

Summary of American Heart Association Diet and Lifestyle Recommendations Revision 2006

Alice H. Lichtenstein, Lawrence J. Appel, Michael Brands, Mercedes Carnethon, Stephen Daniels, Harold A. Franch, Barry Franklin, Penny Kris-Etherton, William S. Harris, Barbara Howard, Njeri Karanja, Michael Lefevre, Lawrence Rudel, Frank Sacks, Linda Van Horn, Mary Winston, Judith Wylie-Rosett

This article summarizes the recent American Heart Association (AHA) Science Statement, Diet and Lifestyle Recommendations, published in *Circulation* in the July 4, 2006 issue.¹ Improving diet and lifestyle recommendations is a critical component of the AHA's strategy for cardiovascular disease risk reduction in the general population. Specific goals are to consume an overall healthy diet; aim for a healthy body weight; aim for recommended levels of low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides; aim for normal blood pressure; aim for a normal blood glucose level; be physically active; and avoid use of and exposure to tobacco products. The recommendations are to balance caloric intake and physical activity to achieve and maintain a healthy body weight; consume a diet rich in vegetables and fruits; choose whole-grain, high-fiber foods; consume fish, especially oily fish, at least twice a week; limit intake of saturated fat to <7% of energy, *trans* fat to <1% of energy, and cholesterol to <300 mg/d by choosing lean meats and vegetable alternatives, fat-free (skim) or low-fat (1% fat) dairy products and minimize intake of partially hydrogenated fats; minimize intake of beverages and foods with added sugars; choose and prepare foods with little or no salt; if you consume alcohol, do so in moderation; and when you eat food prepared outside of the home, follow these Diet and Lifestyle Recommendations. By adhering to these diet and lifestyle recommendations, the risk of developing cardiovascular disease can be substantially reduced, which remains the leading cause of morbidity and mortality in the United States.

From the Tufts University (A.H.L.), Boston, Mass; John Hopkins University (L.J.A.), Baltimore, Md; Medical College of Georgia (M.B.), August, Ga; Northwestern University (M.C., L.V.H.), Chicago, Ill; University of Colorado (S.D.), Boulder, Colo; Emory University (H.A.F.), Atlanta, Ga; Wayne State University (B.F.), Detroit, Mich; Pennsylvania State University (P.K.-E.), University Park, Penn; St. Luke's Hospital (W.S.H.), Kansas City, Mo; MedStar Research Institute (B.H.), Washington, DC; Center for Health Research (N.K.), Berkeley, Calif; Pennington Biomedical Research Center (M.L.), Baton Rouge, La; Wake Forest University School of Medicine (L.R.), Winston-Salem, NC; Harvard School of Public Medicine (F.S.), Boston, Mass; and Albert Einstein College of Medicine (J.W.-R.), New York, NY. M.W. is an AHA consultant.

Correspondence to Alice Lichtenstein, Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University, Boston, MA 02111. E-mail alice.lichtenstein@tufts.edu

Arterioscler Thromb Vasc Biol. 2006;26:2186-2191.)

© 2006 American Heart Association, Inc.

Arterioscler Thromb Vasc Biol. is available at <http://www.atvbaha.org>
DOI: 10.1161/01.ATV.0000238352.25222.5e

Improving diet and lifestyle is a critical component of the AHA strategy to prevent cardiovascular disease (CVD). The 2006 AHA Diet and Lifestyle Recommendations¹ were designed to meet this objective and are one component of a comprehensive plan for cardiovascular risk reduction. The recommendations are appropriate for the general public, including adults and children over 2 years of age. Separate AHA dietary recommendations specifically addressing the special needs of growing children have recently been published.²

Public Health and Clinical Application of AHA Diet and Lifestyle Recommendations

Public Health Recommendations

Maintaining a healthy diet and lifestyle offers the greatest potential of all known approaches to reduce CVD risk in the general public. This is still true in spite of major advances in clinical medicine. The recommendations contained in the document provide a foundation for a public health approach to CVD risk reduction through healthy eating habits and other lifestyle factors.

Clinical Recommendations

The recommendations can be applied to the clinical management of patients with or at risk for CVD. For certain patients at higher risk, the recommendations may have to be intensified. Although great advances have been made in prevention and treatment of CVD through drug therapies and procedures, diet and lifestyle therapies remain the foundation of clinical intervention for prevention. Unfortunately, the latter are commonly neglected, to the detriment of patients.

Goals

The AHA Diet and Lifestyle Goals are intended to reduce CVD risk (Table 1). They provide guidance for adults and children over the age of 2 years.

