

Discussion Of Proposed Changes

In its discussions, the Dietary Guidelines Advisory Committee determined that research conducted since 1995 supports much of the text of the fourth edition of the *Dietary Guidelines*. This section of the report identifies the committee's recommendations for changes to the fourth edition and provides the basis for these recommendations. It covers overall recommendations—ones that apply to the document as a whole—and recommendations specific to each guideline.

General

Three Major Messages

The committee recommends a major revision of the presentation of the guidelines by introducing three basic messages: Aim for fitness, Build a healthy base, and Choose sensibly—for good health. The intent of these messages is to help the user to organize the guidelines in a memorable, meaningful way (the ABCs for good health).

Order of the Guidelines

The use of the three messages calls for a somewhat revised order of the guidelines, with the weight and physical activity guidelines preceding the others. The committee considers this change essential for clarity.

Writing Style

Since focus group participants have indicated that they like the “Advice for today” style (Prospect Associates, 1995), much of the text has been changed to be more targeted and actionable. Also in response to comments from focus group participants, the number of boxes has been increased—from 16 to 26.

Introduction

The brief text in the introduction now focuses on the three basic messages. It continues to provide an overview of the purposes of the booklet, using a positive approach.

The committee suggests deleting content on food composition, the basis of body weight, and Recommended Dietary Allowances. Pertinent content on food composition or body weight is moved to specific guidelines. With the ongoing work on Dietary Reference Intakes, Recommended Dietary Allowances are in a state of flux and have been omitted entirely.

Aim for a Healthy Weight

Guideline

The proposed title and general focus of this guideline basically are unchanged from the 1995 version in its message to “maintain or improve your weight.” There is now general agreement about the health risks of obesity, since the data linking overweight/obesity to adverse health outcomes are incontrovertible. Justification for this position is provided in a recent report from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK, in press).

There is less agreement about the management of obesity—especially with regard to whether the emphasis should be on weight maintenance or on weight loss. Because of concern that repeated failures at weight loss may be harmful and might outweigh the risks of maintaining the overweight or obese state, an NIDDK task force (NIDDK, 1994) conducted a comprehensive review of the literature on the potential negative physical consequences of weight cycling in obese subjects. The evidence was not sufficiently compelling to override the potential benefits of moderate weight loss in significantly obese persons. Furthermore, studies by Bartlett et al. (1996) and Foster et al. (1996) of groups of individuals who had experienced at least one bout of significant weight loss and weight regain found that weight cycling is not associated with long-term adverse psychopathology such as depression. Therefore, the committee considers the revised title to be appropriate for all people.

As in the 1995 Guidelines, the message to persons with a healthy weight is to aim to prevent weight gain, even within the “healthy” body mass index (BMI) range. The message for persons with overweight or obesity is, initially, to maintain current weight and then to aim to lose about 10 percent of body weight. This is consistent with National Institute of Health (NIH, 1998) guidelines and the recently expressed views of Willett and colleagues (1999). This position is also consistent with a recent NIDDK Obesity Task Force Report, which stated the following:

Efforts to prevent further weight gain in adults at risk for overweight and obesity are essential. The advice to eat a healthful diet, increase physical activity, and avoid further weight gain is appropriate for almost all individuals at or above a healthy weight. For those whose current or future health is at risk because of their obesity and who are motivated to make lifestyle changes, a recommendation for weight loss is appropriate (NIDDK, in press).

In part because of the importance of physical activity in the etiology and management of obesity and other disorders, the committee recommends deferring most of the discussion of physical activity to a new, separate guideline (see next section).

The proposed change in the guideline title improves clarity. The word *balance* in the 1995 guideline “Balance the food you eat with physical activity” was interpreted by some to suggest that it was okay to be overweight as long as activity and intake were balanced. The word *improve* in the phrase “Maintain or improve your weight” was interpreted by some to mean to increase weight and by others to mean to decrease weight (Prospect Associates, 1998). The proposed title simplifies the message in one actionable phrase, “Aim for a healthy weight.”

Introductory Paragraph

The introduction, as in the previous version, emphasizes the relationship of overweight and obesity with risk for various diseases, and it adds risk for premature mortality (Calle et al., 1999).

Evaluate Your Body Weight

The committee recommends that this section replace the 1995 sections “How to evaluate your body weight” and “Location of body fat” because of the complementary contributions to health of body weight and body fat location. It suggests that the section be directed toward adults specifically. The revised text is tailored to the content of boxes 1 and 2 and figure 1 (see below).

Some individuals with a BMI below 25 kg/m² may have increased medical risk, especially if they have an increased waist circumference, which is an additional independent predictor of risk factors and morbidity (Han, 1995; Lemieux et al., 1996; Rexrode, 1998). Waist circumference has been found to be a better marker of abdominal fat content than the ratio of waist-to-hip circumferences (Despres, 1989) and to have greater prognostic significance for disease risk (NIH, 1998). Relatively accurate measurements of abdominal fat can be made with computed tomography or magnetic resonance imaging. However, these methods are expensive and not readily available in clinical practice. Hence, the committee recommends the use of waist circumference alone, not in comparison with hip circumference, as the most practical measurement of a person’s abdominal fat content. At BMIs above 35 kg/m², waist circumference has little added predictive power of disease risk (NIH, 1998). It is, therefore, not necessary to measure waist circumference in persons with BMIs at or above 35 kg/m². In contrast to the absence of gender differences for BMI, waist circumference cut-offs differ for men and women.

Not all persons who have a BMI in the overweight category need to lose weight for health reasons. However, if the BMI is ≥ 25 kg/m² or if the waist circumference is >88 cm (35 in) for women or >102 cm (40 in) for men, the presence of additional risk factors for obesity-related conditions should be assessed. Weight reduction may be indicated, especially if a person has two or more obesity-related risk factors (NIH, 1998). Obese individuals with a

BMI ≥ 30 kg/m² are likely to have health benefits from weight reduction (Maggio and Pi-Sunyer, 1997).

Manage Your Weight

In the proposed revision of this section, the first paragraph introduces the concept of the relative contributions to weight gain of modifiable attributes (i.e., individual food and physical activity choices) versus unmodifiable and less modifiable attributes (i.e., genes and environment). Specifically, the committee recommends the addition of a paragraph that makes it clear that genetic traits and the environment greatly influence but do not determine an individual’s weight status. The committee acknowledges that the three major factors that modulate body weight (metabolism, physical activity, and diet) are each influenced by genetic traits (Weinsier et al., 1998). However, the recent increase in obesity prevalence cannot be explained on the basis of genetic mutations within the general population. Despite major environmental obstacles of modern society, personal decisions regarding physical activity and dietary lifestyle can still affect an individual’s weight status (Weinsier, 1999).

The committee recommends that this section emphasize the importance of long-term weight control through a lifestyle that encompasses other components of the Dietary Guidelines. This emphasis is in concert with recently published documents on weight control published by the NIH (1998) and the World Health Organization (WHO, 1998).

The proposed second paragraph introduces a new emphasis on the consumption of foods that are low in energy density as a means to control energy intake. The statement is included “Eating mainly vegetables, fruits, and grains helps you feel full, achieve good health and manage your weight.” A series of recent studies indicates that the energy density of foods plays a role in short-term daily energy consumption (Bell et al., 1998; Rolls et al., 1998, 1999; Stubbs, Harbron et al., 1995; Stubbs, Ritz et al., 1995). In these tightly controlled metabolic ward studies, which ranged in duration from a few days to 2 weeks, subjects were given free access to meals of varying energy density, and in some instances similar fat content. The reports of Stubbs and colleagues indicated that energy density increased with the fat content of the meals. In turn, energy balance over periods of 7–14 days was greater with *ad libitum* intake of the high-fat, high-energy-dense meals than with the low-fat, low-energy-dense meals. The authors commented: “Of considerable interest is the apparent ease with which normal men can, without being aware of it, feed themselves into a large positive energy balance while consuming a high-fat diet” (Stubbs, Harbron et al., 1995).

A subsequent report of this group (Stubbs et al., 1996) demonstrated that the macronutrient content of the diet did not determine energy intake when the meals, fed over a 14-day period, were isoenergetic. The studies from the labora-

stories of Bell and of Rolls (cited above) showed that, regardless of the energy density of the meals, subjects consumed similar amounts of food by weight. However, in agreement with the findings of Stubbs and colleagues (1996), the subjects consumed significantly more energy with access to high energy-dense meals, whether high in fat or not. This excess in energy intake occurred despite satiety levels that were comparable among the diets. In an earlier study (Duncan et al., 1983), *ad libitum* access to foods low in energy density facilitated portion control and spontaneous energy intakes at levels significantly below those observed with free access to energy-dense meals. The study was conducted over two 5-day periods, on a clinical research center, among obese and lean women who were permitted unlimited intakes of meals of either high or low energy density. Importantly, comparable levels of satiety occurred with meals high or low in energy density, indicating that subjects ate to a comfortable level of fullness with both diets. Despite comparable feelings of fullness, total daily energy was almost one-half as much on the low energy-dense meals.

Thus, available data suggest that access to low energy-dense meals favors control of energy intake. Long-term studies are limited to those showing weight-control advantages of *ad libitum* intake of low-fat, high-carbohydrate meals, which may or may not have been low in energy density (Hammer et al., 1989; Shintani et al., 1991). The implication of the above studies is that energy intake is determined to a large extent by the weight of the meals consumed (Rolls and Hill, 1998). Hence, excessive energy intake is more likely to occur with energy-dense meals, particularly high-fat meals. As stated in the report:

Limiting fat intake and increasing carbohydrate and fiber intake during weight loss allows dieters to consume a greater and perhaps more satisfying volume of food and helps them avoid periods of positive energy balance, which lead to weight gain.

A diet of low energy density is usually characterized as low in fat and high in complex carbohydrates and fiber. Fruits, vegetables, and grain products are likely to be the mainstays of a diet with a low energy density. (Rolls and Hill, 1998, page 41)

These research findings are congruous with the other Dietary Guidelines for Americans proposed in this report, and the NIH (1998) and WHO (1998) reports, emphasizing relatively high-fiber, low-fat vegetables, fruits, and grains for the prevention of obesity.

The paragraph on physical activity includes a new recommendation to aim to be active for at least 45 minutes per day for weight maintenance (Leon et al., 1979; NIH, 1998; Pollock et al., 1998; Rippe and Hess, 1998; see also the next section "Be Physically Active Each Day").

The committee also suggests clarifying that low-fat foods are not necessarily low in calories (Rolls and Miller, 1997).

The paragraph on snacks and foods eaten away from home now includes a few concrete suggestions. The increased attention reflects changes in eating patterns in the United States (Lin et al., 1999).

The committee suggests adding a paragraph to address older adults, including an emphasis on weight-bearing exercise to maintain bone and muscle (Pollock and Evans, 1999).

If You Need to Lose Weight, Do So Gradually

The proposed guideline is congruous with the NHLBI Guidelines (NIH, 1998) in indicating that weight reductions of 5 percent to 15 percent may reduce risk factors for obesity-associated conditions (Goldstein, 1992) and that the initial goal should be to lose 10 percent of one's weight over about 6 months (NIH, 1998). The committee recommends a minor change in the specification of a gradual rate of weight loss: 1/2 to 2 lb/wk instead of 1/2 to 1 lb/wk. This higher upper limit is consistent with NIH Clinical Guidelines, and it does not significantly increase the risk of new gallstone formation (Weinsier et al., 1995).

Encourage Healthy Weight in Children

During the past decade, the number of U.S. children who are overweight has more than doubled. Approximately 11 percent of American children are overweight. An additional 14 percent have a BMI between the 85th and 95th percentiles, which puts them at increased risk for becoming overweight (Troiano and Flegal, 1998). New federal guidelines for healthy BMI levels for children are under development and will soon be available to health-care providers and the public. Parents with concerns about the weight of their children are referred to their health-care providers for evaluation and intervention, as appropriate.

The committee suggests continuing the recommendation to limit television watching since one quarter of all U.S. children watch four or more hours of television each day, and hours of television watched is positively associated with increased BMI and skinfold thickness (Andersen et al., 1998). The committee suggests drawing attention to the parents' role in setting examples for their children. Parents have a major impact on their children's eating and physical activity patterns. Nutrient intakes are known to aggregate in families, with the strongest associations found between mothers and their children (Oliveria et al., 1992). In addition, children's eating behaviors are influenced by characteristics within the family unit, such as the number of meals eaten together (Vauthier et al., 1996).

The committee also suggests giving more attention to child feeding practices. Young children are reported to adjust their meal size according to the energy density of

food available and are able to adjust their food intake across successive meals to regulate energy intake tightly for 24-hour periods (Birch et al., 1991). However, child-feeding practices have been shown to influence children's responsiveness to energy density and meal size (Birch and Fisher, 1998). When parents assume control of meal size or coerce children to eat rather than allowing them to focus on their internal cues of hunger, children's ability to regulate meal size in response to energy density is diminished (Johnson and Birch, 1994). This seems especially problematic among girls with high BMIs and may play a later role in the chronic dieting and dietary restraint that have become common among U.S. adolescent girls (Johnson and Birch, 1994). In summary, perhaps some of the best advice regarding child feeding practices continues to be the division of parental and child responsibility. That is, parents are responsible for presenting a variety of healthful foods to children and for the manner in which these foods are presented, but children are responsible for whether and how much they eat (Satter, 1986).

Serious Eating Disorders

The committee suggests revising the heading and content of the 1995 section entitled "Problems with excessive thinness." The committee recommends deletion of the sentence: "Excessive concern about weight may cause or lead to such unhealthy behaviors as excessive exercise, self-induced vomiting or the abuse of laxatives or other medications." That sentence might be misinterpreted to suggest that serious attempts at weight control might lead to eating disorders. Most studies of behavioral weight loss interventions report improvements in psychological status during weight loss. (Wadden et al., 1997; Wing et al., 1984). The committee recommends adding guidance to seek the help of a health professional if there are signs of an eating disorder.

