

## **PART B: INTRODUCTION**

Since first published in 1980, the *Dietary Guidelines for Americans* have provided science-based advice to promote health and to reduce risk for major chronic diseases through diet and physical activity. The *Dietary Guidelines* is targeted to the general public over age 2 years who are living in the United States. Because of its focus on health promotion and risk reduction, the *Dietary Guidelines* form the basis of Federal food, nutrition education, and information programs. By law (Public Law 101-445, Title III, 7U.S.C. 5301 et seq.), the most recent edition of the *Dietary Guidelines* is reviewed by a committee of experts, updated if necessary, and published every 5 years. This report presents the recommendations of the 2005 Dietary Guidelines Advisory Committee (DGAC) to the Secretaries of the Department of Health and Human Services (HHS) and the Department of Agriculture (USDA). The legislation also requires that the Secretaries of HHS and USDA review all Federal dietary guidance-related publications for the general public for consistency with the *Dietary Guidelines for Americans*.

### **THE ROLE OF DIET AND PHYSICAL ACTIVITY IN HEALTH PROMOTION**

Poor diet and a sedentary lifestyle contribute to about 400,000 of the 2 million or so annual deaths in the United States. Specific diseases and conditions linked to poor diet include cardiovascular disease (CVD), hypertension, dyslipidemia, type 2 diabetes, overweight and obesity, osteoporosis, constipation, diverticular disease, iron deficiency anemia, oral disease, and malnutrition (HHS, 1996; U.S. Preventive Services Task Force, 1996). Lack of physical activity has been associated with cardiovascular disease, hypertension, overweight and obesity, osteoporosis, diabetes, and certain cancers (World Health Assembly, 2004). Furthermore, muscle strengthening and balance training can reduce falls and increase functional status among older adults (World Health Assembly, 2004). Together with physical activity, a high-quality diet that does not provide excess calories should enhance the day-to-day health, vitality, energy, and a sense of well-being among most individuals.

The intent of the Dietary Guidelines Advisory Committee is to summarize and synthesize knowledge regarding many individual nutrients and food components into recommendations for an overall pattern of eating that can be adopted by the public. Several different indicators of diet quality have been developed to assess adherence to the *Dietary Guidelines for Americans*. Those indicators include the Recommended Foods Score (Kant et al., 2000), the Healthy Eating Index (Kennedy et al., 1994), and an Alternate Healthy Eating Index (McCullough et al., 2002). Although adherence to the *Dietary Guidelines for Americans* is low among the U.S. population, evidence is accumulating that selecting diets that comply with the guidelines reduces the risk of chronic disease. High scores on the Alternate Healthy Eating Index were associated with a 20 percent decrease in the risk of chronic disease in men and an 11 percent decrease in women (McCullough et al., 2002). Reductions in risk were particularly strong for CVD. Recently, Kant and co-workers reported that dietary patterns consistent with recommended dietary guidance were associated with a lower risk of mortality among individuals age 45 years and older in the United States (Kant et al., 2004). The authors

estimated that about 16 percent and 9 percent of mortality from any cause in men and women, respectively, could be eliminated by the adoption of desirable dietary behaviors.

Although diet and physical activity influence health both together and separately, their joint effects have not been assessed, particularly the extent to which increased physical activity enhances the ability to meet nutrient guidelines. Physical activity is a fundamental means of improving the physical and mental health of individuals. Future studies of diet quality and health need to include measures of physical activity.

The *Dietary Guidelines for Americans* can be used to prevent the onset of targeted diseases (i.e., primary prevention), to improve health in individuals who have already developed risk factors or preclinical disease (i.e., secondary prevention), and to provide care for individuals with established disease (i.e., tertiary care) (U.S. Preventative Services Task Force, 1996). Both diet quality and physical activity appear to play important roles in preventing primary, secondary, and tertiary prevention.

### **THE ROLE OF FOOD SAFETY IN DISEASE PREVENTION**

Food will promote health only if it is safe to eat. Foodborne diseases cause approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year. Three pathogens (*Salmonella*, *Listeria*, and *Toxoplasma*) are responsible for more than 75 percent of these deaths. Actions by consumers can reduce the occurrence of foodborne illness substantially.