Consume an Overall Healthy Diet

Healthy dietary patterns are associated with a substantially reduced risk of CVD, CVD risk factors, and noncardiovascular diseases.³⁻⁶ An emphasis on the whole diet is appropriate to ensure nutrient adequacy and energy balance.⁷ The AHA recommends that individuals consume a variety of fruits, vegetables, and grain products, especially whole grains; choose fat-free and low-fat dairy products, legumes, poultry, and lean meats; and eat fish, preferably oily fish, at least twice a week.

TABLE 1. AHA 2006 Diet and Lifestyle Goals for Cardiovascular Disease Risk Reduction

Consume an overall healthy diet.
Aim for a healthy body weight.
Aim for recommended levels of low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides.
Aim for a normal blood pressure.
Aim for a normal blood glucose level.
Be physically active.
Avoid use of and exposure to tobacco products.

Aim for a Healthy Body Weight

Obesity is an independent risk factor for CVD.⁸ Excess body weight adversely affects CVD risk factors (eg, increasing low-density lipoprotein [LDL] cholesterol levels, triglyceride levels, blood pressure [BP], and blood glucose levels, and reducing high-density lipoprotein [HDL] cholesterol levels) and increases the risk of developing coronary heart disease (CHD), heart failure, stroke, and cardiac arrhythmias. It is important to intensify efforts in the general population to help individuals avoid inappropriate weight gain during childhood and subsequent weight gain during adult years.

Aim for a Desirable Lipid Profile

LDL is the major cholesterol-carrying lipoprotein particle in plasma. Its concentrations are most closely associated with risk of developing CVD.⁹ The strongest dietary determinants of elevated LDL cholesterol concentrations are dietary saturated fatty acid and *trans* fatty acid intakes.⁹ To a lesser extent, dietary cholesterol and excess body weight are positively related to levels of LDL cholesterol.⁹ The concentration of HDL cholesterol is inversely associated with CVD risk.⁹ This association is thought to be mediated by a constellation of events collectively referred to as reverse cholesterol transport. Determinants of high triglycerides are mainly the same as those of low HDL cholesterol.¹⁰ The major dietary factors adversely affecting HDL cholesterol levels include very low-fat diets (<15% energy as fat) and excess body weight.¹⁰

Aim for a Normal Blood Pressure

A normal BP is a systolic BP <120 mm Hg and a diastolic BP <80 mm Hg. BP is a strong, consistent, continuous, independent, and etiologically relevant risk factor for cardiovascular-renal disease. Dietary factors known to lower BP are reduced salt intake, caloric deficit to induce weight loss, moderation of excess alcohol consumption, increased potassium intake, and consumption of an overall healthy diet consistent with the recommendations in this document.⁴

Aim for a Normal Blood Glucose Level

A normal fasting glucose level is ≤ 100 mg/dL, whereas diabetes is defined by a fasting glucose level ≥ 126 mg/dL. Hyperglycemia and the often-associated insulin resistance are related to numerous cardiovascular complications, including CHD, stroke, peripheral vascular disease, cardiomyopathy, and heart failure. Reducing caloric intake and increasing physical activity to achieve even a modest weight loss can

TABLE 2. AHA 2006 Diet and Lifestyle Recommendations for Cardiovascular Disease Risk Reduction

Balance calorie intake and physical activity to achieve or maintain a healthy body weight.
Consume a diet rich in vegetables and fruits.
Choose whole-grain, high-fiber foods.
Consume fish, especially oily fish, at least twice a week.
Limit your intake of saturated fat to <7% of energy, <i>trans</i> fat to <1% of energy, and cholesterol to <300 mg per day by:
choosing lean meats and vegetable alternatives;
selecting fat-free (skim), 1%-fat, and low-fat dairy products; and
minimizing intake of partially hydrogenated fats.
Minimize your intake of beverages and foods with added sugars.
Choose and prepare foods with little or no salt.
If you consume alcohol, do so in moderation.
When you eat food that is prepared outside of the home, follow the AHA Diet and Lifestyle Recommendations.

delay the onset of insulin resistance and improve glucose control once it is established.^{11,12}

Be Physically Active

Regular physical activity is essential for maintaining physical and cardiovascular fitness, maintaining healthy weight, and sustaining weight loss once achieved.¹³ Physical activity improves cardiovascular risk factors and lowers the risk of developing other chronic diseases.¹⁴

Avoid Use of and Exposure to Tobacco Products

On the basis of the overwhelming evidence for the adverse effects of tobacco products and secondary exposure to tobacco smoke on CVD, as well as cancer and other serious illness, the AHA strongly and unequivocally endorses efforts to eliminate the use of tobacco products and minimize exposure to second-hand smoke.^{15–17} Concern about weight gain should not be a reason for continued use of tobacco products.¹⁸

AHA Diet and Lifestyle Recommendations

These recommendations are intentionally presented in a manner that allows maximal flexibility in their implementation (Table 2).¹ They are not presented as a “diet plan,” per se, but rather a lifestyle prescription to promote cardiovascular health. Practical approaches for implementing these recommendations are presented in Table 3.

