

THE BASIS OF A HEALTHY DIET

chapter 2

How many times have you heard wild claims about how healthful certain foods are for you? As consumers focus more and more on diet and disease, food manufacturers are asserting that their products have all sorts of health benefits. Supermarket shelves have begun to look like an 1800s medicine show.^{20, 23} “Take garlic capsules to avoid a heart attack.” “Eat more olive oil and oat bran to lower blood cholesterol.” Hearing these claims, you would think that food manufacturers have solutions to all of our health problems.

Advertising aside, nutrient intakes out of balance with nutrient needs—such as excess energy, saturated fat, sodium, and alcohol and sugar intake—are linked to many leading causes of death in the United States, including obesity, hypertension, heart disease, cancer, liver disease, and type 2 diabetes.^{2, 26} In this chapter, you will explore the components of a healthy diet—a diet that will minimize your risks of developing nutrition-related diseases. The goal is to provide you with a firm understanding of basic diet-planning concepts before you study the nutrients in detail.

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KEY CHAPTER CONCEPTS

- The watchwords about nutrition are *variety, balance, moderation*, and *moderation* when it comes to dieting or dieting. To those, we can also add *variety, balance, moderation, and moderation* to complement the diet.
- Nutrient density compares the nutrient content of a food with its energy content. A nutrient-dense food is high in one or more nutrients compared with energy content; for example, milk is a nutrient-dense source of calcium.
- Energy density of a food is determined by comparing energy content with the weight of food. A food rich in calories but with relatively few nutrients is considered energy dense. Examples include nuts, cookies, fried foods in general, and fast-food snacks. Foods with low energy density include fruits, vegetables, and fluid foods that incorporate lots of water during cooking, such as soups and meat. Having low-energy-density foods in a diet can help you eat more without contributing many calories and so may aid in weight loss. Conversely, foods with high energy density can help people with poor appetites, such as the elderly, maintain or gain weight.
- Dietary Reference Intakes are associated nutrient standards provided as a benchmark for estimating the nutrient needs of healthy individuals. These standards should be met primarily (or entirely) by consuming a variety of nutrient-rich foods—not by relying on the quality of nutrient supplements.
- Daily values are adopted from accepted nutrient standards. Daily values are used to express the nutrient content of foods on the Nutrition Facts panel, and labels are a valuable tool for tracking nutrient intakes.
- The Food Guide Pyramid provides one blueprint for a healthy diet and is an appropriate place to begin when evaluating daily nutrient intake.
- Dietary Guidelines issued by the federal government encourage a varied diet; daily physical activity; plenty of fruits, vegetables, and grains; and moderation in fat, cholesterol, sugar, and sodium intake; moderation in alcohol intake; if not completely abstemious, is also to exercise, along with safe cooking and food-storage practices.
- The Exchange System is a tool for estimating the carbohydrate, protein, and energy content of a food or meal and for planning a diet to correspond to specific goals for carbohydrate, fat, protein, and energy consumption.
- Dietary patterns in the United States have been influenced by the many ethnic diets seen around the world. Most ethnic diets show a basic dietary pattern as recommended by the Food Guide Pyramid—particularly, a diet rich in refined grains, fruits, and vegetables and one low in saturated fats, simple sugars, and alcohol. Many ethnic diets include dairy, milk, and meat, but the Food Guide Pyramid, focusing more on nuts, beans, and cereals.

REFRESH YOUR MEMORY

As you begin your study of diet planning in Chapter 3, you may want to review the terms in the margin of Chapter 1 and Table 1-1. This will help, as much of the same terminology appears in this chapter.



CASE SCENARIO

Andy is like many other college students. He grew up on a quick bowl of cereal and milk for breakfast and a hamburger, French fries, and cola for lunch, either in the school cafeteria or at a local fast-food restaurant. At dinner, he generally avoided eating any of his salad or vegetables, and by 9 o'clock he was deep into bags of chips and cookies. Andy has taken most of these habits to college. He prefers coffee for breakfast and possibly a chocolate bar. Lunch is still mainly a hamburger, French fries, and cola, but pizza and tacos now alternate more frequently than when he was in high school. One thing Andy really likes about the restaurants surrounding campus is that, for just about half a dollar more, he can *stretch* his meal. This helps him stretch his food dollar; searching out value meals for lunch and dinner now has become part of a typical day.

Provide some dietary advice for Andy. Start with his positive habits and then provide some constructive criticism. Use the concepts of variety, balance, and moderation, developed in the chapter, as well as the term *biochemicals* to frame your advice.

A FOOD PHILOSOPHY THAT WORKS

You maybe surprised to learn that **what you should eat to minimize the risk of developing the common nutrition-related diseases seen in the United States is exactly what you've heard many times before:**

Variety—choose different types of foods within each food group.
Balance—choose foods from all five food groups.
Moderation—control portion size so that balance and variety are possible in your diet.

¹⁰ A variety of foods is best because no one food meets all your nutrient needs. ⁶ Human milk comes close to meeting all of an infant's needs, except that it provides only limited amounts of iron, vitamin D, and fluoride. Cow milk contains very little iron; neither form of milk provides dietary fiber. Meat provides protein but little calcium. Eggs have no vitamin C and provide little calcium because the calcium is mostly in the shell. Thus, you need variety in your diet because the required nutrients are scattered among many different foods.

Health professionals have recommended the same basic diet and health plan for the past 30 years: Watch how much you eat, focus on the major food groups, and stay physically active. Whole grains, fruits, and vegetables have always been among the foods emphasized for our diet for the past 30 years. ²

It is disappointing, however, that, according to a survey conducted by the American Dietetic Association, **two of five people in the United States believe that following a healthful diet means giving up foods they enjoy.** To the contrary, a healthful diet requires only some simple planning and doesn't have to mean deprivation and misery. Besides, eliminating favorite foods typically doesn't work for dieters. In the long run, the best plan consists of learning the basics of a healthful diet—variety and balance of foods from all food groups and moderate consumption of all foods.⁹ Let's now fine-tune this advice.

Variety Contributes to Diet Adequacy

Variety in your diet means choosing a number of different foods within any given food group, rather than eating the "same old thing" day after day. Variety makes meals more interesting and helps ensure that a diet contains sufficient nutrients. For example, carrots may be your favorite vegetable; however, if you choose carrots every day as your only vegetable source, you may miss out on the vitamin folate. Other vegetables, such as broccoli and asparagus, are rich sources of this nutrient. This concept is true of all classes of foods: fruits, vegetables, grains, and so on. Different foods within each class vary somewhat in the nutrients they contain, but they generally provide similar types of nutrients.

An added bonus of variety in the diet is the inclusion of a rich supply of what scientists call **phytochemicals**. These substances are not absolutely required elements of the diet. Still, many of these substances probably provide significant health benefits. Considerable research attention is focused on various phytochemicals in reducing the risk for certain diseases.⁷ Because current vitamin and mineral supplements contain few or none of these potentially beneficial substances, they generally are available only from food.

Numerous population studies showed reduced cancer among people who regularly consume fruits and vegetables. This is true for cancer of the gastrointestinal (GI) tract, breast, lung, and bladder. Researchers surmise that some phytochemicals present in the fruits and vegetables block the cancer process.^{14, 18, 21, 23} The cancer process is described in the Nutrition Perspective in Chapter 10. For now, realize that cancer develops over many years in a multistep process. If an agent such as a phytochemical can block anyone of the steps in this process, the chances that cancer will ultimately appear in the body are reduced. Other phytochemicals have been linked to a reduced risk of cardiovascular disease.^{3, 4} Could it be that, because humans evolved on a wide variety of plant-based foods, the body developed with a need for these phytochemicals to maintain optimal health?

It will likely take many years for scientists to unravel the important effects of the myriad of phytochemicals in foods, and it is unlikely that all will ever be available in supplement form. For this reason, leading heart disease and cancer researchers sug-

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Some people might like to live on pizza alone. What are pizza's nutrient strengths and inadequacies? Check the food composition table in Appendix A for the vitamin C content of cheese pizza. How many slices would you need to eat to yield the vitamin C RDA of 75–95 milligrams? (Answer: 30–40 slices.)

phytochemical A chemical found in plants. Some phytochemicals may contribute to a reduced risk of cancer or heart disease in people who consume them regularly.



Focus on nutrient-rich foods as you strive to meet your nutrient needs.

gest that a diet rich in fruits and vegetables is the most reliable way to obtain the potential benefits of phytochemicals.²⁷ Table 2-1 lists a variety of phytochemicals under study with their common food sources. Table 2-2 provides a number of suggestions for including more phytochemicals—essentially more fruits and vegetables, as well as more whole grains and legumes (beans)—in a diet.

■ Balance Means Not Overconsuming Any One Food

One way to balance your diet as you consume a variety of foods is to select foods from the five major food groups every day:

- Milk, yogurt, and cheese
- Meat, poultry, fish, dry beans, eggs, and nuts
- Vegetables
- Fruit
- Bread, cereal, rice, and pasta

A lunch consisting of a bean burrito with tomatoes accompanied by a glass of milk and an apple covers all groups. Fats, oils, and sweets can also be added to your diet in moderation to increase its flavor and to help deliver certain nutrients, such as vitamin E and essential fatty acids.

■ Moderation Refers Mostly to Portion Size

Eating moderately requires planning your entire day's diet, so that you don't overconsume nutrient sources. For example, if you eat something relatively high in fat, sugar, or energy such as a bacon cheeseburger with a regular soft drink at a fast-food (quick-service) restaurant, you should eat other foods that are less concentrated sources of the same nutrients, such as fruits and salad greens, the same day. If you prefer whole milk to low-fat or nonfat milk, reduce the fat elsewhere in your meals. Try low-fat salad dressings, or use jam rather than butter or margarine on toast. Overall, strive to simply moderate rather than eliminate intake of some foods.



Fruits, vegetables, beans, and whole grains are typically rich in phytochemicals.

A term has been coined to refer to foods rich in phytochemicals—*functional foods*.¹⁵ This term indicates that the food provides health benefits beyond those supplied by the traditional nutrients it contains. Since a tomato contains the phytochemical lycopene, it can be called a functional food. The food industry especially has begun to use this term.

Some research suggests that increasing variety in a diet can lead to overeating. Thus as one incorporates a wide variety of foods in a diet, attention to total calorie intake is also important to consider.

TABLE 2-1 Phytochemical Compounds Under Study.^{1, 4, 14, 16, 17, 18, 21}

Phytochemical	Food Sources
Allyl sulfides/organosulfurs	Garlic, onions, leeks
Saponins	Garlic, onions, licorice, legumes
Phenolic acids	All plants
Protease inhibitors	Soybeans and all other plants
Carotenoids	Orange, red, yellow fruits and vegetables (egg yolks are a source as well)
Monoterpenes	Oranges, lemons, grapefruit
Capsaicin	Chili peppers
Lignans	Flaxseed, berries, whole grains, licorice
Triterpenoids (glycyrrhizin)	Citrus fruit, mushrooms, licorice
Indoles	Cruciferous vegetables (broccoli, cabbage, kale)
Isothiocyanates	Cruciferous vegetables, especially broccoli
Phytosterols	Soybeans, other legumes, cucumbers, other fruits and vegetables
Flavonoids	Citrus, onions, apples, grapes, wine, tea, chocolate
Isoflavones	Soybeans, other legumes, licorice
Catechins	Tea
Ellagic acid	Strawberries, raspberries, grapes, apples, bananas
Anthocyanosides	Red, blue, and purple plants (eggplant, blueberries)
Curcumin	Turmeric
Dithiolthiones	Carrots
Fructoligosaccharides	Onions, bananas, oranges

Some related compounds under study are found in animal products, such as sphingolipids (meat and dairy products) and conjugated linoleic acid (meat and cheese). These are not phytochemicals per se because they are not from plant sources, but they have been shown to have health benefits.^{14, 25}

CRITICAL THINKING

Andy, described in the Case Scenario would benefit from more variety in his diet. What are some practical tips he can use to increase fruit and vegetable intake?



Choosing whole-grain cereals is an excellent way to increase nutrient value of a diet. Ideally, the cereal should have ≥ 3 g of dietary fiber per serving.