### **THE ROLE OF DIET AND PHYSICAL ACTIVITY IN REDUCING HEALTH DISPARITIES**

Of substantial concern are disparities in health among racial and ethnic minorities and among different socioeconomic groups. For example, blacks tend to have a higher prevalence of elevated blood pressure and a greater incidence of blood pressure-related diseases, such as stroke and kidney failure, than non-blacks. Also, several subgroups of the population (e.g., Hispanics, American Indians, and blacks) have a strikingly high prevalence of overweight and obesity—even higher than the already high prevalence rates observed in the general population (see “Overweight and Obesity” below).

Dietary patterns differ among different groups. For example, individuals of lower education and income levels tend to eat fewer servings of vegetables and fruit than do those with more education and higher income. According to national surveys, blacks tend to have the lowest intakes of fruits and vegetables among ethnic and racial groups. (USDA 2004; USDHHS 2004)

While the reasons for these differences are complex and multifactorial, this report addresses research indicating that certain dietary changes provide a means to reduce disparities. Part D, Section 7 “Fluid and Electrolytes” provides evidence that blacks tend to be more salt sensitive than non-blacks. Likewise, blacks tend to be more sensitive to the blood pressure lowering effects of increased potassium intake. Ironically, the average potassium intake of blacks is less than that of non-blacks. A healthful low sodium, high

potassium dietary pattern, termed the DASH diet (described in Part D, Section 1), has been shown to lower blood pressure to a greater extent in blacks than in non-blacks.

The effects on blood pressure of a reduced salt intake, increased potassium intake and an overall healthy dietary pattern provide an example of how dietary changes could reduce health disparities. Such evidence exemplifies important, yet under-appreciated, opportunities to reduce health disparities in minorities through dietary changes.

### **THE ROLE OF THE ENVIRONMENT IN IMPLEMENTING THE GUIDELINES**

Ultimately, individuals choose the types and amount of food they eat and the amount of physical activity they perform. In conducting the research on which this report is based, the Committee was struck by the critical and likely predominant role of environment in determining whether or not individuals consume excess calories, eat a healthful diet, and are physically active. By environment we mean the constellation of cultural forces, societal norms, family influences (e.g., mealtime structure and parental feeding styles), changes in meal patterns, and commercial advertising that potentially influence individual behavior.

In brief, the Committee believes that the current environment tends to encourage the over-consumption of calories and discourage the expenditure of energy. Changes in the environment and changes in individual behavior (but not changes in genes) are the driving forces that account for the obesity epidemic. Environmental factors that may contribute to excess calorie intake include, but are not limited to, the increased availability of energy dense, nutrient-poor foods and beverages, expanding portion sizes, and increased consumption of meals outside the home. Environmental factors that discourage physical activity lead to reduced energy expenditures at school, work, and home. Among these factors are limited time for physical education, labor-saving devices, long work hours or commutes, and increased time in sedentary activities such as watching television, using computers, and playing video games.

In this report, we assess the impact of several of these environmental factors as well as the effects of individual food components and food groups on overweight and obesity (e.g., the roles of added sugars, fats, alcohol, fruits and vegetables, and dairy products). Not surprisingly, no single factor appeared to be responsible for the epidemic. Such findings reinforce the belief that multiple factors, rather than any one factor, are responsible for the obesity epidemic and that the optimal strategy to arrest the epidemic will be multi-factorial. Teasing apart the relative importance of each factor is inherently difficult given the challenges of estimating calorie intake and energy expenditure on a population basis. Because many of these factors often are beyond the control of individuals (e.g., the size of portions served in food establishments and lack of information on calorie content at point of purchase), substantial changes to the environment are required to achieve a milieu that supports healthy behaviors.

