

Improving the Nutritional Status of Adolescents

Current Trends and Strategies for Success



NATIONAL DAIRY COUNCIL®

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Executive Summary

If one had to choose a word to describe adolescence, it would be “change.” The adolescent experiences rapid physical growth and maturational changes, cognitive development with increased abstract thinking and decision-making abilities, as well as psychological maturation characterized by a growing sense of self efficacy, independence, and identification with peers. In the midst of so much change, it is not difficult to understand why nutrition might not be “top of mind” for most teens. Data from recent national surveys reveal that the nutritional status for many adolescents is less than ideal. According to 1994-96 data from USDA’s Continuing Survey of Food Intakes of Individuals (CSFII), adolescents 12-19 years have intakes of total fat and saturated fat, and in some cases cholesterol, that are higher than currently recommended. However, some experts believe that dietary fat recommendations should be more flexible for children and adolescents – since providing adequate energy and nutrients during the growing years is of primary importance.

Many teens are underconsuming several nutrients that are of immediate concern for normal growth and development. According to 1994-96 CSFII data, the average adolescent male is consuming less than the 1989 Recommended Dietary Allowance (RDA) for vitamin E, calcium, magnesium, and zinc, while females consume less than the RDA for vitamin E, vitamin A, calcium, phosphorus, magnesium, iron, and zinc. Intakes of magnesium and vitamin E for adolescent males and intakes of calcium, phosphorus, magnesium, iron, zinc, vitamin E and vitamin A for adolescent females, are of particular concern - - since at least two-thirds of the teen population is underconsuming these nutrients. When calcium consumption is compared to the higher 1997 recommendations, approximately 7 out of 10 teen boys and 9 out of 10 teen girls consume less calcium than they need.

The best sources of the nutrients low in teenage diets are whole grain or fortified bread and cereal products, meat or meat alternates, fruits, vegetables, and dairy products. Meat consumption for the average teen is adequate. However, adolescents need to consume more fruits, vegetables, and dairy products. Only about 3 or 4 percent of teens ever eat any dark green vegetables. Adolescent boys consume about 1-1/3 cups of milk daily, while girls consume less than a cup. The trend to substitute soft drinks for milk is partly to blame for teens’ low calcium and milk intakes -- which put them at greater short-term risk for stress fractures and nutrient inadequacies and at greater long-term risk for osteoporosis.

Several subgroups of teens -- such as those who are obese, chronic dieters, pregnant, or who have an eating disorder or chronic illness, or who participate in athletics -- require specialized nutrition services. Eleven percent of adolescent males and 10 percent of adolescent females are considered obese. The prevalence of obesity among adolescents has increased over the last ten

years and is a public health concern. Since teenage fat intakes have been decreasing, while energy intakes have remained fairly stable, most authorities attribute the increase in obesity in part to lower levels of physical activity. Several organizations such as the American College of Sports Medicine, the American Medical Association, and the President's Council on Physical Fitness and Sports have made recommendations for physical activity for youth.

Over 40% of U.S. teens, especially females, are attempting to lose weight -- often employing inappropriate and unhealthy strategies. Many dieters are not overweight, but are trying to conform to the thin body image portrayed in the media. However, chronic dieting is often counterproductive, leading to binge eating and little or no long-term weight loss. Restrictive dieting may lead the most psychologically vulnerable to develop a full-blown eating disorder, such as anorexia nervosa or bulimia nervosa. An eating disorder requires a comprehensive evaluation followed by intensive therapy with a multidisciplinary team consisting of a physician, a registered dietitian and a psychotherapist.

Athletics imposes additional energy and nutrient demands on the growing adolescent. Since over 50% of children and adolescents in the U.S. participate in competitive athletics either at school or in the community, health professionals may be frequently called upon to provide sound guidance for sports nutrition. Nutrition professionals can help dispel many of the myths surrounding issues of hydration, weight loss/dieting, and supplement use. The American Dietetic Association issued a timely statement providing specific guidance for dietitians who are educating coaches and teens involved in organized sports.

Pregnancy in adolescence superimposes the needs of the growing fetus on the young girl's nutritional needs for her own rapid growth. As a consequence, teenage mothers -- who are often from low income households -- have a greater risk of delivering a low birthweight, or premature infant than do older mothers. Good prenatal care and nutritional counseling can help reduce these risks.

Various aspects of teen culture, lifestyle and environment influence food selection and nutritional status. An adolescent's growing independence means fewer meals with the family, and more meals eaten at fast food restaurants and concession stands. Teens receive most of their nutrition information from television and magazines. Finding out what teens already know about nutrition is an important first step in designing a program to improve eating behavior. Teens appear to understand the basic principles of balance, variety and moderation, but hold misconceptions about fat in foods and what foods are "good" and "bad" for them. Data from recent surveys indicate that teens may increase their consumption of milk if nutrition educators emphasize the good taste of dairy foods and focus on how to make drinking milk more personally important to them. The most effective nutrition education programs are based

on behavioral learning theory, and include a self-assessment component, are long-term, and involve the family, school environment, and the community. Research shows that often a number of unhealthy behaviors -- such as poor diet, smoking, alcohol use, and sedentary lifestyle -- cluster in the same individuals. This argues for including nutrition education as part of a broad-based lifestyle education program. Practitioners need to carefully assess the unique status and needs of each adolescent to maintain the delicate balance between short-term developmental needs and future health.

Introduction

Recent national consumption surveys provide insight into the nutritional status and eating patterns of American adolescents 12-19 years old. The data indicates that their dietary habits are less than ideal. Improving the nutritional status of adolescents presents a distinct challenge for health professionals.

Superimposed on the increased nutritional needs of rapid growth are the psychosocial changes of adolescence -- the emotional and social needs that often take precedence over nutritional concerns. Finding strategies that increase nutrition knowledge and change eating behavior is the ultimate challenge of the nutrition professional.

The primary goal of nutrition during adolescence is to maximize intake of the nutrients needed for rapid growth and maturational development. However, many teens face problems of obesity, chronic dieting, or eating disorders -- or the additional nutrient demands of athletics or pregnancy -- that place them at increased nutritional risk. Since dietitians and other health providers may be called upon to counsel adolescents with these problems, we will present a brief overview of current trends and recommended strategies in these areas. The challenge for the nutrition professional is to help adolescents understand how their lifestyle -- including eating patterns and physical activity -- can affect their current and future health. Thus, we will review current educational strategies that have been successful in helping adolescents adopt a healthier diet and lifestyle.

Adolescents -- Who Are They?

The adolescent period is characterized by change. During this period, the child grows physiologically, psychologically, and socially into a mature adult. While all teens must pass through the same maturational stages, each is an individual with unique needs. Many teens sail through the maturational stages without a hitch, while some become sidetracked by harmful behaviors (i.e., drinking, smoking, sexual activity, eating disorders) that put their health and nutritional status at high risk. Health professionals can help all teens adopt a healthier lifestyle. They can help healthy teens learn skills that promote life-long health; they can help teens at high health/nutritional risk improve their health status.¹

Physiological Development

Adolescence is a period characterized by rapid physical growth and maturational changes. The adolescent "growth spurt" which begins at the onset of puberty, contributes 15% to adult height and 50% to adult weight, and 45% of adult skeletal mass.² It typically occurs between the ages of 10 and 13 years in American females, and two years later in males. A nutritionally adequate diet is necessary for growth, but the rate of growth is influenced by multiple factors

including genetics, physical activity, age, gender, and endocrine balance.³ Gender has a distinct influence on body composition (i.e., lean body mass and fat distribution). Girls deposit relatively more total body fat when compared to boys, while boys accumulate proportionately more lean body tissue and skeletal mass.

Psychosocial Changes

The progression toward maturity involves several psychological and social changes. Psychologically, the adolescent's personality adopts more adult-like behaviors, and he/she learns to accept increasing amounts of responsibility. Socially, the adolescent moves from a state of dependence upon parents and family to become more independent and self-directing. As adolescents become more independent, the peer group becomes increasingly important in offering support, a source of self-esteem and behavioral standards. Cognitively, the adolescent moves into the "formal operations" phase and acquires the ability to deal with the hypothetical as well as the actual. They develop the ability to think abstractly, which aids decision-making and resolving interpersonal problems.¹

How an adolescent adapts to these changes can impact his or her nutritional and health status. For example, a psychological change resulting from physiological changes is the reformulation of body image. Adolescents continually compare their bodies to those of their peers. Overweight in varying degrees can cause teens to experiment with dieting, often using inappropriate techniques which can threaten nutritional status.

Environmental Factors That Affect Nutrient Intake

Teens' growing independence and busy schedules often mean fewer meals with the family and more food purchased from fast food restaurants, vending machines, and concession stands. A basic knowledge of nutrition and wise food selection is critical for this age group, as they are purchasing food for their own consumption, as well as family groceries. According to results from a recent survey, most teens (11-14 years) make their own snacks (87%), make their own meals (78%), go to fast food restaurants (78%) or convenience stores (73%). Many (46%) also grocery shop for the family.⁴ One would expect these percentages to be as high or higher for older teens who are driving and have even more autonomy.

