributing to infant mortality and serious disability. Women capable of becoming pregnant can substantially reduce the risk of having an infant with certain congenital malformations, including spina bifida, by taking appropriate amounts of folic acid before and during early pregnancy. Current guidelines indicate that all females capable of becoming pregnant take a daily multivitamin or multivitamin-mineral supplement containing 400 µg of synthetic folic acid (from fortified food or supplements) in addition to consuming foods rich in folate.<sup>10-13</sup> Women who have given birth previously to a child with a neural tube defect or women who have a history of insulin-dependent diabetes or a seizure disorder and are taking antimetabolites or antiepileptic drugs (eg, carbamazepine) require higher dosages of folate. Knowledge about appropriate folic acid dosages continues to evolve. Current recommendations are available from the Centers for Disease Control and Prevention (CDC).<sup>12</sup>



## Omega-3 Fatty Acids and Choline

To guarantee a sufficient concentration of pre-formed docosahexaenoic acid (DHA) in her breast milk, the mother's diet should include an average daily intake of 200 to 300 mg of the omega-3 long-chain polyunsaturated fatty acid (PUFA) DHA.<sup>14</sup> One or two 3-oz servings of fish weekly will provide the necessary omega-3 long-chain PUFAs. The possible risk from intake of excessive mercury or other contaminants in fish is offset by the neurobehavioral benefits of adequate DHA intake. Predatory fish (eg, shark, king mackerel, tile fish, swordfish) are to be *avoided*, as they carry the highest heavy metal contamination risk. Salmon, herring, canned white tuna, and trout are *recommended* as very low-risk.<sup>15</sup> Additionally, the mother's diet should include 550 mg/day of choline because human milk is rich in choline and breastfeeding depletes the mother's tissue stores. Eggs, milk, chicken, beef, and pork are the biggest contributors of choline.<sup>16</sup>

### Promoting Nutritional Health: Infancy—Birth Through 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 the infant to progress from a diet of human milk or infant formula to feeding with an increasingly wide variety of flavors, textures, and foods.

Feeding practices and routines serve as the foundation for much of a child's and family's 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.

## 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 14 days after birth.<sup>17</sup> By the time they are 4 to 6 months of age, infants typically have doubled their birth weight, gaining about 4 to 7 oz per week. Infants typically triple their birth weight by 1 year of age, gaining about 2 to 3 oz per week (breastfed) and 3 to 5 oz per week (formula fed from 6–12 months of age).<sup>18</sup>

Infants grow approximately 1 in per month from birth to 6 months of age, but the rate of growth slows from 6 to 12 months of age when infants gain about a half an inch per month. Infants usually increase their length by 50% in the first year of life. Infant growth is properly assessed using the World Health Organization (WHO) Growth Charts for 0 to 2 years (Appendix A), as recommended by the American Academy of Pediatrics (AAP) and the CDC. The WHO charts are derived from a population of healthy breastfed infants.<sup>18</sup> They are conceptually prescriptive and prospective for desired growth, unlike the CDC birth to 2 charts, which are observational and often based on overweight populations and include a large number of formula-fed infants.

Infants who are fed on demand usually consume the amount they need to grow well. Breastfeeding



initiation and duration are associated with a reduction in excess weight gain by age 3 years compared to formula feeding.<sup>19</sup> The significance of this difference to future growth or risk of overweight is uncertain. Infants' growth depends on nutrition, perinatal history, epigenetic and genetic factors (eg, parental height, genetic syndromes, disorders), and other physical factors.

Growth in 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 an infant's nutritional status than do body length measures. After 2 years of age, head circumference grows so slowly that it is a poor indicator of nutritional status. However, in an older child, small head circumference may be a good indicator of malnutrition that occurred during the first 2 years. Head circumference, however, remains important in screening for microcephaly and macrocephaly because these abnormalities are not nutritional in origin.