### **CHRONIC DISEASE RISKS AFFECTED BY DIET**

The reduction of chronic disease risk merits strong emphasis in our Nation for many reasons. Among the leading causes of death in the United States in 2000 were poor diet

and physical inactivity (400,000 deaths; 16.6 percent of total U.S. deaths) and alcohol consumption (85,000 deaths; 3.5 percent of total U.S. deaths) (Mokdad et al., 2004). Only tobacco accounted for a greater percentage of total U.S. deaths (18.1 percent). Poor diet and physical activity could overtake tobacco as a cause of death if the trend continues. Together, cancer, cardiovascular disease, and diabetes account for about two-thirds of all deaths in the United States and about \$700 billion in direct and indirect costs annually (Eyre, 2004). An overview of specific diet-related causes of death and morbidity and of selected risk factors for some of these conditions is presented in the following sections.

### **Cardiovascular Disease**

CVD<sup>1</sup> comprises coronary heart disease (CHD), the leading cause of death in the United States), cerebrovascular disease (also termed stroke, the third leading cause of death), and other conditions. In 2001, CVD accounted for 38.5 percent of all deaths or 1 of every 2.6 deaths in the United States. To put this in context, CVD accounts for more deaths than the next five leading causes of death combined, which are cancer, chronic lower respiratory diseases, accidents, diabetes mellitus, and influenza and pneumonia. While the occurrence of CVD typically occurs earlier in men than women, CVD is also the leading cause of death in women. In 2001, 32 percent of CVD deaths occurred before age 75 years.

The healthcare costs associated with CVD are staggering. The estimated direct and indirect costs in 2004 are projected to be \$368.4 billion. Direct costs account for about \$226.7 billion and include the cost of physicians and other professionals, hospital and nursing home services, medications, home health care, and other medical durables. Indirect costs account for the remainder and include lost productivity caused by CVD-related morbidity and mortality.

A substantial body of research has documented the importance of traditional CVD risk factors, which are extraordinarily common in the United States. Modifiable risk factors include elevated blood pressure, dyslipidemia, diabetes, and smoking. As documented in this report, several dietary factors and physical activity directly influence these risk factors or have independent effects on CVD. Hence, changes in diet and physical activity provide an important opportunity to delay, if not prevent, the occurrence of CVD.

### **Overweight and Obesity**

Overweight and obesity in the United States among children and adults (Flegal et al., 2002) have increased at an alarming rate. The prevalence of obesity among adults has doubled in the past two decades (31 percent have a BMI > 30) (Flegal et al., 2002;

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<sup>1</sup> The term total CVD, as used here, includes rheumatic fever/rheumatic heart disease; hypertensive diseases; ischemic (coronary) heart disease; pulmonary heart disease and diseases of pulmonary circulation; other forms of heart disease; cerebrovascular disease (stroke); atherosclerosis; other diseases of arteries, arterioles, and capillaries; diseases of veins, lymphatics, and lymph nodes; and other unspecified disorders of the circulatory system. Some congenital cardiovascular defects also are included. (American Heart Association, 2003, p. 3)

Hedley et al., 2004). Overweight among children has doubled (7 percent in 1980 to 16.5 percent in 1999–2002), whereas overweight among adolescents has tripled (5 percent in 1980 to 16 percent in 1999–2002) (Hedley et al., 2004).

There is no significant difference in the prevalence of obesity among men across racial/ethnic categories for all age groups (Hedley et al., 2004). Among women at least age 20 years, the prevalence of obesity in 1999–2000 differed significantly between racial/ethnic groups, with non-Hispanic white women having the lowest prevalence (30.7 percent) and non-Hispanic black women having the highest (49.0 percent) (Hedley et al., 2004). The prevalence of obesity in non-Hispanic black men and women has increased from 21.1 to 28.1 percent and from 38.2 to 49.7 percent, respectively, in the past two decades, whereas, during the same time, obesity in Mexican American men and women increased from 23.9 to 28.9 percent and from 35.3 to 39.7 percent, respectively (Flegal et al., 2002). The prevalence of overweight among non-Hispanic black and Mexican American adolescents increased more than 10 percent between 1988–1994 and 1999–2000 (Ogden et al., 2002). Data suggest that obesity is more prevalent among persons living in lower income households, especially among women (*Healthy People 2010*, 2000).