Advice for Today

The text is changed to place more emphasis on foods from the grains, fruit, and vegetable groups. It places less emphasis on physical activity in this section only because of the addition of a separate physical activity guideline.

Figure 1: Are You at a Healthy Weight?

The committee suggests that the previous graphic entitled "Are you overweight?" be retained with the title "Are you at a healthy weight?" It recommends that the figure include BMI cut-points because of the increasing use of BMI as a reference guide for a healthy body weight. A healthy body weight has recently been defined as a BMI of 18.5 to 24.9 kg/m², overweight as a BMI of 25 to 29.9 kg/m², and obesity as a BMI of 30 kg/m² (NIH, 1998; WHO, 1998). The relevance of these cut-offs to health risk and mortality is discussed in a cogent review article by Willett et al. (1999). Accordingly, the cut-points between the colors in the figure

should occur at BMIs of 18.5, 25, and 30, to coincide with the cut-points recommended in the NHLBI and WHO reports. As was the case in the 1995 version of the guidelines, BMI cut-offs are the same for men and women (Gallagher et al., 1996) since morbidity appears to increase with increasing BMI in a similar manner for men and for women (Willett et al., 1999), as does mortality (Stevens et al., 1998).

Box 1: Evaluate Your Weight (Adults)

Box 2: Find Out Your Other Risk Factors

The committee recommends adding these boxes to provide consumers with a step-by-step method that is consistent with NHLBI (NIH, 1998) recommendations.

Box 3: Choose Sensible Portion Sizes

The committee recommends that this box, which focuses on portion size, replace box 6, "To Decrease Calorie Intake." The points made in former box 6 are now made in numerous places throughout the booklet.

Be Physically Active Each Day

Recommendation for a New Guideline

The committee recommends the addition of a separate guideline on physical activity for several reasons, as summarized here and discussed in more detail below:

- Relationships between nutrition and physical activity are multi-faceted, including, but going beyond weight management.
- The health benefits of physical activity are extensive and are intertwined with the health benefits of healthful eating patterns.
- Physical activity levels in the United States are much lower, on average, than is desirable for good health and for weight management.
- People in every age group need to improve their physical activity levels, regardless of their weight status.

In the 1995 Dietary Guidelines, physical activity recommendations were included with the guideline "Balance the food you eat with physical activity—maintain or improve your weight." Based on current consensus documents (CDC, 1997a; Mazzeo, et al., 1998; NIH, 1998; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health; Pate, et al., 1995; Pollock and Evans, 1999; Pollock et al., 1998; U.S. DHHS, 1996, 1998) regarding the four points mentioned above, the committee recommends separation of most of the content on physical activity from the weight guideline and the addition of content to form a physical activity guideline.

In addition, the committee recommends a separate physical activity guideline to provide a clearer, more understandable, and more forceful message to consumers. A recent survey commissioned jointly by the American College of Sports Medicine, The American Dietetic Association, and the International Food Information Council (ACSM, et al., 1999) showed that sports and nutrition professionals support collaborative efforts to promote physical activity and nutrition advice for consumers.

Below, the committee discusses a definition of physical activity, interactions between nutrition and physical activity, health benefits and nutrition interactions, current physical activity levels and improvements needed, and the rationale for specific recommendations.

Definition. Physical activity is generally defined as bodily movement involving muscle contraction and resulting in energy expenditure above the basal rate (U.S. DHHS, 1996). Aerobic moderate-intensity physical activity expends 3 to 6 metabolic equivalents (METs), which is equivalent to walking at a pace of 3 to 4 miles per hour for 30 minutes (i.e., 2 miles briskly) (Pate et al., 1995). Aerobic vigorous activity (60 to 90 percent of maximum heart rate or 50 to 85 percent of maximal aerobic capacity) is related to cardiovascular fitness. Resistance training builds strength and flexibility. Moderate, vigorous, and strength activities affect general physical fitness; vigorous activity benefits cardiovascular fitness specifically. Physical fitness is a general marker of physical activity and is seen as the ability to carry out daily tasks easily and with vigor (U.S. DHHS, 1996).

Relationships Between Nutrition and Physical Activity. Relationships between nutrition and physical activity are multi-faceted and include the potential to become obese, the intake of essential nutrients, and weight management.

The prevalence of overweight among U.S. adults and children is rising (U.S. DHHS, 1998). The etiology of the rising prevalence of obesity is unclear, although there is increasing epidemiologic evidence to suggest that physical inactivity may play a major role (Weinsier et al., 1998). Physical activity offers an avenue for energy expenditure, which can aid in weight management. In fact, based on cross-sectional and prospective epidemiological studies, several investigators have suggested that physical activity may have a stronger influence on variations in adiposity than do dietary intake patterns (Poehlman et al., 1995; Rissanen et al., 1991; Samaras et al., 1999). However, because both self-reported dietary and physical activity data are subject to bias (Prentice, et al., 1986), these findings should be viewed with caution (DiPietro, 1995). Nonetheless, the consistency of the epidemiologic data on obesity and physical activity supports the association.

Some data show a relationship between physical activity and the development of obesity in children. Klesges and colleagues (1995) followed 146 healthy children, with an

oversampling of obese children ages 3–5 years, for 2 years. Obesity in this study was defined as greater than the 75th percentile of BMI according to the U.S. Department of Health and Human Services (U.S. DHHS, 1987) norms. The major modifiable physical activity predictors of change in BMI included baseline aerobic activity and change in activity between the second and third year of the study. Notably, in this study, 55 percent of the children had at least one overweight parent. Moore and colleagues (1995) found that more active preschoolers (ages 3–5 years) were likely to gain less weight than less active preschoolers over the course of 1 to 3 years. Upon follow-up in the Cardiovascular Risk in Young Finns Study (Raitakari et al., 1994), physically active young women and men had smaller subscapular skinfolds, indicating less body fat, than did the inactive youth and young adults. Regarding weight control, a number of randomized, controlled experimental studies reported in *Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People* (CDC, 1997a) showed that the degree of overweight among obese children decreased with physical activity.

Higher energy expenditure through physical activity allows for higher intakes of energy and thus facilitates intake of recommended amounts of nutrients without weight gain. Thirty minutes of moderate-intensity activity burns approximately 150 to 200 kilocalories for an adult, depending on body size (Ainsworth, et al., 1993; Pate et al., 1995), and can be balanced by correspondingly increased energy intakes. van der Wielen and colleagues (1996) reported follow-up data from the Study in Europe on Nutrition and the Elderly, a Concerted Action Study, that nutrient intake was greater among physically active than inactive older Dutch persons. On a cautionary note, riboflavin requirements may increase upon vigorous physical activity (Belko et al., 1983; Soares et al., 1993; Winters et al., 1992). However, the increased need for riboflavin may be offset by increased intake (van der Wielen, et al., 1996).

Blair and colleagues (1996) reviewed epidemiologic, animal, clinical, and metabolic research and concluded that diet and physical activity together have the potential to reduce the risk of chronic diseases such as type 2 diabetes mellitus, heart disease, obesity, and osteoporosis.

Physical activity also facilitates weight management. Because of the energy expended by physical activity, persons who are underweight or at a healthy body weight will need to ensure adequate food consumption to gain or maintain weight, respectively, if they increase their level of physical activity.

In view of these data, the committee finds that the substantial weight of the evidence supports a synergistic relationship between physical activity and diet.

Health Benefits. The health benefits of physical activity extend well beyond energy balance and weight management—the only two benefits identified in the 1995 Dietary

Guidelines. Within the past 5 years, nine national position papers or reports have been published documenting the importance of moderate physical activity for health and well-being (CDC, 1997a; Mazzeo, et al., 1998; NIH, 1998; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health; Pate, et al., 1995; Pollock and Evans, 1999; Pollock et al., 1998; U.S. DHHS, 1996, 1998). The most striking evidence supporting the general health benefits of moderate physical activity come from the *Surgeon General's Report: Physical Activity and Health* (U.S. DHHS, 1996), draft guidelines of *Healthy People 2010* (U.S. DHHS, 1998), and recommendations from the Centers for Disease Control and Prevention (CDC) (Pate, 1995). Those reports document that being moderately physically active for 30 to 45 minutes daily increases general physical fitness; and it reduces the risk of developing heart disease, hypertension, colon cancer, and type 2 diabetes mellitus—conditions that are major contributors to morbidity and mortality in the United States. All-cause mortality is lower among persons who are physically active than those who are sedentary, but the effect is stronger for cardiovascular fitness than for general fitness. Among hypertensive adults, physical activity reduces systolic and diastolic blood pressure. Further, physical activity is related to improvements in flexibility, bone mass density, risk of hip fractures in women, depression and anxiety, and health-related quality of life.

With osteoporosis being a leading cause of fractures in older persons, building and maintaining bone density is critical. Engaging in physical activity has a positive effect on bone health among people of all ages (Layne and Nelson, 1999; Mazzeo et al., 1998; Riddoch, 1998; U.S. DHHS, 1996). Conversely, bed rest or lack of exercise can result in bone loss (Convertino et al., 1997). In young persons, bone mineral density is higher among athletes than among non-athletes (Riddoch, 1998, U.S. DHHS, 1996). Similarly, bone mineral density is higher in older persons who exercise than those who do not (Mazzeo et al., 1998). Resistance training has a greater effect than aerobic activity, although either confer benefit as long as they are weight-bearing in nature (Layne and Nelson, 1999).

In children, research shows that physical activity improves aerobic endurance (cardiovascular fitness) and muscular strength, and may improve BMI, blood lipids, blood pressure (CDC, 1997a), and bone health (Ulrich, 1996). Among children with borderline hypertension, physical activity decreases blood pressure (CDC, 1997a). Among teenagers, physical activity is associated with greater self-esteem and self-concept, and lower levels of anxiety and stress (CDC, 1997a).

Strength and flexibility confer general health benefits in addition to those of aerobic physical fitness. Resistance training may increase muscle strength and physical function (Pollock and Evans, 1999), which, in turn, make it easier to engage in free-living physical activity. Specifically,

compared with aerobic training, resistance training results in greater muscle fiber hypertrophy (Goreham et al., 1999), greater muscle mass (Ades et al., 1996; Hunter et al., 1998; Pollock and Evans, 1999), and greater muscle strength in almost every age/gender group (Geliebter et al., 1997; Hunter et al., 1995; Kraemer et al., 1997; Marks et al., 1995; Pollock and Evans, 1999; Treuth et al., 1998). With increased postural stability and flexibility, the elderly may experience fewer falls (Mazzeo et al., 1998). The observed benefit of increased physical fitness is increased physiologic ease of conducting daily activities, such as standing from a chair, carrying a load of groceries, and increasing the velocity and endurance of walking (Ades et al., 1996; Hunter et al., 1995). These functional improvements appear *not* to be explained by greater peak aerobic capacity, but by increased strength (Ades et al., 1996; Parker et al., 1996).

The benefits of moderate physical activity in the whole population are greater than the hazards, although injury can occur (U.S. DHHS, 1996). The types of injury include musculoskeletal injuries, metabolic abnormalities (e.g., dehydration upon extreme exertion), hematologic and body organ injuries (e.g., anemia or bladder trauma from long-distance running), trauma (e.g., injury resulting from collisions with motorized vehicles), infectious and inflammatory conditions (e.g., swimmer's ear), and cardiac events (sudden death upon vigorous exertion). Foot and leg injuries are common among runners (U.S. DHHS, 1996). A number of adverse events are related to high levels of intensity, duration, or frequency and can be decreased to some extent by exercising within known limits, training properly, and starting exercise programs slowly if one is usually inactive. Sudden death upon vigorous activity, which has received recent attention, is less common among physically active persons than sedentary persons. Persons with known cardiovascular disease, those who are at high risk of heart disease, and men over age 40 and women over age 50 who are considering beginning an activity program should consult their physician before starting. (U.S. DHHS, 1996).

Low Physical Activity Levels Among Americans. Several reports describe the considerable lack of physical activity by Americans. Sixty percent of Americans are not active on a regular basis and 23 percent of adults are sedentary (U.S. DHHS, 1996, 1999). Twenty-two percent of U.S. adults reported being moderately physically active in 1985, and there was only one percentage point increase over a decade—to 23 percent in 1995 (U.S. DHHS, 1999). Similarly, the decrease in sedentary lifestyle was only one percentage point, from 24 percent of adults in 1985 to 23 percent in 1995 (U.S. DHHS, 1999). Among men and women over the age of 70, 14.3 percent and 9.8 percent, respectively, reported exercising vigorously 2 to 4 days per week, both of which are the lowest percentages among age groups (by decade) from 20 to 70 and over (USDA, 1998a).

For youth, the data show low activity levels as well. In 1997, only 21 percent of youth in grades 9 through 12 were

physically active for at least 30 minutes for five of the seven previous days, and only 27 percent participated in physical education in school (U.S. DHHS, 1999). Participation in school-based physical education classes is declining; daily enrollment dropped from 42 percent of students in 1991 to 25 percent in 1995 (U.S. DHHS, 1996). In addition, one quarter of all U.S. children watch four or more hours of television daily, and hours of television watched is positively associated with increased body mass index and skinfold thickness (Andersen et al., 1998).

Improvements in Physical Activity Needed in Every Age Group. Proposed Healthy People 2010 Objectives (U.S. DHHS, 1998) provide physical activity guidelines for youth and adults, irrespective of weight status. The recommendations proposed for Dietary Guidelines are similar to those proposed in *Healthy People 2010* and are discussed in the next section “Recommendations for Moderate Physical Activity.”