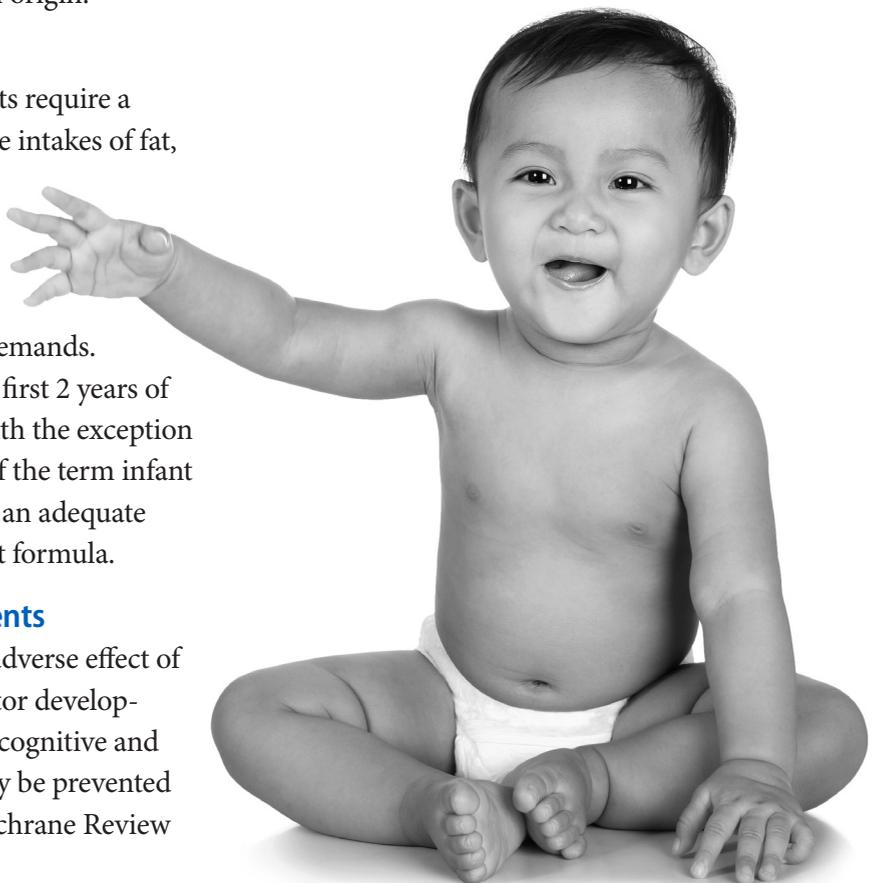
### Energy (Caloric) Needs

To meet growth demands, all infants require a high intake of calories and adequate intakes of fat, protein, carbohydrates, vitamins, and minerals. Human milk and infant 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 term infant is breastfed or if the infant receives an adequate volume of correctly prepared infant formula.

### 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,<sup>20</sup> some of which may be prevented with iron supplementation.<sup>21</sup> A Cochrane Review

on the subject concluded there is no clear evidence that treating young children with anemia secondary to iron deficiency will improve psychomotor development within 30 days of therapy, but the effects of longer-term iron supplementation are not yet known.<sup>22</sup> Thus, prevention is extraordinarily important. During the first year of life, infants at highest risk of iron deficiency are those born prematurely, those fed infant formula that is not iron fortified, and those who are exclusively breastfed for more than 4 months without iron supplements. Term, healthy infants have enough iron stores for at least 4 months of life. Because human milk contains little iron, infants who receive only human milk are at an increasing risk for iron deficiency after 4 months of age.<sup>15</sup> Therefore, the AAP Committee on Nutrition recommends that oral iron drops (1 mg/kg/day) begin at 4 months of age and continue until iron- and zinc-rich complementary foods (baby meats and iron-fortified cereals) are introduced.<sup>23</sup>





It may take a month or two following introduction of these foods for infants to consume sufficient iron from complementary foods alone. Red meat is a better source of iron than are iron-fortified cereals for older infants because a higher percentage of the iron in red meat is absorbed. Infants who receive at least 500 mL (17 oz) of iron-fortified infant formula per day do not need additional iron supplementation.

Vitamin D deficiency or insufficiency is now more prevalent in infants because of the decreased exposure to sunlight secondary to changes in lifestyle and use of topical sunscreens. The AAP recommends that all breastfed infants receive vitamin D supplementation (400 IU per day) beginning in the 2 months after birth.<sup>24</sup> Breastfed infants whose mothers are vegans or vitamin B<sub>12</sub> deficient need supplements of vitamin B<sub>12</sub>. Calcium intake is sufficient in infants who receive enough human milk or infant formula.

Fluoride supplementation is not indicated until after the eruption of teeth, which usually occurs at approximately 6 months of age. Beginning at 6 months, fluoride supplementation is recommended for infants and children who do not drink fluoridated water.<sup>25</sup> (*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 known essential nutrients and to support the development of appropriate feeding and eating skills.

### Breastfeeding

Breastfeeding is recommended for at least the first year of life because of its benefits to newborn and infant nutrition, gastrointestinal function, host defense, neurodevelopment, and psychological well-being (Box 1). Maternal avoidance of highly allergenic foods during lactation is *not* recommended because it provides no proven benefit to the infants and children.

Immediately after delivery, early and frequent physical contact, rooming-in, and exclusion of commercial infant formula samples enhance the duration of breastfeeding. The AAP Section on Breastfeeding recommends exclusive breastfeeding for about 6 months to maximize its benefits.<sup>15,26</sup>

Because the decision about whether to breastfeed is often made before or early in pregnancy, the Prenatal Visit offers an important opportunity to promote exclusive breastfeeding. Women may have questions about breastfeeding and its nutritional adequacy, their ability to know if the infant is drinking enough human milk, the mother's ability to produce enough human milk to satisfy the infant's hunger, or whether the mother should breastfeed if she smokes or has an underlying health condition. Women also express concerns about their need to return to work or school within 6 to 8 weeks after the infant's birth, or the competing needs of other children and family members. To promote continued breastfeeding, health care professionals can inform women about breast pumping and proper storage and handling of human milk as an option for women returning to work and school. Prenatal and postpartum counseling can address these issues and also prolong the duration of breastfeeding.<sup>27</sup>

Parents also may raise concerns about maternal medication usage or maternal or infant illness and the advisability of breastfeeding. Decisions about 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 human milk if the infant is unable to feed directly at the breast, but a few contraindications to breastfeeding exist. Medications taken by the mother should be individually evaluated to determine whether they can be used safely when breastfeeding.<sup>28</sup> Few prescription and nonprescription medications are contraindicated for the mother who breastfeeds her infant.