A high prevalence of overweight and obesity is of great public health concern because excess body fat leads to a much higher risk for premature death and for many serious disorders, including diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease, stroke, gall bladder disease, respiratory dysfunction, gout, osteoarthritis, and certain kinds of cancers (NHLBI, 1998; Pi-Sunyer, 1993).

### **Elevated Blood Pressure**

Elevated blood pressure is causally associated with several forms of CVD, including CHD (the leading single cause of death in the United States), stroke (the third leading cause of death in the United States), and congestive heart failure (the leading cause of hospitalizations among Medicare beneficiaries), and with kidney failure.

The contemporary classification of blood pressure has three major categories:

- Normal (systolic BP < 120 mmHg and diastolic BP < 80 mmHg)
- Pre-hypertension (systolic BP 120–139 mmHg or diastolic BP 80–89 mmHg)
- Hypertension (systolic BP  $\geq$  140, diastolic BP  $\geq$  90 mmHg, or use of anti-hypertensive medication)

Pre-hypertension affects approximately 22 percent of adults (or about 45 million people), whereas hypertension affects more than 25 percent of adults (approximately 50 million Americans) (Chobanian, 2003).

The prevalence of hypertension is increasing. According to U.S. survey data from the National Health and Nutrition Examination Survey (NHANES), the prevalence of hypertension in adults age 18 and older increased from 25 percent in 1988–1991 to 28.7 percent in 1999–2000 (Hajjar and Kotchen, 2003). The concomitant increase in weight between these periods only partially explained this trend. Hypertension prevalence was

highest in blacks (33.5 percent), women (30.1 percent), and older persons (65.4 percent of persons age  $\geq$  60 years). It is estimated that approximately 90 percent of non-hypertensive adults will develop hypertension during their lifetime (Vasan et al., 2002). In a recent report, average blood pressure levels in children and adolescents age 8 to 17 years increased between NHANES surveys conducted in 1988–1994 and 1999–2000 (Muntner et al., 2004). In aggregate, these data indicate that elevated blood pressure is an extraordinarily common problem, one that is increasing in magnitude in the United States.

Evidence from numerous observational studies has documented a direct, progressive relationship between blood pressure and mortality from CHD and stroke (Lewington et al., 2002). The relationship between blood pressure and kidney disease also is direct and progressive (Klag et al., 1996). Strong support for efforts to reduce blood pressure comes from a combination of information: (1) the direct relationship of blood pressure with blood pressure-related cardiovascular-renal diseases and (2) the well-documented benefits of anti-hypertensive drug therapy. Efforts to reduce blood pressure are warranted in both non-hypertensive and hypertensive individuals.

Reduction in blood pressure and the prevention of hypertension in non-hypertensive individuals are vital and complementary components of public health strategies to prevent blood pressure-related chronic disease. A number of lifestyle modifications that help to control blood pressure are covered in this report. In non-hypertensive individuals, including those with pre-hypertension, lifestyle modifications have the potential to blunt the age-related rise in blood pressure and to lower the risk of blood pressure-related clinical complications. Indeed, even an apparently small reduction in blood pressure, if applied to an entire population, could have an enormous, beneficial impact on cardiovascular events. Stamler et al. (1989) estimated that a 3-mmHg reduction in systolic blood pressure could lead to an 8 percent reduction in stroke mortality and a 5 percent reduction in mortality from CHD.

## **Dyslipidemias**

Dyslipidemias are abnormalities in the types and/or amount of cholesterol and triglycerides in the blood. Of the various lipid abnormalities, an elevated concentration of low-density lipoprotein (LDL) cholesterol is especially important. Elevated LDL cholesterol is causally associated with CHD, the leading cause of death in the United States, and is considered to be a major risk factor for the disease. In addition, LDL cholesterol is the primary target for cholesterol-lowering therapies.

The Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) has defined the following categories for LDL cholesterol values (NCEP, 2002):

- Optimal: < 100 mg/dl
- Near optimal/above optimal: 100–129 mg/dl
- Borderline high: 130–159 mg/dl
- High: 160–189 mg/dl

- Very high: 190 mg/dl

These recommendations were recently revised (Grundy et al., 2004). The major modifications follow:

- In high-risk persons, the recommended LDL cholesterol goal is less than 100 mg/dl.
- When risk is very high, the LDL cholesterol goal is less than 70 mg/dl (considered a therapeutic option).
- For more moderately high-risk persons, the recommended LDL cholesterol goal is less than 130 mg/dl, but an LDL cholesterol goal of less than 100 mg/dl is a therapeutic option.

Elevated serum LDL cholesterol levels are widely prevalent in the United States. Based on data collected from 1988 to 1994, at least 25 percent of all adult men and women over the age of 20 have LDL cholesterol levels above 130 mg/dl. More than 50 percent of men age 35 to 74 and women over age 55 had LDL cholesterol levels above 130 mg/dl (NCEP, 2002). According to NHANES data collected from 1988 to 1994 and then from 1999 to 2000, serum total cholesterol in the U.S. population decreased from 205 mg/dl to 203 mg/dl (Ford et al., 2003). Changes in LDL cholesterol would be expected to parallel serum total cholesterol changes observed in the population during this time span. This very modest decrease in mean total (and LDL) cholesterol values reinforces the importance of public health interventions to reduce this major coronary disease risk factor.

Epidemiologic studies have shown a progressive, dose-response relationship of serum total and LDL cholesterol levels with CHD risk (Stamler et al, 1986). Numerous clinical trials have shown that a reduction in LDL cholesterol concentration translates into a reduction in CHD incidence. For every 1 percent decrease in LDL cholesterol there is a corresponding 1 to 2 percent decrease in CHD risk (NCEP, 2002). The relationship between elevated LDL-cholesterol and the progression and development of CHD is a multistep process that begins early in life. LDL cholesterol lowering at all ages has beneficial effects on the risk of CHD. In early life, LDL cholesterol lowering delays, and even prevents, atherogenesis and subsequent plaque development. In later life, reductions in LDL cholesterol can slow atheroprogession, and marked reductions can, in fact, even reverse atherosclerosis.

## **Diabetes**

Diabetes mellitus is increasing in the United States. At present, some 18.2 million people, or 6.3 percent of the population, have diabetes. However, of these, only about 13 million are aware that they have the disease (National Diabetes Information Clearinghouse, 2003). There are three primary types of diabetes. Type 1 diabetes, present in 5 to 10 percent of persons with diabetes, is an autoimmune disease in which the body makes antibodies to the beta cells of the pancreas, thereby causing destruction of these cells and leading to a failure of secretion of insulin. Type 2 diabetes results from a combination of insulin resistance (an inability of insulin to carry out its function appropriately) and insulin deficiency (an inability of the beta cells to produce enough

insulin). Some 90 to 95 percent of persons with diabetes suffer from this type of diabetes, and 80 to 85 percent of them are obese. Gestational diabetes affects about 4 percent of pregnant women (about 135,000 cases per year) (American Diabetes Association Web site, 2004).

Diabetes leads to a number of serious complications. Diabetes is the leading cause of blindness in the United States today. It also is a leading cause of kidney failure and the leading diagnosis of patients requiring kidney dialysis. Compared with persons without diabetes, persons with diabetes are more than twice as likely to suffer from heart attacks and have a 2 to 4 times greater risk for stroke. More than 60 percent of nontraumatic amputations are related to complications from diabetes. Diabetes is the sixth leading cause of death in this country, and more than half of these deaths are due to heart disease. According to 2002 estimates, the health costs of diabetes in the United States were calculated at \$132 billion (\$91.8 billion direct and \$40.2 billion indirect) (Brandle et al., 2003).

### **Metabolic Syndrome**

The metabolic syndrome is defined by the presence of a collection of metabolic risk factors in an individual. The root causes of metabolic syndrome are overweight/obesity, physical inactivity, and genetic factors. Various risk factors have been included in metabolic syndrome. Factors generally accepted as being characteristic of this syndrome include abdominal obesity, atherogenic dyslipidemia, elevated blood pressure, insulin resistance with or without glucose intolerance, prothrombotic state, and proinflammatory state.