Children and teenagers are eating more meals away from home than they did twenty years ago, according to the USDA. Fully 72% of teenage males and 64% of teenage females ate away from home on any given day. Meals eaten away from home contributed approximately one third of these teens' daily energy and macronutrient intake.¹⁰ Fast food restaurants are the most frequent sources for outside food for boys and a close second to the school cafeteria for girls.

Food eaten away from home may be less nutritious than home meals. For example, milk is most often consumed at home, rather than away from home.⁵ In a recent survey of young teens, more than half claimed they would rather not drink milk at a restaurant.⁴ Therefore, the trend toward more away-from-home eating has likely contributed to the low calcium and milk intake of adolescents.

How teens view particular foods may influence their nutrient intake. In a study conducted among adolescent girls in Toronto, so-called “junk foods” were associated with friends and independence, while “healthy foods” were associated with home and family.⁶ A teenager’s drive for independence and peer acceptance may override nutritional concerns. Therefore, it is important for any nutrition intervention to address the functional meaning of foods in the teen culture in order to bring about more healthful food choices.

The mass media is a powerful communication channel and source of nutrition information for adolescents. Seventy-five percent of 14-18 year olds reported receiving their nutrition information from magazines.⁷ A pilot study of nutrition messages conveyed by the largest circulation teen magazines, revealed that the most frequently occurring topics included exercise and physical activity (15%), dietary fat/cholesterol (13%), weight loss (11%), and calcium (8%). Although no messages mentioned the USDA Food Guide Pyramid, messages about all food groups occurred at a frequency of about 11%.⁷

Teens need to learn how to evaluate the nutrition information as well as the more subtle body image messages they receive via television and magazines. Food advertisements on television that are targeted to teens frequently feature candy and snack foods that contribute fat and calories, but add few nutrients to a teen’s diet. Teens receive a mixed message from the media. Juxtaposed to the ads encouraging overindulgence, are ads with svelte models who portray a body image that requires continuous food restriction to maintain. In such an environment, it is no wonder that many teenage girls have a poor body image and develop disordered patterns of eating.

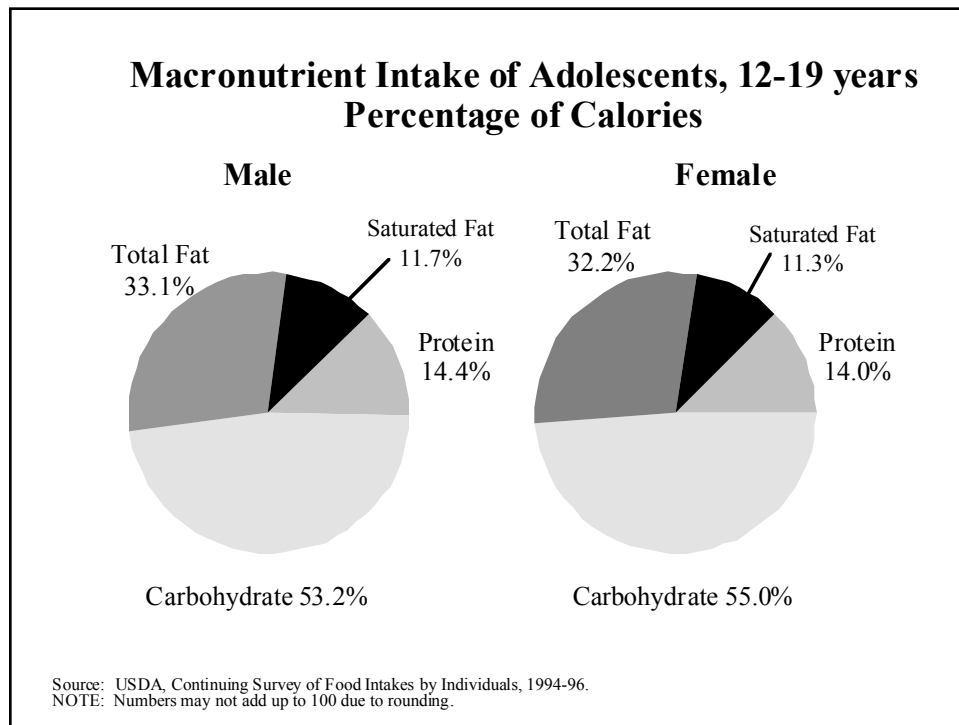
Nutritional and Health Status of Adolescents

Recent national nutrition surveys such as the National Health and Nutrition Examination Survey (NHANES-III, 1988-91)^{8 9}, and Continuing Food Intakes by Individuals (CSFII 1994-96)¹⁰, provide nutrition data for children from 1-19 years of age. National data on the nutritional status of American adolescents helps formulate national nutrition policy and gives health practitioners a framework for counseling individual adolescents.

Macronutrient Status

According to 1994-96 data from USDA's Continuing Survey of Food Intakes of Individuals (CSFII), adolescents have intakes of protein, total fat and saturated fat and in some cases cholesterol, that are higher than currently recommended.¹⁰ The 1995 Dietary Guidelines for Americans¹¹ recommends that people 5 years and older choose a diet with no more than 30 percent of calories from total fat, less than 10 percent of calories from saturated fat, and no more than 300 milligrams of cholesterol per day. Adolescents 12-19 years old consume between 32 and 33 percent of their total calories from fat, and between 11 and 12 percent of their calories as saturated fat (see chart below). Less than a third of the males and slightly more than a third of the females meet the recommendations for fat and saturated fat, while over half (56%) of the males and over three quarters (81%) of the females meet the recommendation for cholesterol.¹⁰

According to 1994-96 data, male and female Black youths consume more fat than do White youths of the same age.¹² Cholesterol intakes of Black youths (12-19 years) are also higher than those of White youths. White and Black males 12-19 years, consumed more than the recommended 300 mg of cholesterol per day. Cholesterol intakes of female adolescents are within the recommended limit.



The Canadian Paediatric Society and Health Canada revised their dietary fat guidelines for children and adolescents in 1994 -- upon determining that dietary fat recommendations should be more flexible during the growing years.¹³ The new guidelines recommend a gradual transition throughout childhood from the high-fat diet of infancy to a diet that provides no more than 30% of energy from fat by the end of linear growth (i.e., late adolescence). The new guidelines were based on a report from a Working Group of the Canadian Paediatric Society that reviewed the scientific evidence within a framework of determining both the safety and efficacy of a low fat diet for children and adolescents. Based on their analysis, the group concluded that:

- Implementing dietary guidelines suitable for adults is not necessarily an appropriate action for children or adolescents while they are still growing.
- There are no controlled studies demonstrating that a low-fat diet in childhood reduces the risk of coronary heart disease in adulthood.
- The few intervention studies to lower children's fat intake have demonstrated little or no changes in blood cholesterol levels.
- There is no evidence that any reduction in blood cholesterol levels in childhood persists into adulthood.

A recent randomized controlled trial – the Dietary Intervention Study (DISC) – was designed to assess the safety of a reduced fat diet (30 percent of calories) in children who had elevated LDL cholesterol levels. A low fat diet consumed over a period of three years had minimal impact on blood cholesterol levels and mixed results on nutritional adequacy in children during puberty.¹⁴ A lower fat intake was associated with higher intakes of folate, vitamin C and vitamin A. Although the children and their parents received diet instruction and monitoring throughout the study period, the low fat diet was associated with lower intakes of calcium, zinc, magnesium, phosphorus, vitamin B₁₂, thiamine, niacin, and riboflavin. Growth was not affected and the authors concluded that the diet was nutritionally adequate based on biochemical measures of nutritional status. However, since no biochemical measure of calcium balance or bone metabolism was used, the adequacy of calcium status in these young people remains undetermined.

Micronutrient Status

According to 1994-96 data from CSFII, adolescents 12-19 years of age have a mean intake for several nutrients that are below 100 percent of the 1989 Recommended Dietary Allowances (RDA).¹⁰ Males have intakes below the RDA for vitamin E, calcium, magnesium, and zinc, while females consume less than the RDA for vitamin E, vitamin A, calcium, phosphorus, magnesium, iron, and zinc. Since the RDAs provide a safety factor for each nutrient, individuals with intakes below the RDA do not necessarily have inadequate intakes. However, "as the percentage of the population with intakes below 100 percent of the RDA increases, so does the likelihood that some individuals in the population are at nutritional risk."¹⁰ The diets of at least two thirds of

adolescent males (12-19 years) are not meeting 100% of the RDA for magnesium (67%) and vitamin E (65%). Almost that many are underconsuming calcium (64%) zinc (65%), and vitamin A (64%). Many adolescent females (12-19 years) are not meeting their RDA for calcium (87%), phosphorus (66%), magnesium (82%), zinc (76%), vitamin E (76%), vitamin A (69%), and iron (72%).

Nutrients Underconsumed by Adolescents 12-19 Years

	Male	Female
Percentage of adolescents not meeting 100% of 1989 RDA^a		
*Calcium	63.7	86.5
*Magnesium	66.5	82.1
Iron	16.9	72.3
*Phosphorus	27.2	66.3
Zinc	65.3	76.1
Vitamin A	64.1	69.3
Vitamin E	64.7	75.7

* Nutrient guidelines increased with new DRIs in 1997.