**Box 1****Benefits of Breastfeeding**

Human milk is uniquely suited to the needs of the newborn and growing infant and provides many benefits for general health, growth, and development.<sup>26</sup>

**Breastfeeding<sup>15</sup>**

- Provides ideal nutrition and promotes the best possible growth and development
- Significantly decreases the incidence of diarrhea, lower respiratory tract infection, otitis media, bacteremia, bacterial meningitis, botulism, and urinary tract infection
- May be protective against inflammatory bowel disease, leukemias, and certain genotypes of type 1 diabetes mellitus
- Lowers the risk of obesity in some populations
- Promotes healthy neurologic development
- May reduce the incidence of atopic illness, such as allergy or eczema, in children at genetic risk<sup>29</sup>
- 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 prepregnancy weight, delayed resumption of ovulation with increased child spacing, improved postpartum bone remineralization, and reduced risk of ovarian cancer and premenopausal breast cancer.
- Lactation amenorrhea promotes the recovery of maternal iron stores depleted during pregnancy.
- Breastfeeding lowers the risk for maternal chronic diseases such as hypertension, type 2 diabetes, coronary artery disease, and some cancers.<sup>30,31</sup>

**Benefits to the Family**

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

**Benefits to the Community**

- Breastfeeding reduces health care costs and employee absenteeism by reducing childhood illness.

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.

**Formula Feeding**

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



Health care professionals should counsel parents to avoid propping the bottle or letting their infant self-feed. This precaution will minimize the risk for choking, ear infections, early childhood caries, insufficient intake, and the missed opportunities for enhancing the parent-child relationship. To prevent dental caries, parents should be instructed not to put the infant to bed with a bottle or sippy cup that contains milk, infant formula, juices, soda, or other sweetened beverages. (*For more information on this topic, see the Promoting Oral Health theme.*) Fruit juices are not needed during the first 6 months of life, but if they are given after 6 months, they should be given by cup, not a bottle. Caregivers should not add cereal or other foods to infant formula unless a health care professional has instructed them to do so.

Soy, protein hydrolysates, and amino acid infant formulas have been developed for infants who cannot tolerate milk protein or lactose. It is recommended that parents manage their infant's milk intolerance with guidance from their health care professional. Intolerance to cow's milk-based infant formulas, manifested by loose stools, spitting up, or vomiting, may prompt a change to soy infant formula, but little evidence supports this practice. Soy infant formulas may be recommended for a vegetarian lifestyle, transient lactase deficiency, and galactosemia. Soy infant formula should not be used for premature infants, cow's milk protein-induced enterocolitis, or the prevention of colic or allergy.<sup>32</sup>

### Frequency and Amount of Feedings

Hunger cues for the newborn 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. It may take multiple exposures to a food before an infant is willing to recognize a new taste as part of her diet.

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

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



When she begins to sleep for longer periods at night (4–5 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 will consume an average of 31 oz of infant formula per day without complementary foods with a range of 26 to 36 oz per day. However, her intake will fluctuate from day to day and week to week. During growth spurts, intake volume increases but will fall back to lesser volumes when the growth spurt ends.

Infants 6 months and older generally consume 24 to 32 oz per day in addition to complementary foods. Over time, the increasing volume of complementary foods is accompanied by a decreasing volume of infant formula.

### Introducing Complementary Foods

Complementary foods, commonly referred to as solids, include any foods or beverages besides human milk or infant formula. The AAP Committee on Nutrition states that complementary foods can be introduced in infants' diets at about 6 months of age and when the infant is developmentally ready.<sup>33</sup> During the second 6 months of life, complementary foods are an addition to, not a replacement for, human milk or infant formula.

Parents need practical guidance when they begin to introduce complementary foods, as they seek 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 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 semi-solid (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 the 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 self-supported by her arms and has good head and neck control. The infant can indicate her desire for food by opening her 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 her palms, she is ready to progress to thicker pureed foods and soft, mashed foods without lumps. She also can begin to sip from a small cup. When the infant crawls and pulls to a standing position, she also begins to use her 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, she 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 her mouth and will try to feed herself. 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 and no more frequently than every 3 days. The order in which solid foods are introduced is not



critical as long as essential nutrients that complement human milk or infant 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 her to control how much she eats. Parents also can offer store-bought or home-prepared baby food and soft table foods, such as mashed potatoes, bananas, or avocados. 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 human milk enhances acceptance of cereal by the breastfed infant.<sup>34</sup> Repeated exposures to foods enhances acceptance by both breastfed and formula-fed infants.<sup>35</sup>

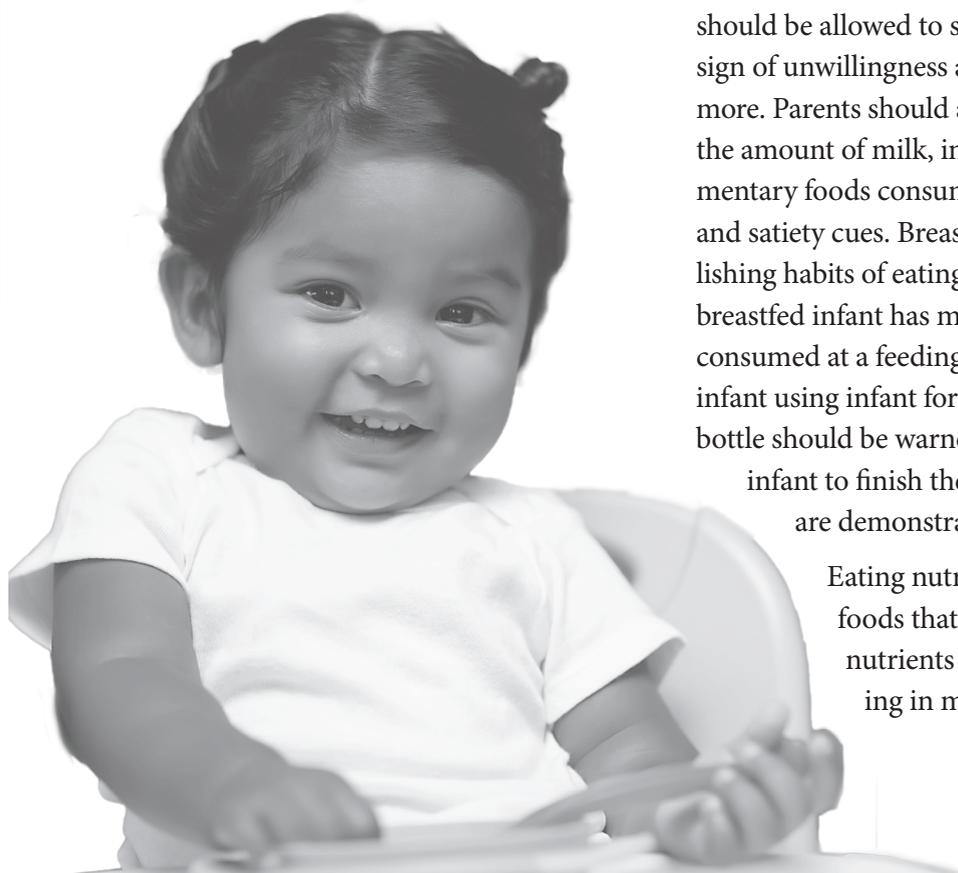
A nutritious and balanced diet for the older infant includes appropriate amounts of human milk or infant formula and complementary foods to ensure intake of all essential nutrients and to foster