TABLE 2-2 Tips for Including Foods Rich in Phytochemicals in a Diet

- Include vegetables in main and side dishes. Add these to rice, omelets, potato salad, tuna salad, and pastas. Try broccoli or cauliflower florets, mushrooms, peas, carrots, corn, or peppers.
- Look for quick-fixing grain side dishes in the supermarket. Pilafs, couscous, rice mixes, and tabbouleh are just a few that you'll find.
- Choose fruit-filled cookies, such as fig bars. Use fresh or canned fruit as a topping for puddings, hot or cold cereal, pancakes, and frozen desserts.
- Put raisins, grapes, apple chunks, pineapples, grated carrots, zucchini, or cucumber into coleslaw, chicken salad, or tuna salad.
- Be creative at the salad bar: try fresh spinach, leaf lettuce, red cabbage, sprouts, zucchini, yellow squash, cauliflower, peas, mushrooms, or red or yellow peppers.
- Pack fresh or dried fruit for snacks away from home instead of grabbing a candy bar or going hungry.
- Add slices of cucumber, zucchini, spinach, or carrot slivers to the lettuce and tomato on your sandwiches.
- Try one or two vegetarian meals per week, such as beans and rice or pasta; Chinese vegetable stir fry; or spaghetti, squash, and tomato sauce.
- When daily protein intake more than meets required amounts, reduce the meat, fish, or poultry in casseroles, stews, and soups by one-third to one-half and add more vegetables and legumes.
- In the refrigerator, keep a bowl of fresh vegetables handy for snacks.
- Choose 100% fruit or vegetable juices instead of soft drinks.
- Substitute tea for coffee or soft drinks on a regular basis.
- Have a bowl of fruit on hand.
- Switch from crisphead lettuce to leaf lettuce, such as romaine.
- Use salsa as a dip for chips.
- Choose whole-grain breakfast cereals, breads, and crackers.
- Flavor food with plenty of herbs and spices, including ginger, rosemary, basil, thyme, garlic, parsley, and chives.
- Experiment with soy products, such as tofu, soy milk, soy protein isolate, and roasted soybeans (see Chapter 7).

Although there are no "good" or "bad" foods as such, many Americans have diets overloaded with high-fat foods (e.g., whole milk, doughnuts, French fries, hot dogs), white bread and related refined-grain products, and sugared soft drinks. Such diets lack the foundations of a healthy food plan—variety, balance, and moderation—and pose substantial risks for nutrition-related diseases.¹¹

■ Nutrient Density Can Also Help Guide Food Choice

nutrient density The ratio derived by dividing a food's contribution to nutrient needs by its contribution to energy needs. When its contribution to nutrient needs exceeds its energy contribution, the food is considered to have a favorable nutrient density.

Nutrient density has gained acceptance in recent years for assessing the nutritional quality of an individual food. To determine the nutrient density of a food, simply compare its vitamin or mineral content with the amount of energy it provides. A food is said to be nutrient dense if it provides a large amount of a nutrient for a relatively small amount of kcal (compared with other food sources). The higher a food's nutrient density, the better it is as a nutrient source. Comparing the nutrient density of different foods is an easy way to estimate their relative nutritional quality. Generally, nutrient density is assessed with respect to individual nutrients. For example, many fruits and vegetables have a high content of vitamin C, compared with their modest energy content: That is, they are nutrient-dense foods for vitamin C. Moreover, as Figure 2-1 shows, nonfat milk is much more nutrient dense than sugared soft drinks for many nutrients.

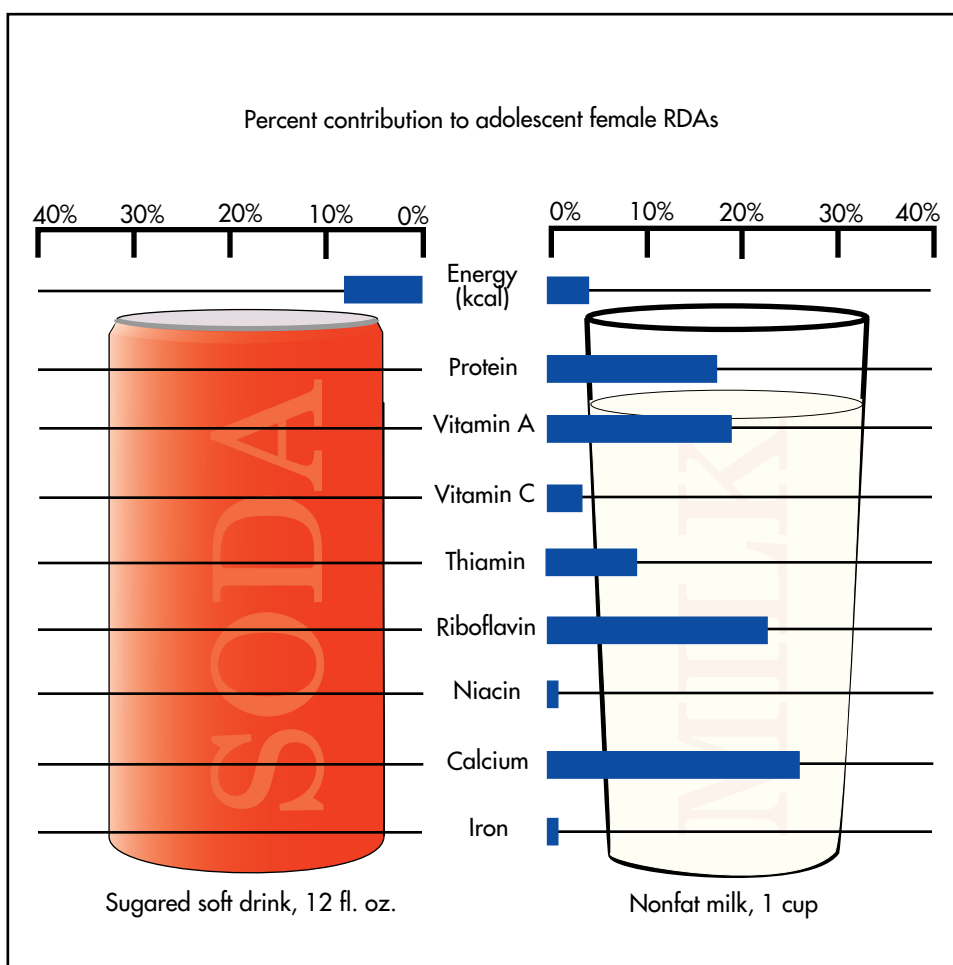


FIGURE 2-1 Comparison of the nutrient density of a sugared soft drink with that of nonfat milk. Both contribute fluid to the diet. However, choosing a glass of nonfat milk makes a significantly greater contribution to nutrient intake in comparison with a sugared soft drink. An easy way to determine nutrient density is to see how many of the nutrient bars in the graph are longer than the kcal bar. The soft drink has no longer nutrient bars. Nonfat milk has longer nutrient bars for protein, vitamin A, thiamin, riboflavin, and calcium. Including many nutrient-dense foods in your diet aids in meeting nutrient needs.

As what noted before, menu planning focuses mainly on the total diet, not on the selection of one critical food as key to an adequate diet. Nonetheless, nutrient-dense foods such as nonfat and lowfat milk, lean meats, beans, oranges, carrots, broccoli, whole-grain bread, and whole-grain breakfast cereals do help balance less nutrient-dense foods such as cookies and potato chips, which many people like to eat. The latter are often called empty-calorie foods because they tend to supply much energy as sugar and/or fat but few other nutrients.

Searching for nutrient-dense foods is especially important in some cases. For example, this strategy can aid diet planning for people who tend to consume little food energy, including some older people and those following weight-loss diets.

■ Energy Density Especially Influences Energy Intake

Energy density is a concept that has captured the attention of nutrition scientists in recent years.¹⁹ Energy density of a food is determined by comparing energy (kcal) content with the weight of food. A food that is rich in calories but that weighs relatively little is considered energy dense. Examples include nuts, cookies, fried foods in general, and fat-free snacks, such as fat-free pretzels. Foods with low energy density include fruits, vegetables, and any food that incorporates lots of water during cooking, such as oatmeal (Table 2-3).

Researchers have shown that having low-energy-density foods in a meal contributes to satiety without contributing many calories. This is because we probably consume a constant weight of food at a meal, rather than a constant number of calories. How this constant weight of food is regulated is not known, but careful labo-

energy density A comparison of the energy (kcal) content of a food with the weight of the food. An energy-dense food is high in calories but weighs very little (e.g., many fried foods), whereas a food low in energy density has few calories but weighs a lot, such as an orange.

TABLE 2-3 Energy Density of Common Foods (Listed in Relative Order)

Very Low Energy Density (< 0.6 kcal/g)	Low Energy Density (0.6 to 1.5 kcal/g)
Lettuce	Milk
Tomatoes	Oatmeal
Strawberries	Cottage cheese
Broccoli	Beans
Salsa	Bananas
Grapefruit	Broiled fish
Nonfat milk	Fat-free yogurt
Carrots	Breakfast cereals with 1% low-fat milk
Vegetable soup	Plain baked potato
	Cooked rice
	Spaghetti noodles
Medium Energy Density (1.5 to 4 kcal/g)	High Energy Density (> 4 kcal/g)
Eggs	Graham crackers
Ham	Fat-free sandwich cookies
Pumpkin pie	Chocolate
Whole-wheat bread	Chocolate chip cookies
Bagels	Tortilla chips
White bread	Bacon
Raisins	Potato chips
Cream cheese	Peanuts
Cake with frosting	Peanut butter
Pretzels	Mayonnaise
Rice cakes	Butter or margarine
	Vegetable oils

Data adapted from Rolls B, Barnett RA: *Vol/mets*. New York: HarperCollins, 2000.

laboratory studies show that people consume fewer calories in a meal if the food choices tend to be low in energy density compared with foods high in energy density. A popular book now promotes following a diet low in energy density in order to lose weight.

Overall, foods with lots of water and dietary fiber provide a low energy density contribution to a meal and help one feel full, whereas foods with high energy density, especially those high in fat, must be eaten in greater amounts in order to contribute to fullness. This is one more reason to support a diet rich in fruits, vegetables, and whole grains, a pattern that also is typical of many ethnic diets throughout the world (see the Nutrition Perspective at the end of this chapter). Still, favorite foods, even if they are high in energy density, have a place in our dietary pattern, but you will have to plan for them. For example, chocolate is a very energy-dense food, but a small portion at the end of a meal can supply a satisfying finale. In addition, foods with high energy density can help people with poor appetites, such as the elderly, to maintain or gain weight.

A useful diet/lifestyle acronym is ABCDE:

- A adequacy of diet
- B balance in diet
- C calorie control
- D diversity in food choice
- E exercise on a regular basis

CONCEPT CHECK

Basic diet-planning concepts include consuming a variety of foods, balancing a diet by consuming foods from each of the five food groups, and moderating portion size with each food choice, so that the diet is not excessive in energy. Choosing nutrient-dense foods, such as nonfat milk, fruits, vegetables, and whole grains, helps supply a diet with

many nutrients but not excessive calories. Many of these foods are also rich sources of phytochemicals, supplying an even greater health benefit to the diet. Consuming foods of low energy density such as fruits and vegetables, may also help in weight control, in that these provide satiety for a meal because of their large volume but few calories. As you will also see throughout this book, regular physical activity complements any diet plan.

DEFINITION OF NUTRIENT NEEDS—DIETARY REFERENCE INTAKES (DRIs)

Before designing a diet plan, such as the Food Guide Pyramid, it must be determined what frequency and amount of each nutrient are needed. People have asked this question for centuries. During World War II, when many men were rejected from military service because of the effects of poor nutrition on their health, the need for official dietary recommendations was recognized. In 1941, a group of 25 scientists formed the first Food and Nutrition Board. They established dietary standards for evaluating the nutritional intakes of large populations and for planning agricultural production, first published in 1943.

The current Food and Nutrition Board was formed in 1993. It recognized the need for an overhaul of previously published nutrient standards for several reasons. New research has made it clear that some of the previous standards did not maximize human benefit from food components. The new recommendations that board members are now developing will include an additional amount of each nutrient when appropriate to help prevent chronic diseases, such as heart disease, osteoporosis, and cancer. Previous standards only accounted for the amount of each nutrient needed to reduce the risk of deficiency diseases, such as rickets and scurvy.²⁹

The framework of these new recommendations are named **Dietary Reference Intakes (DRIs)** and will be released in stages through the next few years and possibly beyond.