### **Cancer**

Cancer is a general term for diseases in which abnormal cells divide uncontrollably in various organ systems of our body. These cells can invade nearby tissues and spread through the bloodstream and lymphatic system to other areas of the body (NCI, 2004). It has been estimated that more than 1.3 million people will be diagnosed with cancer and more than one-half million will die from cancer in 2004 (ACS, 2004).

Among Americans, the risk of developing and dying from cancer declined from 1975 to 2001 (ACS, 2004). The overall observed cancer incidence rate dropped 0.5 percent per year from 1991 to 2001, and the overall death rate from all cancers combined decreased 1.1 percent per year from 1993 to 2001. Death rates decreased for 11 of the top 15 cancers in men and 8 of the top 15 cancers in women. The incidence declined in men for lung, colon, oral cavity, leukemia, stomach, pancreas, and larynx cancers but increased for melanoma, prostate, kidney, and esophagus cancers. A decline in lung cancer incidence was noted for the first time in women. Incidence rates in women also declined for colon, cervix, pancreas, ovary, and oral cavity cancers but increased for breast, thyroid, bladder, kidney, and melanoma cancers (NCI, 2004).

This progress can be attributed to prevention, earlier detection, and better treatment; however, health disparities and wide variations in survival are observed among different ethnic and racial populations (Jemal et al., 2004). Many cancers are preventable,

especially since nutrition and dietary practices, as well as adherence to healthy lifestyles, appear to be important in reducing the risk and mortality of cancer (Cerhan et al., 2004; Forman et al., 2004).

### **Osteoporosis**

According to a World Health Organization definition (WHO, 1994), osteoporosis is characterized by reduced bone mass, increased bone fragility, and increased risk of fracture. Osteoporosis is a major health risk for Americans, with 10 million individuals already having osteoporosis and 18 million more having low bone mass, placing them at increased risk for this disease (NIH, 2000). The prevalence of osteoporosis among postmenopausal women in the United States is 21 percent in Caucasian and Asian, 16 percent in Hispanic, and 10 percent in African American women (Looker et al., 1995).

In the United States each year approximately 1.5 million fractures are associated with osteoporosis, including 300,000 hip fractures, 700,000 vertebral fractures, 250,000 distal forearm fractures, and 250,000 fractures of other sites (Riggs and Melton, 1995). Among individuals at age 50, the risk of having a hip fracture at some point in the future is estimated at 17 percent for Caucasian women, 6 percent for African American women, 6 percent for Caucasian men, and 3 percent for African American men (Cummings et al., 1993; Melton et al., 1992).

Osteoporosis may be attributed to three factors: (1) accelerated bone loss at menopause in women or as men and women age; (2) suboptimal bone growth during childhood and adolescence, resulting in failure to reach peak bone mass; and (3) bone loss secondary to disease conditions, eating disorders, or certain medications and medical treatments (NIAMS, 2000).

Osteoporotic fractures, particularly vertebral fractures, can be associated with chronic disabling pain. Nearly one-third of patients with hip fractures are moved to nursing homes within the year following a fracture. Notably, one in five patients is no longer living 1 year after sustaining an osteoporotic hip fracture. Hip and vertebral fractures are a problem for women in their late 70s and 80s, wrist fractures are a problem in the late 50s to early 70s, and all other fractures (e.g., pelvic and rib) are a problem throughout postmenopausal years (NIH, 2000).

Direct financial expenditures for treatment of osteoporotic fracture are estimated at \$10 billion to \$15 billion annually. A majority of these estimated costs are due to inpatient care but do not include the costs of treatment for individuals without a history of fractures, nor do they include the indirect costs of lost wages or productivity of either the individual or the caregiver. Consequently, these figures substantially underestimate the true costs of osteoporosis (NIH, 2000). With the expected increase in the average age of the population, the incidence of hip fractures in the United States may triple by the year 2040 (Schneider and Guralnik, 1990).