Adults. For persons 18 and older, the *Healthy People 2010* proposed objectives are for 85 percent to participate in leisure-time physical activity and for 30 percent to engage in moderate-intensity physical activity for at least 30 minutes, preferably daily (U.S. DHHS, 1998). Additionally, there is a proposed objective for 25 percent of adults to be vigorously physically active 20 minutes or more daily for cardiorespiratory fitness and another that stipulates increases in activity to build muscular strength, endurance, and flexibility.

Adolescents. For adolescents in grades 9–12, proposed *Healthy People 2010* objectives are for 85 percent to engage in vigorous physical activity three or more days of the week for 20 minutes per session, 30 percent to engage in moderate physical activity five or more days of the week for 30 minutes per session, and for an increase in activity during physical education classes. Data from 1995 show that not one of these objectives is being met (U.S. DHHS, 1998). The Health Education Authority (1998) recommends that young persons be physically active a minimum of 60 minutes daily. The CDC (1997) recommends that children ages 6 years and above engage in moderate physical activity for at least 30 minutes daily, in vigorous activity three or more days per week for at least 20 minutes per session, and in regular activities that improve strength, endurance, and flexibility.

Participation in school physical activity programs for grades 9 through 12 is among the proposed Healthy People 2010 Objectives. In support of school physical activity programs, a proposed recommendation is to increase the proportion of schools that provide physical activity programs (U.S. DHHS, 1998).

Recommendations for Moderate-Intensity Physical Activity

The committee proposes the following recommendations for physical activity:

Adults. Be physically active (at least 30 minutes most days, preferably all days of the week). The committee continues with the 1995 advice of being moderately physically active for at least 30 minutes on most, preferably all, days of the week, as supported by the CDC and the American College of Sports Medicine (Pate et al., 1995). Since 1995, a number of similar recommendations have been issued for adults and older adults (Mazzeo et al., 1998; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health, 1996; U.S. DHHS, 1996, 1998).

- Split activity into three 10-minute sessions if preferred over a single 30-minute session (Pate et al., 1995).
- Engage in lifestyle or structured activities, depending on preference (Andersen et al., 1999; Dunn et al., 1999; Phillips et al., 1996). Examples of lifestyle activities are brisk walking, house cleaning, and lawn care or gardening. Structured activities include aerobics classes, jogging, and swimming laps.
- If already active, do more than 30 minutes of activity, including more vigorous activity (Pate et al., 1995; U.S. DHHS, 1996).
- Increase activity to 45 minutes per day for weight maintenance (Leon et al., 1979; NIH, 1998; Pollock et al., 1998; Rippe and Hess, 1998).
- Build strength and flexibility. The committee recommends weight training, resistance exercises, and stretching to build strength and endurance for children and adults, as discussed under “Health benefits” above. Examples of weight and resistance activities include repetitive light free-weight lifting, using elastic bands, or carrying light loads like groceries. Examples of stretching include yoga and T’ai Chi Chuan.

Although national recommendations include advice on vigorous physical activity, the committee recommends focusing the message only on increasing physical activity in general.

Young persons. Be moderately physically active at least 60 minutes daily (CDC, 1997a; Health Education Authority, 1998). Further, the committee recommends limiting television watching and playing sedentary video or computer games, based on the findings of Andersen and colleagues (1998) described earlier. Although computer games and videos were not mentioned in this report, they are sedentary activities that are similar to watching television.

Content of the New Guideline

The text of the new guideline provides examples of moderate physical activity for adults, children, and adolescents. It lists health benefits of regular physical activity, distinguishes between aerobic activities and those for strength and flexibility, summarizes relationships between physical activity and nutrition, and gives examples of how to make physical activity a regular part of one’s lifestyle. The content of the guideline is consistent with national and

international recommendations (CDC, 1997a; Mazzeo, et al., 1998; NIH, 1998; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health; Pate, et al., 1995; Pollock and Evans, 1999; Pollock et al., 1998; U.S. DHHS, 1996, 1998). The guideline promotes moderate daily physical activity, aerobic activities, and activities for strength and flexibility. The relationship between physical activity and weight maintenance is carried forward from the 1995 Dietary Guidelines and elaborated upon. Brief guidance is provided about precautions when increasing physical activity.

Let the Pyramid Guide Your Food Choices

Guideline

The committee recommends changing the wording of this guideline from “Eat a variety of foods” to “Let the Pyramid guide your food choices.” The change was based on three lines of evidence.

First, a key concept to be captured by the guideline is to ensure nutritional adequacy. Following the Food Guide Pyramid, by design, promotes nutrient adequacy (Welsh et al., 1992), and the Pyramid was an integral part of the variety guideline in 1995 for this reason. Research has shown that if variety is interpreted as choosing foods from all the Pyramid food groups (between-group variety), nutrient adequacy is improved (Kant et al., 1999; Krebs-Smith et al., 1987). However, no evidence could be located that demonstrated that choosing a variety of foods within selected Pyramid food groups (within-group variety) promoted, much less ensured, nutritional adequacy. Only one report (Krebs-Smith et al., 1987) was found that examined the separate effects of within-group variety and between-group variety using national survey data. These authors reported only a minor effect of variety within groups after controlling for variety between groups. As a result, the committee concluded that the guideline needed to be more specific about advice given to consumers, and that a specific recommendation to use the Food Guide Pyramid as a guide was more scientifically justified than the broader recommendation to eat a variety of foods.

The second concern addressed by the committee was that advice to consume a variety of foods might promote overconsumption of energy. As people eat a greater variety of foods, they tend to eat more food and thus may be at greater risk of overconsumption. Earlier work from controlled feeding studies has shown that more food is eaten at a meal if a variety of foods is available than if the selection is more limited (Rolls, 1985). A recent observational study (McCrary et al., 1999) examined a possible association of within-group dietary variety and overconsumption. This analysis showed that within-food-group variety was strongly correlated with energy intake. Furthermore, variety within most food groups was also associated with body fatness,

with the exception of the consumption of a variety of vegetables, which was inversely associated with fatness. A study of diets in France also found a positive association of overall dietary variety and energy intake (Drewnowski et al., 1996). In a seeming contradiction, a study of U.S. diets did not find an association of variety with energy intake (Drewnowski et al., 1997). However, these authors noted that their definition of variety was heavily biased in favor of vegetables and fruit, which further supports the concept that a variety of these foods may not be associated with overconsumption of energy.

A third consideration by the committee was that the 1995 variety guideline was not clear to consumers. Several respondents in focus groups indicated that they viewed the variety guideline as a license to consume foods that may not be considered healthy choices (Prospect Associates, 1998). For example, one woman suggested that variety could mean different candy bars, and another felt that people would consider pizza, ice cream, and cake an appropriate variety of foods. In contrast, another focus group study noted that many respondents said the Food Guide Pyramid was the most useful part of the Dietary Guidelines (Systems Assessment & Research, Inc., 1999). Thus, it appears that the focus on variety in the 1995 guideline is too vague to guide consumers to take specific actions. There are no definitions of variety (e.g., whether different forms of the same food qualify), or of a desirable level of variety (e.g., how many different foods should be consumed in a given time period). The committee felt that this lack of specificity detracts from the usefulness of the variety guideline for consumers. If the focus of the text of the 1995 guideline was to encourage consumers to follow the Food Guide Pyramid, then naming the Pyramid in the guideline retains and clarifies this intent. Furthermore, the Pyramid is widely recognized by consumers and is already the core of many nutrition education activities.

Despite the proposed change in the title of the guideline, the committee recommends that the text continue to promote variety within the Pyramid food groups, especially within the grain, fruit, and vegetable groups. The committee concluded that there is merit in this recommendation within the context of following all the Dietary Guidelines. As noted by previous committees, dietary variety promotes enjoyment of food, and there is evidence that consumption of a variety of low-energy foods like fruits and vegetables does not promote overconsumption of energy.

Introductory Paragraph

The text for the first paragraph introduces the Food Guide Pyramid and is similar to the previous edition. The heading regarding varying foods has been omitted as it is not relevant to the reworded guideline.

Use Plant Foods as the Foundation of Your Meals

The committee proposes changes to increase the emphasis on plant foods and on whole grain foods within the grains group (see Grains Guideline).

Keep an Eye on Servings

A new section title is proposed to increase the emphasis on the importance of serving sizes and numbers. The first paragraph in this section refers to Box 7, now named “How Many Servings Do You Need Each Day?” The revised section clarifies that mixed dishes may contain foods from more than one food group (previously covered in “Advice for Today.”) The paragraph heading “What counts as a serving?” has been deleted, but the content has been retained and reference is made to box 8, which has that title. The heading “Choose different foods within each food group” has been deleted also. In this case, the content previously under that heading has been revised to be more specific.

There Are Many Healthful Eating Patterns

The committee proposes this heading for the section previously called “What about vegetarian diets?” to make it clearer that many different eating styles can provide adequate nutrition. The change makes the information more suitable for members of groups who avoid dairy products and/or most meats as a part of their cultural heritage and do not necessarily think of themselves as vegetarians. The text under the heading has been revised with these considerations in mind.

Growing Children, Teenagers, Women, and Older Adults Have Higher Needs for Some Nutrients

The committee recommends adding older adults to the list of age groups having higher nutrient needs. The new recommended calcium intake for those ages 51 and older is nearly as high as that for teens (IOM, 1997). The recommended vitamin D intake for those ages 51 through 70 is two times higher than that for younger age groups. For those ages 71 and older, it is three times higher (IOM, 1997).

Check the Food Label Before You Buy

The committee recommends changing the heading previously called “Enriched and fortified foods have essential nutrients added to them” and making the corresponding text more actionable. The section now provides guidance on finding information about added nutrients and provides guidance for using the Nutrition Facts Label.

Some People Need a Vitamin-Mineral Supplement

The heading for this section has been changed to reflect recommendations from the National Academy of Sciences (IOM, 1990, 1991, 1992a, 1997, 1998; NRC, 1989) concerning certain vitamin and mineral supplements.

The first paragraph has been revised to correspond with new recommendations from the Institute of Medicine (IOM, 1997, 1998). (See above regarding vitamin D.) For adults ages 51 and older, it is recommended that a majority of the Recommended Dietary Allowance for vitamin B₁₂ be obtained in the crystalline form, as from fortified food or a supplement (IOM, 1998). The Institute of Medicine recommends that folic acid from fortified food or supplements be used by women capable of becoming pregnant to reduce risk of a neural tube defect-affected pregnancy (IOM, 1998).

The third paragraph clarifies that the term *dietary supplements* now includes herbal products and other substances beyond vitamins and minerals, consistent with the Dietary Supplement Health and Education Act of 1994 (PL 103-417).

Advice for Today

The text now emphasizes the five major food groups of the Food Guide Pyramid (the 1995 text of “Advice for Today” highlighted six, distinguishing protein-rich plant foods from protein-rich animal foods).

Figure 3: How to Read a Food Label

The committee suggests using the new figure developed by the Food and Drug Administration (FDA) for educational purposes. The accompanying text defines how to tell if a food is high or low in a nutrient, using guidelines suggested in FDA educational materials.

Box 7: How Many Servings Do You Need Each Day?

The committee suggests using a box similar to that included with the Food Guide Pyramid (USDA, 1992), but with additions to encourage selection of low-fat dairy foods and lean meats and to discourage selection of other sources of saturated fats and added sugars. This makes the box more consistent with the rest of the Dietary Guidelines. Other minor changes make the box more consistent with new Dietary Reference Intakes for calcium (IOM, 1997).

Box 8: What Counts As A Serving?

The committee recommends specifying *lean* meat. It suggests adding three soy foods and adding notes regarding (1) the differences in portion sizes specified by the Food

Guide Pyramid and the Nutrition Facts Label and (2) lactose-reduced dairy products.

Box 9: Some Sources of Calcium

Minor changes are suggested for readability and to ensure that foods are listed in approximately descending order of calcium content per serving. To be included in the list, foods must usually provide at least 10 percent of the Daily Value (DV) for the serving size specified in Box 8. Calcium-fortified juice, soy-based beverage with added calcium, and breakfast cereal with added calcium have been added to the list of choices; and a note has been added to make it clear that lactose-free and lactose-reduced dairy products provide calcium.

Box 10: Some Sources of Iron

Emphasis on lean meat and poultry is incorporated in the list, and the very high cholesterol foods and high sodium foods are identified. Some of the foods in the list have been changed based on a cut-off point of 10 percent of the DV for iron for servings of the size specified in Box 8. However, enriched and whole grain breads were retained even though a slice of bread provides only 4–5 percent of the DV; because these foods are consumed frequently, they are important sources of iron.

Choose a Variety of Grains Daily, Especially Whole Grains

Guideline

The committee recommends that the 1995 guideline “Choose a Diet with Plenty of Grain Products, Vegetables, and Fruits” be split into two separate guidelines. Splitting the 1995 guideline serves several purposes: it increases attention to grains as distinct from vegetables and fruits, it simplifies the messages, and it helps make clear that there are distinct advantages of the two broad categories of plant foods. Americans come much closer to achieving recommended intakes of grains and vegetables than of fruits (Cleveland et al., 1997). Those who do not meet the recommendation for either grain or fruit intake (approximately 75 percent of the population from the 1989–1991 Continuing Survey of Food Intake by Individuals, CSFII) are likely to have excessive fat intake and lower than recommended fiber intake (Krebs-Smith et al., 1997). Splitting grains from fruits and vegetables should foster better implementation of both guidelines.

Because the recommended intake of calories from grains exceeds that of vegetable and fruits, the committee continues to place the guideline on grains before the guideline for fruits and vegetables.