So far, DRIs have been set for all vitamins and most minerals. There are other categories of nutrients for which recommendations are in process. These include macronutrients (carbohydrates, proteins, and fats), electrolytes (sodium, potassium, and chloride), water, and other food components (for example, dietary fiber). Until these updates are available, older nutrient standards developed in 1989 will remain in place.

Under the umbrella of the DRIs, four sets of standards have been established: **Estimated Average Requirements (EARs)**, **Recommended Dietary Allowances (RDAs)**, **Adequate Intakes (AIs)**, and **Upper Limits (ULs)** (see the inside cover of this textbook). Following is a more detailed discussion of each of these standards.

Estimated Average Requirements (EARs)

EARs are the nutrient intake that is estimated to meet the needs of 50% of the individuals in a certain age and gender group (Fig. 22). To set an EAR, the Food and Nutrition Board must be able to agree on a specific measurable functional marker to use for establishing nutrient adequacy. Such markers are typically the activity of an enzyme in the body or the ability of a cell to maintain physiological health. (The specific markers used for various nutrients will be discussed in Chapters 9 through 12.) If no measurable functional marker is available, no EAR can be set. This is the case for the mineral calcium. The EAR also includes an adjustment for the amount of each nutrient that passes through the body unabsorbed. At this intake, though, the needs of the other 50% of the population would not be met. Thus, the EAR can only be used to evaluate the adequacy of diets of a group of people.

Current revisions of U.S. dietary standards will apply to Canadians as well, as this revision is a joint venture of scientists from both countries (see Appendix C for details on Canadian standards).

Dietary Reference Intakes (DRIs) The term used to encompass the latest nutrient recommendations made by the Food and Nutrition Board of the National Academy of Sciences. These include RDAs and AIs.

enzyme A compound that speeds the rate of a chemical process but is not altered by the chemical process. Almost all enzymes are proteins.

Adequate intake (AI): a recommended intake value based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of healthy people that is assumed to be adequate – used when an RDA cannot be determined. When set for a nutrient, aim for this intake.

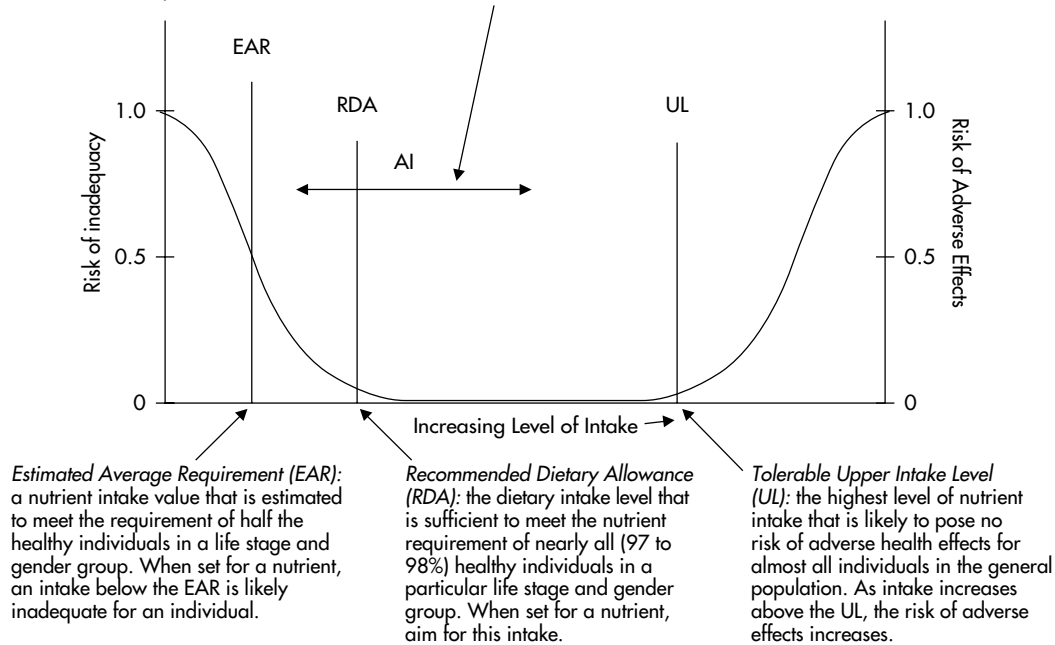


FIGURE 2-2 Dietary Reference Intakes. This figure shows that 50% of North Americans would have an inadequate intake by consuming the *Estimated Average Requirement (EAR)*, whereas 50% would have their needs met. Only about 2 to 3% of such people would have an inadequate intake if each were to meet the *Recommended Dietary Allowance (RDA)*, whereas 97 to 98% would have their needs met. At intakes between the RDA and the *Tolerable Upper Intake Level (UL)*, the risk of either an inadequate diet or adverse effects from the nutrient in question is close to 0. The UL is then the highest level of nutrient intake that is likely to pose no risks of adverse health effects to almost all individuals in the general population. At intakes above the UL, the risk of adverse effects increases. The *Adequate Intake (AI)*, set for some nutrients instead of an RDA, lies somewhere between the EAR and the UL. In determining the AI for a nutrient, it is expected that the amount exceeds the RDA for that nutrient, if an RDA were known. Thus, the AI should cover the needs of more than 97 to 98% of individuals. The actual degree to which the AI exceeds the RDA is likely to differ among the various nutrients and population groups. The Food and Nutrition Board states that there is no established benefit for healthy individuals if they consume nutrient intakes above the RDA or AI.

Recommended Dietary Allowances (RDAs)

The RDA is the nutrient intake that is sufficient to meet the needs of nearly all individuals (about 97%) in an age and gender group. RDAs are based on a multiple of the EARs. Generally the $RDA = EAR \times 1.2$. Because of this relationship, RDAs can be set for nutrients only if the Food and Nutrition Board has enough information to determine an EAR. Additional consideration in setting an RDA also can be given to a nutrient's ability to prevent chronic disease, rather than just prevent deficiency. A good example is vitamin C (see the section titled Setting One RDA: Vitamin C).

Setting One RDA: Vitamin C

The amount of vitamin C needed each day to prevent scurvy is about 10 mg. However, as you will learn in Chapter 10, vitamin C has other functions as well, some of which are involved in the workings of the immune system. Based on this relationship, the concentration of vitamin C in one component of the immune system—namely white blood cells (specifically neutrophils)—can be used as a marker for vitamin C adequacy in an individual. The Food and Nutrition Board feels that near-maximal saturation of neutrophils with vitamin C is, in fact, the best marker for optimal vitamin C status. Research published to date suggests that, for adults 19 to 30 years of age, it takes on average a daily intake of 75 mg for men and 60 mg for women for near-saturation of neutrophils. These average amounts then become the EAR for young adult men and women.

The EAR for vitamin C is multiplied by 1.2 to yield the RDA; in this case, the RDA becomes 90 mg for men and 75 mg for women. Other age groups have slightly different recommendations; smokers should add 35 mg to the RDA for their age and gender (see Chapter 10 for details).

Putting the RDA for Vitamin C to Use

If you total the amount of vitamin C you eat in 1 week and divide by 7, you will have your average daily vitamin C consumption. If that value is close to the RDA, you are most likely consuming enough vitamin C. Even if you eat less than the RDA, you might not suffer ill effects because your needs are most likely less than the RDA, as it is set to include almost all individuals, some of whom probably need more vitamin C than you do. As a general rule, however, the further you stray below the RDA, particularly as you approach the EAR, the greater your risk of a nutritional deficiency. Symptoms of a vitamin C deficiency may be subtle and develop slowly. It takes a long time to detect problems such as a weakened immune system and even poor wound healing. If you suspect that your diet is not nutritious enough, don't wait for warning signs to develop. Start eating a diet that meets the RDAs set for vitamin C (and all the other nutrients listed for your age and gender), rather than risk the development of health problems from poor nutrition.

Setting RDAs for Energy Needs

RDAs for nutrients are set high enough to meet the needs of almost all healthy individuals. In contrast, the RDAs for energy set last in 1989, refer to the average needs for various age groups (see the inside cover of this textbook). Unlike most vitamins and minerals, excess energy consumed (above energy needs) is not excreted. Thus, to promote weight maintenance, a more conservative standard was used for energy needs than for nutrient needs. Overall, an energy RDA is only a rough estimate, because energy needs depend on energy use. For most adults, the ability to obtain and maintain a healthy weight is the best yardstick of energy balance—energy intake matching energy output.

■ Adequate Intakes (AIs)

Nutrients for which there is not enough information to establish an EAR are assigned an AI. AIs are based on observed or experimentally determined estimates of the average nutrient intake that appears to maintain a defined nutritional state (for example, normal circulating nutrient values or bone health) in a certain population. AIs have been set for two B-vitamins, the vitamin-like choline, vitamin D, and some minerals such as calcium and fluoride. In addition, AIs are being set for all nutrients for infants under 1 year of age.

■ Tolerable Upper Intake Levels (ULs)

The UL is the maximum level of daily intake of a nutrient that is unlikely to cause adverse health effects in almost all people (97 to 98%) in a population. This number applies to chronic daily use and is set to protect even very susceptible people in the healthy general population. The UL is not a goal for nutrient intake but, rather, is a ceiling below which nutrient intake should remain. Not enough information is available to set a UL for all nutrients, but this does not mean that toxicity from these nutrients is impossible. Furthermore, there is no clear-cut evidence that intakes above the RDA or AI confer any additional health benefits for most of us.

The UL for most nutrients is based on the combined intake of food, water, supplements, and fortified foods. One exception is magnesium, for which the UL refers only to nonfood sources, such as medicines and supplements. This is because toxicity due to dietary intake of magnesium is unlikely.



Energy needs in adulthood are based on the number of calories required to maintain weight.

Minimum Requirements

Minimum requirements have been set for sodium, potassium, and chloride (see the inside cover of this textbook). These values represent minimum nutrient needs. Note that these amounts are much less than typical intakes of sodium or chloride but are about equal to Americans' typical intake of potassium. It is likely that these nutrients will be given AIs when re-evaluated by the Food and Nutrition Board in 2001.

■ Appropriate Uses of the DRIs

The DRIs are intended mainly for diet planning. Specifically a diet plan should aim to meet any RDAs set. If no RDA has been determined, it is reasonable to use the AI as a guide for nutrient intake. Finally the UL for a nutrient should not be exceeded.²⁹ Keep in mind also that none of these dietary standards are necessarily appropriate amounts for individuals who are already undernourished or for those with diseases that require higher intakes. This concept will be covered in Chapters 9 through 12.

CONCEPT CHECK

Dietary Reference Intakes are set for specific nutrients in order to guide food intake. These standards include Recommended Dietary Allowances (RDAs), Adequate Intakes (AIs), and Tolerable Upper Intake Levels (ULs). Recommended Dietary Allowances represent the nutrient needs for healthy individuals. RDAs are established for specific age and gender categories. No one knows his or her own nutritional requirements; the best general rule is that, the further you stray from nutrient standards set for your age and gender, especially below the Estimated Average Requirement (EAR), the greater your chance of having a nutritional deficiency or toxicity. Adequate Intakes are set when there is not enough information to set a more precise RDA. Intakes above Tolerable Upper Intake Levels should not be consumed on a regular basis, as toxic effects are possible.

■ DAILY VALUES (DVs): THE STANDARDS USED FOR FOOD LABELING

Daily Values Standard nutrient-intake values developed by FDA and used as a reference for expressing nutrient content on nutrition labels. The Daily Values include two types of standards—RDIs and DRVs.

Reference Daily Intakes (RDIs) Nutrient-intake standards set by FDA based on the 1968 standards for various vitamins and minerals. RDIs have been set for four categories of people: infants, toddlers, people over 4 years of age, and pregnant or lactating women. Generally the highest RDA value in each category is used as the RDI. The RDIs constitute part of the Daily Values used in food labeling.

Daily Reference Values (DRVs) Nutrient-intake standards established for protein and some other dietary components lacking an RDA or a related nutrient standard, including fat, saturated fat, cholesterol, carbohydrate, dietary fiber, sodium, and potassium. The DRVs for cholesterol, sodium, and potassium are constant; those for the other nutrients increase as energy intake increases. The DRVs constitute part of the Daily Values used in food labeling.