Balance Calorie Intake and Physical Activity to Achieve or Maintain a Healthy Body Weight

To avoid weight gain after childhood, individuals must control calorie intake so that energy balance is achieved—that is, energy intake matches energy expenditure. To control calorie intake, individuals should increase their awareness of the calorie content of foods and beverages per portion consumed.¹⁹ Regular daily physical activity has been shown to be particularly effective in maintaining weight loss once achieved.²⁰ The AHA recommends that all adults accumulate ≥ 30 minutes of physical activity most days of the week.

TABLE 3. Practical Tips to Implement AHA 2006 Diet and Lifestyle Recommendations**Lifestyle**

- Know your caloric needs to achieve and maintain a healthy weight.
- Know the calorie content of the foods and beverages you consume.
- Track your weight, physical activity, and calorie intake.
- Prepare and eat smaller portions.
- Track and, when possible, decrease screen time (eg, watching television, surfing the Web, playing computer games).
- Incorporate physical movement into habitual activities.
- Do not smoke or use tobacco products.
- If you consume alcohol, do so in moderation (equivalent of no more than 1 drink in women or 2 drinks in men per day).

Food choices and preparation

- Use the nutrition facts panel and ingredients list when choosing foods to buy.
- Eat fresh, frozen, and canned vegetables and fruits without high-calorie sauces and added salt and sugars.
- Replace high-calorie foods with fruits and vegetables.
- Increase fiber intake by eating beans (legumes), whole-grain products, fruits, and vegetables.
- Use liquid vegetable oils in place of solid fats.
- Limit beverages and foods high in added sugars. Common forms of added sugars are sucrose, glucose, fructose, maltose, dextrose, corn syrups, concentrated fruit juice, and honey.
- Choose foods made with whole grains. Common forms of whole grains are whole wheat, oats/oatmeal, rye, barley, corn, popcorn, brown rice, wild rice, buckwheat, triticale, bulgur (cracked wheat), millet, quinoa, and sorghum.
- Cut back on pastries and high-calorie bakery products (eg, muffins, doughnuts).
- Select milk and dairy products that are either fat free or low fat.
- Reduce salt intake by:
 - comparing the sodium content of similar products (eg, different brands of tomato sauce) and choosing products with less salt;
 - choosing versions of processed foods, including cereals and baked goods, that are reduced in salt; and
 - limiting condiments (eg, soy sauce, ketchup).
- Use lean cuts of meat and remove skin from poultry before eating.
- Limit processed meats that are high in saturated fat and sodium.
- Grill, bake, or broil fish, meat, and poultry.
- Incorporate vegetable-based meat substitutes into favorite recipes.
- Encourage the consumption of whole vegetables and fruits in place of juices.

Consume a Diet Rich in Vegetables and Fruits

In longitudinal observation studies, persons who regularly consume rich in vegetable and fruit diets are at a lower risk of developing cardiovascular disease, particularly stroke.^{21,22} Most vegetables and fruits are rich in nutrients, low in calories, and high in fiber. Vegetables and fruits that are deeply colored throughout (eg, spinach, carrots, peaches, berries) should be emphasized. Techniques that preserve nutrient and fiber content without adding unnecessary calories, saturated or *trans* fat, sugar, and salt are recommended (Table 3). Fruit juice is not equivalent to the whole fruit in fiber content and perhaps satiety value and should not be emphasized.

Choose Whole-Grain, High-Fiber Foods

Dietary patterns that are high in whole-grain products and fiber have been associated with increased diet quality.²³ Fiber modestly reduces LDL cholesterol levels, has been associated with decreased CVD risk and slower progression of CVD, and may promote satiety.^{24–27} The AHA recommends that at least half of grain intake come from whole grains.

Consume Fish, Especially Oily Fish, at Least Twice a Week

Fish, especially oily fish, is rich in very long-chain omega-3 polyunsaturated fatty acids: eicosapentaenoic acid, C20:5n-3 (EPA) and docosahexaenoic acid, C22:6n-3 (DHA). The consumption of 2 servings (\approx 8 ounces) per week of fish is associated with a reduced risk of both sudden death and death from coronary artery disease in adults.^{28,29} Methods used to prepare fish should minimize the addition of saturated and *trans* fatty acids, as occurs with the use of cream sauces or hydrogenated fat during frying.