The committee proposes that variety be emphasized in the grains guideline because of substantial differences in the

nutrient content of different grains. For example, when the nutrient content of 100 grams of dry grain is expressed as a percentage of the Daily Value used on food labels, iron content ranges from 8.2 percent for brown rice to 26.2 percent for oats; dietary fiber content ranges from 14 percent for brown rice to 69 percent for barley; zinc content ranges from 12 percent for cornmeal to 26 percent for oats, and thiamin content ranges from 21 percent for rye to 51 percent for oats (Center for Nutrition Policy and Promotion, U.S. Department of Agriculture, analysis using data from USDA Nutrient Database for Standard Reference, Release 12, June 1999).

The committee recommends that the phrase “especially whole grains” be added for two major reasons:

- (1) Recent research has found that people who consume higher amounts of whole grains have a lower risk for cardiovascular disease, and possibly some forms of cancer, than do people who have a low intake of whole grains (see section “Why choose whole grains?”). This apparently beneficial association of a dietary pattern higher in whole grains is related to factors distinct from their fiber content (Jacobs, Meyer et al., 1998b).
- (2) Intake of whole grains is very low in the United States. A survey of 4,000 U.S. households (demographically matched to U.S. census data on five variables) indicates that the intake of whole grain products averages only about one-half serving per person per day (Albertson and Tobelmann, 1995). A somewhat higher average (one serving per day) was obtained using data from the 1994–1996 CSFII (Food Surveys Research Group, 1999) for all individuals over age 2 years.

Introductory Paragraph

The committee recommends clarifying what grains and whole grains are and briefly explaining the emphasis on variety. The health benefits of grains are now more correctly linked with the consumption of plenty of whole grains (Jacobs et al., 1999), as discussed below.

Why Choose Whole Grain Foods?

Since recent scientific evidence strengthens the concept that whole grain intake may provide health benefits by decreasing the prevalence of coronary heart disease (Jacobs, Meyer et al, 1998; Liu et al, 1999; Pietinen et al., 1996a; Rimm, Ascherio et al., 1996) and possibly some types of cancer (Chatneoud et al., 1998; Jacobs, Jr. et al., 1995; Jacobs, Marquart et al., 1998a; Tavani et al., 1997b), the committee recommends increasing the emphasis on whole grains. Substitution of whole for refined grain may be associated with reductions in a spectrum of chronic disease risks (Jacobs et al., 1999). Recent large prospective association studies have provided evidence for substantial reductions in heart disease risk associated with dietary patterns characterized by high intake of whole grain intake in both men and women in the United States and abroad (Jacobs,

Meyer et al, 1998; Jeppesen et al., 1997; Liu et al, 1999; Pietinen et al., 1996b; Rimm, Ascherio et al, 1996). Intake of whole grains along with fruits and vegetables also may reduce risk of hypertension (Appel et al., 1997). In general, risk reduction in the cited studies was associated with higher levels of whole grain intake and could not be explained by adjustments for fiber intake. This suggests that components of whole grain nutrients other than fiber help reduce risk for coronary heart disease (e.g., Jacobs, Meyer et al., 1998).

Several case-control studies have suggested lower risk with high (vs. low) whole grain intake for colorectal, gastric, and endometrial cancers—and likely other cancers as well (Chatneoud et al., 1998; Jacobs, Jr. et al., 1995; Jacobs, Marquart et al, 1998; Liu, 1998; Tavani et al., 1997a; Witte et al., 1996). Again, beneficial effects appear to be due to a number of components in whole grains, not only fiber. In all these studies, the risk reduction associated with higher intake of whole grains (within the usual range of intakes) appeared to be continuous and without an apparent threshold. Given the current low intake of whole grain products in the general population, increasing the frequency of consumption of whole grains should be quite feasible and, if achieved, may result in substantial reductions of the risks of different chronic diseases. Diets high in whole grain foods also may help avoid excessive energy intake because they tend to be of low energy density (Rolls and Hill, 1998).

Specific mechanisms that explain the associations of higher intakes of whole grains with reductions in chronic disease risk are not defined well. It has been postulated that fiber and other components in whole grains—such as resistant starches, antioxidants (e.g., trace minerals, vitamins, and phenolic compounds), and phytochemicals—could contribute to the putative protective effects (Slavin et al, 1999). More research is needed to identify better how individual components of whole grains interact with biological pathways to slow chronic disease progression. Because whole grains contain a number of components putatively linked to diminishing the activity of harmful cellular pathways, it is probable that multiple mechanisms could be involved in their protective effects.

The committee considered whether or not increasing the intake of whole grains at the expense of enriched, folate-fortified refined grains would decrease the intake of some micronutrients (e.g., iron, folate, zinc) to undesirably low levels. Analyses of dietary patterns using 1994–1996 CSFII composites show that substituting three servings of whole grains for three servings of enriched, folate-fortified refined grains would not adversely affect nutrient intake levels (USDA, Center for Nutrition Policy and Promotion. Unpublished analysis of CSFII 1994-96 intake data, 1999).

Enriched Grains Are a New Source of Folic Acid

This new heading and the revised text point out health advantages of folate intake and that folic acid now is added to enriched grains. In addition to its demonstrated role in the reduction of neural tube defects, a number of studies show that higher intakes of folic acid lower plasma levels of homocysteine, a risk factor for atherosclerosis (e.g., Malinow et al., 1998), and may reduce the risk of coronary heart disease (Rimm et al., 1998) and possibly certain cancers (Giovannucci et al., 1998; Slattery et al., 1999; Stolzenberg-Solomon, et al., 1999). These advantages of enriched grains add support to the recommendation to choose a variety of grains.

Advice for Today

This replaces part of Box 9 and the very short “Advice for Today” section, expanding on the information that is provided about grains. This section reemphasizes eating appropriate numbers and sizes of servings and the inclusion of several servings of whole grains daily.

Box 11: How to Increase Your Intake of Whole Grain Foods

The box has been added to help consumers identify and choose whole grain foods.

Figure 4: Sample Ingredient List for a Whole Grain Food

The committee suggests adding this figure to illustrate how to determine if a food contains a substantial quantity of whole grains. The committee recommends that the term “whole wheat flour” be circled or otherwise highlighted in the figure in the consumer publication.

Choose a Variety of Fruits and Vegetables Daily

Guideline

As discussed under the preceding guideline on grains, the committee recommends that the former guideline “Choose a Diet with Plenty of Grain Products, Vegetables, and Fruits” be split into two separate guidelines. This new guideline focuses attention on fruits and vegetables—two food groups for which few Americans meet intake recommendations (Krebs-Smith et al., 1995). Because barriers to the consumption of fruits and vegetables are different from those for grains (i.e., perishability, appropriate methods of storage and preparation, cost), it was felt that more specific focus and guidance might result in the increased intake of these foods. Fruits are listed before vegetables since fewer people meet the recommended intake of fruits than of vegetables (Food

Surveys Research Group, 1999). The revised wording of the guideline reinforces the message of variety within the fruit and vegetable groups (see discussion below); and it avoids the use of the word “diet,” which many consumers consider to be suggestive of restrictions (Systems Assessment and Research, Inc., 1999).

Introductory Paragraph

Potential health benefits from the consumption of fruits and vegetables are identified. With regard to cardiovascular disease, support is summarized in two reviews of human studies (Law and Morris, 1998; Ness and Powles, 1997). The majority of studies that have addressed the issue, either directly assessing fruit and vegetable intake or using surrogate measures of intake (marker nutrients), have suggested that dietary patterns high in fruits and vegetables are associated with a decreased risk of developing cardiovascular disease. Those studies include 6 ecological studies (Armstrong et al., 1975; Artraud-Wild et al., 1993 [folate only]; Bellizzi et al., 1994; Crombie et al., 1990; Gramenzi et al., 1990; Pietinen et al., 1996b), 12 prospective studies (Fehily et al., 1993; Gale et al., 1995; Gaziano et al., 1995; Hertog et al., 1993 [apples]; Joshipura et al., 1999; Knekt et al., 1994 [men only]; Knekt et al., 1996; Kushi et al., 1996; Menotti et al., 1999; Pandey et al., 1995; Rimm et al., 1993 [beta-carotene, smokers only]; Rimm et al., 1995), and 6 case-controlled studies (Gale et al., 1995; Gaziano et al., 1995; Gillman et al., 1995; Khaw and Barrett-Connor, 1987; Lee et al., 1989; Tavani et al., 1997). Those showing no relationship between fruit and vegetable intake and incidence of cardiovascular disease include two ecological studies (Artraud-Wild et al., 1993 [vitamin C and potassium only]; Tzonou et al., 1993), four prospective studies (Gillman et al., 1995; Knekt et al., 1994 [women only]; Lapidus et al., 1986; Rimm et al., 1993 [vitamin C only]; and three case-control studies (Barer et al., 1989; Enstrom et al., 1992; Lapidus et al., 1986;).

Many case-control studies indicate that dietary patterns high in fruits and/or vegetables, or that intakes of selected fruits or vegetables, are associated with a lower incidence of certain kinds of cancer (Agudo et al., 1997; Hertog et al., 1996; Levi et al., 1998; Lindblad et al., 1997; Michaud et al., 1999; Nyberg et al., 1998; Pillow et al., 1997; Schuurman et al., 1998; Slattery, Potter et al., 1997b [along with whole grains]; Terry et al., 1998; Witte et al., 1996. Other investigators (Botterweck et al., 1998; Verhoeven et al., 1997) have found no association of fruit and vegetable intake with the incidence of specific types of cancer. The majority of the evidence supports an inverse relationship between fruit and vegetable intake and the incidence of certain cancers.

A recent trial designed to assess the effect of increasing fruit and vegetable intake on blood pressure with and without increasing non-fat dairy products concluded that

increased intake of fruits and vegetables was associated with decreased blood pressure (Appel et al., 1997).

Why Eat Plenty of Different Fruits and Vegetables?

This paragraph is a simplification of the 1995 paragraph “Plant foods provide a variety of vitamins and minerals essential for health.” Specific nutrients highlighted in the paragraph were chosen because they are the ones for which fruits and vegetables are considered major sources in the diet.

Aim for Variety

This proposed new section focuses on variety. It has long been documented that different types of fruits and vegetables differ widely in their content of nutrients. The U.S. Department of Agriculture (USDA) recognizes this in reports on fruit and vegetable intake, in which seven categories of vegetables and two categories of fruits are used. More recently, attention has been directed to the various plant sources of non-nutritive substances that may have a role in health promotion (see review by Steinmetz and Potter, 1996, for example.) Until more is known about specific nutrients or other food components in relation to health, encouraging variety in fruit and vegetable intake promotes the intake of a broad range of nutrients and non-nutritive food components. One large population-based case-control study (Slattery, Berry et al., 1997a) suggests that women with the most diverse pattern of vegetable intake were at lower risk of colon cancer than were women with the least diverse pattern.

This section of the text also makes it clearer that fruits and vegetables with long shelf lives (canned, frozen, etc.) are good choices. In focus groups, consumers have indicated that it is difficult to have plenty of fruits and vegetables since they don't keep well (Communication on Dietary Fats Qualitative Research, 1998).

Find Ways to Include Plenty of Fruits and Vegetables in Your Meals and Snacks

The committee proposes the addition of this new section to provide concrete suggestions for using fruits and vegetables, making the guideline more actionable.

Advice for Today

Compared with the 1995 version, this section has been expanded slightly, especially with regard to desirable choices of fruits and vegetables.

Box 12: Which Fruits and Vegetables Provide the Most Nutrients?

This listing replaces boxes 7, 8 and 14 in the 1995 version and includes encouragement to choose some of the listed fruits and vegetables daily. The information in the box is expanded to include good sources of vitamin C.

Consumption of most of the listed fruits and vegetables is very low, on average, in the United States (Food Surveys Research Group, 1999).

Keep Food Safe to Eat

Basis for the New Guideline

The committee recommends the adoption of an additional guideline: “Keep Food Safe to Eat.” The committee views the inclusion of this guideline as a step in unifying and strengthening the focus of the Dietary Guidelines on actionable measures that can be taken by consumers and public officials to keep Americans healthy. That is, the guideline could assist them to make wise food choices and improve their dietary practices. Also, the Dietary Guidelines for Americans are used as a policy blueprint for federal, state, and local public health efforts. At the federal level, food safety has a more explicit focus than ever before in the proposed Year 2010 Objectives for Promoting Health and Preventing Disease (U.S. DHHS, 1998).

Ensuring that food is safe and wholesome is a major responsibility of state and local public health departments and of food handlers in eating establishments and in the home. Existing Dietary Guidelines do not mention food safety. This is an unfortunate omission since only consumers themselves are able to ensure safety once they obtain food. Therefore, the addition of a Dietary Guideline on food safety complements existing measures at other points in the food supply chain. Keeping food safe is a critical element in ensuring that Americans know what and how to eat to stay healthy.

There is a legal basis for considering foodborne illness as an eating-related problem about which Americans need guidance. PL 101-445 Section 3 instructs the relevant Executive Branch departments that the publication *Dietary Guidelines for Americans* shall contain nutritional and dietary information and guidelines for the general public. They are to be based on the preponderance of current scientific and medical knowledge. The President’s Council on Food Safety, publications of the Institute of Medicine (IOM, 1992b, IOM/NAS, 1998), the proposed Year 2010 objectives of the U.S. DHHS (1998), articles in the peer reviewed literature (Beuchat et al., 1998; Daniels, 1998; Kapperud et al., 1996; Lindsay, 1997; Payment et al., 1997), publications of the CDC (CDC, 1999), and guidelines of the Food and Agriculture Organization (FAO, 1998b) state that information on foodborne illness is basic information that consumers need, want, and can benefit from.

The text of the proposed guideline covers the following topics:

- *Healthy eating requires that food be safe.* Consumers are one of the many groups that must be involved in the process of ensuring food safety. Other groups include

commercial producers, manufacturers, and food preparers.