The DRIs and accompanying nutrient standards are not used in food labeling because they are age and gender specific. We can't have different packages for men and women or for teens and adults. Food and Drug Administration (FDA) has developed a set of generic standards, called **DVs**, which are used to express the nutrient content of foods for the Nutrition Facts panel on food labels. The content of a particular nutrient is listed on labels as a percentage of the Daily Value. These percentages serve as a benchmark for evaluating the nutrient content of foods. They do not, however, represent a set of tailor-made recommendations for an adult. You will see how once the method for setting Daily Values is described.

The Daily Values are based on two sets of dietary standards. The first, **RDIs**, are for vitamins and minerals. The second, **DRVs**, are standards for protein and various dietary components that have no RDA or other established nutrient standard (e.g., total fat, cholesterol, and dietary fiber). These two terms—**RDIs** and **DRVs**—do not appear on labels. To make reading labels less confusing for consumers, the term **DVs** is used to represent the combination of these two sets of dietary standards, since the differences between RDIs and DRVs for typical consumers are inconsequential. For health professionals and nutrition experts, though, it is important to understand how nutrition label information (RDIs vs. DRVs) is actually derived:

For food labels, standards are set for nutrients that have RDAs or other established nutrient standards, called RDIs.

For food labels, standards are set for many nutrients that do not have RDAs or other established nutrient standards, called DRVs.

Daily Values, used on food labels, are a combination of RDI and DRV standards.

Reference Daily Intakes (RDIs)

Reference Daily Intakes (RDIs) make up the majority of the Daily Values (DVs). The RDIs have been set by FDA using a compilation of the nutrient standards published in 1968. Essentially, RDIs use the highest values of any age category set in 1968. For example, consider iron: In 1968, the RDA for adult men was 10 mg/day and that for adult women and adolescents was 18 mg/day. The iron RDI for adults is the higher value: 18 mg/day. Table 2-4 lists the RDIs used for various age groups.

The RDI values currently in use, which are based on the 1968 RDAs, are generally slightly higher than current RDAs and related nutrient standards. FDA will likely

TABLE 2-4 Comparison of Daily Values with the Latest DRIs and Other Nutrient Standards*

Dietary Constituent	Unit of Measure	Current Daily Values for People Over 4 Years of Age	DRI or other current dietary standard	
			Males 19 Years Old	Females 19 Years Old
Fat [†]	g	<65	—	—
Saturated fatty acids [†]	"	<20	—	—
Protein [†]	"	50	58	46
Cholesterol [§]	mg	<300	—	—
Carbohydrate [†]	g	300	—	—
Fiber	"	25	—	—
Vitamin A	Retinol equivalents	1000	1000	800
Vitamin D	International units	400	200	200
Vitamin E	"	30	22–33	22–33
Vitamin K	µg	80	70	60
Vitamin C	mg	60	90	75
Folate	µg	400	400	400
Thiamin	mg	1.5	1.20	1.10
Riboflavin	"	1.7	1.30	1.10
Niacin	"	20	16	14
Vitamin B-6	"	2	1.30	1.30
Vitamin B-12	µg	6	2.40	2.40
Biotin	mg	0.3	0.03	0.03
Pantothenic acid	"	10	5	5
Calcium	g	1	1	1
Phosphorus	"	1	0.70	0.70
Iodide	µg	150	150	150
Iron	mg	18	10	15
Magnesium	"	400	400	310
Copper	"	2	1.5–3.0	1.5–3.0
Zinc	"	15	15	12
Sodium [†]	"	<2400	500	500
Potassium [†]	"	3500	2000	2000
Chloride [†]	"	3400	750	750
Manganese	"	2	2–5	2–5
Selenium	µg	70	55	55
Chromium	"	120	50–200	50–200
Molybdenum	"	75	75–250	75–250

Abbreviations: g = gram, mg = milligram, µg = microgram

*Daily Values are generally set at the highest nutrient recommendation in a specific age and gender category. Many Daily Values exceed current nutrient standards. This is in part because aspects of the Daily Values were originally developed in the early 1970s using estimates of nutrient needs published in 1968. The Daily Values have yet to be updated to reflect the current state of knowledge.

[†]Sodium, potassium, and chloride values are based on the minimum requirement for health. The considerably higher Daily Values for sodium and chloride are there to allow for more diet flexibility, but the extra amounts are not needed to maintain health.

[‡]No RDA has been set for these nutrients, except protein (see Chapter 7). These values are based, instead, on a 2000 kcal diet, with a caloric distribution of 30% from fat (and one-third of this total from saturated fat), 60% from carbohydrate, and 10% from protein.

[§]Based on recommendations of federal agencies

Nutrition educators often instruct patients to look only at the total amount of a nutrient (shown on the left side of the Nutrition Facts panel) rather than the % Daily Value when watching a specific nutrient. This is because the % Daily Value is not correct unless that person consumes 2000 kcal/day. For example, if a person is to limit his or her saturated fat intake to 20 g per day, the % Daily Value does not provide adequate information to assess grams of saturated fat consumed in a day.

revise the RDIs to reflect the latest nutrient standards once the current Food and Nutrition Board has completed its work on the DRIs.

■ Daily Reference Values (DRVs)

The Daily Values for some food constituents are based on Daily Reference Values (DRVs) rather than RDIs. Except for the protein DRV, which is based on RDA values, the other DRVs cover certain dietary components that have no RDA or related nutrient standard at this time: total fat, saturated fatty acids, cholesterol, carbohydrate, fiber, sodium, and potassium. The DRVs are intended to help consumers evaluate their food choices by comparing their actual intakes of these food constituents with desirable (or maximum) intakes. Table 2-5 lists the DRVs. The amounts for energy-yielding nutrients are based on 30% of total kcal from fat, 60% from carbohydrate, and 10% from protein, which corresponds to the Dietary Guidelines and recommendations from various other major health-related associations (see the section entitled Dietary Guidelines—Another Planning Tool).

Note that many of the DRVs, such as those for saturated fat, total fat, and dietary fiber, are related to total energy intake. By accounting for this, you can evaluate your diet even if your energy intake is more or less than the standard energy intake, 2000 kcal, used on the label. For example, if you consume only 1600 kcal per day, the total percentage of Daily Value for each of these nutrients should add up to no more than 80% because $1600 \div 2000 = 0.8$, or 80%. If you eat 2800 kcal, your total percentage of Daily Value for each nutrient in all the foods you eat in one day can add up to 140%, because $2800 \div 2000 = 1.4$, or 140%. However, the % Daily Values for some dietary constituents, such as cholesterol and sodium, are not adjusted for differences in energy intake.

In the same way, you can calculate the amount of a certain nutrient you have left in a day by using the % Daily Value. For example, if you consume 2000 kcal per day, your total fat intake for the day should be 65 g or less. If you consume 10 g of fat at breakfast, you have 55 g, or 85%, of your Daily Value left for the rest of the day.

■ Daily Values in Perspective

The Nutrition Facts panel on the label of a food product lists various components of the food as a percentage of their Daily Values. Use this information to learn more about your food choices. For example, suppose that one serving of a macaroni and cheese product contains 15% of the Daily Value for iron. Since the Daily Value for iron is 18 mg, this product contains about 3 mg of iron per serving ($18 \times 0.15 = 2.7$ mg).

TABLE 2-5 Daily Reference Values (DRVs)*

Food Component	Unit of Measure	DRV (2000 kcal Intake)	DRV (2500 kcal Intake)	DRV (3200 kcal Intake)
Fat	g	<65	<80	<107
Saturated fatty acids	g	<20	<25	<36
Protein	g	50	65	80
Cholesterol	mg	<300	<300	<300
Carbohydrate	g	300	375	480
Fiber	g	25	30	37
Sodium	mg	<2400	<2400	<2400
Potassium	mg	3500	3500	3500

*DRVs based on an energy intake of 2000 kcal constitute the Daily Values used as reference standards for food labeling. Note that the DRVs for some nutrients (e.g., total fat) increase as energy intake increases.

CONCEPT CHECK

Daily Values are currently used as a benchmark for representing the nutrient content of foods on nutrition labels. Nutrient content is expressed as percentages of the Daily Values, which in turn are based on Reference Daily Intakes (RDIs) or Daily Reference Values (DRVs). The RDIs for vitamins and minerals constitute the majority of Daily Values and are based on the 1968 nutrient standards. The DRVs have been set for protein and some nutrients that don't have an RDA or AI, such as fat, cholesterol, and dietary fiber. To decrease confusion, the Daily Value is the only term that appears on food labels.



Use the Nutrition Facts label to learn more about the nutrient content of the foods you eat. Nutrient content is expressed as a % of Daily Value.

FROM NUTRIENT RECOMMENDATIONS TO FOOD CHOICES

The following sections of the chapter will describe various guidelines for planning healthy diets.

The Food Guide Pyramid—a Menu-Planning Tool

Since the early twentieth century, researchers have worked to clarify the science of nutrition into practical terms, so that people with no special training could estimate whether their nutritional needs were being met. A seven-food-group plan, based on foods traditionally eaten by Americans, was one of the first formats. Daily food choices had to include items from each group. This plan had been simplified by the mid-1950s to a four-food-group plan: a milk group, a meat group, a fruit and vegetable group, and a breads and cereals group. The entire plan was designed to provide a minimum foundation for a diet, and it represented about 1200 to 1400 kcal/day. Other food choices were to be added to meet daily energy needs.

Today, the Food Guide Pyramid, which is designed to represent a total diet providing sufficient protein, vitamins, and minerals, is widely advocated for diet planning (Fig. 2-3).⁹ This pyramid goes beyond earlier guides to suggest a pattern of food choices for the entire day, rather than simply a foundation diet. The major changes from earlier food guides include an increase in total fruit and vegetable servings from 4 per day to 5 to 9 per day and an increase in bread and cereal servings from 4 per day to 6 to 11 per day. One goal of these changes is to provide the bulk of dietary energy intake from unrefined carbohydrates while moderating fat intake.

Components of the Food Guide Pyramid

The number of servings to consume from each food group in the current Food Guide Pyramid depends on a person's age and energy needs. Serving size is also adjusted downward for young children (see Chapter 17). Table 2-6 lists serving sizes and amounts for adults of various ages. The table also lists the major nutrients each food group supplies. Note the similarities and differences among the groups.

The plan for an adult over 18 essentially consists of the following:

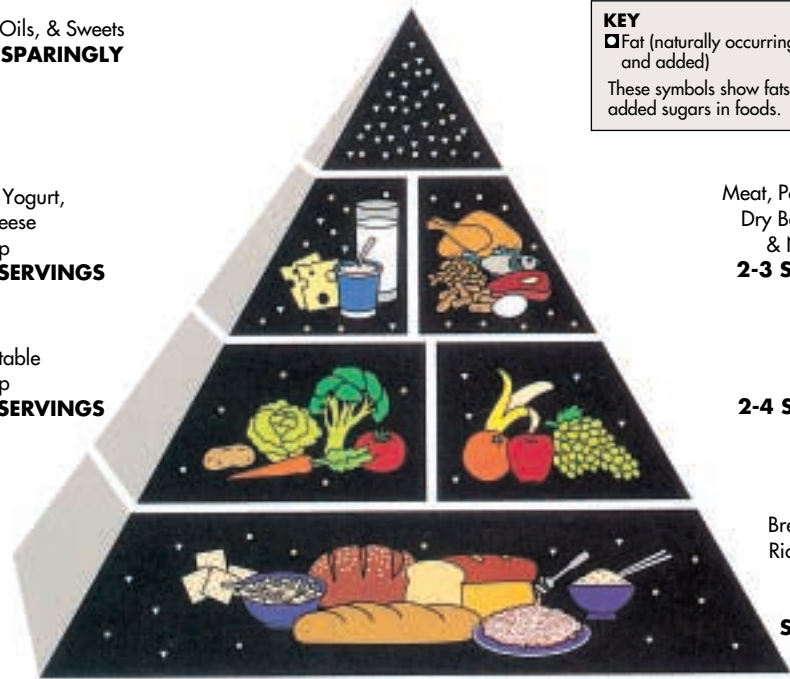
- 2 servings from the milk, yogurt, and cheese group
- 2 to 3 servings from the meat, poultry, fish, dry beans, eggs, and nuts group (5 to 7 ounces total)
- 3 to 5 servings from the vegetable group
- 2 to 4 servings from the fruit group
- 6 to 11 servings from the bread, cereals, rice, and pasta group

For some population groups—children, teenagers, and pregnant or breastfeeding women—three servings of the milk, yogurt, and cheese group are recommended due to higher calcium needs.