^a Nutrients were listed for which at least 2/3 of either males or females were not meeting 100% of the RDA.

Source: USDA, Continuing Survey of Food Intakes by Individuals, 1994-96.

In 1997 the National Academy of Sciences (NAS) released new recommendations for calcium and other bone-related nutrients (vitamin D, magnesium, phosphorus, and fluoride).¹⁵ They increased the recommendation for calcium to 1,300 mg per day for children and teens ages 9-18. In addition, in 1998 NAS released new recommendations for the B vitamins including thiamin, riboflavin, niacin, vitamin B₆, folate, vitamin B₁₂, pantothenic acid, biotin, and choline. Future USDA consumption surveys will compare nutrient intakes with the most current recommendations.

Previously, an Expert Panel convened by the NIH in 1994 recommended optimal calcium intakes to reduce the risk of osteoporosis.¹⁶ The Panel recommended a range of 1200-1500 mg of calcium per day (or the equivalent of 4-5 servings of milk, yogurt or cheese) for adolescents and young adults ages 11-24 years. These recommendations are endorsed by the American Medical Association.¹⁷

Calcium Intake Recommendations

National Institutes of Health Expert Panel

Age (Years)	Calcium (mg/day)	Milk Servings
11-24	1,200-1,500	4-5

National Academy of Sciences

9-18	1,300	4
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Most of the nutrients deficient in the adolescent diet play important roles in growth and development:

Calcium is important for building bone mass and strength. Optimizing the amount of bone laid down during the adolescent period is the most effective strategy for reducing the risk of osteoporosis (porous bones) later in life.¹⁸ The most opportune time to initiate efforts to increase calcium intake is during the five year period from 11 to 16 years of age, since this is when a substantial part of bone accretion takes place.¹⁹

Zinc is important for growth and sexual maturation. Supplementation trials with zinc suggest that even marginal zinc nutriture may limit skeletal growth in infants, children and adolescents. Therefore, efforts to achieve peak bone mass in adolescents should promote the intake of foods rich in zinc and other nutrients.²⁰

Magnesium aids bone growth and is necessary for proper functioning of nerves and muscles.

Iron is essential to the formation of hemoglobin, and is needed in increasing amounts in adolescence to meet needs for rapid growth as well as to meet the demands of teens engaged in athletics.²¹ Iron may also affect cognitive functioning in adolescence. According to a recent report, iron supplementation improved verbal learning and memory in non-anemic iron-deficient adolescent girls.²²

Many of the same nutrient inadequacies apparent in adolescent diets may carry over into young adulthood. In a study conducted among young adults (19-28 years) in Bogalusa, Louisiana, 40 percent of participants did not meet two-thirds of the RDA for vitamins A, B₆, C, D, and E, folic acid, thiamin, magnesium, zinc, and calcium.²³ The greatest inadequacies for both sexes were calcium and

vitamin D, and iron in women. The researchers expressed concern that young women, especially, were entering their childbearing years with low intakes of several vitamins and minerals. There is a need for nutritionists and other health professionals to educate adolescents about the importance of improving micronutrient intake by including more nutrient-dense foods in the diet.

Milk, eggs, cheese, and fortified bread and breakfast cereals are among the top key foods identified by USDA as providing 90% of the calories, fiber, calcium, iron, fat, saturated fat and eight other nutrients of public health interest consumed in the U.S.²⁴ Some experts believe that educational efforts to improve nutrient intake should begin before the sixth grade, before poor eating habits become more difficult to change.²⁵

The Dietary Guidelines recommend eating a variety of foods and choosing a diet with plenty of grain products, fruits and vegetables. The guidelines recognize that adolescent girls need to eat more calcium-rich and iron-rich foods to get the calcium needed for healthy bones throughout life and to maintain the body's iron stores at adequate levels.¹¹ In order to obtain the nutrients they lack, many adolescents need to consume larger amounts of nutrient-dense foods, such whole grain or fortified bread and cereal products, fruits and vegetables (especially green leafy vegetables), and dairy products.

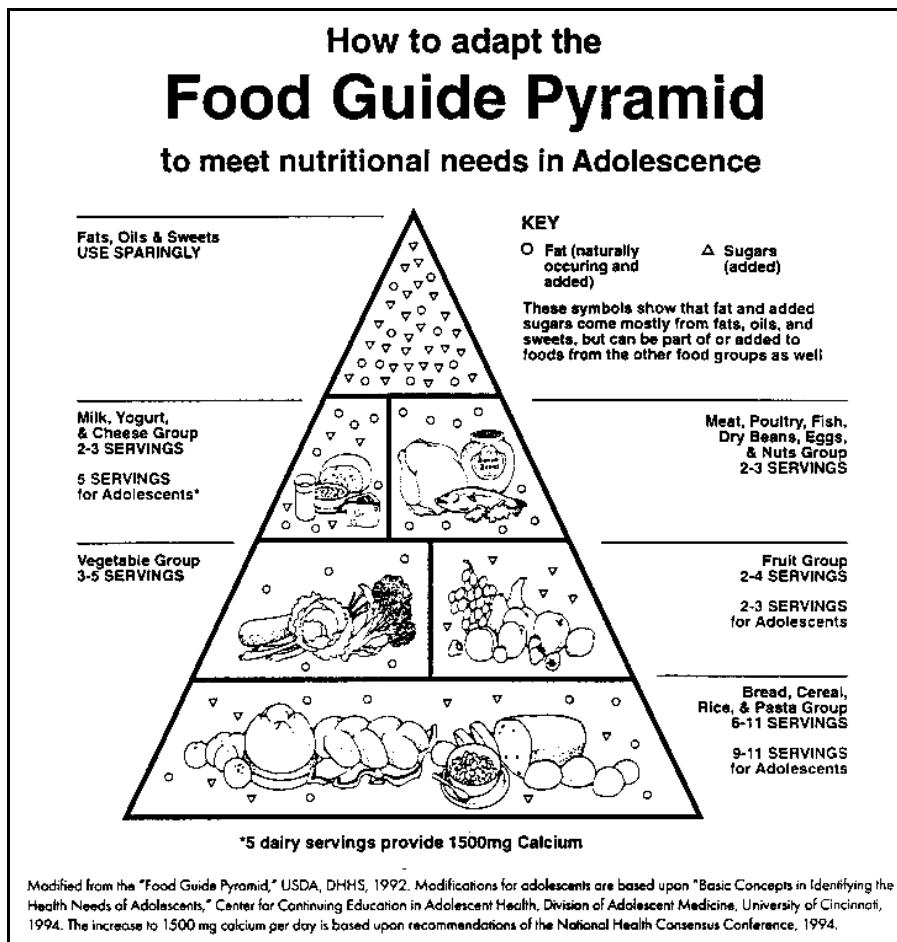
Food Sources of Problem Nutrients: Percent Contribution to the Food Supply, 1994

Nutrient	Percent Contribution	
Calcium	Milk Group foods	72.8
Magnesium	Grain products	25.5
	Milk Group foods	16.4
Zinc	Meat, poultry, fish	41.5
	Milk Group foods	18.9
	Grain	18.4
Vitamin A	Vegetables	35.3
	Meat, poultry, fish	21.4
	Milk Group foods	17.4
Vitamin E	Fats and oils	67.8
Iron	Grain products	50.5
	Meat, poultry, fish	16.3

(Source: Nutrient Content of the U.S. Food Supply, 1909-1994)

AAP Adolescent Pyramid

To help pediatricians counsel their teen patients about diet, the American Academy of Pediatrics customized USDA's Food Guide Pyramid to meet the nutritional needs of adolescents (see below).²⁶ At the tip of the pyramid is the instruction to "use fats, oils and sweets sparingly." To assure that teens consume 1,500 mg of calcium daily as recommended by the NIH Expert Panel, the AAP pyramid recommends 5 servings of Milk Group foods. In addition, the pyramid recommends that teens eat 2-3 servings (5 to 9 ounces) from the Meat Group, 3-5 servings from the Vegetable Group, 2-3 servings from the Fruit Group, and 9-11 servings from the Grain Group.



Despite the instruction to "use sparingly," teens eat more discretionary fat and added sugar than any other age group -- approximately 45 percent of daily calories. Boys consume more food and Calories than girls (2,739 kcals vs. 1,809 kcals). They eat at least the minimum number of recommended servings in the Meat, Vegetable, and Grain groups. Girls, however, consume below the minimum number of recommended servings in all food groups.

Teens' consumption of milk, yogurt, and cheese is critically low. According to USDA 1996 Pyramid Servings Data, boys 12-19 years ate 2.4 servings, while girls ate only 1.5 of the recommended five servings of Milk Group foods.²⁷ (Serving estimates that include all milk products including those used in desserts or mixed dishes are not yet available.)