- *Foodborne illness is a major preventable public health problem in the United States, and it may be increasing.* Some of the causes of these increases occur between either picking or purchase and consumption and are under the consumer’s control. Therefore, foods must be handled safely from the garden or market to the table.
- *Consumers can apply simple food handling practices to minimize their risk of foodborne illness.* These practices complement safe food handling practices at other points in the food safety chain.

The scientific basis for covering each topic is given below.

Healthy Eating Requires That Food Be Safe. There are many hazards along the food chain from production to market. Those who commercially raise, produce, process, or prepare food have a legal obligation and duty to keep foods safe. Fulfilling their responsibilities is critical, since the sources of much foodborne illness arise before foods reach the market or food service operations outside the home (IOM/NAS, 1998). The Hazard Analysis and Control Point (HAACP) approach to keep foods safe is essential, as are other programs to minimize pre-market food hazards (Ralston, 1999). Safe preparation by food preparers in eating establishments is especially important since consumption of food away from home is rising in the United States (Lin et al., 1999).

Many foods have the potential to cause foodborne illness if they are handled incorrectly. Some foodborne illnesses, such as staphylococcal food poisoning and salmonellosis, are acute. They occur after a one-time intake of enough toxins or microorganisms to cause illness. Other foodborne illnesses have long-term effects and complications. For example, hemolytic uremic syndrome is a serious complication caused by *E. coli* O157H7; and chronic joint diseases can follow campylobacteriosis, *E. coli* enteritis, salmonellosis, shigellosis, and yersinosis (FSIS, 1997a; Lindsay, 1997).

Everyone is at risk from eating unsafe food, but foodborne illness is a special hazard for vulnerable individuals including pregnant women, the elderly, the very young, the many people who are being treated with immunosuppressive medications, those infected with HIV, and others who are immunocompromised. Vulnerable individuals become ill more readily, and foodborne illness is more serious and more likely to lead to death of vulnerable persons than of healthy persons. Foods that can transmit listeriosis or toxoplasmosis pose especially severe risks for pregnant women and their fetuses.

In the United States, bacteria are the major cause of the foodborne illnesses that have been identified by current

surveillance for foodborne illness outbreaks (Bean et al., 1996). Underreporting of foodborne illness is considerable, because the reporting system is passive and largely depends on the affected individuals seeking help for their illnesses. Many such illnesses go unrecognized. At least four factors are necessary for bacterial foodborne illness to occur: (1) bacterial cells or spores; (2) a food vehicle; (3) conditions that allow bacteria to survive, reproduce, or form a toxin; and (4) a susceptible person who ingests enough of the bacteria or toxin to cause illness. Perishable foods such as eggs, meats, poultry, fish, shellfish, and milk can harbor bacteria and are the most common sources of problems. If fruits, vegetables, or grains are contaminated, they also can become a source of risk. Contamination of one food by another spreads the risk.

In addition to considering problems caused by microorganisms, the committee considered food safety issues such as pesticide residues, genetically altered foods, parasites, contamination with filth, additives, and dangers in undefined food supplements. Although these risks were judged as also having merit for inclusion in the proposed guideline, the documented prevalence of these food safety problems is very much less than that of illness caused by microbes (Bean et al., 1996); and few steps are available to consumers to address the nonmicrobial problems. The current regulatory system appears adequate to address concerns about exposure to pesticide residues in food. Some contamination with filth and pesticides can be decreased by appropriate cleaning and handling of fruits, vegetables, and sprouts before, as well as after, they are purchased.

Foodborne Illness Is a Major Preventable Public Health Problem in the United States, and It May Be Increasing. The number of reported cases of foodborne illness, around 15,500 per year, is believed to represent a very small fraction of the total number of cases (CAST, 1994; CDC, 1998). Most cases of foodborne illness do not come to the attention of health providers, are not diagnosed, or are not reported to public health authorities even if diagnosed. Thus, the actual number of occurrences of foodborne illness can be estimated only roughly. One such estimate is 6.5 to 33 million illnesses yearly (U.S. GAO, 1996). Even the most conservative estimates are troubling and represent a considerable burden of illness. CDC workers (Bean et al., 1996) found that 18 percent of outbreaks reported in its surveillance system from 1988–1992 occurred at home; either from foods prepared at home or convenience and take-out foods eaten at home. The estimated costs in lost productivity of Americans ranges between \$20 billion and \$40 billion yearly (Buzby et al., 1996; FDA, USDA, EPA and CDC, 1997). It is not known to what extent factors under consumers' control contribute to the incidence and costs of foodborne illness. However, recent observational surveys by the CDC show that high-risk food handling, preparation, and consumption behaviors are common among both consumers and food handlers (Yang et al., 1998). Additionally, two observational studies

(Altekruse et al., 1999; Daniels, 1998) indicate that improved practices are needed in many U.S. homes. Unsafe food consumption and preparation practices have been linked with congenital toxoplasmosis in pregnant women, which causes blindness in the fetus (Kapperud et al., 1996).

The problem of foodborne illness may be increasing because of an increase in the number of vulnerable individuals, the emergence of more virulent pathogens, and perhaps the introduction of new hazards through the increasingly global nature of the food supply and the centralized nature of the food distribution system (IOM, 1992b). Even without an increase in the actual number of cases, the number of reported cases is expected to increase because of improvements in reporting systems. National monitoring and surveillance of foodborne disease are coordinated by the CDC Food Net and by the National Alert and Response Monitoring System. Other offices of the CDC, the Food Safety and Inspection Service of USDA, and FDA provide technical assistance.

Consumers Can Apply Simple Food Handling Practices to Minimize Their Risk of Foodborne Illness. Efforts to keep food safe and reduce the risk of foodborne illness can be made whenever and wherever food is handled or stored for example, during food production, distribution, and preparation in eating establishments or at home. Consumers can keep foods safe by taking steps to destroy microorganisms and other pathogens that are in the food at the time of purchase, preventing contamination of food with microorganisms, and preventing their growth in foods within the home. Most steps taken to keep food safe from harmful bacteria also reduce risks from other organisms. Preventive measures to minimize bacterial foodborne illnesses are easy to learn and apply. These include thorough cooking of foods to destroy harmful bacteria, using thermometers to check the temperature of cooked animal foods (FSIS, 1997b), using refrigerators and freezers to store foods, keeping raw and cooked foods separate, thorough cleaning of hands and other objects and surfaces that come in contact with food, and holding and storing foods at safe temperatures.

Content of the New Guideline

The new guideline contains seven simple messages targeted to actions that consumers can take whenever they are preparing, serving, and storing food:

- Clean. Wash hands and food surfaces often.
- Separate. Separate raw, cooked, and ready-to-eat foods while shopping, preparing, or storing.
- Cook. Cook foods to a safe temperature.
- Chill. Refrigerate perishable foods promptly.
- Follow the label.

- Serve safely.
- If in doubt, throw it out.

Each of the messages in the proposed guideline is consistent with well-established principles of microbiology and sanitation (CAST, 1994; IOM, 1992b). These are messages that have long been used by the USDA to teach food safety. The first four messages (clean, separate, cook, chill) are essentially identical to the FightBAC! messages of the Partnership for Food Safety Education. The FightBAC! messages were developed from the consensus of food safety experts and have been tested for consumer comprehension. The last three messages in the proposed guideline (“Follow the label;” “Serve safely;” and “If in doubt, throw it out”) provide additional guidance to ensure that food will be safe and wholesome. Each message is easy to understand and follow. The proposed text identifies the groups of people who are most vulnerable to foodborne illness because they or those who care for them need to pay special attention to safe food handling.

Choose A Diet That is Low in Saturated Fat and Cholesterol and Moderate in Total Fat

Guideline

The 1995 recommendation stated “Choose a Diet Low in Fat, Saturated Fat, and Cholesterol.” The committee recommends changing the wording of the guideline to place greater emphasis on reducing intake of saturated fat and cholesterol. This recommendation is based on strong scientific evidence that high intakes of saturated fat and cholesterol contribute to the development of coronary heart disease. The committee concluded that the scientific evidence does not support assigning first priority to a diet low in total fat. In fact, changing perceptions of what constitutes a “low fat diet” led the committee to recommend a diet *moderate* in total fat. This change in wording accords better with the recommended numerical intake of total fat. Throughout the guideline, emphasis is placed on food choices that will assist consumers to achieve a lower saturated fat intake.

Introductory Paragraph

As in the 1995 version, the introductory paragraph identifies both positive and negative health aspects of dietary fat. The text concerning current fat intake is updated (although the percentage of energy from fat in the American diet has fallen, total fat intake is not lower than in the recent past [Anand and Basiotis, 1998]). This paragraph continues to point out that high intakes of fat potentially contribute to overconsumption of energy. Because relationships between fat intake and cancer are inconclusive and currently under investigation, they are deleted. The putative cancer-fat intake relationship is discussed later in this rationale.

Choose Foods Low in Saturated Fat and Cholesterol

The committee recommends replacing the sections “Foods high in fat should be used sparingly” and “Choose a diet low in fat” with a section that focuses mainly on foods low in saturated fat. This is consistent with the greater emphasis on saturated fat. For ease of application by the consumer, the committee suggests addressing both saturated fat and cholesterol in the information on food choices. The guidance is consistent with the recommendation of the National Cholesterol Education Program (1994) that all Americans eat a diet containing 8 to 10 percent of energy from saturated fat. Saturated fat is not required for human health, and no lower limit of saturated fat intake has been identified. The scientific foundation for the relationship between dietary saturated fats and coronary heart disease consists of multiple lines of evidence.

Many years of epidemiological research have shown that populations consuming diets high in saturated fats have relatively high levels of serum cholesterol and carry a high prevalence of coronary heart disease (Kagan, et al., 1974; Keys, 1970; Kromhout et al, 1984; Kushi et al., 1985; Marmot et al., 1975; McGee, et al. 1984, 1985; Shekelle et al. 1981; Worth et al., 1975). This relationship continues to be observed in more recent epidemiological studies (Caggiula and Mustad, 1997; Esrey et al. 1996; Hu et al. 1997; Kromhout et al., 1996; Pietinen et al, 1996; Singh et al., 1998).

Research in experimental animals shows that saturated fats raise the serum cholesterol levels and produce atherosclerosis (Goldsmith and Jacob, 1978; Rudel et al., 1995; Rudel, 1997; Strong et al., 1994; Wissler et al., 1983). Reports from many earlier clinical investigations document that saturated fats raise serum cholesterol levels (Bonanome and Grundy 1988; Denke and Grundy, 1991, 1992; Grundy 1986; Grundy and Denke, 1990; Mattson and Grundy, 1985; Mensink and Katan, 1989; 1992; Zock et al., 1994). Further abundant evidence in both animals (Ishibashi et al. 1994; Kita et al., 1981; Kushwaha and McGill, 1998) and humans (Kannel, et al. 1971; Law et al, 1994; The Pooling Project Research Group, 1978; Stamler et al, 1986) documents that high levels of serum cholesterol, particularly low density lipoprotein (LDL) cholesterol, promote the development of atherosclerosis and predispose to coronary heart disease. Controlled clinical trials show that lowering LDL-cholesterol levels will reduce the risk for coronary heart disease significantly. These results provide convincing confirmation that LDL cholesterol is a direct cause of coronary heart disease (Brown, et al., 1993; Downs et al., 1998; Lipid Research Clinics Program, 1984; The LIPID Study Group, 1998; Sacks et al., 1996; Scandinavian Simvastatin Survival Study Group, 1994; Shepherd et al., 1995).

In the past 5 years, the concept has become accepted widely that lowering LDL cholesterol by virtually any safe means will reduce the risk for coronary heart disease (Gould et al., 1998). Reducing serum cholesterol levels by dietary means has been shown to be effective in decreasing the risk for coronary heart disease. The most definitive evidence comes from a meta-analysis by Gordon (1995a,b) of six dietary trials, in aggregate including 6356 patients (Dayton et al., 1968; Leren, 1966; Research Committee to the Medical Research Council, 1968; Watts et al. 1992; Woodhill et al., 1978). This analysis revealed that lowering serum cholesterol levels by decreasing intakes of saturated fats achieved a statistically significant 24 percent decrease in the incidence of coronary heart disease. In addition, reducing saturated fat intake produced a trend towards a decrease in coronary mortality (21 percent) and total mortality (6 percent). In these trials, non-cardiovascular mortality did not increase with diets low in saturated fats. The results of these dietary trials (Gordon, 1995a,b), which are augmented by controlled clinical trials with cholesterol-lowering drugs (Gould et al., 1998), strongly support the committee's conclusion that reducing serum cholesterol by decreasing the intake of saturated fats will lower the risk for coronary heart disease.

The committee suggests changes in the booklet to make it easier for the consumer to understand how to lower intake of saturated fat. The initial focus is on the selection of types of food that are low in both saturated fat and cholesterol. Then the consumer is told about using Box 17 if more flexibility in food choice is desired. Because the calculation of fat gram limits is complicated, the committee recommends deleting the description of the calculation method that appeared in the 1995 booklet.

With this section and Box 15, the previous section "Choose a diet low in cholesterol" would be redundant. The committee supports the 1995 recommendation that Americans should limit intake of dietary cholesterol and specifies 300 mg per day a value that is consistent with the recommendations of authoritative bodies (National Cholesterol Education Program, 1994).

Keep Fat Intake Moderate

This paragraph addresses total fat intake and reiterates the point that cutbacks should be made largely in intake of saturated and *trans* fats. A notable change from the 1995 recommendation is the placement of total fat after that of saturated fat and cholesterol in the guideline. The current committee concluded that the 1995 recommendation carries the danger of turning attention away from the primary offender, saturated fat, and towards total fat, where the evidence of causality of chronic disease is less conclusive.