Fats, Oils, & Sweets
USE SPARINGLY

Milk, Yogurt,
& Cheese
Group
2-3 SERVINGS

Vegetable
Group
3-5 SERVINGS



KEY
 ◻ Fat (naturally occurring or added)
 ◻ Sugars (added)
 These symbols show fats, oils, and added sugars in foods.

Meat, Poultry, Fish,
Dry Beans, Eggs,
& Nuts Group
2-3 SERVINGS

Fruit
Group
2-4 SERVINGS

Bread, Cereal,
Rice, & Pasta,
Group
6-11 SERVINGS

FIGURE 2-3 USDA's Food Guide Pyramid. The Food Guide Pyramid lists the food groups and the amount to consume from each group. Note that, for children, teenagers, and adults under age 25, three servings should be chosen from the milk, yogurt, and cheese group. Once you have estimated your energy needs, recommended servings from the other groups with wider ranges are as follows:

Energy Intake	1600 kcal	2200 kcal	2800 kcal
Bread, etc. group	6	9	11
Vegetable group	3	4	5
Fruit group	2	3	4
Milk, etc. group	2-3	2-3	2-3
Meat, etc. group (ounces)	5	6	7
Total fat (grams)	53	73	93
Total added sugars (teaspoons)	6	12	18

Foods in a final category, which is not a group per se, include fats, oils, and sweets. These can be eaten to help meet individual energy needs but should not replace foods from other groups.

Menu Planning with the Food Guide Pyramid

Table 2-7 illustrates a 1-day menu based on the Food Guide Pyramid. Remember the following points when using the Food Guide Pyramid to plan daily menus:

1. The guide does not apply to infants or children under 2 years of age.
2. No one food is absolutely essential to good nutrition. Each food is deficient in at least one essential nutrient.
3. No one food group provides all essential nutrients in adequate amounts. Each food group makes an important, distinctive contribution to nutritional intake.
4. Variety is the key to the success of the guide and is first guaranteed by choosing foods from all the groups. Furthermore, one should consume a variety of foods within each group.
5. The foods within a group may vary widely with respect to nutrient and energy content. For example, the energy content of 3 ounces of baked potato is 98 kcal, whereas that of 3 ounces of potato chips is 470 kcal. Compare an orange and an apple with respect to vitamin C, using the food composition table in Appendix A.

TABLE 2-6 The Food Guide Pyramid—a Summary

Food Category	Major Contributions	Foods and Individual Serving Sizes†
Milk, yogurt, and cheese	Calcium Phosphorus Carbohydrate Protein Riboflavin Vitamin D Magnesium Zinc	1 cup milk (includes low-lactose products) 1½ oz cheese 2 oz processed cheese 1 cup yogurt 2 cups cottage cheese 1 cup soy-based beverage with added calcium
Meat, poultry, fish, dry beans, eggs, and nuts	Protein Thiamin Riboflavin Niacin Vitamin B-6 Folate§ Vitamin B-12 Phosphorus Magnesium§ Iron Zinc	2–3 oz cooked meat, poultry, or fish 1–1½ cups cooked dry beans 4 tbsp peanut butter 2 eggs 2/3–1 cup nuts 5 oz soyburger
Fruit	Carbohydrate Vitamin A (few varieties) Vitamin C Folate Magnesium Potassium	¼ cup dried fruit ½ cup cooked or canned fruit ¾ cup juice 1 whole piece of fruit 1 melon wedge (about ¼)
Vegetable	Dietary fiber Carbohydrate Vitamin A Vitamin C Folate Magnesium Potassium	½ cup berries ½ cup raw or cooked vegetables 1 cup raw leafy vegetables ¾ cup vegetable juice
Bread, cereal, rice, and pasta	Dietary fiber Carbohydrate Thiamin Riboflavin¶ Niacin Folate# Magnesium# Iron¶# Zinc#	1 slice of bread 1 oz (about ¾ cup) ready-to-eat cereal ½ cup cooked cereal, rice, or pasta ½ hamburger roll, bagel, or English muffin 3–4 plain crackers 1 small roll, biscuit, or muffin 1 6" tortilla
Fats, oils, and sweets	Dietary fiber#	Food from this category should not replace any from the other groups. Amounts consumed should be determined by individual energy needs.

†May be reduced for child servings

§Primarily in plant protein sources

||Only in animal foods

¶If enriched

#Whole grains and enriched products

To quickly estimate serving sizes, use the following equivalents:

Thumb = 1 oz of cheese

4 stacked dice = 1 oz cheese

Thumb tip = 1 tsp

Matchbox = 1 oz meat

Bar of soap or pack of cards = 3 oz meat

Palm of a hand = 3 oz

1 ice cream scoop = 1/2 cup

Fist = 1 cup

Handful = 1 or 2 oz of a snack food

Tennis ball = 1 medium fruit serving

Computer mouse = 1 medium potato

Ping-pong ball = 2 tbsp peanut butter

Yo-yo = 1 bagel serving

TABLE 2-7 Putting the Food Guide Pyramid into Practice

Meal	Servings/Food Group*
Breakfast	
1 peeled orange	1 fruit
¾ cup Healthy Choice Low-fat Granola with ½ cup nonfat milk	1 bread ½ milk
½ toasted raisin bagel toasted with 1 tsp soft margarine	1 bread 1 fat/sweet
Optional: coffee or tea	
Lunch	
Ham sandwich	
2 slices whole-wheat bread	2 bread
2 oz ham	1 meat
2 tsp mustard	
1 apple	1 fruit
2 oatmeal-raisin cookies (small)	2 fat/sweet
Optional: diet soft drink	
3 P.M. Study break	
6 whole wheat crackers	2 bread
1 tbsp peanut butter	¼ meat
½ cup nonfat milk	½ milk
Dinner	
Lettuce salad	
1 cup romaine lettuce	1 vegetable
½ cup sliced tomatoes	1 vegetable
1 ½ tsp Thousand Island dressing	1 ½ fat/sweet
½ grated carrot	½ vegetable
3 oz broiled salmon	1 meat
½ cup rice	1 bread
¾ cup green beans with 1 tsp soft margarine	1 vegetable 1 fat/sweet
Optional: coffee or tea	
Late-Night Snack	
1 cup "light" fruit yogurt	1 milk
Nutrient Breakdown	
1800 kcal	
Carbohydrate	56% of kcal
Protein	18% of kcal
Fat	26% of kcal

This menu meets nutrient needs for all vitamins and minerals for an average adult. For adolescents, teenagers add one additional serving from the milk, yogurt, and cheese group.

*Names of food groups are abbreviated as follows: milk = milk, yogurt, and cheese group; meat = meat, poultry, fish, dry beans, eggs, and nuts group; bread = bread, cereal, rice, and pasta group; fat/sweet = fats, oils, and sweets category.

Overall, the Food Guide Pyramid incorporates the foundations of a healthy diet: variety, balance, and moderation. The nutritional adequacy of diets planned using this tool, however, depends on the selection of a variety of foods. In addition, to ensure enough vitamin E, vitamin B-6, magnesium, and zinc—nutrients sometimes low in diets based on this plan—consider the following advice:

1. Choose primarily low-fat and nonfat items from the milk, yogurt, and cheese group. By reducing energy intake in this way, you can select more items from other food groups.
2. Include plant foods that are good sources of proteins, such as beans, at least several times a week because these are rich in minerals and dietary fiber.
3. For vegetables and fruits, try to include a dark green vegetable for vitamin A and a vitamin C-rich fruit, such as an orange, every day. Surveys show that only 25% of adults eat a green vegetable on any given day. Increased consumption of these foods is important because they contribute vitamins, minerals, dietary fiber, and phytochemicals.
4. Choose whole-grain varieties of breads, cereals, rice, and pasta often because they contribute dietary fiber. A plate with about two-thirds covered by grains, fruits, and vegetables and one-third or less covered by protein-rich foods promotes this diet advice. As well, a daily serving of a whole-grain breakfast cereal is an excellent choice because the vitamins and minerals typically added to it, along with dietary fiber, help fill in the potential gaps listed earlier.

Following the Food Guide Pyramid makes it possible to create daily diets containing as few as 1600 to 1800 kcal (Table 2-7), sufficient for a sedentary adult or an older person. Not following this advice can leave a diet of 1600 to 1800 kcal short on the nutrients just mentioned. Recall that excessive consumption of any one food—even ones considered “healthy”—is also not desirable and possibly risky.

If 1600 to 1800 kcal represents too much food energy for you, you should first consider becoming more physically active rather than eating less. Obtaining enough nutrients from a diet that supplies fewer than 1600 kcal/day is very difficult. If you can't increase your energy output, you can make a special attempt to choose regularly some nutrient-fortified foods (e.g., breakfast cereals) or take a balanced nutrient supplement (see Chapter 9). In addition, for those whose diets do not include meat or other animal products, the Nutrition Perspective on vegetarianism in Chapter 7 provides advice on adapting the Food Guide Pyramid to that dietary practice.

Evaluation of the Current American Diet Using the Food Guide Pyramid

The average American diet, based on surveys, fails to meet the serving recommendations in the Food Guide Pyramid for many food groups. For example, the average diet includes only one to two fruit servings (rather than the recommended two to four servings) and only two to three vegetable servings (rather than three to five servings), and much of that comes from potatoes, not a particularly nutrient-dense vegetable choice. Overall, fruits and vegetables are the most underrepresented groups. In contrast, the fats, oils, and sweets are well represented.¹¹

Criticisms of the Food Guide Pyramid

The Food Guide Pyramid has recently come under criticism on three accounts (excluding the call for the elimination of all animal products issued by some groups). First, some people have difficulty digesting large amounts of the sugar lactose; this is present in appreciable amounts in many dairy products. Singling out dairy products in the pyramid has been criticized as inappropriate for these people. Ways to address this concern are to consume moderate amounts of dairy products at any one time or to consume yogurt (most of the lactose is broken down in the small intestine by the bacteria in the yogurt; see Chapter 5 for other options). A second criticism is that refined grains and whole grains are lumped together; it would be healthier to emphasize primarily whole-grain choices because of their fiber content.²⁸ This is relatively easy to implement (see Chapter 5). Third, fat need not necessarily be placed at the top of the pyramid, indicating caution should be used with intake. Fat could be a more central part of the diet if the fat is primarily from plant oils. The Mediterranean diet discussed in the Nutrition Perspective at the end of this chapter is an example of one of such plans. And, as you will see in the next section, the latest Dietary Guidelines issued by the federal government recommend

Other food pyramids have been proposed by various nutrition organizations. The Nutrition Perspective at the end of this chapter discusses the Latin American, Asian, Mediterranean, and Soul Food pyramids.

moderation in fat consumption (limitation is primarily directed to saturated fat intake). This allows for more plant oil use than is suggested by the placement of fat at the top of the pyramid. Whole grains are also emphasized in the latest Dietary Guidelines.

In the final analysis, however, the Food Guide Pyramid provides enough latitude that one can make appropriate choices based on personal health concerns and still consume the recommended servings of the five food groups. Some additional fat from plant oils is fine, as long as overall calorie balance is maintained. Following a diet that avoids all animal products, which will be covered in Chapter 7, is another matter altogether.

How Does Your Current Diet Rate?

Regularly comparing your daily food intake with the Food Guide Pyramid recommendations is a relatively simple way to evaluate your overall diet. Strive to meet the recommendations. If that is not possible, identify the nutrients that are low in your diet based on the nutrients found in each food group (Table 2–6). For example, if you do not consume enough from the milk, yogurt, and cheese group, your calcium intake is most likely too low. After completing the Take Action activities at the end of this chapter, you will be able to determine more accurately which nutrients are too low in your current diet and by how much. Armed with this knowledge, find foods that you enjoy that supply those nutrients, such as calcium-fortified orange juice. Customizing the Food Guide Pyramid to accommodate your own food habits may seem a daunting task now, but it is not difficult once you gain some additional nutrition knowledge. To learn more, see the web page sponsored by USDA (<http://www.usda.gov/cnpp>). At this site, you can download the entire booklet describing the pyramid.