Boys consume 5.9 ounces of meat daily, while girls consume an average of 3.5 ounces – only 70% of the minimum recommended. Favorite meat choices among girls and boys are beef, poultry, and frankfurters/luncheon meats. Adolescents are eating few other foods in the Meat Group, such as eggs, legumes, or nuts.

Vegetable consumption is nearly adequate, with boys consuming 3.6 servings per day and girls consuming 2.8 servings. The vegetable most frequently chosen by teens are white potatoes, especially french fries. Teens eat very few (one tenth of a serving/day) green leafy or deep yellow vegetables.

Teens consume only about half the amount of fruit recommended in the Pyramid. Boys eat an average of only 1.3 servings and girls eat 1.2 servings of the 2 to 3 servings of fruit (raw, canned, or dried) or fruit juice currently recommended. About half of the fruit consumed is citrus fruit, melon, or berries.

Teen boys consume 9.6 servings of breads and cereals from the Grain Group (the minimum recommended), while teen girls consume only 6.3 servings. Only one of those servings is a whole-grain product, which may contribute to teens' low fiber intake.

Fiber

A diet with adequate amounts of both soluble and insoluble fiber -- obtained primarily from fruits, vegetables and whole grains -- promotes regularity of bowel function, helps regulate blood lipid levels, and may help prevent obesity by reducing the energy density of meals. Adolescents in the U.S. consume between 13 gm (girls) and 17.5 gm (boys) of dietary fiber/day, according to 1994-96 CSFII survey data.¹⁰ This level is below that recommended by the American Academy of Pediatrics (AAP) and the American Health Foundation for optimal health. The AAP recommends children and adolescents consume 0.5 gm of dietary fiber per kilogram of body weight, up to a maximum of 35 gm/d.²⁸ The goal recently recommended by the American Health Foundation for children and adolescents is equivalent to the child's age plus 5 gm/day.²⁹ This recommendation takes into account increasing fiber needs as a child grows. Using the age + 5 rule, a 12 year-old would need to consume 17 gm of dietary fiber daily, while an 18 year-old would need 23 gm. Since a high fiber diet can block mineral absorption, adolescents who consume a mineral-deficient diet should not consume more than 25 gm of fiber daily.³⁰

Sodium

Data from Phase one of the National Health and Nutrition Examination Survey, 1988-91, indicates that sodium intake of adolescents is higher than the Daily Value of 2,400 mg/day recommended on the Nutrition Facts food label. It is unclear whether dietary sodium intake in childhood or adolescence contributes to the development of adult hypertension. The benefit of reducing a child's or adolescent's sodium intake to lower the risk of hypertension is controversial, primarily because sodium's effect on blood pressure is highly variable among individuals. Most "salt sensitive" individuals who respond to sodium restriction are older.³¹ However, high intake of sodium can increase urinary calcium excretion, increasing calcium needs.³² Adolescents who already have quite low calcium intakes may jeopardize bone mass development even further by consuming a diet high in sodium.

Milk vs. Soft Drink Consumption

Data on more than 1,700 children and teens indicate that they are substituting soft drinks for more nutritious beverages such as milk and fruit juice.³³ The result is an increased intake of sugar and calories, and a decreased intake of important nutrients such as calcium, vitamin A, riboflavin, and phosphorus (provided by milk) and folate and vitamin C (provided by fruit juice). Teens today drink twice as much soft drinks as milk. According to USDA data, soft drink usage among teens doubled or tripled between 1977-78 and 1994, while milk consumption dropped by 40 percent.¹⁰ Dietetic professionals are urged to: 1) counsel teens to limit soft drink consumption and increase their intake of more nutritious beverages, and 2) counsel parents to limit the amount of soft drinks brought into the home.³³

Low milk consumption and a high intake of soft drinks may increase the risk of stress fractures and broken bones in youth as well as decrease overall nutrient status. Wyshak et al. found a strong association between carbonated beverage consumption (particularly colas containing phosphoric acid) and the occurrence of bone fractures in 14-year-old girls. However, a high intake of dietary calcium was protective.³⁴ The authors conclude that the trend of increasing soft drink consumption and decreasing milk consumption is of public health concern.

Low milk and dairy food consumption contributes to low intakes of several nutrients. In an analysis of calcium consumption and food sources of calcium in the U.S., Fleming and Heimbach compared the nutrient profiles of teenage girls (13-18 years) who drank milk with those who didn't.³⁵ Milk-drinkers consumed 80% more calcium, 59% more vitamin B₁₂, 56% more riboflavin, 38% more folate, 35% more vitamin A, 24% more of each vitamin B₆ and potassium, and 22% more magnesium than did non-milk-drinking teenagers. The authors urge placing emphasis on changing current consumption patterns of milk, since milk and milk products are the source of more than three-fourths (77%) of the calcium in the diets of teenage girls. Encouraging adolescent girls to consume

more milk and dairy foods will likely help improve their overall nutrient profile.

Breakfast Skipping

Meal-skipping is common during middle and late adolescence – and breakfast is the meal most often missed. According to national survey data, 25% of adolescent girls and 20% of adolescent boys skipped breakfast on a given day.³⁶ Eating breakfast has both nutritional and cognitive benefits for adolescents (and children). Breakfast contributes to total daily dietary intake and increases the likelihood of meeting nutrient requirements. Children who eat breakfast are more likely to meet the recommended levels of calories, protein, vitamins, and minerals than those who skip breakfast.³⁷

In a recent review of the literature (1979-1995) on the effects of breakfast on cognition and school performance, Pollit concludes that “the data as a whole indicate that brain function is sensitive to short-term variations in the availability of nutrient supplies.” Although the evidence is stronger for nutritionally at-risk children, the working memory of well-nourished children is also sensitive to an overnight and morning fast.³⁸ For example, students in Lawrence, Massachusetts who participated in the School Breakfast Program achieved higher scores on the Comprehensive Tests of Basic Skills and decreased rate of absences and tardiness.³⁹ In a cross-sectional and longitudinal study of students in three inner-city public schools, participation in a school breakfast program was associated with improved student functioning on a broad range of psychosocial and academic measures -- including significantly higher math grades (one grade higher) and significantly fewer reports of depression and anxiety.⁴⁰

Because of the recognized importance of breakfast for both children and adolescents, The American Dietetic Association supports free access to adequate food and nutrition programs, “regardless of economic status, special needs, and cultural diversity”.⁴¹ Breakfast should provide about 25% of the daily energy requirement, and should include servings from at least three of the five food groups.⁴²

Adolescents at High Nutritional Risk

Obese Adolescents

The vast majority of adolescents are not obese. However, the prevalence of obesity in children and adolescents has increased over the last ten years, similar to that seen in adults.⁴³ This is cause for public health concern, since obesity in adults is associated with hypertension, diabetes, and lipid abnormalities.⁴⁴ The prevalence of obesity in adolescent males and females is 11 and 10 percent, respectively, when defined as above the 95th percentile of body mass index

(weight (kg)/height(m)²). An additional 14 percent of adolescents who have a BMI between the 85th and 95th percentile are considered at risk for overweight.⁴³ This represents an increase of about 5 percent over a ten-year period – though the increase is seen primarily among those who have the greatest BMIs.⁴³ One of the Healthy People 2010 goals is to “Reduce to 5 percent the proportion of children and adolescents (aged 6-19 years) who are overweight or obese.”⁴⁵

While weight status in early childhood is poorly correlated with adult weight, overweight in late adolescence tracks more closely.⁴⁶ Although BMI may be the most appropriate measure for clinical assessment of adiposity in children and adolescents, BMI alone does not predict adverse health outcomes.⁴⁷ Since over-diagnosing obesity has the potential to cause harm (i.e., psychological stress, growth failure, eating disorders), clinicians should consider other factors such as age of the child, persistence of overweight, and family history of weight-related morbidity, before initiating treatment.⁴⁷

Some authorities attribute weight gain to lower levels of physical activity, since overweight in adolescence has increased while fat intakes (as percentage of calories) have decreased and there has been little change in energy intakes.⁴⁸ Declining participation in physical education classes at school, safety concerns, parents’ work schedules, television viewing and availability of video and computer games have all contributed to teen’s more sedentary lifestyles.^{49 43 50} An international Conference on Nutrition and Physical Activity to Optimize Performance and Well-being was held in April of 1995 to examine the impact of nutrition and physical activity on physical and mental performance and well-being in youth and adults.⁵¹ A national program called Improving Child and Adolescent Health Through Physical Activity and Nutrition (PAN) has been launched as a result of the program. Objectives include “developing new scientific knowledge and new community-based intervention programs to improve child and adolescent health through physical activity and nutrition.”⁵²

Several organizations have made recommendations for physical activity for youth. While there are slight differences in wording, The American College of Sports Medicine⁵³, the American Medical Association’s Healthier Youth by the Year 2000 project⁵⁴, and the President’s Council on Physical Fitness and Sports⁵⁵, all recommend 20 minutes or more of vigorous exercise three or more times per week to help children and teens maintain or reduce body weight, as well as to provide other potential health and psychosocial benefits. In addition, the American Heart Association developed a strategic plan for promoting physical activity which includes specific behavior and knowledge outcomes for youth.⁵⁶