Limit Your Intake of Saturated and Trans Fat and Cholesterol

As a set of goals, the AHA recommends intakes of <7% of energy as saturated fat, <1% of energy as *trans* fat, and <300 mg cholesterol per day. These goals can be achieved by choosing lean meats and vegetable alternatives; selecting fat-free (skim), and low-fat (1%-fat), dairy products; and minimizing intake of partially hydrogenated fats. The AHA supports the recommendations of the Institute of Medicine and the National Cholesterol Education Program of 25% to 35% of total energy as fat.^{30,31}

Minimize Your Intake of Beverages and Foods With Added Sugars

Over the past few decades, the consumption of beverages and foods with added sugars has risen markedly.^{32,33} The primary reasons for reducing the intake of beverages and foods with added sugars are to lower total calorie intake and promote nutrient adequacy.³⁴ Some evidence suggests that calories consumed as liquid are not as satiating as calories consumed as solid food.³⁵

Choose and Prepare Foods With Little or No Salt

A reduced sodium intake can prevent hypertension in nonhypertensive individuals, can lower BP in the setting of antihypertensive medication, and can facilitate hypertension control.^{36,37} Because of the progressive dose–response relationship between sodium intake and BP, it is difficult to set a recommended upper level of sodium intake. In view of the available high-sodium food supply and the currently high levels of sodium consumption, the AHA recommends a reduction in sodium intake to 2.3 g/d (100 mmol/d).

If You Consume Alcohol, Do So in Moderation

Moderate alcohol intake has been associated with reduced cardiovascular events in many populations.^{38,39} The consumption of alcohol cannot be recommended solely for CVD risk reduction. Alcohol can be addictive, and high intake can be associated with serious adverse health and social conse-

quences.⁷ For these reasons, and on the basis of available epidemiological data, the AHA recommends that if alcoholic beverages are consumed, they should be limited to no more than 1 drink per day for women and 2 drinks per day for men, and should be consumed with meals.

When You Eat Food That Is Prepared Outside of the Home, Follow the AHA 2006 Diet and Lifestyle Recommendations

Common features of food prepared outside of the home, including restaurants and grocery stores, quick-serve establishments, schools and daycare centers, and other non-home locations, is large portion sizes and high energy density, compared to food prepared at home.⁴⁰ Many types of take-away foods, particularly traditional quick-serve, are also high in saturated fat, *trans* fatty acids, cholesterol, added sugars, and sodium and low in fiber and micronutrients. Individuals should make wise choices when they eat food prepared outside of the home.

Dietary Factors With Unproven or Uncertain Effects on CVD Risk

Antioxidant Supplements

Antioxidant vitamin supplements or other supplements such as selenium to prevent CVD are not recommended.^{41–44} Nevertheless, food sources of antioxidant nutrients, principally from a variety of plant-derived foods such as fruits, vegetables, whole grains, and vegetable oils are recommended.

Soy Protein

Evidence of a direct cardiovascular health benefit from consuming soy protein products instead of dairy or other proteins or of isoflavone supplements is minimal.^{44–48} Nevertheless, consumption of soy protein-rich foods may indirectly reduce CVD risk if they replace animal and dairy products that contain saturated fat and cholesterol.

Folate and Other B Vitamins

Available evidence does not support recommending folate and other B vitamin supplements as a means to reduce CVD risk.^{49–54}

Phytochemicals

Flavonoids and sulfur-containing compounds are classes of compounds found in fruits and vegetables which have not been well characterized.⁵⁵ At this time the most prudent way to ensure optimum consumption of macronutrients, micronutrients, and associated bioactive compounds is to consume diets consistent with the recommendations in this document.⁵⁶

Other Dietary Factors That Affect CVD Risk

Fish Oil Supplements

The AHA only recommends fish oils supplements for individuals with documented CHD (1g/d) or hypertriglyceridemia (2 to 4 g/d) under supervision of a physician.²⁹

Plant Stanols/Sterols

Plant stanols/sterols, at levels up to 2 g/d, lower LDL cholesterol levels up to 15%^{9,57} and therefore are seen as a therapeutic option, in addition to diet and lifestyle modification, for individuals with elevated LDL cholesterol levels. Plant stanol/sterols are currently available in a wide variety of foods (eg, margarine), drinks (eg, orange juice), and soft gel capsules. The choice of vehicle should be determined by availability and by other considerations, including caloric content. To sustain LDL cholesterol reductions from these products, individuals need to consume them daily, just as they would use lipid-lowering medication.