CONCEPT CHECK

The Food Guide Pyramid translates the general needs for carbohydrate, protein, fat, vitamins, and minerals into the recommended number of daily servings from each of five major food groups. It is a convenient and valuable tool for planning daily menus.

■ Dietary Guidelines—Another Tool for Menu Planning

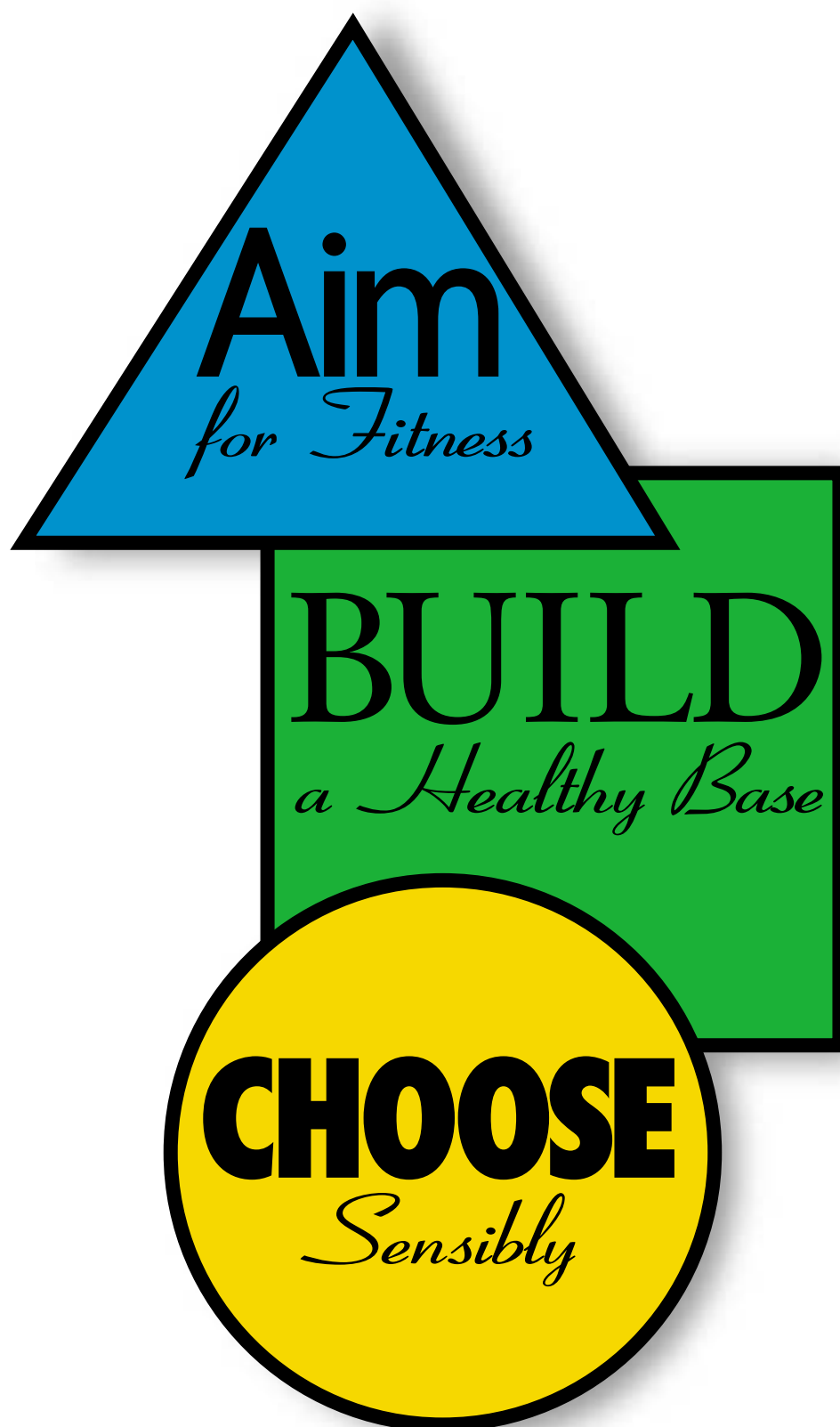
The Food Guide Pyramid was designed to help meet nutritional needs for carbohydrate, protein, fat, vitamins, and minerals. However, most of the major chronic “killer” diseases in America, such as cardiovascular disease, cancer, and alcoholism, are not primarily associated with deficiencies of these nutrients. Nor are deficiency diseases such as scurvy (vitamin C deficiency) and pellagra (niacin deficiency), still common. For many Americans, the primary dietary culprit is an overconsumption of one or more of the following: energy, saturated fat, cholesterol, alcohol, and sodium (salt). Underconsumption of calcium, iron, folate and other B-vitamins, zinc, or dietary fiber is also a problem for some people, but easy to fix as the major dietary problems are addressed.²²

In response to concerns regarding these killer disease patterns in the United States, since 1980 the USDA and Department of Health and Human Services (DHHS) have published **Dietary Guidelines** to aid diet planning. The latest Dietary Guidelines begin with three overarching messages and then list 10 specific guidelines:

Aim for Fitness

1. **Be physically active** (body mass index of 18.5 to 24.9; see Chapter 13).
2. **Limit sedentary behavior** (about 30 minutes per day as a minimum; see Chapter 14).

Dietary Guidelines General goals for nutrient intakes and diet composition set by the USDA and the Department of Health and Human Services (DHHS).



Logo for the current Dietary Guidelines.

Build a Healthy Base

3. ~~High-fat~~ (see the section on the Food Guide Pyramid).
4. ~~High-fat~~ (see the Food Guide Pyramid and Chapter 5).
5. ~~High-fat~~ (see the Food Guide Pyramid).
6. ~~High-fat~~ (especially proper cooking and refrigeration of perishable foods; see Chapter 19).

Choose Sensibly

7. ~~High-fat~~ (animal fats are the chief culprits; see Chapter 6).
8. ~~High-fat~~ (soft drinks, cookies, and candy are the chief culprits; see Chapter 5).
9. ~~High-fat~~ (it is easy to adjust to a lower salt intake; see Chapter 11).
10. ~~High-fat~~ (no more than one to two drinks per day; see Chapter 8).

These guidelines are intended for healthy children (2 years and older) and adults of any age. You can download the entire Dietary Guidelines booklet at <http://www.usda.gov/cnpp>.

Practical Use of the Dietary Guidelines

The Dietary Guidelines are designed to promote adequate vitamin and mineral intake. The guidelines also emphasize changes that will reduce the risk of obesity, hypertension, cardiovascular disease, type 2 diabetes, alcoholism, and food-borne illness.

The Dietary Guidelines are not difficult to implement (Table 2-7). In addition, this overall diet approach is not especially expensive, as some people suspect. Fruits, vegetables, and low-fat and nonfat milk are no more costly than the chips, cookies, and sugared soft drinks they should in part replace.

Note also that diet recommendations for adults have been issued by other scientific groups, such as the American Heart Association, U.S. Surgeon General, National Academy of Sciences, American Cancer Society, Canadian Ministries of Health (see Appendix C), and World Health Organization. All are consistent with the spirit of the Dietary Guidelines. These groups encourage people to modify their eating behavior in ways that are both healthful and pleasurable.^{2, 24}

Advice from the American Dietetic Association suggests five basic principles with regard to diet and health. Be realistic, making small changes over time. Be adventurous, trying new foods regularly. Be flexible, balancing some sweet and fatty foods with physical activity. Be sensible, including favorite foods in smaller portions. Finally, be active, including physical activity in daily life.

TABLE 2-7 Advice for Applying the Dietary Guidelines to Practical Situations

You Usually Eat This	Reconsider and Eat This
White bread	Whole-wheat bread (fewer nutrients lost in refinement/processing and more fiber)
Sugared breakfast cereal	Low-sugar (and high-fiber) cereal (use the kcal you save for a side dish of fruit)
Cheeseburger and French fries	Hamburger (hold the mayonnaise) and baked beans (for less fat and cholesterol and the benefits of plant proteins)
Potato salad at the salad bar	Three-bean salad
Doughnut, chips, salty snack foods	Bran muffin or bagel (little or no cream cheese)
Soft drinks	Diet soft drinks (save the kcal for more nutritious foods)
Boiled vegetables	Steamed vegetables (for more nutrient retention)
Canned vegetables	Frozen vegetables (fewer nutrients lost in processing)
Fried meats	Broiled meats (watch the fat drain away)
Fatty meats, such as ribs	Lean meats, such as ground round (also, eat chicken and fish often)
Whole milk and ice cream	Low-fat or nonfat milk and sherbet or frozen yogurt (to reduce saturated fat intake)
Mayonnaise or sour cream salad dressing	Oil and vinegar dressings or diet varieties (to save kcal)
Cookies for a snack	Popcorn (air popped with minimal margarine or butter)
Heavily salted foods	Foods flavored primarily with herbs, spices, lemon juice

The Dietary Guidelines and You

When using the Dietary Guidelines, you should consider your own state of health. Dr. David Klurfeld discusses the importance of this concept in his Expert Opinion. Make specific changes and see whether they are effective. Note that results are sometimes disappointing, even when you are following a diet change very closely. Some people can eat a lot of saturated fat and still keep blood cholesterol under control. Other people, unfortunately, have high blood cholesterol even if they eat a diet low in saturated fat. Differences in genetic background are a key cause, as emphasized in Chapter 1. Thus, we have individual nutritional needs and risks of developing certain diseases. One's diet should be planned with this in mind, responding to one's current health status and family history for specific diseases. However, tailoring a unique nutrition program for every North American citizen is unrealistic. The Food Guide Pyramid and the Dietary Guidelines provide adults with simple advice, which can be actively practiced by anyone willing to take a step toward good health.

There is no "optimal" diet. Instead, there are numerous healthful diets. The web page <http://www.ificinfo.health.org> is a great source to lead you in that direction.

CONCEPT CHECK

Dietary Guidelines have been set by a variety of private and government organizations. These guidelines are designed to reduce the risk of developing obesity, hypertension, type 2 diabetes, cardiovascular disease, and alcoholism. To do so, they recommend eating a variety of foods, which is fostered by following the Food Guide Pyramid. They also recommend performing regular physical activity, aiming for a healthy weight, and moderating total fat, saturated fat, salt, sugar, and alcohol intake, while focusing more on fruits, vegetables, and grain products in daily menu planning. Safe food preparation and storage are also highlighted.



Nutrition recommendations are often made on a populationwide basis. However, in some cases, it would be more appropriate if we were evaluated on an individual basis.

CRITICAL THINKING

Athe has grown up eating the typical American diet. Having recently read and heard many news items about the relationship between nutrition and health, she is beginning to look critically at her diet and is considering making changes. However, she doesn't know where to begin. What advice would you give her?



Expert Opinion

WHAT SHOULD I EAT TO LIVE LONGER?

David M. Klurfeld, Ph.D.

The fountain of youth emanates, according to popular culture, from a proper diet. This rosy view stems, in part, from the dietary recommendations made to reduce the risk of several chronic diseases. Implicit in the recommendations is the promise of longer life—but how long and for whom?

Cardiovascular disease and cancer account for almost three-fourths of all deaths in affluent societies. One reason for this is that many causes of premature death—infections, poor sanitation, and accidents—have been dramatically allayed. This change translates into a life expectancy at birth in the United States of 76.5 years. At the same time, more people are overweight, and health-care costs are a greater percentage of the economy than in any other country, so we have lots of room for improvement. In spite of our highly publicized “killer diet,” deaths from cardiovascular disease, stroke, and cancer unrelated to tobacco have all declined markedly over the past 30 years.

We don’t know for sure why this drop has occurred, but it has been attributed, in part, to less use of tobacco and reductions in hypertension and blood cholesterol, along with better medical care. These changes in risk factors point to the multifaceted causes of both cardiovascular disease and cancer. In addition, since many environmental factors interact with genetic

predisposition to a disease, we simply don’t know enough to attribute a specific portion of risk for chronic diseases to diet. Many of the estimates of dietary contribution to the risk of cancer are made by default; that is, cancers that are not traceable to other risk factors are often lumped as being caused by diet. Although many health recommendations emphasize a Mediterranean diet, there are markedly different diets in this region of the world that fall under the category (see the Nutrition Perspective at the end of this chapter for one example). In addition, there is no evidence that populations living around the Mediterranean Sea have a longer life expectancy than people in the United States, Japan, or Scandinavia, where diets differ substantially.