Dietary data show parallel decreases in fat and saturated fat as a percentage of energy over the past 5 years. Saturated fat intake decreased from 12 to 11 percent and total fat

intake decreased from 34 percent to 33 percent of calories (U.S. DHHS, 1999). If intakes of foods high in saturated fats are reduced, there likely will be some decrease in absolute intake of total fat. A greater decrease in absolute intake of saturated fat would be expected with a focus on saturated fat. Such a decrease likely also would result in a reduction in the percentage of energy intake provided by total fat.

The proposed change in terminology from *low* to *moderate* represents the committee's view that a change in perception has occurred in the meaning of these two terms with respect to total fat. This change is not accompanied by a change in the numerical recommendation (30 percent) for the maximum percentage of energy provided by fat. In part, this change represents a growing view that recommendations for low-fat diets could lead to a less healthy ratio of unsaturated fat to carbohydrates in the American diet. However, it may be anticipated that the change in terminology from *low* to *moderate* may be perceived as less restrictive by allowing total fat to approach the 30 percent level. In the discussion to follow, the term *high fat* refers to total fat intake of approximately 40 percent of calories, *moderate fat* to approximately 30 percent, and *low fat* to approximately 20 percent.

There has been a long-standing belief among experts in nutrition that low-fat diets are most conducive to overall health. This belief is based on epidemiological evidence that countries in which very low fat diets are consumed have a relatively low prevalence of coronary heart disease, obesity, and some forms of cancer. For example, low rates of coronary heart disease have been observed in parts of the Far East where intakes of fat traditionally have been very low (Xie et al., 1998). However, populations in these countries tend to be rural, consume a limited variety of food, and have a high energy expenditure from manual labor. Therefore, the specific contribution of low-fat diets to low rates of chronic disease remains uncertain. Particularly germane is the question of whether a low-fat diet would benefit the American population, which is largely urban and sedentary and has a wide choice of foods.

Largely because of cross-cultural comparisons of fat intakes and body weight, one persistent concern on the part of many investigators is that a higher percentage of energy from dietary fat may promote the development of obesity. One theory holds that the high caloric density of high-fat foods facilitates the consumption of an excess of calories. This theory is supported by research in laboratory animals (West and York, 1998). It also has been supported by some short-term studies in humans since 1995 (Astrup, 1996; Astrup et al., 1997; Jeffery et al., 1995; Nelson and Tucker, 1996; Proserpi et al., 1997; Schutz, 1995; West and York, 1998). Limited epidemiological data within populations provide some additional support for this theory (Heitmann et al., 1995; Lissner and Heitmann, 1995). The combined evidence for a link between high-fat diets and obesity has

been updated in recent reviews of the literature (Blundell et al., 1996; Bray et al., 1998; Golay and Bobbioni, 1997). In spite of evidence to support this theory, there is a growing body of counterbalancing data from a number of experimental and population studies that raises questions about the effect of the percentage of energy from dietary fat on body weight (Harvey-Berino, 1998; Heini and Weinsier, 1997; Hirsch et al., 1998; Leibel et al. 1992; Rolls and Bell, 1999; Rolls et al. 1999; Saltzman et al., 1997; Seidell, 1997, 1998; Shah and Garg, 1996; Willett, 1998). Thus, the theory that a high percentage of fat contributes to obesity in the American public may warrant placing a ceiling on total fat, but it is not strong enough to make a definitive recommendation for a low-fat diet.

Another long-standing argument for a “low-fat diet” is based on the theory that dietary fat contributes to the development of various forms of cancer, especially cancers of the breast, colon, and prostate gland. The evidence for this theory derives from early studies in laboratory animals (Tannenbaum, 1942) and epidemiological studies, particularly cross cultural studies (Greenwald et al. 1997; Harrison and Waterbor, 1999; Slattery, Potter et al. 1997). The evidence for a possible link between dietary fat and breast cancer was considered by the National Cancer Institute to be strong enough to justify spending public funds on a low-fat trial as part of The Women’s Health Initiative (1998), which is scheduled to end in 2005. The rationale for this trial is based on international food disappearance data (Prentice and Sheppard, 1990) and migrant and time-trend studies (Kliwer and Smith, 1995; Kolonel, et al. 1981; McMichael and Giles, 1988; Ziegler et al. 1993). Several recent epidemiological investigations, mainly prospective studies within populations, offer little support for a significant relationship between the percentage of fat in the diet and various forms of cancer (Franceschi et al., 1996; Giovannucci and Goldin, 1997; Holmes, et al. 1999; Honda et al. 1999; Hunter, et al. 1996; Kolonel 1996; Kolonel et al. 1999; de Lorgeril et al, 1998; LaVecchia and Favero, 1998; Potter 1996; Rose, 1997; Veierod, et al., 1997; Willett 1997, 1998; Wolk et al. 1998). These recent studies led the committee to conclude that the weight of evidence concerning the contribution of a high-fat diet to cancer incidence in the U.S. population is not strong enough at the present time to justify recommending a low fat intake for the entire population.

One concern about recommending a percentage of fat well below 30 percent of calories relates to the potential for adverse metabolic effects of low-fat, high-carbohydrate diets in the U.S. population. The metabolic changes that accompany a marked reduction in fat intake could predispose to coronary heart disease and type 2 diabetes mellitus. For example, reducing the percentage of dietary fat to 20 percent of calories can induce a serum lipoprotein pattern called atherogenic dyslipidemia, which is characterized by elevated triglycerides, small-dense LDL, and low high-

density lipoproteins (HDL) (Grundy, 1998; Krauss, 1998). This lipoprotein pattern apparently predisposes to coronary heart disease (Austin et al. 1990). This blood lipid response to a high-carbohydrate diet was observed earlier (Grundy, 1986; Mensink and Katan, 1987) and has been confirmed repeatedly (Archer et al., 1998; Blades and Garg, 1995; Brown and Cox, 1998; Chen et al., 1995; Dreon et al., 1994, 1999; Garg, 1998; Garg et al., 1994; Gumbiner et al., 1998; Jarvi et al., 1999; Jeppesen et al., 1997; Katan, 1997, 1998; Krauss and Dreon, 1995; McDonald, 1999; Morgan et al., 1997; Nelson et al., 1995; Starc et al., 1998; Turley et al., 1998). Consumption of high-carbohydrate diets also can produce an enhanced post-prandial response in glucose and insulin concentrations (Garg et al., 1992, 1994;). In persons with insulin resistance, this response could predispose to type 2 diabetes mellitus.

Another reason for not overly restricting intake of total fat comes from evidence that populations consuming higher quantities of unsaturated fats have a favorable profile of blood lipoproteins and a relatively low prevalence of coronary heart disease, provided that intakes of saturated fats are low. Thus, the recommendation for a diet *moderate* in total fat is based in part on the recognition that unsaturated fats carry potential benefits. Dietary studies have demonstrated that both polyunsaturated and monounsaturated fats reduce LDL-cholesterol levels when they are substituted for saturated fats (Ahrens et al., 1957; Hegsted et al. 1965; Keys et al., 1965; Mattson and Grundy, 1985; Mensink and Katan, 1989; 1992). Moreover, epidemiological studies (Gjonca and Bobak, 1997; Keys, 1970; Renaud et al. 1995; Wolk et al., 1998) have shown that populations that consume relatively high intakes of unsaturated fats, particularly monounsaturated fats, have low rates of both coronary heart disease and cancer. In addition, clinical trials strongly suggest that substitution of N-6 polyunsaturated fats for saturated fats reduces the risk for coronary heart disease (Gordon 1995a,b; Katan et al. 1997). Recent clinical trials further find that N-3 polyunsaturated fatty acids reduce risk for myocardial infarction in patients with established coronary heart disease (Burr et al., 1989; GISSI-Prevenzione Investigators, 1999). Finally, a higher intake of unsaturated fats offers the public a safe alternative to saturated fats while retaining the organoleptic qualities of a moderate fat intake.

The committee further held the concern that the previous priority given to a “low-fat intake” may lead people to believe that, as long as fat intake is low, the diet will be entirely healthful. This belief could engender an overconsumption of total calories in the form of carbohydrate, resulting in the adverse metabolic consequences of high-carbohydrate diets. Further, the possibility that overconsumption of carbohydrate may contribute to obesity cannot be ignored. The committee noted reports that an increasing prevalence of obesity in the United States has corresponded roughly with an absolute increase in carbohydrate consump-

tion (Anand and Basiotis, 1998). Finally, with a “low-fat” recommendation, the potential benefit to be derived from the several forms of unsaturated fats may not be realized.

Advice for Children

The committee recommends changing this section to make it clear that the guidelines apply to children beginning at age 2 years. There is no evidence that current recommendations for adults need to be modified for children who are 2 years of age or older. Studies support the safety for children of diets that are low in saturated fat and cholesterol and moderate in total fat as described under this guideline (Lauer et al., 1996; Niinikoski et al., 1997; Obarzanek et al., 1997).

Advice for Today

This section omits the recommendation to use vegetable oils sparingly and suggests substituting them for saturated fats. It focuses on saturated rather than total fat.

Box 15: Know the Different Types of Fats

The committee suggests the addition of this box to help the reader distinguish among the different kinds of fats—saturated, *trans*, and unsaturated. It specifies the effects of each type of fat on the blood cholesterol level. *Trans* fatty acids are included because a definitive body of recent experimental evidence indicates that *trans* fatty acids raise the concentration of the most dangerous form of serum cholesterol (LDL-cholesterol) (Aro et al. 1997; Judd et al, 1994; Lichtenstein, et al. 1993, 1999; Mensink and Katan, 1990; Zock and Katan, 1992;). *Trans* fatty acids also tend to lower a protective form of serum cholesterol (HDL cholesterol). Prospective epidemiological studies further note that higher intakes of *trans* fatty acids are associated with a higher incidence of coronary heart disease (Pietinen et al., 1997; Willett et al., 1993).

The box also lists the major sources of each type of fat and of dietary cholesterol. The unsaturated fats in fatty ocean fish are specifically mentioned because of a growing interest in omega-3 fatty acids as possibly protective against heart disease.

Box 16: Food Choices Low in Saturated Fat and Cholesterol and Moderate in Total Fat

The committee recommends revision of former Box 11 to emphasize saturated fat rather than total fat. In the suggested revisions, guidance on cutting back on added fat is tied in with weight control. Less detail is provided on the fat content of specific foods.

Box 17: What is Your Upper Limit on Fat for the Calories You Consume?

This is a revision of box 10 from the 1995 bulletin. The revised box gives upper limits for saturated fat intake levels

and retains the same limits on total fat. The saturated fat limits correspond to 10 percent of calories at the three calorie levels represented by the Food Guide Pyramid.

Box 18: A Comparison of Saturated Fat in Some Foods

To further help consumers to understand the effect of different food choices on saturated fat intake, the committee recommends the inclusion of Box 18 (Subar et al., 1998 a, b).

Choose Beverages and Foods That Limit Your Intake of Sugars

Guideline

The committee recommends changing the wording of the guideline to include the word *limit* because intake of sugars has increased steadily since the early 1980s. It suggests adding the word *beverages* because they are the primary source of added sugars in U.S. diets.

Introductory Paragraph

The committee recommends that the first paragraph emphasize the role of limiting sugars for the prevention of dental caries, as this is the principal diet and health association. Only minor changes are suggested in the text that addresses dental caries. Diet plays a central role in the development of dental caries. Observations in humans have shown clearly that frequent and prolonged oral exposure to certain carbohydrates (primarily glucose, fructose, and sucrose) is fundamental to caries activity (Fitzsimons et al, 1998). There is abundant epidemiological evidence that sugars, and especially sucrose, are the main dietary factor affecting dental caries prevalence and progression (Depaola et al., 1999). Sugars increase caries most if they are consumed between meals, and in a form that is retained in the mouth for a long time (Kandelman, 1997).

Intake of Sugars Is Increasing

Proposed Content. The committee recommends highlighting the increasing intake of sugars in a new section of the guideline. Although dental caries continue to provide a major rationale for this guideline, the committee expressed very serious concern about current trends in the consumption of sugars by the U.S. population. These trends raised concerns because of their coincidence with other undesirable changes in the country’s nutritional well-being, e.g., increasing rates of obesity and inadequate intakes of calcium that carry a risk of impaired long term bone health. Further discussion of these trends follows the description of the proposed contents of this section.

The committee recommends that this section of the booklet distinguish added sugars from naturally occurring sugars, identify main sources of added sugars, and give an

additional reason for moderating intake of foods high in added sugars. Distinguishing added sugars from naturally occurring sugars is consistent with the approach used by the Department of Health in the United Kingdom (FAO, 1998a) and by the USDA in its analyses of the nutrient intake of Americans in nationwide surveys. Added sugars are defined as all sugars used as ingredients in processed and prepared foods, such as bread, cake, soft drinks, jam, and ice cream, as well as sugars eaten separately. Sugars occurring naturally in foods such as fruit and milk are excluded (Cleveland et al. 1997). Specifically, added sugars include white sugar, brown sugar, raw sugar, corn syrup, corn syrup solids, high fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey, molasses, anhydrous dextrose, and crystal dextrose (USDA, 1998b).

The committee suggests drawing attention to the major sources of added sugars in U.S. diets. Foods and beverages high in added sugars include cakes, cookies, candies, soft drinks, jam, ice cream, fruitades and juice drinks, and sugars eaten separately or added to foods at the table (USDA, 1998b). According to data from the 1994–96 CSFII, the most important source of added sugars is nondiet soft drinks: they account for one-third of added sugars intake (Guthrie and Morton, 2000). Sugars and sweets (such as candies) contribute 16 percent of added sugars, sweetened grains contribute 13 percent, fruitades and fruit drinks made with added sugars provide 10 percent, and flavored milk and other sweetened milk products provide 9 percent. Together, these foods and beverages provide over three-fourths of the total intake of added sugars (Guthrie and Morton, 2000).