Healthy People 2010 objective 22-7 calls for increasing to 85 percent the proportion of adolescents (grades 9-12) who engage in vigorous physical activity that promotes cardiorespiratory fitness 3 or more days per week for 20

or more minutes per occasion.⁴⁵ In 1997, 64 percent of adolescents engaged in the recommended amount of physical activity.⁴⁵

Most health professionals recommend increasing physical activity to achieve or maintain a healthy weight in adolescents who are moderately overweight, since restrictive diets may interfere with an adolescent's growth and development.⁵⁷ Results from a review of exercise programs with obese adolescents supports the continued use of exercise in combination with a growth-promoting diet that provides recommended levels of nutrients.⁵⁸ According to experts presenting at a scientific roundtable held by the American College of Sports Medicine, the best approach for treating overweight in childhood and adolescence is a lifestyle approach that involves multiple interventions and sets small, incremental goals.⁵⁹ According to screening guidelines developed to identify adolescent obesity, youths with a BMI at the 95th percentile or higher should be referred for in-depth medical assessment and follow-up. Adolescents with a BMI between the 85th and 95th percentiles should be referred for additional screening which includes an evaluation of family and weight history, blood pressure, total cholesterol level, and concern about weight.⁶⁰

Most interventions to reduce pediatric obesity have achieved only small changes in weight and body fatness and are marked by substantial relapse. Although there are no officially recognized standardized treatments for childhood and adolescent obesity, recent reviews of obesity treatment research highlight components of treatment programs that have been the most effective.^{61 62}

Robinson states that current state-of-the-art behavioral treatments for childhood and adolescent obesity produce long-term weight control in about one third of participants.⁶² Based on existing research, the components with the most potential for success include:

- ✓ **Increased intensity and duration of treatment.** Results from adult studies suggest that meeting weekly for the first 10-12 weeks, then monthly for 6-12 months improves treatment success.
- ✓ **Simple, but explicit reduced calorie diet that promotes goal-setting, evaluation, and feed-back control.** Frequent monitoring and rewarding weight changes seems to produce greater short-term weight loss.
- ✓ **Reduced sedentary behavior.** Providing children with rewards for reducing their sedentary behaviors (i.e., television watching, playing video games) may be more effective at increasing physical activity levels and promoting weight loss than focusing on promoting physical activity.

Dieting Adolescents

During adolescence, both males and females are preoccupied with their weight and appearance.⁶³ Two thirds of adolescent girls are dissatisfied with their weight⁶³, and girls are twice as likely as boys to be concerned about losing

weight.⁶⁴ Underweight boys are the most dissatisfied with their body shape and are more likely to exercise to increase the size of their upper arms, chest, and shoulders. Teenage girls especially, are dieting in order to attain the thin body image portrayed in the media and avoid the social stigma of obesity.⁶⁵ Many teens employ inappropriate and unhealthy strategies to lose weight, such as fasting, crash diets, use of diuretics, laxatives, diet pills, and self-induced vomiting.^{49 66} A recent study of a nationally representative sample of adolescents in the U.S., reported that 58 percent of high school females are dieting to lose weight.⁶⁷ Of the dieting female students, only 5.5 percent were considered “extreme dieters” – using diet pills and vomiting to control weight, and limiting fruit and vegetable intake. This study also found that not all dieting was unhealthy. The teens who practiced more moderate methods of weight control had eating and exercise habits in line with national guidelines.

Excessive preoccupation with weight and unhealthy dieting can have a number of harmful psychological as well as physical consequences. Dieters are susceptible to episodes of overeating (binge-eating), tend to over-react emotionally, are easily distractible, and constantly think about food and eating.⁶⁸ Fear of obesity which leads to excessive dieting may adversely affect an adolescent’s growth and development.⁶⁹ Dieting teenage girls tend to have poor eating habits (i.e., skip meals) and low intakes of nutrients, particularly calcium and iron. In addition, intermittent weight loss and regain, may make weight maintenance more difficult over time.

It has been estimated that dieters are more than eight times as likely as nondieters to develop a more serious eating disorder (i.e., anorexia, bulimia).⁷⁰ A study conducted among 14 and 15-year-olds in Australia found that girls who dieted severely were 18 times more likely to develop an eating disorder within six months than were those who did not diet, while those who dieted moderately were five times more likely to develop one.⁷¹ However, a full-blown eating disorder occurs only in those who have an underlying psychological pathology -- about 1-3% of adolescent females.⁷⁰ Nutrition professionals should not try to treat teens with an eating disorder without psychiatric supervision.

Over 40 percent of U.S. teens, especially females, are attempting to lose weight⁴⁹ -- and the same proportion begin dieting when they are only 9 and 10 years old.⁷² However, quite a few teens who are dieting do not need to lose weight. When asked about their weight-loss practices, 24 percent of female and 12 percent of male teens who perceived themselves to be underweight had dieted during the last week. Among those who considered themselves to be at an appropriate weight, 47 percent of the females and 31 percent of the males had made some effort to control their weight.⁴⁹

Since being overweight is not always the strongest predictor of dieting behavior, dieters may be hard to identify. According to a recent study

conducted among black and white, male and female adolescents, what differentiated dieters from non-dieters was their *perception* of being overweight before and after kindergarten and at the time of the study.⁷³ Dieters had greater feelings of body dissatisfaction and wanted to be thinner. Self-esteem scores were lower in female dieters. White females set the lowest ideal weights for themselves, which were often unrealistic. According to the author, the cultural ideal for thinness desired by most teenage girls, required a body mass index at approximately the 22nd percentile for age.⁷³

Although research shows that black women accept a larger ideal body size and are less likely to diet than white women, an analysis of over 2,300 girls found that the degree of overweight, not race, was the main determinant of whether preadolescent girls dieted.⁷² A higher BMI, body dissatisfaction, and having her mother say she was too fat, increased the odds that a girl would become a dieter or chronic dieter (usually or always dieting). In fact, the likelihood of a girl dieting increased by 2.5 times when her mother admonished her for being overweight.⁷² The authors caution that preoccupation with body size and dieting in preadolescents should be recognized by the health practitioner as a possible risk factor for an eating disorder.

In spite of all the dieting by adolescents, rates of obesity continue to rise. Studies conducted among restrained and unrestrained eaters indicate that on-and-off dieting produces little if any weight loss. On the contrary, an expert in eating behavior warns that dieting frequently results in feelings of psychological deprivation that result in binge eating.⁶⁸ By willfully training oneself not to eat in response to internal hunger signals, the dieter becomes susceptible to other signals to eat. Since dietary restraint is often counterproductive, the author recommends that individuals who are of normal weight (up to a BMI of 25-27) avoid food restrictions. Instead, they should be advised to establish a healthful lifestyle that incorporates moderate exercise and a balanced diet, without restrictions of any particular food. Even those who are obese should be taught to incorporate their favorite foods into more moderate levels of intake, while increasing energy expenditure with physical activity.⁶⁸

Programs designed to change dieting, bingeing, and overall eating patterns, need to address both psychological (body/self image) and cognitive issues (nutrition knowledge and attitudes). In a study conducted among 10th grade girls in Jerusalem, body/self image was a strong predictor of both dieting and bingeing. Nutrition knowledge and attitudes were strong predictors of nutrient intake. Since clear guidelines do not exist to identify adolescents most at risk for eating disturbances, these authors recommend that both primary prevention (aimed at all students) and secondary prevention (aimed at those with unhealthy eating behaviors) be part of comprehensive health education programs in schools.⁷⁴

Eating Disorders

Eating disorders are the third most common chronic illness among adolescent females in the U.S.⁷⁵ Teens who follow inappropriate or overly restrictive diets (including vegetarian diets) may be at risk of developing a clinical eating disorder. According to a position paper by The American Dietetic Association, while following a vegetarian diet does not cause eating disorders, teens who are predisposed to disordered eating are often attracted to a vegetarian diet.⁷⁶ However, only the most emotionally and psychologically vulnerable (primarily female) adolescents develop the self-destructive behaviors characteristic of an eating disorder (i.e., unsafe dieting techniques, taking unproven diet products, maintaining arbitrary standards of weight). Anorexia nervosa, or voluntary self-starvation, occurs in approximately 0.48 percent of adolescents 15-19 years, and bulimia nervosa, characterized by alternately bingeing and purging, occurs in 1-5 percent.⁷⁷

Anorexia has serious physical consequences, including loss of muscle tissue in the arms, legs and heart, slowed metabolism, hair loss, bloating and delayed gastric emptying.⁷⁸ Anorexia is particularly devastating to bone. Inadequate calcium and protein intakes, accompanied by glucocorticoid excesses (due to chronic stress), reduce bone formation -- while low levels of estrogen in the blood (associated with amenorrhoea) increase bone breakdown.⁷⁹ In the absence of menstrual periods, bone-thinning can occur in as little as six months. The physical consequences of bulimia include irregular or no menstrual periods, slowed metabolism, dental caries, loss of electrolytes, swollen glands, and an inflamed esophagus.⁷⁸

Eating disorders are complex, involving issues of food and weight as well as relationships with oneself and others. Therefore, effective treatment involves a psychiatric evaluation followed by therapy with a multidisciplinary team consisting of a physician, a registered dietitian and a psychotherapist.⁸⁰ Criteria for diagnosis of anorexia nervosa and bulimia nervosa are included in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders*.⁸¹

Attempts to prevent the development of eating disorders by educating schoolchildren about the dangers of inappropriate dieting have not been effective, possibly because the minority who are prone to eating disorders are resistant to this type of program. Therefore, health professionals should focus on shortening the time between the onset of an eating disorder and its treatment by becoming knowledgeable of eating disorder warning signs.⁸²

Teen Athletes

Sports training increases a teen's need for nutrients, especially calories and water, by superimposing the physical demands of the activity on the already high nutritional demands for rapid growth.⁸³ Over half of teens in grades 9 through 12 report participating in vigorous physical activity three or more times per week.⁸⁴ Half participate in organized team sports at school and 37

percent participate on a sports team run by another organization.⁸⁴ Since a significant portion of youth are involved in athletic activity, it is important for parents, coaches, and health practitioners to be familiar with the basic principles of sports nutrition.