Actually, the only dietary change effective in reducing many types of cancer and increasing life span in animals is caloric restriction. When energy intake is reduced to about 70% of what would normally be eaten—but all nutrient requirements are met—the result is physiologically younger animals. Long-term studies of monkeys eating such low-calorie diets have found reduced body fat and lower blood glucose, insulin, and lipids when compared with animals given free access to food. These studies have been in progress long enough for some of the monkeys to have died from natural causes; far fewer in the

low-calorie groups have died. Circumstantial evidence for a calorie effect in people includes the fact that the highest concentration of centenarians is found in Okinawa. The people over 100 years old have been found to consume less energy and to eat more fruits, vegetables, and meat than in the rest of Japan. In addition, most of the very elderly in ~~every~~ society tend to be slimmer and shorter than average.

Can we reduce cardiovascular disease by dietary means with some degree of certainty? Probably, according to epidemiological and animal data. But epidemiology offers only leads—it cannot prove cause and effect. Today, there’s little controversy over increased risk of cardiovascular disease with elevated blood cholesterol. What is debated is at what point dietary or drug treatments should begin. And, although the consensus recommendation is to reduce blood cholesterol below 200 mg/dl, some argue that this is too modest a target, whereas others contend that it’s an unnecessary one. Still, the slope of cardiovascular disease versus blood cholesterol is quite steep at the upper concentrations (over 250 mg/dl) but shallow near 210 mg/dl, the average adult concentration. Thus, much less benefit is derived from lowering average cholesterol values.

CASE SCENARIO

Follow-Up

The most positive aspect of Andy’s diet is that it contains adequate protein, zinc, and iron because it is rich in animal protein. On the downside, his diet is low in calcium, some B-vitamins (such as folate), and vitamin C. This is because it is low in dairy products, fruits, and vegetables. It is also low in many of the phytochemical (plant-based) substances discussed at the beginning of this chapter. In addition, dietary fiber intake is low because fast-food restaurants primarily use refined grain products, rather than whole-

Several prospective epidemiological studies have reported that a healthy dietary pattern, rather than an intake of individual nutrients predicts longer life expectancy. One study found a strong dose-response relationship evidenced by decreased mortality in subjects who consumed more fruits, vegetables, whole grains, low-fat dairy, and lean meats and poultry. Another large study implicated high consumption of cereal fiber, some fish, the vitamin folate, along with a high polyunsaturated-saturated fat ratio, and low consumption of trans fatty acids (present primarily in stick margarine, shortening, and deep-fat-fried foods; see Chapter 6), simple sugars, and refined carbohydrates as a dietary pattern linked to a reduced risk of cardiovascular disease. However, this dietary pattern strongly correlated with lower weight-for-height status, more exercise, nonsmoking, moderate alcohol intake, and daily use of vitamin/mineral supplements. Although scientists often attempt to sort out these factors to find the most important, it is becoming apparent that a combination of healthy habits achieves the desired benefits.

There's a strong statistical correlation of gross national product, telephones, flush toilets, and other signs of wealth with the incidence of cancer and cardiovascular disease because life expectancy is longer in more affluent countries. The chronic diseases are much more common among older individuals. Populations that can afford to eat a lot of fat, sugar, and salt do so because these three dietary

components are what people think make food taste good.

Everyone in the country has been told to follow a low-sodium diet when only a minority of young and middle-aged adults are hypertensive, and only some of those are salt sensitive. There is also substantial evidence implicating low protein and high calcium, potassium, and magnesium intakes in controlling blood pressure.

A potential explanation for the lack of uniformity in response to dietary factors is that perhaps only some of the population shows elevated blood cholesterol from eating saturated fat, and only some people are genetically predisposed to colon cancer, whereas a fortunate few are destined to live long, healthy lives no matter what rules they violate. This observation does not discount the importance of nutrition in longevity but suggests that recommendations for dietary modification should not be blanket public health policies. Instead, these need to be made on individualized bases—that is, dietary guidelines for those who are at increased risk for specific diseases via family history or the presence of other risk factors may differ. This conclusion should not be taken to mean that a good diet is unimportant. High consumption of fruits, vegetables, and whole grains is associated with a lower incidence of obesity, type 2 diabetes, intestinal disorders, cardiovascular disease, and cancer.

Observational studies have implicated a high intake of vitamin E as a protective factor against cardiovascular disease.

However, increased survival has not been found in bottles of antioxidant supplements. Three of four intervention studies have failed to find a significant benefit of vitamin E on cardiovascular disease rates or mortality. However, diets low in this vitamin and other antioxidants are associated with excess mortality from both cancer and cardiovascular disease.

The explanation that diet modification wouldn't hurt may satisfy some, but it's certainly not scientific. The burden of proof falls on those who suggest specific dietary changes, rather than on those who question the efficacy of those changes. Although what is written today will surely be outdated in the future, there are two nutritional rules that will make sense over time: (1) Eat a variety of foods and (2) consume all foods in moderation. Combining these recommendations with adequate physical activity and the avoidance of tobacco and excess alcohol is a lifestyle that promotes good health and extra years, whereas dietary changes made in isolation may be doomed to failure—boring, perhaps, but advice one can take to heart.

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grain products. And, since most super-sized options apply to foods rich in fat (French fries) and sugar (soft drinks), his diet is likely excessive in those two components.

He could alternate between tacos and bean burritos to gain the benefits of plant proteins in a diet. He could choose a low-fat granola bar instead of the candy bar for breakfast, or he could take the time to eat a bowl of whole-grain breakfast cereal with low-fat or nonfat milk to increase fiber intake (and calcium intake in the latter case). He could also order milk at least half the time at his restaurant visits and substitute diet soft drinks for the regular variety. This would help *moderate* his sugar intake. Overall, his diet is most lacking in a variety of fruit and vegetable choices and dairy products because it lacks *variety* in food choice and *balance* among the five food groups.

What Do Food Labels Have to Offer in Diet Planning?

Today, nearly all foods sold in the grocery store must be labeled with the product name, name and address of the manufacturer, amount of product in the package, and ingredients listed in descending order by weight. This food and beverage labeling is monitored by government agencies such as Food and Drug Administration (FDA). The listing of certain food constituents also is required—specifically, a Nutrition Facts panel (Fig. 2-4). Use this information to learn more about what you eat. The following components must be listed: total kcal, kcal from fat, total fat, saturated fat, cholesterol, sodium, total carbohydrate, dietary fiber, sugars, protein, vitamin A, vitamin C, calcium, and iron. In addition to these required components, manufacturers can choose to list polyunsaturated and monounsaturated fat, potassium, dietary fiber, and others. Listing these components is *not* however, if a claim is made about the health benefits of the specific nutrient (see the section in this chapter entitled “Health Claims on Food Labels”) or if the food is fortified with that nutrient.

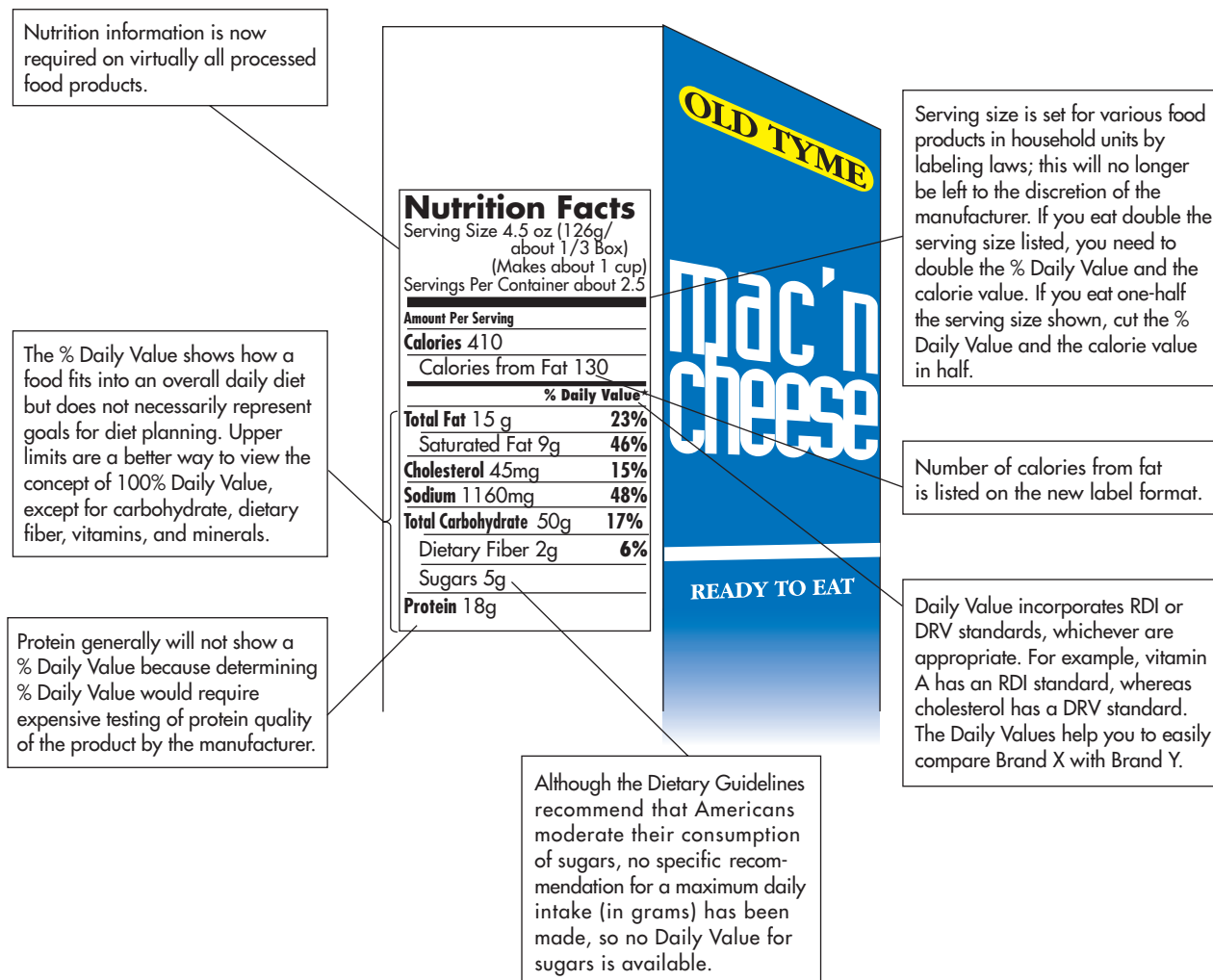


FIGURE 2-4a The Nutrition Facts panel on a current food label. The box is broken into two parts: (a) the top and (b) the bottom. The % Daily Value listed on the label is the percentage of the generally accepted amount of a nutrient needed daily that is present in one serving of the product. You can use the % Daily Values to compare your diet with current nutrition recommendations for certain diet components. Let's consider dietary fiber. Assume that you consume 2000 kcal per day, which is the energy intake corresponding to the % Daily Values listed on labels. If the total % Daily Value for dietary fiber in all the foods you eat in one day adds up to 100%, your diet meets the recommendations for dietary fiber.

Illustration by William Ober.

The percentage of the Daily Value (% Daily Value) is usually given for each nutrient per serving. It is important to understand that these percentages are based on a 2000 kcal diet. In other words, they are not as applicable to people who require considerably more or less than 2000 kcal per day with respect to fat and carbohydrate intake.

Serving sizes on the Nutrition Facts panel must be consistent between similar foods. This means that all brands of ice cream, for example, must use the same serving size on their labels. In addition, food claims made on packages must follow legal definitions (Table 2–8). For example, if a product claims to be “low sodium,” it must have 140 mg of sodium or less per serving.