The committee recommends deleting the general information about carbohydrates and the listing of reasons why sugars may be added to foods. Instead, the proposed section gives more explanation of food label information.

Background on Trends in Added Sugars Intake and Reasons for Concern. A substantial increase in sugars intake over time is documented by a variety of data sources. Based on time series analysis of food supply data, total consumption of added sugars has risen steadily since 1970 (Putnum and Allshouse, 1999). Between 1982 and 1996, caloric sweetener consumption increased 16 percent. The 1994–1996 CSFII documented that the mean intake of added sugars ranged from 12 percent of total calories in females ages 51 years and above to 20 percent of total calories in males and females ages 12 to 17 years (Guthrie and Morton, 2000). Soft drinks contributed 27 percent of the total intake of added sugars.

Since 1990, on average, Americans increased their energy intake. This increase came primarily from increased carbohydrate consumption (Anand and Basiotis, 1998). Much of the increased energy intake by children and adolescents has been attributed to increased consumption of nondiet soft drinks (Morton and Guthrie, 1998). Soft drink consumption among children ages 2 to 17 years increased

from a mean of 198 grams (about 6.9 ounces) per day in 1989–1991 to 279 grams (about 9.5 ounces) per day in 1994–1995 (Morton and Guthrie, 1998).

Nationwide food intake survey data for all age groups demonstrate that consumption of soft drinks and other sweetened beverages like fruitades and tea increased dramatically over the past decade (Borrud et al., 1997; Morton and Guthrie, 1998). Based on analysis of USDA nationwide food intake data obtained in 1977–1978 and 1994–1996 (Tippett and Cleveland, 1999), consumption of soft drinks increased 130 percent—from 144 grams to 332 grams. On a per capita basis, yearly consumption of soft drinks increased from 22 gallons in 1970 to 40 gallons in 1994 and to 41 gallons in 1997 (Gerrior et al., 1998). The average nondiet soft drink has 9 teaspoons of added sugars for a 12-ounce container. Consumption of sweetened milk desserts (including ice cream) increased 29 percent.

Other data suggest that a significant proportion of the population may not be meeting its needs for calcium and other nutrients because of their displacement by the increased consumption of sweetened beverages. Nationwide food intake data between 1977 and 1994 indicate that milk consumption declined 24 percent among boys and 32 percent among girls 6 to 11 years of age (Borrud et al., 1997). In a study of beverage intake at the noon-time meal, Johnson and colleagues (1998) found that, on average, only children who drank milk at that meal achieved the recommended intake (RDA) for calcium for the day. From 1989 to 1995, while calorie intakes increased for children ages 2 to 17 years, micronutrient intakes (except for iron) did not increase; and calcium intakes decreased (Morton and Guthrie, 1998). In addition, children who were high consumers of nondiet soft drinks had lower intakes of riboflavin, folate, vitamin A, vitamin C, calcium, and phosphorus in comparison with children who were nonconsumers of soft drinks (Harnack et al., 1999). Several of these nutrients (folate, vitamin A, and calcium) have been identified in national surveys as “shortfall” or “problem” nutrients among various age and gender groups (USDA, 1998a).

Using 1990–1991 cross-sectional data, Guthrie (1996) found that women whose diets met their RDA for calcium consumed significantly more milk products, fruit, and grains but less nondiet soft drinks than did women who did not meet their calcium recommendation. Others have shown that intakes of soft drinks are negatively related to intakes of milk (Guenther, 1986; Harnack et al., 1999; Skinner et al., 1999).

Adequate calcium intake is of particular concern during childhood and adolescence since 45 percent of the adult skeleton is built and enlarged during adolescence (NIH Consensus Development Panel on Optimal Calcium Intake, 1994). Inadequate consumption of calcium during the first two decades of human growth is associated with reduced

peak bone density in adult life and increased risk of osteoporosis (IOM, 1997). It has been estimated that osteoporosis currently affects 25 million people in the United States and is responsible for 1.5 million fractures annually at a cost in excess of 10 billion dollars per year to the U.S. health care system (NIH Consensus Development Panel on Optimal Calcium Intake, 1994).]

New recommendations for calcium intake were set in 1997 at levels associated with maximum retention of body calcium (IOM, 1997). Translated into dietary habits, it is recommended that most Americans consume 2 to 3 servings a day of foods high in calcium. Nonetheless, USDA's food intake survey data indicate that Americans ages 2 years and over consumed an average of 1.5 servings a day of high-calcium dairy foods in 1994–1996 (Gerrior et al., 1998). The increased intake of beverages high in added sugars is of concern because it may indicate that they are being consumed in place of calcium-rich beverages.

Hence, the committee recommends the identification of the kinds of beverages and foods that are the major contributors of added sugars in American's diets (see box 20). Intake of some of these foods has been shown to be inversely associated with the consumption of beverages and foods that are richer in essential nutrients, such as milk, fruit and fruit juices, and grains (Guthrie, 1996; Harnack et al, 1999).

In two large dietary surveys (Farris et al. 1998; Gibney et al. 1995), there were no consistent associations between intake of total sugars and nutrient adequacy. That is, consumers (both children and adults) of large amounts of total sugar did not necessarily have poorer quality diets in comparison with consumers with low total sugar intakes. However, this is expected since total sugar intake includes naturally occurring sugars from nutrient-dense foods such as fruits (fructose) and milk (lactose). Gibney and colleagues (1995), for example, reported that dairy foods contributed 31 percent of the total sugars intake in children, and fruits contributed 17 percent of the sugars for all ages.

Sugar Substitutes

The content of this section is essentially unchanged except for the addition of acesulfame potassium and sucralose as Food and Drug Administration approved sugar substitutes.

Sugars and Other Health Problems

This section replaces “Sugars, health, and weight maintenance.”

A meta-analysis of 23 studies conducted over a 12-year period concluded that there is little objective evidence that intake of sugars has a significant influence on either behavior or cognitive performance in children (Wolraich et al., 1995). Thus, a sentence has been added to address this point.

The paragraph concerning weight control has been shortened and no longer refers to the Food Guide Pyramid. There is little evidence that diets high in total sugars are associated with obesity (Gibson, 1996). Hence, there is no direct link between the trend toward higher intake of sugars and increased rates of obesity. However, their concomitant occurrence and the severe consequences of increased obesity suggest the need to monitor potential causal links among diet and other behaviors (e.g., physical activity) and rates of obesity and overweight. The lack of association between intake of added sugars and obesity may be partially due to the pervasive problem of underreporting of food intake which is known to occur with dietary surveys (Black et al., 1993). Underreporting is more prevalent and severe among obese adolescents and adults than among their lean counterparts (Bandini et al., 1990; Lichtman et al., 1992; Prentice et al., 1986). In addition, intakes of foods high in added sugar are known to be underreported to a greater extent than of other foods (Poppitt et al., 1998). Hence, it is difficult to draw conclusions about associations between sugar intake and body mass index using self-reported dietary data.

Children's energy intake has been positively associated with consumption of nondiet soft drinks. Mean adjusted energy intake was 188 kilocalories per day higher for children who consumed an average of 9 ounces of soft drink per day in comparison with children who were nonconsumers of nondiet soft drinks (Harnack et al., 1999). However, there was no indication that soft drink consumption was associated with BMI in this study.

Reference to diabetes mellitus has been removed. Two large, prospective cohort studies in men and women reported an increased risk of type 2 diabetes mellitus associated with diets with a high glycemic index (Salmeron, Ascherio et al., 1997a; Salmeron, Manson et al., 1997b). The paucity of evidence at this time makes it difficult to determine if diets high in sugars are linked with the etiology of non-insulin dependent diabetes.

Advice for Today

The committee suggests including a focus on limiting foods high in added sugars, encouraging intake from the five basic food groups, drinking water, and not letting sweets crowd out foods higher in nutrients.

Box 19: For Healthy Teeth and Gums

The committee recommends the addition of a bullet concerning rinsing the mouth after eating dried fruit.

Box 20: Major Sources of Added Sugars in the United States

Box 20 gives information on kinds of beverages and foods that are high in added sugars and low in essential

nutrients. This list is based on CSFII 1994–1996 food consumption data and contains those foods that contribute about 68 percent of the total added sugars intake in the United States (USDA, Center for Nutrition Policy and Promotion. Unpublished analysis of CSFII 1994–96 intake data, 1999)

Box 21: Names for Added Sugars That Appear on Food Labels

This is a slightly expanded version of former box 12.

Choose and Prepare Foods with Less Salt

Background Information

The Debate. Although most diet and health issues are subject to some ongoing debate, an unusually high level of controversy surrounds recommendations for population-wide dietary salt reduction (Alderman et al., 1997; Gibbs et al., 1997; McCarron 1998; Oparil, 1997; Taubes, 1998; deWardener 1999).

A recent document, which was signed by 16 prominent scientists from North America and Europe, addressed this debate and called attention to new scientific evidence that raised questions about the sodium-hypertension relationship and the basis for the sodium health claims allowed by the Food and Drug Administration on food labels (Alderman et al., 1997). On the other hand, consensus reports supportive of population-wide sodium reduction as a measure for hypertension prevention and control were published by the National High Blood Pressure Education Program of the NHLBI (JNC VI, 1997) and the American Heart Association (Kotchen and McCarron, 1998).

The debate about salt reduction also was featured in a widely publicized article “The (Political) Science of Salt” in *Science* (Taubes, 1998). This article reviewed the wide range of views on the topic overall and the completely divergent interpretations often given to the same evidence.

Sodium and Blood Pressure. The general role of sodium in blood pressure regulation and a role for sodium reduction in the control of established hypertension are not debated. Rather, the debate centers around whether sodium reduction is warranted in the general population. That is, does it apply to people who do not have established hypertension and who might not be genetically at risk for developing hypertension? Arguments against population-wide sodium reduction tend to be based on (1) estimates that a relatively low proportion of the population is sensitive to the blood pressure-raising effects of high sodium intake and (2) the observation that the effects of sodium reduction on the blood pressure of normotensive individuals are small in comparison with the effects of weight reduction. Some consider the effects too small to offset the presumed burden

that a population-wide sodium reduction effort would cause for consumers and industry.

In contrast, those who favor sodium reduction point out that high blood pressure is a multifactorial condition for which susceptibility (i.e., salt-sensitivity) is probably not an “either-or” situation. In any case, if discrete salt-sensitivity does exist in human populations, a means of identifying salt-sensitive individuals in the population at large would be necessary to make it feasible to target recommendations for reduced sodium intake to those who are salt-sensitive (Cowley, 1997; Luft and Weinberger, 1997). In addition, it is not clear whether sodium intake should be singled out in this respect. Differential sensitivity in response may apply to other dietary changes as well, e.g., blood cholesterol response to reduction of dietary saturated fat. Yet, there has been wide support for population-wide dietary recommendations to lower cholesterol.

Several lines of evidence relate sodium intake to blood pressure: results from animal experiments, clinical studies, international comparisons, and population-based trials. Experimental and epidemiological studies of mechanisms and genetic factors continue (Oparil, 1997). Recent studies judged most relevant to the recent debate on sodium recommendations include an intervention study of the effects of moderate sodium reduction on blood pressure of individuals without established hypertension (TOHP Collaborative Research Group, 1997) and meta-analyses synthesizing relevant randomized trials (Cutler and Follmann, 1997; Graudal et al., 1998; Midgely et al., 1996).

The Trials of Hypertension Prevention, Phase II (TOHP-II), evaluated the efficacy of sodium reduction—either alone or in combination with weight reduction—as a strategy for controlling blood pressure and preventing hypertension over a 3- to 4-year period in normotensive overweight men and women who were ages 30–54 at the time of enrollment (TOHP Collaborative Research Group, 1997). Although the reductions observed in blood pressure and hypertension incidence are both small, they support clear inferences because they occurred under the rigorous conditions of a randomized, controlled trial designed specifically to address the question of how sodium reduction affects blood pressure. A limitation of TOHP-II is the relatively short follow up, i.e., 3 to 4 years. Therefore, health outcomes such as coronary heart disease, stroke, and total mortality, which occur relatively infrequently among healthy young adults over the short term, cannot be studied.

Some findings from TOHP-II may relate to sodium sensitivity in the population at large (Hunt et al., 1998, 1999). An analysis stratified by angiotensinogen (AGT) genotype in TOHP II participants identified a subgroup (AA) with a significantly greater predisposition to developing hypertension during the 3-year study period in the absence of intervention (usual care) but with a significantly greater reduction in hypertension after sodium reduction. For

example, response to the sodium intervention was significant in those with the AA genotype (relative risk of 3-year incidence, when compared with usual care, was 0.57 [0.34,0.98]). In those with GG genotype, the risk of developing hypertension was not significantly different in the sodium reduction and usual care groups (relative risk 1.2 [0.79,1.81]). However, the relevance of this analysis to the specific question of sodium-sensitivity in the general population is complicated: the same effect (i.e., better response in AA than in GG) was also observed in the weight reduction arm of the study, in which no sodium reduction occurred. Also, the AA and GG contrast was only relevant to Caucasian participants because of the very low frequency (3 percent) of the GG genotype in the African-American participants.

In general, three recent meta-analyses all support the conclusion that sodium reduction lowers the blood pressure of people with hypertension (Cutler and Follmann, 1997; Graudal et al., 1998; Midgely et al., 1996). They also all indicate that, on average, the effect of sodium reduction on blood pressure is relatively small in people with normal blood pressure. Two analyses (Graudal et al, 1998; Midgely et al, 1996) find no significant effect on blood pressure in normotensive individuals, while Cutler and Follmann (1997) do find a statistically significant blood pressure lowering effect of moderate sodium reduction in normotensives.