appropriate growth. By the end of the first year of life, the infant should be introduced to healthy foods, such as vegetables, fruits, and whole grains, as well as poultry, fish, and lean meats. Foods that are high in calories, saturated fats, and added sugars and low in essential nutrients, such as sweetened drinks, soda, chips, and french fries, should be avoided.

Parents should not give their infants soda and fruit drinks because of their high added sugar and calorie content and lack of nutrients. In addition, parents should give no more than 4 to 6 oz of 100% fruit juice daily to infants 6 months or older who can drink from a cup. Because many parents consider 100% fruit juice to be nutritious, they may not recognize the need to limit consumption. However, fruit juice is high in calories and sugar. Consuming large quantities can contribute to early childhood caries, pediatric overweight and obesity, and diarrhea. Fruit juice could be used as part of a meal; it should not be diluted with water and sipped throughout the day as a means to pacify an unhappy child.<sup>36</sup>

To establish habits of eating 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, infant formula, or complementary foods consumed according to her 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.<sup>37</sup> Parents who feed their infant using infant formula or human milk by bottle 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 overweight and underweight.

### 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 and hypersensitivity are forms 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 not common*. 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 in generalized, life-threatening allergic reactions (ie, anaphylaxis). Hyperactivity is not a manifestation of food allergy.

The most common foods associated with allergic reactions in young children are cow's milk, eggs, peanuts, soy, and wheat. Approximately 2.5% of infants and children will experience an allergic reaction to cow's milk in the first 3 years of life, 1.3% will have a reaction to eggs, and 0.8% will have a reaction to peanuts. Tree nuts, fish, and shellfish become more common causes of food allergy in adolescence and adulthood.<sup>38</sup>

The American Academy of Allergy, Asthma & Immunology (AAAAI) has developed recommendations, based on current evidence and expert opinion, for the primary prevention of

allergic disease through nutrition interventions. They endorse exclusive breastfeeding for at least 4 months and up to 6 months of age to reduce the incidence of atopic dermatitis, wheezing before 4 years of age, and cow's milk allergy but not food allergy in general.<sup>39</sup>

Additionally, the AAAAI endorses the introduction of complementary foods between 4 and 6 months of age, with recommendations for how and when to introduce the main allergenic foods (cow's milk, egg, soy, wheat, peanuts, tree nuts, fish, and shellfish). Importantly, they concluded that *delayed introduction* of solid foods, especially the highly allergenic foods, may *increase* the risk of food allergy or eczema.<sup>39,40</sup>

Once a few typical complementary foods (eg, pureed meat, infant cereal, yellow or orange vegetables [eg, sweet potato, carrots], fruits [eg, pears, bananas], green vegetables) are tolerated, foods considered to be potentially allergenic (eg, wheat, egg, fish, cow's milk in small amounts) may be introduced as complementary foods.

The infant should be given an initial taste of one of these foods *at home* rather than at day care or at a restaurant. Most reactions occur within a day or two in response to what is believed to be the initial ingestion. If there is no apparent reaction, the food can be introduced in gradually increasing amounts. Introduction of other new foods should continue if no adverse reactions occur.

#### *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 vomiting or "wet burps" within the first 1 to 2 hours after feeding. Vomiting or wet burps are 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 infant formula too vigorously before feeding). Approximately half of infants younger than 3 months spit up or regurgitate 1 or 2 times a day, with the incidence peaking between 2 to 4 months of age. The frequency may increase again when the infant 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 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.<sup>41</sup> The health care professional will need to differentiate these symptoms from pyloric stenosis in some young infants.