## AUDIENCE FOR DIETARY GUIDELINES

The *Dietary Guidelines* is intended for the general public over age 2 years. Since the general public now comprises large numbers of individuals with chronic health problems such as obesity, high blood pressure, and dyslipidemias, the Committee considered topics beyond the dietary concerns of persons who meet strict definitions for good health. The populations addressed in the following sections posed special challenges regarding dietary guidance.

### Children

Relatively few studies addressing the role of diet quality and physical activity in promoting health focus on children. Nevertheless, a high-quality diet, sufficient but not excessive in calories, and physical activity are integral in promoting the health, growth, and development of children. The rapid rates of growth occurring during adolescence increase the need for iron and calcium during that period to higher amounts per 1,000 calories than required at any other stage of life. In other words, the additional need for iron and calcium for growth is greater than the additional need for energy. Failure to achieve the recommended calcium intakes may reduce the peak bone mineral content and predispose the individual to osteoporosis later in life. Inadequate iron intakes increase the risk of iron-deficiency anemia, particularly among women. A nutrient-dense diet rich in milk and milk products, lean meats, poultry, fish, and legumes is needed to meet the calcium and iron recommendations during adolescence.

Moreover, it is important to address the needs of children when developing dietary guidance because development, extending from the fetal period through childhood and adolescence, can have a substantial influence on the risk of chronic disease. Furthermore, eating patterns established during childhood often are carried into adulthood (Aggett et al., 1994; Baranowski et al., 2000).

Recent research suggests that adult diseases may have their roots very early in life, even as early as the fetal period, as a result of inadequate nutrient intakes during pregnancy. According to the Barker hypothesis, low birth-weight infants may have increased risk of heart disease, obesity, and type 2 diabetes as a result of conditions in the womb, or in the first few weeks of infancy (Barker, 2003). Childhood and adolescence also are critical periods for developing the antecedents of chronic disease. It is well recognized that peak bone development occurs during the pubertal period. Blood pressure rises through childhood and tracks into adult years. Evidence from autopsy studies of young soldiers has documented early evidence of atherosclerosis in persons under the age of 20. The high and increasing prevalence of overweight has markedly increased the prevalence of type 2 diabetes in children. As recently as 20 years ago, only 2 percent of all newly diagnosed cases of diabetes among youths age 9 to 19 were type 2 diabetes. Today, type 2 diabetes accounts for up to 50 percent of new cases of diabetes among youths. One in 400 youths, by the time they are 20, will have type 2 diabetes mellitus. Excess weight, particularly around the abdomen, as well as too little physical activity, appears to be the basis for developing this disease early in life. At least 2 percent of children have an inherited tendency toward high cholesterol levels known as familial hyperlipidemia, predisposing them to heart disease as an adult if not treated. In addition, children may

adopt health behaviors that have a major influence on chronic disease, including dietary habits, physical activity, and smoking. In fact, 4.1 million children age 12 to 17 are already smokers, and nearly half of the children age 12 to 21 do not exercise on a daily basis.

Thus, children, as well as adults, are at risk for developing chronic disease because of a poor intrauterine environment, inherited tendencies toward the diseases, or an unhealthy lifestyle. Healthy lifestyles started at an early age (e.g., sensible eating and regular exercise) have the potential to diminish these health problems greatly. Childhood represents a sensitive time for developing healthful eating patterns. Studies have documented that patterns of food and nutrient intake track from childhood into later years, including adulthood. When 5 to 6 year olds were followed for 2 years, the correlations between initial and subsequent distribution of energy from macronutrients were statistically significant, ranging between 0.46 and 0.65 (Kemper et al., 1999; Nader et al., 1995; Singer et al., 1995; Stein et al., 1991). Other studies suggest that the intake of micronutrients also tracks from childhood to later years of life (Kelder et al., 1994; Moilanen et al., 1987; Nicklas et al., 1991; Singer et al., 1995). For example, fruit and vegetable consumption (Resnicow et al., 1998) and dairy food intake in childhood both show a moderate degree of tracking with age (Dwyer et al., 1989; Teegarden et al., 1999; Skinner et al., 2003; Welton et al., 1997). In other words, those who consume fruits and vegetables or milk regularly as children are more likely to do so as adults.