Special Groups

Children Over 2 Years of Age

Overweight and obesity are a particular concern for children and adolescents. Children can eat a diet consistent with the AHA 2006 Diet and Lifestyle Recommendations and maintain appropriate growth while lowering risk for future CVD.¹ More specific guidance is provided in a separate AHA diet statement for children.²

Older Adults

Atherosclerosis is a chronic process beginning in youth. Because of the high incidence of CVD events in older-aged individuals, even relatively small improvements in risk factors (eg, small reductions in BP and LDL cholesterol through diet and lifestyle changes) should be of substantial benefit.^{58–59}

Persons With Metabolic Syndrome

Metabolic syndrome refers to a cluster of abnormalities that are related to insulin resistance and that commonly occur in the setting of overweight and obesity. Refer to a AHA statement specifically addressing the unique issues associated with metabolic syndrome.⁶⁰

Persons With Chronic Kidney Disease

Chronic kidney disease (CKD), which precedes end-stage kidney disease, substantially increases the risk of CVD.⁶¹ Dietary therapies recommended for the general population are also recommended for persons with early stages of CKD, consistent with the individualized guidance provided by the patient's healthcare provider.⁶²

Socioeconomic Groups at High Risk of CVD

It is well recognized that individuals of lower socioeconomic status have a higher incidence of CVD risk factors and CVD than do individuals of higher socioeconomic status.^{63,64} Although the reasons for such disparities are complex and multifactorial, available research is sufficient to advocate diet and lifestyle changes as a means to reduce disparities. Targeted messages directed at ethnic minorities and policies that affect availability and affordability are critical.

Environmental Influences on CVD

Health Behaviors

Ultimately, people select the types and amount of food they eat and the amount of physical activity they perform. Still,

environment has a powerful influence on whether people consume excess calories, follow a healthy diet, and are physically active. For individuals to adhere to a healthy diet and lifestyle, the AHA strongly believes that substantial changes to the environment must occur. Key parties in implementing these changes include practitioners, restaurants, food industry, schools and local governments.

Conclusions

A substantial and expanding body of evidence has implicated several aspects of diet and lifestyle in the pathogenesis of CVD and its risk factors. To harness this potential, individuals should aim for a desirable body weight, be physically active, avoid tobacco exposure, and follow a diet and lifestyle consistent with the 2006 AHA diet and lifestyle recommendations.¹ Accomplishing these objectives will require individuals to change their behavior and society to make substantial environmental changes. The current challenge to healthcare providers, researchers, and government officials is to develop and implement effective clinical and public health strategies that lead to sustained lifestyle changes among individuals and, more broadly, among populations.

Disclosures

None.