### 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 her develop a sense of trust that her 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 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 if 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 elicit strong emotions in parents 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 infant formula feeding strengthens the psychological bond between the parent 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
- 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 easily develop the skills for feeding and eating. Approximately 25% of all children have some form of feeding problem, and 80% of children with a developmental disability have some form of feeding problem.<sup>42</sup> 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. It is recommended that health care professionals address the following common concerns expressed by parents:

- Refusing 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 (eg, refusing to eat certain foods), or food jags (ie, favoring only 1 or 2 foods)
- Prolonged feeding time (>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 developmental and behavioral pediatrician, a dietitian, an occupational therapist, a speech pathologist, a nurse or nurse practitioner, a social worker, and a 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/day) until they reach 1 year of age.<sup>43</sup> They also may need special food (eg, preterm discharge infant 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 use 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 human milk). Parents may need to modify human milk or infant formula or adapt their feeding techniques to ensure that infants with the following conditions achieve adequate caloric intake:

- Prematurity and low birth weight
- Chronic respiratory or congenital heart disease



- Gastrointestinal tract disease
- Kidney disease
- Neurologic disorders
- Syndromes and genetic disorders affecting growth potential, such as cystic fibrosis

### Promoting Nutritional Health: Early Childhood—1 Through 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. 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 (Box 2). This diminished intake is compensated for by eating foods with increased caloric density. Health care professionals

can alert parents to this change while plotting the child's height, weight, and BMI on the sex- and age-appropriate WHO or CDC Growth Charts (Appendixes A and B) to demonstrate expectations for healthy growth.

Monitoring growth measures by age also allows the health care professional to determine how the child compares with others of the same age and sex. 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, along with BMI growth charts after that, allows the health care professional to determine underweight and overweight or obesity and whether the child is maintaining his own growth trajectory. If the child has moved up or down 2 percentile lines on the growth chart since the previous visit, it is recommended that the health care professional 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.

Early childhood is the time to establish lifelong eating habits. Healthy eating includes 3 meals daily, beginning with breakfast, and 2 to 3 snacks. Because most children, adolescents, and adults in the United States consume too few vegetables, fruits, and whole grains and too little dairy, early

#### Box 2

##### Changes in Appetite in Early Childhood

The anticipated but sudden reduction in appetite is a common source of concern and anxiety to parents of infants soon after the first birthday. This parental concern affords a unique opportunity to educate parents about changing dietary needs.

Health care professionals can use this opportunity to emphasize that

- Reduced intake is normal.
- Picky eating more often reflects lack of hunger than a change in taste preferences.
- Encouraging a child to eat when he is not hungry leads to consumption of excess calories, an undesired outcome because obesity is a major nutrition problem.
- Offering multiple alternatives to a child who is not hungry is unnecessary and it rewards picky eating, potentially contributing to lifelong food biases.



childhood is the proper time to establish tastes and preferences, as well as healthy eating patterns. Refined grains, saturated fat, added sugars, and sodium are overconsumed throughout the age range, so care should be taken with introducing foods and beverages that are high in these components. Many young children do consume recommended amounts of fruit and dairy, a habit to be supported and maintained.

As additional table foods are offered, young children consume foods similar to those of the entire family. The Feeding Infant and Toddler Study suggests that, in general, young children are getting sufficient intakes of calcium.<sup>44</sup> Children in this age group using cow's milk or soy as a primary protein and calcium source should be encouraged to drink 16 to 32 oz (480–960 mL) of cow's milk or soy milk per day to receive adequate levels of these nutrients. Other products sold as “milk” (eg, almond milk, hemp milk) are generally lower in protein and have not been studied sufficiently to promote their use.

Even in early childhood, however, 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 soda increases. 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 3). Fruit drinks and sodas are discouraged, and 100% fruit juice is recommended at no more than 4 to 6 oz daily.<sup>36</sup> 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 young children during feeding is choking or inhalation of food. The following foods should be avoided at this age:

- Peanuts and other whole nuts
- Chewing gum
- Popcorn

### Box 3

#### Dietary Reference Intakes for Calcium and Vitamin D<sup>45</sup>

##### Birth at Term Until 1 Year

- 200 mg calcium per day, birth–6 months
- 260 mg calcium per day, 7–12 months
- 400 IU vitamin D per day

##### Children Aged 1–3

- 500 mg calcium per day
- 400 IU of vitamin D per day

##### Children Aged 4–8

- 800 mg calcium per day
- 600 IU vitamin D per day

##### Children, Adolescents, and Young Adults Aged 9–18

- 1,300 mg calcium per day
- 600 IU vitamin D per day

Data derived from Ross AC, Taylor CL, Yaktine AL, Del Valle HB; Institute of Medicine Committee to Review Dietary Reference Intakes for Vitamin D, Calcium, Food and Nutrition Board. *Dietary Reference Intakes for Calcium and Vitamin D*. Washington DC: National Academies Press; 2011.

- Chips
- Round slices of hot dogs or sausages
- Raw carrot sticks
- Whole grapes and cherries
- Large pieces of raw vegetables or fruit
- Whole cherry or grape tomatoes
- Tough meat
- Hard candy

To limit the risk of choking, children should sit up while eating. Infants and children younger than 3 years should not eat without direct adult supervision, even if they are able to feed themselves. 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. Furthermore, feeding young children while driving contradicts the recommendation to feed children in appropriate locations.<sup>46</sup>



Because few data are available on nutrient adequacy for young children, the Institute of Medicine<sup>46</sup> extrapolated values from studies of infants and adults to establish Dietary Reference Intakes.<sup>1,2</sup> A clear translation of these nutrient intakes into specific food choices and portions for young children is not yet available. However, guidelines suggest offering appropriate nutritious foods spaced into 3 meals, along with 2 or 3 snacks per day.<sup>2,21</sup> For children older than 2 years, the *Dietary Guidelines for Americans* are the primary source of dietary guidance.<sup>1</sup> Other national health organizations also have developed nutrition policy statements to promote optimal health and reduce risk for obesity and chronic disease, and these statements can be used to guide food choices in children older than 2 years.<sup>47–50</sup>

All of these science-based nutrition guidelines recommend a diet that includes a variety of nutrient-dense foods and beverages from the major food groups and limits the intake of saturated and *trans* fats, 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 healthy foods.<sup>51</sup> However, health care professionals should not assume that all young children are getting the nutrients they need.<sup>52</sup> A significant number of children in the United States live in households with insufficient healthy food.