### **Pregnant and Lactating Women**

Both pregnancy and lactation are critical periods during which maternal nutrition is a key factor influencing the health of both child and mother. Since physiologic adaptations to increased nutrient demand occur during both of these periods, the dietary need for nutrients is similar to that of nonpregnant women of comparable age (IOM, 1991). However, diet quality during pregnancy may influence fetal growth (see the section on children presented earlier). Certain dietary factors, including folic acid intake, may be especially important for normal development of the embryo and fetus during the first 3 months of pregnancy. Dietary factors may contribute to impaired glucose tolerance, a common disorder of pregnancy (Clapp, 1998; Saldana et al., 2004). Dietary contaminants, such as methylmercury, may adversely affect fetal growth. Maternal diet also may influence breastmilk composition somewhat, especially the milk's content of certain vitamins and alcohol (IOM, 1991).

### **Older Persons**

The 2000 U.S. Census Report showed that about 13 percent of the U.S. population, or about 1 in 7, are over age 65. In 2011, the "baby boom" generation will begin to turn 65, and by 2030, it is projected that one in five people will be over age 65. Individuals age 85 and older are the fastest growing segment of the older population.

As the number of older Americans increases, the role of diet quality and physical activity in reducing the progression of chronic disease needs to be addressed in this population group. Furthermore, the process of aging can influence how nutrients are used and can

exacerbate the effect of poor diet quality on health. For example, aging may reduce nutrient adsorption, increase urinary nutrient loss, and alter normal pathways of nutrient metabolism. These changes associated with aging need to be compensated by dietary changes, which are discussed later in the report.

Most important, modifications of diet and increases in physical activity have tremendous potential as a means to prevent or delay chronic disease in older persons. First, the high absolute risk of chronic disease (e.g., high risk of stroke) is modifiable, not fixed. Second, older individuals achieve, in many instances, greater benefit from a given improvement in diet (e.g., older individuals tend to be more responsive to the blood pressure lowering effects of salt) or from an increase in physical activity. Third, it is well-documented that older individuals can make and sustain behavior changes, including weight loss (DPP, 2002; Whelton et al., 1997).

### **USES OF DIETARY GUIDELINES FOR AMERICANS**

A major goal of the 2005 Dietary Guidelines Advisory Committee was to use the available scientific base to characterize elements of guidance for a healthful diet—dietary guidelines that, if followed, will reduce the risk of chronic disease while meeting nutrient requirements.

The U.S. Government takes steps to promote health and reduce risk in its food assistance programs, nutrition education efforts, and decisions about national health objectives. For example, the National School Lunch Program and the Elderly Nutrition Program incorporate the *Dietary Guidelines* in menu planning; the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) applies the *Dietary Guidelines* in its educational materials; and the *Healthy People 2010* objectives for the Nation include objectives based on the *Dietary Guidelines*. Using the *Dietary Guidelines* helps policymakers, educators, clinicians, and others to speak with one voice on nutrition and health and to reduce the confusion caused by mixed messages in the media.

### **SUMMARY**

In this report, the Dietary Guidelines Advisory Committee integrates scientific evidence on diet, physical activity, and health into a set of conclusions and recommendations to be used as the basis for a revision of the *Dietary Guidelines for Americans*. The guidelines will provide steps that individuals can take toward achieving good health and well-being—both in the present and well into the future. Since the nutrient needs and risks of developing disease differ from person to person, the response to selecting a diet consistent with the *Dietary Guidelines* will vary among individuals. Some may enjoy a substantial health response to the dietary changes, whereas others may still develop elevated blood lipids, high blood pressure, or high blood glucose values. Differences in genetic backgrounds likely contribute to the divergent responses. However, irrespective of diverse biochemical and disease response to the dietary changes, improving diet quality and physical activity can substantially improve public health by reducing the risk of chronic disease.

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