References

- Lichtenstein AH, Appel LJ, Brands M, Carnethon M, Daniels S, Franch HA, Franklin B, Kris-Etherton P, Harris WS, Howard B, Karanja N, Lefevre M, Rudel L, Sacks F, Van Horn L, Wionston M, Wylie-Rosett J. Diet and lifestyle recommendations revision 2006. A scientific statement from the American Heart Association Nutrition Committee. *Circulation.* 2006;114:82–96.
- Gidding SS, Dennison BA, Birch LL, Daniels SR, Gilman MW, Lichtenstein AH, Rattay KT, Steinberger J, Stettler N, Van Horn L; American Heart Association; American Academy of Pediatrics. Dietary recommendations for children and adolescents: a guide for practitioners: consensus statement from the American Heart Association. *Circulation.* 2005;112:2061–2075.
- Knoops KT, de Groot LC, Kromhout D, Perrin AE, Moreiras-Varela O, Menotti A, van Staveren WA. Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: the HALE project. *J Am Med Assoc.* 2004;292:1433–1439.
- Appel LJ, Moore TJ, Obarzanek E, Vollmer WM, Svetkey LP, Sacks FM, Bray GA, Vogt TM, Cutler JA, Windhauser MM, Lin PH, Karanja J. A clinical trial of the effects of dietary patterns on blood pressure. DASH Collaborative Research Group. *N Engl J Med.* 1997;336:1117–1124.
- Appel LJ, Sacks FM, Carey VJ, Obarzanek E, Swain JF, Miller ER 3rd, Conlin PR, Erlinger TP, Rosner BA, Laranjo NM, Charleston J, McCarron P, Bishop LM; OmniHeart Collaborative Research Group. The effects of protein, monounsaturated fat, and carbohydrate intake on blood pressure and serum lipids: results of the OmniHeart randomized trial. *J Am Med Assoc.* 2005;294:2455–2464.
- van Dam RM, Rimm EB, Willett WC, Stampfer MJ, Hu FB. Dietary patterns and risk for type 2 diabetes mellitus in U.S. men. *Ann Intern Med.* 2002;136:201–209.
- US Department of Health and Human Services; US Department of Agriculture. *Dietary Guidelines for Americans, 2005.* 6th ed. Washington, DC: US Government Printing Office; 2005.
- Rashid MN, Fuentes F, Touchon RC, Wehner PS. Obesity and the risk for cardiovascular disease. *Prev Cardiol.* 2003;6:42–47.
- Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of 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). *J Am Med Assoc.* 2001;285:2486–2497.
- Wilson PW, Grundy SM. The metabolic syndrome: a practical guide to origins and treatment: part II. *Circulation.* 2003;108:1537–1540.
- Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM. Diabetes Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002;346:393–403.
- Lindstrom J, Louheranta A, Mannelin M, Rastas M, Salminen V, Eriksson J, Uusitupa M, Tuomilehto J. Finnish Diabetes Prevention Study Group. The Finnish Diabetes Prevention Study (DPS): lifestyle intervention and 3-year results on diet and physical activity. *Diabetes Care.* 2003;26:3230–3236.
- Fogelholm M, Kukkonen-Harjula K. Does physical activity prevent weight gain—a systematic review. *Obes Rev.* 2000;1:95–111.
- Maron BJ, Chaitman BR, Ackerman MJ, Bayes de Luna A, Corrado D, Crosson JE, Deal BJ, Driscoll DJ, Estes NA 3rd, Araujo CG, Liang DH, Mitten MJ, Myerburg RJ, Pelliccia A, Thompson PD, Towbin JA, Van Camp SP. Working Groups of the American Heart Association Committee on Exercise, Cardiac Rehabilitation, and Prevention; Councils on Clinical Cardiology and Cardiovascular Disease in the Young. Recommendations for physical activity and recreational sports participation for young patients with genetic cardiovascular diseases. *Circulation.* 2004;109:2807–2816.
- Ockene IS, Miller NH. Cigarette smoking, cardiovascular disease, and stroke: a statement for healthcare professionals from the American Heart Association, American Heart Association Task Force on Risk Reduction. *Circulation.* 1997;96:3243–3247.
- Passive smoke nearly as bad for heart as smoking [press release]. Dallas, Tex: American Heart Association Public and Media Relations; 2005.
- Barnoya J, Glantz SA. Cardiovascular effects of secondhand smoke: nearly as large as smoking. *Circulation.* 2005;111:2684–2698.
- Filozof C, Fernandez Pinilla MC, Fernandez-Cruz A. Smoking cessation and weight gain. *Obes Rev.* 2004;5:95–103.
- Klein S, Burke LE, Bray GA, Allison DB, Pi-Sunyer X, Hong Y, Eckel RH. American Heart Association Council on Nutrition, Physical Activity, and Metabolism. Clinical implications of obesity with specific focus on cardiovascular disease: a statement for professionals from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism: endorsed by the American College of Cardiology Foundation. *Circulation.* 2004;110:2652–2967.
- Wing RR, Phelan S. Long-term weight loss maintenance. *Am J Clin Nutr.* 2005;82:222S–225S.
- Bazzano LA, Serdula MK, Liu S. Dietary intake of fruits and vegetables and risk of cardiovascular disease. *Curr Atheroscler Rep.* 2003;5:492–499.
- Hung HC, Joshipura KJ, Jiang R, Hu FB, Hunter D, Smith-Warner SA, Colditz GA, Rosner B, Spiegelman D, Willett WC. Fruit and vegetables intake and risk of major chronic disease. *J Natl Cancer Inst.* 2004;96:1577–1584.
- Hu FB, Willett WC. Optimal diets for prevention of coronary heart disease. *J Am Med Assoc.* 2002;288:2569–2578.
- Brown L, Rosner B, Willett WW, Sacks FM. Cholesterol-lowering effects of dietary fiber: a meta-analysis. *Am J Clin Nutr.* 1999;69:30–42.
- Pereira MA, O'Reilly E, Augustsson K, Fraser GE, Goldbourt U, Heitmann BL, Hallmans G, Knekt P, Liu S, Pietinen P, Spiegelman D, Stevens J, Virtamo J, Willett WC, Ascherio A. Dietary fiber and risk of coronary heart disease: a pooled analysis of cohort studies. *Arch Intern Med.* 2004;164:370–376.
- Liu S, Manson JE, Stampfer MJ, Rexrode KM, Hu FB, Rimm EB, Willett WC. Whole grain consumption and risk of ischemic stroke in women: a prospective study. *J Am Med Assoc.* 2000;284:1534–1540.
- Erkkilä AT, Herrington DM, Mozaffarian D, Lichtenstein AH. Cereal fiber and whole-grain intake are associated with reduced progression of coronary-artery atherosclerosis in postmenopausal women with coronary artery disease. *Am Heart J.* 2005;150:94–101.
- Kris-Etherton PM, Harris WS, Appel LJ. American Heart Association. Nutrition Committee. Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. *Circulation.* 2002;106:2747–2757.
- Wang C, Chung M, Balk E, Kupelnick B, Jordan H, Harris W, Lichtenstein A, Lau J. N-3 fatty acids from fish or fish-oil supplements, but not α -linolenic acid, benefit cardiovascular disease outcomes in primary and secondary-prevention studies: a systematic review. *Am J Clin Nutr.* 2006;83:5–17.
- Subcommittees on Upper Reference Levels, Institute of Medicine of the National Academies. *Dietary Reference Intakes: Energy, Carbohydrate,*

- Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press; 2005.
31. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. Executive summary of 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). *J Am Med Assoc*. 2001;285:2486–2497.
 32. Cook AJ, Friday JE *Pyramid Servings Intakes in the United States 1999–2002, 1 Day*. Beltsville, Md: USDA, Agricultural Research Service, Community Nutrition Research Group; 2005.
 33. Block G. Foods contributing to energy intake in the US: data from NHANES III and NHANES 1999–2000. *J Food Compos Anal*. 2004;17:439–447.
 34. Popkin BM, Nielsen SJ. The sweetening of the world's diet. *Obes Res*. 2003;11:1325–1332.
 35. Bell EA, Roe LS, Rolls BJ. Sensory-specific satiety is affected more by volume than by energy content of a liquid food. *Physiol Behav*. 78(4–5): 593–600, 2003.
 36. Sacks FM, Svetkey LP, Vollmer WM, Appel LJ, Bray GA, Harsha D, Obarzanek E, Conlin PR, Miller ER 3rd, Simons-Morton DG, Karanja N, Lin PH; DASH-Sodium Collaborative Research Group. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. *N Engl J Med*. 2001;344:3–10.
 37. Johnson AG, Nguyen TV, Davis D. Blood pressure is linked to salt intake and modulated by the angiotensinogen gene in normotensive and hypertensive elderly subjects. *J Hypertens*. 2001;19:1053–1060.
 38. Flesch M, Rosenkranz S, Erdmann E, Bohm M. Alcohol and the risk of myocardial infarction. *Basic Res Cardiol*. 2001;96:128–135.
 39. Goldberg IJ, Mosca L, Piano MR, Fisher EA. Nutrition Committee, Council on Epidemiology and Prevention, and Council on Cardiovascular Nursing of the American Heart Association. *AHA Science Advisory: Wine and your heart: a science advisory for healthcare professionals from the Nutrition Committee, Council on Epidemiology and Prevention, and Council on Cardiovascular Nursing of the American Heart Association*. *Circulation*. 2001;103:472–475.
 40. Nielsen SJ, Popkin BM. Patterns and trends in food portion sizes, 1977–1998. *J Am Med Assoc*. 2003;289:450–453.
 41. Kris-Etherton PM, Lichtenstein AH, Howard BV, Steinberg D, Witztum JL. Nutrition Committee of the American Heart Association Council on Nutrition, Physical Activity, and Metabolism. Antioxidant vitamin supplements and cardiovascular disease. *Circulation*. 2004;110:637–641.
 42. Lee IM, Cook NR, Gaziano JM, Gordon D, Ridker PM, Manson JE, Hennekens CH, Buring JE. Vitamin E in the primary prevention of cardiovascular disease and cancer: the Women's Health Study: a randomized controlled trial. *J Am Med Assoc*. 2005;294:56–65.
 43. Lonn E, Bosch J, Yusuf S, Sheridan P, Pogue J, Arnold JM, Ross C, Arnold A, Sleight P, Probstfield J, Dagenais GR. HOPE and HOPE-TOO Trial Investigators. Effects of long-term vitamin E supplementation on cardiovascular events and cancer: a randomized controlled trial. *J Am Med Assoc*. 2005;293:1338–1347.
 44. Miller ER 3rd, Pastor-Barriuso R, Dalal D, Riemersma RA, Appel LJ, Guallar E. Meta-analysis: high-dosage vitamin E supplementation may increase all-cause mortality. *Ann Intern Med*. 2005;142:37–46.
 45. Krejnkamp-Kaspers S, Kok L, Grobbee DE, de Haan EH, Aleman A, Lampe JW, van der Schouw YT. Effect of soy protein containing isoflavones on cognitive function, bone mineral density, and plasma lipids in postmenopausal women: a randomized controlled trial. *J Am Med Assoc*. 2004;292:65–74.
 46. Sacks FM, Lichtenstein A, Van Horn L, Harris W, Kris-Etherton P, Winston M. American Heart Association Nutrition Committee. Soy protein, isoflavones, and cardiovascular health: an American Heart Association science advisory for professionals from the Nutrition Committee. *Circulation*. 2006;113:1034–1044.
 47. Lichtenstein AH. Soy protein, isoflavones and cardiovascular disease risk. *J Nutr*. 1998;128:1589–1592.