The daily energy requirement for the moderately active teenager may be 1,500 to 3,000 calories beyond baseline needs.⁸⁵ The RDA for energy for males and females 15 through 18 years of age is 3,000 and 2,200 calories per day, respectively.⁸⁶ Available data indicates that teenage boys who participate in athletics consume more calories and nutrients than those who do not. However, female athletes exhibit either higher or lower calorie and nutrient intakes than nonathletes, depending on the sport. Girls who participate in gymnastics, for example, have lower calorie and nutrient intakes than the average teenage girl. A study of 22 teenage male (15-18 years) and female (14-17 years) swimmers found that these adolescents consumed on average 5,222 and 3,573 calories per day, respectively.⁸⁷ In contrast, a study of 97 competitive female gymnasts (11-17 years) found that 40 percent consumed less than two-thirds of the RDA for calcium and 53 percent consumed less than two-thirds of the RDA for iron.⁸⁵

Many teenagers have misperceptions about issues of sports nutrition -- such as hydration, weight control/dieting, and supplement use -- which may require guidance by a health professional. Experts in sports nutrition continue to recommend cold water as the beverage of choice for teenage athletes. Contrary to what many teens believe, consuming electrolyte/carbohydrate containing sports beverages offer no performance advantage (except during prolonged exercise) over plain water.⁸⁸ Likewise, no scientific evidence supports the general use of supplements to improve athletic performance.⁸⁹

Athletes participating in weight-monitored sports such as wrestling, boxing, and martial arts may engage in short-term weight loss practices (i.e., fasting, laxative, fluid deprivation) that can adversely affect nutritional status, muscular strength, aerobic and anaerobic power, and athletic performance.⁹⁰ The female athlete who competes in an appearance or endurance sport, who feels a high degree of pressure to excel, and who constantly focuses on a prescribed weight or percent body fat goal, is at the greatest risk for amenorrhea.⁹¹ A caloric deficit in a female adolescent athlete can cause menstruation to cease; estrogen levels drop to postmenopausal levels, causing rapid spinal bone loss. In fact, the spinal density of some young female athletes is similar to that of women in their 70's and 80's and may be irreversible.⁹¹ It is important for parents, the coach and the team physician to refrain from encouraging a "win at any cost" mentality in the young athlete -- and to understand the severe consequences a nutritional deficit can have on an adolescent's health.

In a timely statement, the American Dietetic Association published the following guidance for adolescent athletes in organized sports:⁹²

- Nutrient intake should be planned around the Food Guide Pyramid, with 55-60 percent of total energy from carbohydrate, 12-15 percent from protein, and 25-30 percent from fat.
- Weight and height should be measured by a qualified health professional and compared to the National Center for Health Statistics to evaluate growth.
- Percent body fat and weight should not be used as a criteria for sports participation or to set stringent weight requirements.
- Monitor iron stores in female athletes, to avoid iron deficiency anemia and decline in athletic performance. Provide young athletes with strategies for increasing dietary iron.
- Encourage adequate consumption of calcium to help prevent stress fractures and future osteoporosis.
- Discourage the indiscriminate use of vitamin/mineral supplements, amino acids, protein mixtures or chromium -- since no scientific evidence supports their use to improve athletic performance. (Supplements may improve nutritional status for those with marginal intakes from food.)
- Encourage young athletes to consume adequate fluids before, during and after exercise. Plain water is best for events lasting an hour or less; sports drinks with a 6-8 percent carbohydrate concentration are recommended for events lasting more than an hour or at high temperatures and/or humidity.

Pregnant Teens

In 1996, almost one in ten teenagers ages 15-19 became pregnant in the U.S.⁹³ Fortunately, the pregnancy rate has fallen 17 percent from a high in 1990 of 117 pregnancies per 1,000 teen girls. Teenage mothers, who are disproportionately poor, have a high risk of delivering a low birthweight infant. Infants born to teenage mothers also have a higher incidence of prematurity and perinatal death.⁹⁴ A teenager who is less than 16 years old or who becomes pregnant within 2 years after menses is at the greatest risk for adverse pregnancy outcomes. It is important, therefore, to consider both chronological age and stage of physical development when assessing reproductive risk and planning management strategies. Even if the pregnant adolescent has reached adult height, she has just come through a period of rapid growth. Because growth draws on nutritional stores, there are fewer reserves to support a pregnancy. In addition, many teens add to their risk by waiting until the second trimester of pregnancy to seek prenatal care.⁹⁵

A weight gain of 25-40 pounds is recommended for pregnant teens depending on their maturational stage and pre-pregnant weight. Her nutritional needs can best be met by consuming a variety of foods with high nutrient density and, if necessary, by adding a prenatal vitamin/mineral supplement recommended by her physician. Adequate calcium intake is particularly important for pregnant teens to maximize peak bone mass development.⁹⁵ The NIH expert panel recommends 1,200-1,500 mg of calcium daily for teens during

pregnancy and 1,500 mg per day for lactating teens¹⁶ – while the NAS recommends 1,300 mg of calcium per day for both pregnant and lactating teens.¹⁵

Using Knowledge and Attitudes to Develop Educational Strategies

Finding out what adolescents know about nutrition and their attitudes toward diet and health is a crucial first step in designing a program to improve eating behaviors. A survey was conducted to assess the eating patterns and physical activity of children and teens 9-15 years of age.⁹⁶ Most of the young people surveyed seem to understand the basic nutritional principles of balance, variety, and moderation. For example, three-fourths agreed that “it is very important for good health to eat a balanced diet.” Two thirds said they “like to eat a lot of different kinds of food.” Over half (58%) said that it’s okay to eat foods like ice cream, cookies and chips, but not all the time. One third (32%) agreed that snacks can be an important part of a healthy diet. However, many hold misconceptions or negative attitudes toward food. Most of the youth surveyed (81%) hold the misconception that “to eat healthy you should avoid all high fat foods”. One fourth believe that their favorite foods are not good for them, and 72% say they are tired of hearing about what foods are good and bad for them.

One in five (21%) of the respondents had exercised or participated in sports for at least twenty minutes on each of either five or seven of the previous days. Fewer than 6% had not participated in any physical activity for the past week. Eighty-one percent of the 13-15 year-olds say they spend the right amount of time doing physical activity or recreation; 20% say they spend too little time. Granted, this survey included many children who were not yet adolescents, but it gives health professionals an understanding of where to begin working with younger teens.

A survey, conducted in 1996 among 500 youth ages 11-14 by Teen Research Unlimited (TRU) for the National Dairy Council®, provides insight into this age group’s concern about nutrition, and their dietary practices.⁴ An overwhelming majority (94%) said that eating healthy and eating a balanced diet (89%) is important for people their age. A majority of the young people surveyed said they strongly agree (50%) or somewhat agree (39%) that “What a person eats and drinks during their teen years can greatly affect how their body develops and their overall health during their adults years.” Commenting on the survey, Errol Alden, MD, FAAP, deputy executive director for the American Academy of Pediatrics, said, “Teens finally understand the effect of good eating habits on long term health -- but obviously not all are convinced it applies to what they put on their own plates. Our challenge now is to relate healthful eating to immediate concerns such as grades, increased physical activity and energy.”