### Developing Healthy Feeding and Eating Skills

Young children often 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 and picky eating are normal behaviors in young children. For most young children, these behaviors disappear before school age if parents 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 other caregivers become discouraged and frustrated when their child 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 should encourage young children to explore food tastes and textures by repeating exposure to foods. Health care professionals can empower caregivers by letting them know that children will often begin to accept foods after 10 or more exposures to certain foods. Preparing a familiar-looking food in different ways can also increase acceptance of foods. Parents and other 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. Parents and other caregivers can be positive role models by practicing healthy eating behaviors themselves.

Mealtime provides opportunities for wonderful parent-child interactions. These opportunities exist for the toddler, who may be fed before the family meal, as well as for young children, 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 is doing the feeding, the child also should be given a spoon. The 12- to 15-month-old should be encouraged to



use a spoon. When the toddler is finished eating, he should be allowed to leave the table and be placed where he 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. Attention to nutritional intake and physical activity is important.

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. By age 15 months, children with autism spectrum disorder (ASD) demonstrate greater food selectivity compared to typically developing peers and demonstrate more challenging food-related behaviors as toddlers, even before diagnosis of ASD.<sup>53</sup> Sometimes, children with special health care needs require special feeding techniques, longer periods of time to feed, or special foods (both type and texture), infant 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.

### **Promoting Nutritional Health: Middle Childhood—5 Though 10 Years**

To achieve optimal growth and development, children need a variety of nutritious foods that provide sufficient—but not excessive—calories, protein, carbohydrates, fat, vitamins, and minerals. Recent data suggest that while many young children

consume recommended amounts of fruit and dairy, the quality of dietary patterns drops in middle childhood and adolescence.<sup>1</sup> Even into middle childhood, a child needs 3 meals and 2 to 3 healthy snacks per day. As the child's ability to feed herself improves, she can help with meal planning and food preparation, and she can perform tasks related to mealtime. Performing these tasks enables the child to contribute to the family and can boost her self-esteem. The USDA MyPlate, which is based on the *Dietary Guidelines for Americans*, provides an easy reference on food intake and physical activity recommendations for children and adolescents 6 to 11 years.<sup>54</sup>

### **Nutrition for Growth**

Middle childhood is characterized by a slow, steady rate of physical growth. Plotting the child's BMI allows the health care professional to note any percentile changes and provide early intervention as needed to prevent childhood underweight or overweight. During middle childhood, children gain an average of 7 lb in weight and 2½ in in height per year. The BMI gradually increases from its lowest point at 5 to 6 years of age. Additionally, during middle childhood, a child's body fat increases in preparation for the growth spurt. On average, the growth spurt and puberty begins for girls at ages 9 to 11 years (Tanner stages 2–3) and for boys at ages 10 to 12 years (Tanner stages 3–4). Children may become concerned about their appearance and body image and may eat less or go on diets for weight loss.

The health care professional can reassure the family about normal growth patterns while addressing the child's or family's weight concerns. Common nutrition concerns in middle childhood include

- Decreased consumption of milk and milk products
- Increased consumption of beverages high in added sugars
- Limited intake of fruit and vegetables



- High consumption of foods high in saturated fat, added sugars, refined grains, and sodium (primarily from snack foods)
- Rise of overweight and obesity
- Increase in body image concerns
- Effect of the media and advertising on nutritional intake

### Calcium and Vitamin D

Calcium and vitamin D intake is a concern during middle childhood. These nutrients are critical for bone health, and a higher incidence of fractures is reported in children who do not get adequate amounts. Studies indicate that few children consume enough of either nutrient. Consumption of juice, soft drinks, or sports drinks often leads to reduced milk intake. Decreased outdoor activity, along with sunscreen use, also has resulted in reduced vitamin D absorption.

Nutrition recommendations for calcium change during middle childhood from 800 mg per day for children aged 4 to 8 years to 1,300 mg per day for children, adolescents, and young adults aged 9 to 18.<sup>45</sup> Health care professionals should encourage parents to provide several servings of low-fat or fat-free milk daily. One 8-oz glass of milk provides approximately 300 mg of calcium and 120 IU of vitamin D. For children who are unable to consume milk or dairy products, health care professionals can recommend the consumption of other calcium-rich foods, calcium-fortified products (eg, some orange juices

and breads), and soy milk foods and beverages that are similar to milk and dairy products in their content of calcium and vitamin D. Parents should be alert to the nutritional content of other products sold as “milk” (eg, almond milk, hemp milk) that may not provide equivalent calcium, vitamin D, or protein. A dietary supplement containing calcium and vitamin D may be recommended for children who do not consume enough of either through their diets.