 48. Weggemans RM, Trautwein EA. Relation between soy-associated isoflavones and LDL and HDL cholesterol concentrations in humans: a meta-analysis. *Eur J Clin Nutr*. 2003;57:940–946.
 49. Malinow MR, Bostom AG, Krauss RM. Homocyst(e) ine, diet, and cardiovascular diseases: a statement for healthcare professionals from the Nutrition Committee, American Heart Association. *Circulation*. 1999;99: 178–182.
 50. Toole JF, Malinow MR, Chambless LE, Spence JD, Pettigrew LC, Howard VJ, Sides EG, Wang CH, Stampfer M. Lowering homocysteine in patients with ischemic stroke to prevent recurrent stroke, myocardial infarction, and death: the Vitamin Intervention for Stroke Prevention (VISP) randomized controlled trial. *J Am Med Assoc*. 2004;291:565–575.
 51. Lange H, Suryapranata H, De Luca G, Borner C, Dille J, Kallmayer K, Pasalary MN, Scherer E, Dambrink JH. Folate therapy and in-stent restenosis after coronary stenting. *N Engl J Med*. 2004;350:2673–2681.
 52. Potena L, Grigioni F, Magnani G, Ortolani P, Coccolo F, Sassi S, Koessels K, Marzocchini C, Marzocchi A, Carigi S, Musuraca AC, Russo A, Magelli C, Branzi A. Homocysteine-lowering therapy and early progression of transplant vasculopathy: a prospective, randomized, intravascularultrasound (IVUS)-based study. *Am J Transplant*. 2005;5: 2258–2264.
 53. Lonn E, Yusuf S, Arnold MJ, Sheridan P, Pogue J, Micks M, McQueen MJ, Probstfield J, Fodor G, Held C, Genest J Jr. Heart Outcomes Prevention Evaluation (HOPE) 2 Investigators. Homocysteine lowering with folic acid and B vitamins in vascular disease. *N Engl J Med*. 2006;354: 1567–1577.
 54. Bona KH, Njolstad I, Ueland PM, Schirmer H, Tverdal A, Steigen T, Wang H, Nordrehaug JE, Arnesen E, Rasmussen K. NORVIT Trial Investigators. Homocysteine lowering and cardiovascular events after acute myocardial infarction. *N Engl J Med*. 2006;354:1578–1588.
 55. Howard BV, Kritchevsky D. Phytochemicals and cardiovascular disease. A statement for healthcare professionals from the American Heart Association. *Circulation*. 1997;95:2591–2593.
 56. US Department of Agriculture, Agricultural Research Service, Dietary Guidelines Advisory Committee. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2005.
 57. Lichtenstein AH, Deckelbaum RJ for AHA Nutrition Committee. Stanol/ Sterol ester-containing foods and blood cholesterol levels. *Circulation* 2001;103:1177–1179.
 58. Mozaffarian D, Longstreth WT Jr, Lemaitre RN, Manolio TA, Kuller luteinizing hormone (LH), Burke GL, Siscovick DS. Fish consumption and stroke risk in elderly individuals: the cardiovascular health study. *Arch Intern Med*. 2005;165:200–206.
 59. Klag MJ, Whelton PK, Appel LJ. Effect of age on the efficacy of blood pressure treatment strategies. *Hypertension*. 1990;16:700–705.
 60. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, Gordon DJ, Krauss RM, Savage PJ, Smith SC Jr., Spertus JA, Costa F; Am. Heart Association; National Heart, Lung, and Blood Institute. Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. *Circulation*. 2005;112:2735–2752.
 61. Sarnak MJ, Levey AS, Schoolwerth AC, Coresh J, Culleton B, Hamm LL, McCullough PA, Kasiske BL, Kelepouris E, Klag MJ, Parfrey P, Pfeffer M, Spinosa DJ, Wilson PW. American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. *Hypertension*. 2003;42: 1050–1065.
 62. Kidney Disease Outcomes Quality Initiative (K/DOQI). K/DOQI clinical practice guidelines on hypertension and antihypertensive agents in chronic kidney disease. *Am J Kidney Dis*. 2004;43(suppl 1):S1–S290.
 63. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *J Am Med Assoc*. 2003;289:76–79.
 64. Reeves MJ, Rafferty AP. Healthy lifestyle characteristics among adults in the United States, 2000. *Arch Intern Med*. 2005;165:854–857.