Older boys (13-14 years) were the least concerned about eating healthfully. While more boys than girls said that dairy products were good for them, more girls than boys said it was personally important for them to “eat a balanced diet,” “avoid high-calorie foods,” “monitor fat intake,” “read nutrition labels,” and “count calories.” The survey revealed that while teens recognize the importance of proper nutrition, calcium, and dairy products, they appear to be less active in monitoring their diets and following nutritional guidelines. As children (11-12 years) move into their teen years (13-14 years), their commitment to eating healthy foods begins to wane, they tend to skip more meals, and replace milk at meals with soft drinks, bottled water and teas.⁴

Data from recent surveys indicate that if nutrition educators focus on the good taste of dairy foods, and can make drinking milk more personally important to teens, they may increase their consumption. Teen participants in the TRU survey overwhelmingly (97%) believe that “Milk is important for building strong bones.” In general, respondents claim they are consuming more milk, less cheese, and about the same amount of yogurt now than they were a year or two ago. Their primary reasons for eating and drinking more dairy foods is that they “like it,” and “it’s good/healthier for me.” Thirty-two percent of the young people surveyed say they eat/drink about three servings of dairy foods daily, but they believe they should be consuming more (closer to four servings). However, National consumption data indicate that they may be overestimating their actual dairy food intake. When asked why they don’t eat/drink the amount of dairy foods they think they should, they said they “don’t think about it” (25%), they “don’t know” (22%), or they “don’t like the taste” (20%).⁴

Interviews conducted among adolescents (10-16 years) at a 4-H club confirm that nutrition messages should focus on an immediate personal benefit. When instructed to discuss calcium and decide how best to influence their friends to increase the amount of calcium in their diets, the younger teens (10-13 years) focused on taste and sources of calcium other than milk. The older teens (14-16 years) also focused on sources and taste, but responded especially well to the idea that calcium could make them look and feel better.⁹⁷

The Food and Drug Administration has used focus groups conducted among teenage girls to determine the best format, style, and messages for their 1996 Calcium Education Project.⁹⁸ The goal of the project is to make girls who are approaching puberty (ages 11-14 years) aware of the importance of adequate dietary calcium to build healthy, strong bones. A student booklet, “Calcium! Do You Get It?,” and accompanying teacher/leader guide were developed to convey the primary message “You need calcium and exercise every day to grow straight and tall,” and to instruct the girls how to use the food label, percent Daily Value and the Food Guide Pyramid to assess and manage their dietary calcium intake.

Healthy People 2010: Nutrition-Related Objectives for Adolescents⁴⁵

- Reduce to 5 percent the proportion of children and adolescents who are overweight or obese.
- Increase to at least 85 percent the proportion of adolescents who engage in vigorous physical activity that promotes cardiorespiratory fitness 3 or more days per week for 20 or more minutes per occasion.
- Increase to at least 75 percent the proportion of persons aged 2 years and older who consume no more than 30 percent of calories from fat and less than 10 percent of calories from saturated fat.
- Increase to at least 75 percent the proportion of persons aged 2 years and older who consume at least two daily servings of fruit.
- Increase to at least 50 percent the proportion of persons aged 2 years and older who consume: 1) three daily servings of vegetables, with at least one-third being dark green or deep yellow vegetables; 2) at least six daily servings of grain products, with at least three being whole grains.
- Increase to at least 65 percent the proportion of persons aged 2 years and older who consume 2,400 mg or less of sodium daily.
- Increase to at least 75 percent the proportion of persons aged 2 years and older who meet dietary recommendations for calcium.
- Increase the proportion of children and adolescents aged 6 to 19 years whose intake of meals and snacks at schools contributes proportionally to good overall dietary quality.
- Reduce to 7% iron deficiency among nonpregnant females aged 12 to 49 years.

Current Trends in Nutrition Education

In the past, nutrition education programs have been successful at increasing nutrition knowledge and changing attitudes. However, knowledge-based intervention studies have generally failed to demonstrate improvement in adolescent eating behavior.⁹⁹ Behavior change strategies, on the other hand, have proven effective in improving nutrient intakes of adolescents.^{100 101 102 103}

¹⁰⁴ A movement toward more behaviorally-based nutrition education programs began in the 1980s. The development of behavior-based programs has been stimulated by national initiatives, such as Healthy People 2010 goals for health promotion that target specific eating behaviors for change (i.e., increase calcium intake). Many of the current interventions being developed to improve nutrient intake and encourage a healthful lifestyle represent a melding of the fields of behavioral and social psychology and nutrition education.¹⁰⁵ Several excellent reviews of nutrition education with young people have been published, for those who would like to explore this area in more depth.^{105 106 107 108}

Behaviorally-Based Curriculum

A behaviorally-based curriculum uses cognitive, affective, and behavioral learning to influence behavior change. The cognitive learning portion of the program focuses on the how of learning (i.e., how to use food labels to make healthy food choices, how to plan a healthful snack, how to choose healthful foods at a fast food restaurant). The affective component focuses on how an individual relates to and uses food on an emotional level. For after all, food choices aren't only about eating to be healthy, but are shaped by how certain foods make us feel and our beliefs and attitudes toward eating and health. It answers the question of why we eat (i.e., to release emotional stress, to relieve boredom, to celebrate a holiday). The behavioral component focuses on skill development, such as hands-on meal preparation, setting goals for healthy food choices, learning self-reinforcement when the goals are reached, or resisting peer pressure by ordering milk or a salad at a fast food restaurant.¹⁰⁵

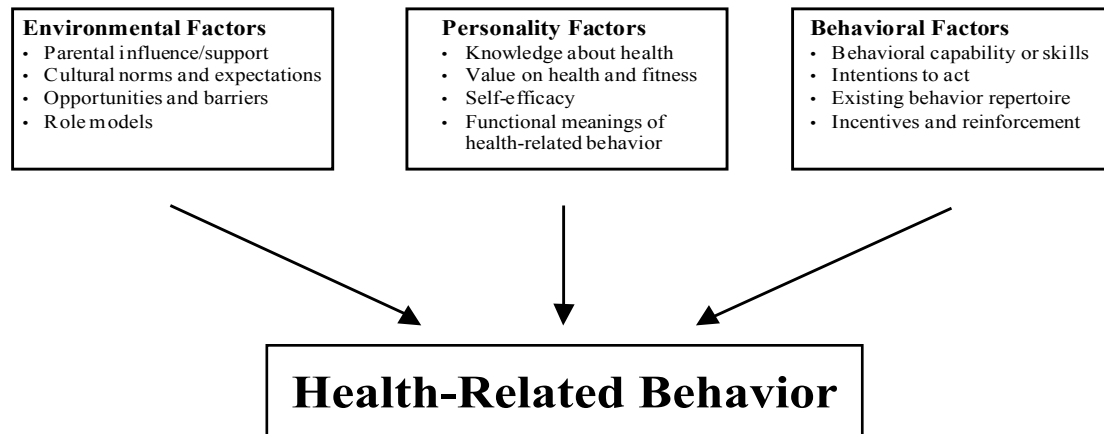
Choosing to eat a healthful diet, as with other health-related behaviors, are influenced by complex interactions between environmental factors, personality factors, and behavioral factors of an individual.¹⁰⁵ Successful nutrition education programs recognize and address these factors. (A chart at the back of the paper lists specific educational strategies that can be used with adolescents to address each of these factors.)

Two studies conducted among 36,284 adolescents (grades 7-12) enrolled in the Minnesota Adolescent Health Survey reported sociodemographic, psychosocial, and behavioral correlates to inadequate consumption of fruits and vegetables¹⁰⁹, and dairy products.¹¹⁰ Although low consumption of fruit and vegetables was common among all Minnesota secondary students (16.9% overall), approximately 40% of those from low socioeconomic backgrounds reported eating fruit or vegetables less than once a day. Similarly, students of low socioeconomic status were at the greatest risk for low consumption of dairy foods, as were those who were non-white and female. Those defined as consuming inadequate amounts of dairy foods consumed no milk, cheese, yogurt, or ice cream on a daily basis. Fruit and vegetable consumption as well as dairy food consumption varied among ethnic groups. American Indians were found to be at the highest risk for inadequate fruit consumption and African Americans were at the greatest risk for inadequate vegetable consumption, and were at the second greatest risk for low dairy food intake. Asian Americans were the least likely to report inadequate fruit and vegetable intake, but the most likely to report inadequate intake of dairy foods. Among the psychosocial factors measured in both studies, family connectedness (perception of family and parental care, understanding and attention) was strongly associated with higher fruit and vegetable as well as higher dairy food consumption. Weight dissatisfaction, binge eating, poor school achievement,

and substance use (tobacco, alcohol, marijuana) were associated with lower consumption of the foods studied.