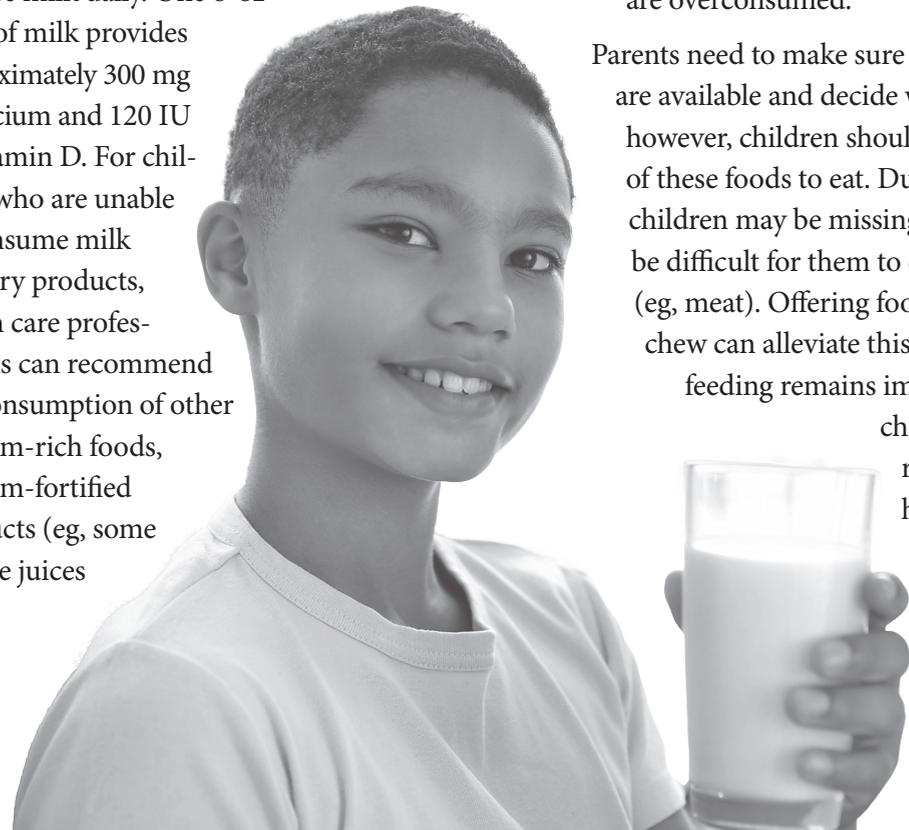
### Developing Healthy Eating Habits

Parents and other family members continue to have the most influence on children’s eating behaviors and attitudes toward foods. They can be positive role models by practicing healthy eating behaviors themselves. The *2015–2020 Dietary Guidelines for Americans* explain that contemporary nutrient consumption patterns are of potential public health concern.<sup>1</sup>

- Vitamin D, calcium, potassium, and fiber are under-consumed.
- Iron is under-consumed in adolescent girls.
- Sodium is overconsumed by people of all ages.
- Saturated fats, added sugars, and refined grains are overconsumed.

Parents need to make sure that nutritious foods are available and decide when to serve them; however, children should decide how much of these foods 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 chew can alleviate this problem. Responsive feeding remains important during middle childhood as a means of reinforcing awareness of hunger and satiety cues.

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 television and other media distractions), 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.<sup>55</sup>

During middle childhood, mealtimes take on social significance, and children become increasingly influenced by outside sources (eg, their peers and the media) regarding eating behaviors and attitudes toward foods. In addition, they eat a growing number of meals away from home and may have expanding options for consuming nonnutritious foods. Their willingness to eat certain foods and to participate in nutrition programs (eg, School Breakfast Program and National School Lunch Program) may be based on what their friends are doing. However, some children can have difficulty adapting to school meals. This difficulty can result from the foods being different from those at home, the foods not conforming to cultural and religious practices, or children having less time to eat than they are accustomed to, eating at different times than accustomed, or having difficulty serving their own food.

### **Nutrition for Children With Special Health Care Needs**

Children with special health care needs can have significant nutritional challenges that can lead to underweight or overweight. These challenges can be the result of behavioral disturbances or of children needing assistance with feeding. Some children may require gastrostomy tubes and funduplications. Medications also can affect appetite, leading to weight loss or weight gain. When weight gain is desired, nutritious high-calorie foods should be served rather than calorie-dense foods with little nutritional value. Overweight and obesity are risks

when physical activity is limited by a special health care need. In addition, children may be making food choices at school, and parents may need help in guiding them to make healthy choices, depending on their particular needs. Health care professionals should be aware of these challenges and be prepared to seek assistance in monitoring and facilitating appropriate nutrition. When a child has a special dietary need, it should be shared with school personnel and included on her Individualized Education Program, if one is in effect. This will allow the school to provide any special foods that may be needed.

### **Promoting Nutritional Health: Adolescence—11 Through 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 Healthy Weight and the Promoting Physical Activity themes.)*

### **Nutrition for Growth**

The adolescent's diet should follow the *2015–2020 Dietary Guidelines for Americans*<sup>1</sup> and complementary recommendations from national health organizations.<sup>49,54</sup> These recommendations emphasize eating healthy foods such as vegetables, fruits, whole-grain products (eg, cereals, bread, or crackers), low-fat or nonfat milk and dairy products (eg, cheese, cottage cheese, and unsweetened yogurt), and lean meats, fish, chicken, eggs, beans, and nuts and limiting or avoiding foods high in saturated fat, added sugars, sodium, and refined grains. They also



emphasize balancing calories consumed from foods and beverages with calories expended in normal body functions and through physical activity.<sup>49</sup>

Nutrient needs should be met by consuming a variety of healthy 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 adequate amounts. However, although they are recommended in some cases, dietary supplements cannot replace a healthy diet.