The inconsistency in the size and statistical significance of findings from these meta-analyses most likely results from several design and methodologic differences among the analyses. Each of the analyses included different sets of trials (short-term and long-term, laboratory-based and population-based, parallel and crossover designs, double and single blind), covered different age ranges and durations, and examined different attempted and achieved levels of sodium reduction. The investigators also analyzed the data in different ways and came to different conclusions—in spite of considerable overlap in the studies included and in some results (Graudal et al., 1998).

The proposition that weight reduction would preclude the need for a population-wide approach to sodium reduction is countered by pointing out that not all individuals who will develop hypertension are overweight. Furthermore, for those who are overweight, both sodium reduction and weight reduction may be beneficial (TOHP Collaborative Research Group, 1997; Whelton et al, 1998).

Also in favor of population-wide approaches to sodium reduction is the high proportion of U.S. adults who will eventually develop hypertension. Although the overall prevalence of hypertension in U.S. adults over ages 18 or 20 is about 25 percent, it is higher in the middle and older age ranges (Burt et al., 1995). According to 1988–1991 NHANES data, hypertension prevalence (defined as systolic blood pressure/diastolic blood pressure 140 or 90 mm Hg

or under treatment for hypertension) in the age range of 50–79 years was 42 to 61 percent for men and 39 to 68 percent for women. For African Americans, 60 to 68 percent of men have hypertension at ages 50–79 years, and 48 to 73 percent of women do (LSRO, 1995).

Cook and colleagues (1995) estimate that a 2 mm Hg-reduction in the mean diastolic blood pressure of the general population would reduce hypertension prevalence by 17 percent, the risk of coronary heart disease by 6 percent, and the risk of strokes and transient ischemic attacks by 15 percent—over and above the effects targeted by medical interventions in those with hypertension. However, some scientists suggest that speculative estimates of mortality reduction from sodium reduction are not a sound basis for making policy, because such estimates require the assumption that reductions in blood pressure automatically translate into reductions in cardiovascular events and deaths.

It has also been suggested that sodium reduction is no longer needed as a population-wide strategy given the published results of the Dietary Approaches to Stop Hypertension Study (DASH) (Appel et al, 1997; McCarron, 1998). The dietary patterns found effective for blood pressure lowering in this controlled 8-week feeding study were high in fruits and vegetables and low-fat dairy products, and one was reduced in fat—consistent with the 1995 Dietary Guidelines for Americans in many respects. However, sodium intake, weight, and alcohol intake were held constant to examine the potential effects of other dietary factors. The DASH-Sodium study, which was designed to address the issue of the effects of the DASH eating pattern in the context of three reduced levels of sodium—approximately 1150, 2300, and 3500 mg per day—is underway (Svetky et al., 1999), but results were not available to the committee.

Guideline

The committee suggests that the wording “Choose and prepare foods with less salt,” replace the former “Choose a diet moderate in salt and sodium.” The intent of the guideline is unchanged from the 1995 guideline in emphasizing food sources of sodium rather than salt added at the table as the primary source of dietary sodium intake and in encouraging lower salt intake. The new wording is framed in terms of choosing *foods* rather than *a diet* to convey a clearer meaning from a behavioral perspective and to avoid the erroneous interpretation that the guideline refers to either prescribed “special diets” or to weight reduction diets. Reference to food preparation, i.e., “choose and prepare foods” was added to highlight the particular importance of food preparation practices in determining the sodium content of foods. “Less” is substituted for “moderate” because of its apparent greater clarity for consumers who find the term “moderate” difficult to interpret. “Sodium” is

dropped from the guideline for simplicity; salt is the more familiar term.

Overview

Most of the proposed changes in the text of this guideline are intended to clarify the reasons for the guideline and ways to implement it. In addition, the recommended text gives more emphasis to the way in which dietary and lifestyle factors other than sodium intake influence blood pressure; and it addresses several potential concerns about the safety of lowering sodium intake. The committee suggests that the word “salt” replace “sodium,” when applicable (e.g., not when distinguishing between the two or referring to the Nutrition Facts Label).

Introductory Paragraphs

The first sentence in this section now highlights and personalizes the concept of potentially reducing one’s risk of high blood pressure by consuming less salt. The suggested revisions more accurately describe the relationship between salt intake and blood pressure. Substantial additional evidence was identified to support the retention of the statement about the effect of salt intake on calcium excretion and to link high sodium intake to the potential acceleration of bone loss (Dawson-Hughes et al., 1996; IOM, 1997; Massey and Whiting, 1995; Matkovic et al, 1995).

The end of the second paragraph in the introduction has been revised to extend the recommendation for sodium reduction to the “normal healthy person” rather than “...adult”, in order not to exclude children. This is based on the observation that sodium intakes of U.S. children are high in relation to physiologic needs.

Salt Is Found Mainly in Processed and Prepared Foods

Analyses of dietary intake data from USDA surveys indicate that consumers continue to obtain most of their dietary sodium from salt that has been added to commercial foods in processing (Cleveland et al., 1993; Subar et al., 1998).

Aim for a Moderate Sodium Intake

Recommendations to reduce sodium intake presume that a substantial percentage of Americans have sodium intakes that are relatively high in relation to physiologic needs and recommended intake levels. The proposed text anchors physiologic need by referring to the amount of salt (1/4 tsp) that provides the estimated minimum level of 500 mg of sodium per day (NRC, 1989). Like the 1995 guideline, the revised text refers to the 2400 mg Daily Value on the Nutrition Facts food label.

The best available estimates of total sodium intake in the U.S. population are from national survey data based on 24-

hour recall interviews conducted as part of NHANES III. Considering the sodium from foods, dietary supplements, tap water, and salt use at the table, and adjusting for day-to-day variation in intake, approximately 79 percent of people ages 2 years and over consumed more than the 2400 mg Daily Value of sodium between 1988–1994 (U.S. DHHS, 1998). Because sodium intake varies with energy intake, there is considerable age and sex variation in the likelihood of exceeding the Daily Value. For example, this level of sodium intake was exceeded by 50 percent of boys ages 2–5 years, 95 percent of males ages 12–19 years, and 70 percent of females ages 20 and over. Average sodium intake of the overweight 30- to 54-year-old men and women in TOHP II was 4200 mg per day, estimated from 24-hour urine samples collected at baseline (TOHP Collaborative Research Group, 1997). NHANES III data suggest that sodium intake increased between 1971–74 and 1988–1991, but this could be an artifact of changes in the dietary assessment methodology (LSRO, 1995).

Evidence about the association of sodium intake and blood pressure does not indicate a threshold of sodium intake above which no benefit can be achieved by sodium reduction. Thus, moderate sodium reduction may be beneficial across a range of sodium intake. The committee considered whether to specify a recommended upper limit of sodium intake—that is, to go beyond the indirect reference to the 2400 Daily Value for sodium on the Nutrition Facts Label. However, it did not find a sufficient basis for doing so. No evidence was identified relevant to the issue of setting a lower limit for sodium intake in the general population, although this was of interest in relation to safety.

Advice for Today

The proposed text now mentions fruits as an additional way to flavor foods without salt. Specific advice about choosing restaurant and fast foods has also been added. A statement about the sodium content of food groups in the Food Guide Pyramid was deleted because specific relevant advice now appears in Box 25.

Box 22: Steps That May Help Keep Blood Pressure in a Healthy Range

This box provides an integrated listing of current dietary and lifestyle change advice related to blood pressure (JNC VI, 1997; National High Blood Pressure Education Program, 1997). Given that the primary focus of this guideline relates to advice about sodium intake, the committee did not directly review the general literature on non-pharmacologic approaches to blood pressure lowering. However, results of the three relevant large-scale trials published since 1995 are supportive of the advice in this box (Appel et al., 1997; TOHP Collaborative Research Group, 1997; Whelton et al, 1998)

Box 23: Is Lowering Salt Intake Safe?

The committee suggests adding a box on this topic primarily to indicate that special circumstances (e.g., illness, initiation of vigorous exercise) might warrant caution.

The committee did not identify evidence supporting concerns about the safety of moderate sodium reduction as such. Kumanyika and Cutler (1997) published a comprehensive review on possible adverse effects of moderate sodium reduction. They concluded that, although the issues have not been studied directly, none of the available evidence raised any reason for concern about the safety of current dietary guidance to reduce sodium to moderate levels in the general population. Because of the publicity given to studies on the question of sodium intake and heart disease incidence or mortality (Taubes 1998), the committee did examine several relevant studies (Alderman et al., 1995, 1997, 1998; Tunstall-Pedoe, 1997). However, the conclusions from these studies were inconsistent and weakened by flawed or imprecise measurement of sodium intake. The most recent analysis of this question supports recommendations for sodium reduction to moderate levels, perhaps particularly in overweight men and women. That is, in the NHANES I Epidemiologic Follow-Up Study, high sodium intakes at baseline were associated with an increased risk of both cardiovascular disease and all-cause mortality, over an average of 19 years of follow up, in overweight persons (BMI 27.3 for women, 27.8 for men). No association of sodium intakes with cardiovascular disease risk was observed in those who were not overweight (He et al., 1999).

The effect of reductions in table salt use on iodine nutriture was considered at length because table salt is currently used as the vehicle for iodine fortification. Iodine deficiency, if present for even a small percent of the U.S. population, would constitute a serious public health problem (LSRO 1995; NCEH, 1998). To date, no published evidence could be found that this is a problem.

Concern about iodine intake with salt reduction is new, in part because at the time that sodium reduction guidelines were first introduced, the levels of iodine contamination in the U.S. food supply were considered excessive (Park et al., 1981). No data were identified on consumption patterns for iodized table salt and the iodine status of those who consume it. Hence, there is currently no basis for determining whether and for whom advice to reduce the use of table salt would compromise iodine status. A conflict in dietary guidance policy would arise if advice to increase the consumption of iodized salt were to be deemed necessary while advice to reduce table salt intake was extant. The statement about iodized table salt was included to be sensitive to this potential conflict.

Box 24. Salt Versus Sodium

The committee suggests adding this box to help consumers understand the relationship between the two terms and to aid in interpreting food labels.

Box 25. Ways to Decrease Your Salt Intake

Apart from the title, the major suggested revisions to former box 15 are in the organization and clarity of the content. The suggested emphasis on foods from eating establishments was based on evidence that food eaten away from home is contributing an increasing amount to Americans' sodium intake (Lin et al., 1999).

If You Drink Alcoholic Beverages, Do So in Moderation

Guideline

The committee concurs with the 1995 wording of this guideline. Revisions of the text are for purposes of placing more emphasis on adverse effects of excess intake and updating statements based on more current scientific evidence.

Introductory Paragraphs

The proposed text now begins with a paragraph that addresses adverse effects of excess alcohol intakes and mentions no beneficial effects. The second paragraph gives the age groups for whom moderate drinking may reduce risk of coronary heart disease and makes it clear that younger groups are unlikely to benefit. This greater specificity is based on the age- and sex-specific rates of coronary disease (NCHS, 1999) and on the age-specific relative risks related to moderate alcohol consumption obtained from detailed prospective data from three very large cohorts of men and women in the United States (Fuchs et al., 1995; Rimm et al., 1991; Thun et al., 1997).

In the list of health risks associated with alcohol intake, "certain cancers" has been changed to add "breast cancer." A recently published pooled analysis (Smith-Warner et al., 1996) shows an increased risk of breast cancer of approximately 9 percent for an increment of 10 g of alcohol/day—a risk that is relatively small but of great concern to some women. The committee suggests adding the caution that risk of alcohol abuse increases with early age at initiation of drinking (Grant and Dawson, 1997; Prescott et al., 1999).

The committee suggests that the sentence in the previous guideline "Alcoholic beverages have been used to enhance the enjoyment of meals by many societies throughout human history" be omitted from the current text. Although that statement is factually correct, a similar statement could be made for many other foods and nutrients, for example, salt or sugar. The committee recognizes the intent of the

earlier committee to place moderate alcohol consumption in the context of a healthy diet. However, the particular sentence is inconsistent with the text in the other guidelines and is therefore omitted.

Box 26: “What Is Drinking in Moderation?”

A sentence has been added to this box to make it clear that the different limits for men and women are based on both metabolism and body size.

Who Should Not Drink?

This section has been changed to be more specific about categories of individuals who should not drink. The bullet pertaining to pregnancy has been strengthened: (1) The phrase “women who may become pregnant” replaces “women who are trying to conceive to reflect the many completed U.S. pregnancies that are unplanned (Brown and Eisenberg, 1995; U.S. DHHS, 1999). Because fetal alcohol syndrome is a well-recognized clinical entity (Jacobson et al., 1994), the text now indicates that major birth defects can be caused by heavy drinking by the pregnant woman; this replaces the phrase that birth defects “have been attributed to heavy drinking.” The change is further supported by several recent studies, both clinical (Holtzman et al., 1995; Sowell et al., 1996) and mechanistic (Cartwright and Smith,

1995a,b; Chen and Sulik, 1996). The phrase “While there is no conclusive evidence that an occasional drink is harmful to the fetus or to the pregnant woman” has been deleted. Although the phrase is scientifically correct, it weakens the message; and survey data show that young women tend to underestimate the adverse effects of drinking alcohol during pregnancy (Cornelius et al., 1997; Ebrahim et al., 1999; Mackinnon et al., 1995). In addition, the phrase “including the first few weeks” has been added to make it clearer that adverse effects may begin before the woman knows she is pregnant. The phrase “operate machinery” has been added as a second example of activities requiring attention or skill. The bullet concerning medications has been changed to be less restrictive. Including all prescription and over-the-counter medications, as was done in the 1995 Dietary Guidelines, is a sweeping statement that is not supported by scientific evidence. The bullet has been modified to indicate that certain medications can interact with alcohol and to advise those who take medications to ask their health care professional for guidance.

Advice for Today

The text has been expanded to provide greater specificity with regard to the meaning of moderation and to not drinking before or when driving.

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