These findings will help educators identify subgroups of the adolescent population who will most benefit from interventions to improve food choices and nutrient intake, as well as identify factors that need to be addressed in such programs. Because high family connectedness positively influences both fruit and vegetable and dairy food intake, the effectiveness of classroom health education will be limited unless it incorporates family involvement.¹⁰⁹

Psychosocial Factors for Youth Health Promotion



Source: USDA, Nutrition Education for School-Aged Children: A Review of Research (1994)

The behavioral component of any nutrition intervention should be appropriate to the cognitive development of the child.¹⁰⁵ Children in grades 6 through 12 are in the formal operational stage of cognitive development. They can begin to recognize the connections between eating behavior and health, and can be taught personal responsibility and decision-making skills. Adolescents can understand abstract nutrition concepts. For example, junior high students can be taught how to make food choices within a social context and the functional meanings of food. Junior and senior high school students can understand causality. Evaluation of their own diet and eating behavior patterns is very useful at this age.¹⁰⁵ For example, high school students in Tennessee used computers to analyze their diets and set a goal to increase their intake of one nutrient. A majority (67%) were successful at meeting their goal, and said that the most useful activities in the program were keeping food records, using the

computer printout to evaluate their personal nutrient intake, implementing solutions, and follow-up classes to evaluate their progress.¹⁰⁰

Secrets of Success

Several studies have reported on the effectiveness of nutrition/health education programs conducted among adolescents in a variety of settings. Most of the programs are school-based, but many include the wider community or use innovative methods or approaches, such as computer learning and peer education. Unfortunately, many other creative programs have been developed either by food companies or state and federal agencies that have not been evaluated for effectiveness. Adequate funds for outcome evaluation is critical if innovative programs are to be implemented in the larger community.¹⁰⁵

According to a recent review of educational efforts designed to change the diets of school-aged children, the following components were found to be the most effective:¹⁰⁸

- Behaviorally-based and theory-driven
- Include a self-evaluation or self-assessment component (for older children)
- Incorporate family involvement
- Interventions include the school environment (cafeteria, physical education classes)
- Include community involvement
- Longer interventions provide greater impact

Below are several examples of nutrition education programs that have been effective in changing eating and/or lifestyle behaviors of teens:

- A three-day nutrition education program was conducted among 64 female high school students in Illinois, to increase knowledge of the importance of calcium, vitamin D and certain lifestyle factors for bone health and to improve food and lifestyle choices.¹⁰² At the completion of the program, students in the experimental group scored significantly higher than the control group on the post-test at the end of the program and one month later. In addition, intakes of calcium and vitamin D increased by 24% and 51%, respectively, in the experimental group, as assessed by a 24-hour recall. However, calcium and vitamin D intakes also increased in the control group (27% and 30%), possibly due to students discussing the material with each other. Compared to the control group, the students who received the education had mean intakes of calcium, vitamin D and phosphorus that were closer to the RDA and a calcium to phosphorus ratio closer to 1:1 than those in the control group – though this ratio is no longer deemed necessary for bone health.¹⁵ The authors conclude that there are potential health benefits of nutrition and lifestyle education in secondary schools, at least on a short-term basis.

- A school-based, behaviorally focused program conducted among tenth graders in California as part of the physical education program, aimed to increase consumption of complex carbohydrates, and decrease intake of saturated fats, sugar, and salt -- particularly from snack foods.¹⁰¹ The three-week, five session curriculum provided students with dietary information (i.e., food myths and facts, current findings on diet and health) as well as a variety of cognitive-behavioral strategies for modifying eating behavior (i.e., self-assessment of current eating behavior, setting goals for changing health habits, modeling problems and solutions). When compared to the control group, the intervention group demonstrated significant increases in knowledge, reported healthful dietary behaviors, and reported availability of healthful foods at home -- such as more lowfat yogurt and fewer soft drinks. The authors noted that attitude change was not necessary for behavior change to occur. After one year, only the knowledge gains remained -- underscoring the need for continued skill reinforcement and practice.
- Computer-assisted behavioral counseling for high school students was significantly more effective than using educational health tip sheets for encouraging students to decrease their consumption of saturated fat and cholesterol, increasing consumption of fiber and complex carbohydrates, and lose weight if they were overweight.¹⁰⁴ The computer program was used over the course of a semester to give students individualized feedback in the form of risk information, practical suggestions, and encouragement for self-reported improvement regarding their weight, exercise, smoking, and diet. However, the program was not effective in getting underweight students to gain weight.
- A recent report demonstrates that a program in Minnesota combining behavioral education in schools with community-wide health promotion strategies can produce modest but lasting improvement in adolescent knowledge and choice of foods.⁹⁹ Sixth graders enrolled in public schools in Fargo, North Dakota and Moorhead, Minnesota were followed annually until they graduated from high school in 1989. A Lunch Bag program was implemented for the younger students, but when students reached tenth grade, they switched to a nutrition intervention called Slice of Life -- a peer-led curriculum which focused on promoting healthy eating and physical activity patterns. The program planned to expand the student's repertoire of healthy foods eaten, aerobic exercise, and skills to resist peer pressure. Males and females in the intervention community reported significantly greater knowledge of healthier food choices when compared to the reference community. Current food choice, rather than knowledge of healthy foods, was the strongest predictor of future food choices. Students in the intervention community also had healthier food choice scores (with the exception of males in 11th and 12th grade), and salted their food less (with the exception of 12th grade males).

The researchers noted a sharp increase in healthy food choices among females beginning in the ninth grade. They attribute the gender differences to the fact that the female students rated physical appearance as the most important factor in how they felt about themselves. Choosing low fat foods was one method for reducing or maintaining weight. This study, however, did not specifically define which foods or types of foods were categorized as “healthy.” Research has suggested that it may be important to assess the impact of choosing more low fat and low sodium foods on the nutrient adequacy of a teen’s diet. One study found that students who set a goal to reduce sodium intake inadvertently decreased their intake of calcium, iron, vitamin A, and folic acid. The authors speculate that the blandness of the food may prompt teens to reduce their intake of nutrient-dense foods and turn to other foods with greater taste satisfaction (i.e., sweets).¹⁰⁰ In another study conducted among adolescents in Maine, setting a goal to lower fat intake negatively affected vitamin/mineral status in females, while setting a goal to lower sodium or increase fiber intake did not.¹¹¹

Nutrition Education in a Broader Health Context

Recent research showing that a number of unhealthy behaviors (i.e., poor diet, smoking, alcohol use, sedentary lifestyle) cluster in the same individuals, argues for conducting nutrition education as part of a broader-based lifestyle education program.^{112 113} For example, the relationship between a food choice score, an activity score, and smoking prevalence was measured in a group of Minnesota youth as they moved from 6th to 12th grade. After the eighth grade, students who reported making fewer healthy food choices also had lower physical activity patterns and were more likely to smoke cigarettes. The highest correlations were found between lack of exercise and poor diet.¹¹² A separate study found that adolescents who engaged in frequent dieting also exhibited greater tobacco, alcohol and drug use, had higher suicide risk, and more sexual activity.¹¹³

Clearly, improving the diets of teens who have multiple problems and low regard for health requires more than providing them with more creative educational materials. More research is needed on what initiates such a profile in youth (i.e., personality type, family environment, peers), before programs can be developed to effect change.

Balancing Current and Future Health

Very little is known about whether or how youth exposed to nutrition education programs will use the information and acquired skills in their adult lives.¹¹⁴ Studies have shown that the effects of successful interventions dissipate over time, arguing for diet and lifestyle programs to be presented

throughout a child's school career. It is also not known whether children or adolescents who consume a healthy diet will experience a decreased risk of chronic diseases such as heart disease or cancer when they reach older adulthood.¹³ Many believe general nutrition advice given to adolescents should be geared toward reduction in cardiovascular risk factors (i.e., obesity, high cholesterol levels and hypertension) to potentially reduce the population-wide incidence of CVD later in life.¹¹⁵ Others believe that imperfect tracking of risk factors from childhood and adolescence into adulthood -- coupled with youth's high nutritional demands for growth and development -- argue for delaying population-wide dietary restrictions until linear growth has ceased.¹³

Since our knowledge of the role of early diet on future disease risk is limited, we must not allow considerations for future health to drive all nutrition decision-making for teens. We must be careful to avoid the potential psychosocial consequences of labeling teens as medically "at risk." When recommending dietary changes or food restriction to individual adolescents, it is important to maintain the nutrient adequacy of their diet, and to make sure that these youthful clients do not become so fearful of fat that they become chronic dieters. Individualized treatment according to recognized guidelines is most appropriate for adolescents identified at high nutritional risk. Practitioners need to carefully assess the status and needs of each adolescent to maintain the balance between short-term developmental needs and future health.

Appendix

Nutrition Intervention Components to Address Psychosocial Risk Factors

The following components can be included in nutrition interventions for adolescents (in the formal operational stage of development) to address environmental, personality, or behavioral risk factors.

Environmental Risk Factors

- Provide healthful food choices in school environment.
- Use peers as role models and in peer-led classes.
- Provide positive modeling through teachers and other adults.
- Teach students how to overcome barriers in the environment (i.e., how to respond to media and social pressures).

Personal Risk Factors

- Make connection between food and present, as well as future health. Focus on chronic diet/disease connections (i.e., osteoporosis) and diet/disease connections relevant to adolescents (i.e., calcium, iron).
- Have students assess diets at a food and nutrient level; compare self assessments with RDA's, Dietary Guidelines, and Food Groups.
- Provide efficacy enhancing experiences (i.e., planning and preparing a simple, quick meal, or choosing a healthy fast food meal).
- Examine functional meaning of food. Keep a food diary, noting what cued eating behavior (i.e., mood, hunger, stress, other people).

Behavioral Risk Factors

- Plan and prepare healthful meals.
- Read labels and discuss best choices.
- Teach self-management skills such as decision making and combatting social pressure.
- Have students identify incentives and reinforcements for their current eating behavior.
- Identify potential problem areas and set goals for more healthful behavior.

Source: Adapted from USDA, Nutrition Education for School-Aged Children: A Review of Research, September 1994

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