For many adolescents, particularly girls and those from families with low incomes, intake of certain vitamins (ie, folate and vitamins A, B<sub>6</sub>, and E) and minerals (ie, iron, calcium, magnesium, and zinc) is inadequate. Box 4 provides current

recommendations for folate, iron, and calcium, which are nutrients of particular concern for adolescents because they are often under-consumed.<sup>33</sup>

Adolescents of both sexes and all income and racial and ethnic groups often consume excess amounts of total fat, saturated fat, and added sugars. Other nutrition-related concerns for adolescents include low intakes of vegetables, fruits, whole-grain products, and low-fat and nonfat milk and other dairy products.<sup>56</sup> These dietary patterns constitute a significant risk factor for obesity and other health conditions.<sup>2,56</sup> Reducing the consumption of high-fat foods as well as beverages and foods with added sugars will lower the caloric content of the diet without compromising its nutrient adequacy.<sup>1</sup>

#### Box 4

##### Current Recommendations for Selected Nutrients<sup>33</sup>

###### Folate

The IOM 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 synthetic folic acid per day from fortified foods, a supplement, or both in addition to consuming foods rich in folate.<sup>1,46</sup>

###### 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 DRIs for iron are<sup>2</sup>

- Girls and boys 9–13 years of age: 8 mg iron per day
- Females 14–18 years: 15 mg iron per day
- Women 19–21 years: 18 mg iron per day
- Males 14–18 years: 11 mg iron per day
- Men 19 and 21 years: 8 mg iron per day

###### 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 are<sup>1</sup>

- Children, adolescents, and young adults 9–18 years of age: 1,300 mg calcium per day
- Young adults 19–21 years: 1,000 mg calcium per day



Only 22% of adolescents report eating fruit 3 or more times per day, only 15% report eating vegetables 3 or more times per day, and only 15% report drinking 3 or more glasses of milk per day. In addition, 11% of adolescents report drinking soda 3 or more times a day, only 37% report eating breakfast every day, 29% describe themselves as having slight or substantial overweight, 46% report trying to lose weight, and 12% report not eating for 24 hours or more to lose weight or to keep from gaining weight.<sup>57</sup> Common nutrition concerns during adolescence include

- Increase in overweight and obesity
- Increase in eating disorders and body image concerns
- Prevalence of iron-deficiency anemia in girls
- Prevalence of hyperlipidemia and type 2 diabetes
- Food insecurity among adolescents from families with low incomes<sup>2</sup>

### Assessing the Adolescent Diet

Evaluating the dietary intake of an adolescent is a fundamental component of health supervision. It is useful for health care professionals 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 and religious patterns and taboos associated with food.

### 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 to express their 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 healthy foods at home and by making family mealtimes a priority.<sup>58</sup> Parents 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.<sup>59</sup> 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 no grocery or other stores that sell affordable, nutritious foods.

Although eating together as a family is a challenge for many adolescents and their families who are coping with school demands, after-school activities, and work schedules, having frequent family meals 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.<sup>56,58,60</sup> Having meals together is positively associated with intake of vegetables, fruits, grains, and milk and dairy products rich in calcium and negatively associated with soda 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 B<sub>6</sub>.<sup>60</sup>

### 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 adolescents, puberty-related changes (in adolescent girls in particular, the normal increase in body fat) may result in weight concerns. The social pressure to be thin and the stigma of having overweight can lead to unhealthy eating behaviors and a poor body image.<sup>61</sup> 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; use illegal "street" drugs (eg, methamphetamines); and vomit or take laxatives. Fad diets that recommend unusual and, sometimes, inadequate or unbalanced dietary patterns promise the loss of several pounds in a short period of time. In addition, the lack of evidence about their efficacy and safety in adolescents make such regimens a poor choice for adolescents who want to lose weight and who may underestimate the health risks associated with them.<sup>62</sup>

Unhealthy eating behaviors and preoccupation with body image can lead to life-threatening eating disorders (eg, anorexia nervosa, bulimia nervosa, binge-eating disorder). Although eating disorders are more prevalent among adolescent girls (prevalence is 1%–2%) than among adolescent boys, they occur in both sexes across socioeconomic and racial and ethnic groups and are even seen in children and young adolescents (10–12 years of age).<sup>63</sup> 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. In 2009, the mortality rate for anorexia nervosa was 4.0%; for bulimia, 3.9%; and for eating disorders not otherwise specified, 5.2%.<sup>64</sup> Death may be caused by cardiac arrhythmia, acute cardiovascular failure, gastric hemorrhaging, or suicide. Bulimia nervosa can damage teeth and cause enlargement of the parotid gland.

### Athletics and Performance-Enhancing Substances

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.

The AAP recommends against the use of performance-enhancing substances (eg, supplements, ergogenic aids [eg, amphetamines, creatine, and steroids]) for athletic or other purposes.<sup>65</sup> Performance-enhancing substances may pose a significant health risk to adolescents. Supplements and amphetamines do not contribute positively to athletic performance. Health care professionals can stress the importance of seeking accurate information so young athletes and their parents can make informed choices.

### Nutrition for Adolescents With Special Health Care Needs

As with younger age groups, adolescents with special health care needs are at increased risk for nutrition-related health problems.<sup>66</sup>

- Physical disabilities can affect their capacity to consume, digest, or absorb nutrients.
- Long-term medications or metabolic disturbances can lead to biochemical imbalances.
- Psychological stress that results from a chronic condition or physical disorder can affect appetite and food intake.
- Environmental factors, often controlled by parents or other caregivers, may influence access to and acceptance of food.

The energy and nutrient requirements of adolescents with special health care needs have been reviewed.<sup>2</sup> The adolescent's diagnosis, medical status, individual metabolic rate, and activity level are used to determine a desired energy level to be established and achieved. The adolescent is subsequently monitored to (1) ensure adequate nutrition for growth, development, and health and (2) make adjustments for periods of stress and illness.



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