Many manufacturers list the Daily Values set for dietary components such as fat, cholesterol, and carbohydrate on the Nutrition Facts panel. This can be useful as a reference point. As noted before they are based on 2000 kcal; if the label is large enough, amounts based on 2500 kcal are listed as well. Recall also from Chapter 1 that the term *kcal* is used to express energy content on the labels; however, scientifically speaking this is an incorrect use of the term.

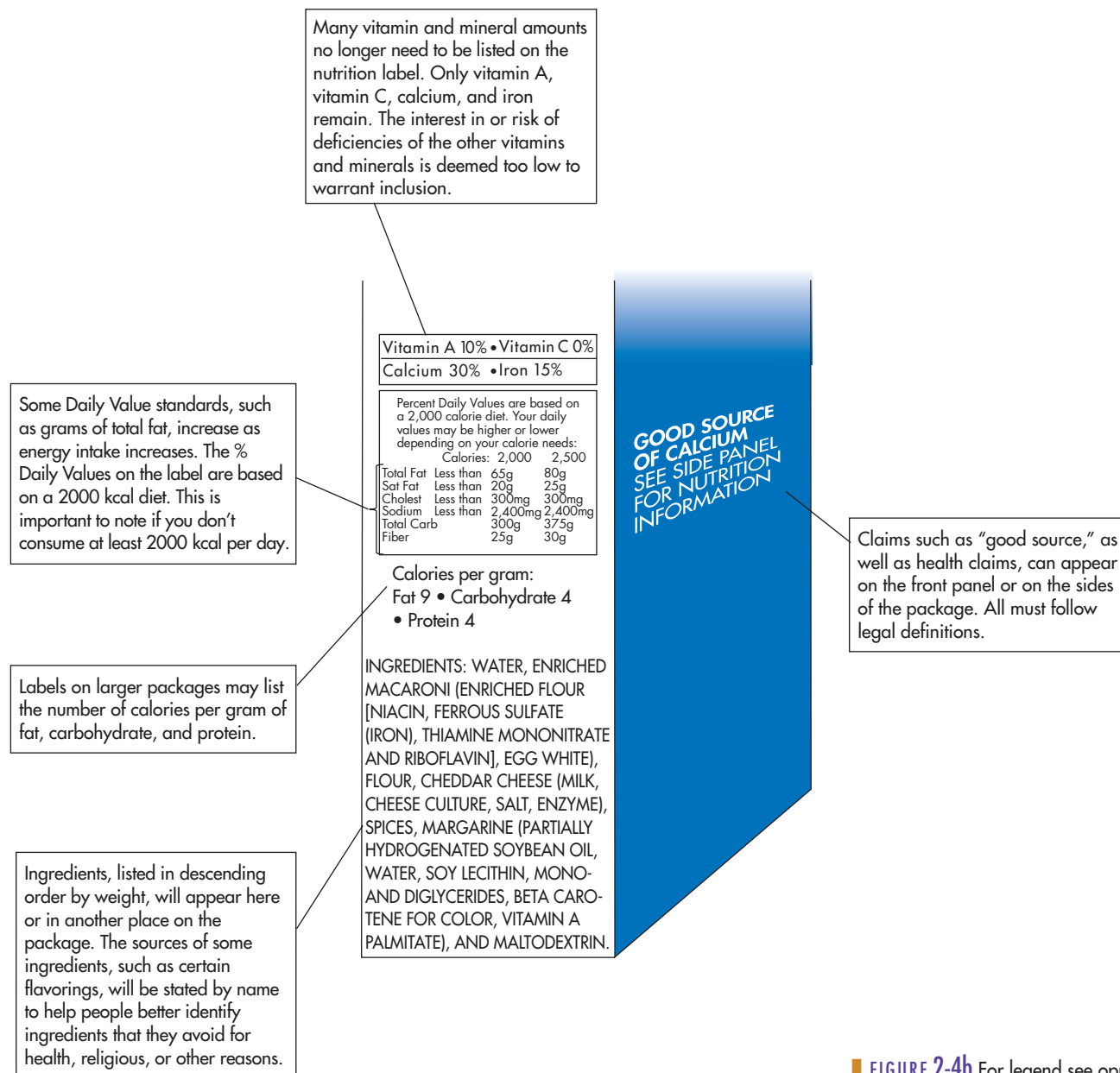


FIGURE 2-4b For legend see opposite page.

TABLE 2-8 Definitions for Comparative and Absolute Nutrient Claims on Food Labels**Sugar**

- **Sugarfree:** less than 0.5 grams (g) per serving
- **No added sugar/ no added sugar/ no sugar added:**
 - No sugars were added during processing or packing, including ingredients that contain sugars (for example, fruit juices, applesauce, or jam).
 - Processing does not increase the sugar content above the amount naturally present in the ingredients. (A functionally insignificant increase in sugars is acceptable for processes used for purposes other than increasing sugar content.)
 - The food that it resembles and for which it substitutes normally contains added sugars.
 - If the food doesn't meet the requirements for a low- or reduced-calorie food, the product bears a statement that the food is not low calorie or calorie reduced and directs consumers' attention to the nutrition panel for further information on sugars and calorie content.
- **Reduced sugar** at least 25% less sugar per serving than reference food

Calories

- **Calorie free:** fewer than 5 kcal per serving
- **Low calorie:** 40 kcal or less per serving and, if the serving is 30 g or less or 2 tablespoons or less, per 50 g of the food
- **Reduced or fewer calories** at least 25% fewer kcal per serving than reference food

Fiber

- **High fiber** 5 g or more per serving (foods making high-fiber claims must meet the definition for low fat, or the level of total fat must appear next to the high-fiber claim)
- **Food source of fiber** 2.5 to 4.9 g per serving
- **More added fiber** at least 2.5 g more per serving than reference food

Fat

- **Fat free:** less than 0.5 g of fat per serving
- **Saturated fat free:** less than 0.5 g per serving, and the level of trans fatty acids does not exceed 0.5 g per serving

- **Low fat** 3 g or less per serving and, if the serving is 30 g or less or 2 tablespoons or less, per 50 g of the food. 2% milk can no longer be labeled low-fat, as it exceeds 3 g per serving. **Reduced fat** will be the term used instead.
- **Low saturated fat** 1 g or less per serving and not more than 15% of kcal from saturated fatty acids
- **Reduced or less fat** at least 25% less per serving than reference food
- **Reduced or less saturated fat** at least 25% less per serving than reference food

Cholesterol

- **Cholesterol free:** less than 2 mg of cholesterol and 2 g or less of saturated fat per serving
- **Low cholesterol:** 20 mg or less cholesterol and 2 g or less of saturated fat per serving and, if the serving is 30 g or less or 2 tablespoons or less, per 50 g of the food
- **Reduced or less cholesterol:** at least 25% less cholesterol and 2 g or less of saturated fat per serving than reference food

Sodium

- **Sodium free:** less than 5 mg per serving
- **Very low sodium:** 35 mg or less per serving and, if the serving is 30 g or less or 2 tablespoons or less, per 50 g of the food
- **Low sodium:** 140 mg or less per serving and, if the serving is 30 g or less or 2 tablespoons or less, per 50 g of the food
- **Light in sodium:** at least 50% less per serving than reference food
- **Reduced or less sodium:** at least 25% less per serving than reference food

Other Terms

- **Fortified/enriched:** Vitamins and/or minerals have been added to the product in amounts in excess of at least 10% of that normally present in the usual product.
- **Healthy** An individual food that is low fat and low saturated fat and has no more than 360 to 480 mg of sodium or 60 mg of cholesterol per serving can be labeled "healthy" if it provides at least 10% of vitamin A, vitamin C, protein, calcium, iron, or dietary fiber.
- **Light or lite:** The descriptor *light* or *lite* can mean two things: first, that a nutritionally

altered product contains one-third fewer kcal or half the fat of reference food (if the food derives 50% or more of its kcal from fat, the reduction must be 50% of the fat) and, second, that the sodium content of a low-calorie, low-fat food has been reduced by 50%. 2% milk can no longer be labeled low fat because it has more than 3 g of fat per serving. In addition, "light in sodium" may be used for foods in which the sodium content has been reduced by at least 50%. The term *light* may still be used to describe such properties as texture and color, as long as the label explains the intent—for example, "light brown sugar" and "light and fluffy."

- **Diet** A food may be labeled with terms such as *diet*, *dietetic*, *officially dietetic*, or *dietetic in non-dietetic* only if the claim is not false or misleading. The food can also be labeled *low calorie* or *reduced calorie*.
- **Good source:** **Good source** means that a food contains 10 to 19% of the Daily Value for a particular nutrient.
- **High:** **High** means that a food contains 20% or more of the Daily Value for a particular nutrient.
- **Organic:** No federal standards currently exist. Current proposals for organic foods are those that do not use genetic engineering, sewage sludge, antibiotics, or irradiation in their production. For livestock, the animals should be fed organic feed and cannot be exposed to antibiotics, growth hormones, or parasite-killing medications.
- **Natural:** The food must be free of food colors, synthetic flavors, or any other synthetic substance.

The following terms apply only to meat and poultry products regulated by USDA.

- **Extra lean:** less than 5 g of fat, 2 g of saturated fat, and 95 mg of cholesterol per serving (or 100 g of an individual food)
- **Lean:** less than 10 g of fat, 4.5 g of saturated fat, and 95 mg of cholesterol per serving (or 100 g of an individual food)

Exceptions to Food Labeling

Foods such as fresh fruits and vegetables, fish, meats, and poultry currently are not required to have Nutrition Facts labels. However, many grocers and some meat packers have voluntarily chosen to provide their customers with information on these products. Nutrition Facts labels on meat products will also likely be required in the coming years. The next time you are at the grocery store, ask where you might find information on the fresh products that do not have a Nutrition Facts panel. You will likely find a poster or pamphlet near the product; often, these pamphlets contain recipes in which to use your favorite fruit, vegetable, or cut of meat. They may even assist you in your endeavor to improve your diet.

Because protein deficiency is not a public health concern in the United States, declaration of the % Daily Value for protein is not mandatory on foods for people over 4 years of age. If the % Daily Value is given on a label, FDA requires that the product be analyzed for protein quality. Because this procedure is expensive and time-consuming, many companies opt not to list a % Daily Value for protein rather than undergo the expense. However, labels on food for infants and children under 4 years of age must include the % Daily Value for protein, as must the labels on any food carrying a claim about protein content (see Chapter 17).

Health Claims on Food Labels

As a marketing tool directed toward the health-conscious consumer, food manufacturers are asserting that their products have all sorts of health benefits. This campaign began in earnest in 1984, when the Kellogg Company, in conjunction with The National Cancer Institute, printed a health claim on its “high-fiber” cereals, stating that fiber may help prevent certain forms of cancer. This type of label message was not allowed at the time and caused a heated debate among nutrition scientists. After reviewing hundreds of comments on the proposed rule allowing health claims, the Food and Drug Administration (FDA), which has legal oversight over most food products, decided to permit this and other health claims with certain restrictions.

Currently, FDA limits the use of health messages to specific diseases in which there is significant scientific agreement concerning the relationship between a nutrient, food, or food constituent and the disease.¹² The claims allowed at this time may show a link between the following:

- A diet with enough calcium and a reduced risk of osteoporosis
- A diet low in total fat and a reduced risk of some cancers
- A diet low in saturated fat and cholesterol and a reduced risk of cardiovascular (heart) disease
- A diet rich in dietary fiber-containing grain products, fruits, and vegetables and a reduced risk of some cancers
- A diet low in sodium and a reduced risk of hypertension
- A diet rich in fruits and vegetables and a reduced risk of some cancers
- A diet adequate in the vitamin folate and a reduced risk of neural tube defects (a type of birth defect)
- Use of sugarless gum and a reduced risk of tooth decay, especially when compared with foods high in sugars and starches
- A diet rich in fruits, vegetables, and grain products that contain fiber and a reduced risk of cardiovascular disease. Oats (oatmeal, oat bran, and oat flour) and psyllium are two fiber-rich ingredients that can be singled out in reducing the risk of cardiovascular disease, as long as the statement also says the diet should also be low in saturated fat and cholesterol.
- A diet rich in whole-grain foods and other plant foods, as well as low in total fat, saturated fat, and cholesterol, and a reduced risk of cardiovascular disease and certain cancers

- A diet low in saturated fat and cholesterol that also includes 25 g of soy protein and a reduced risk of cardiovascular disease. The statement “one serving of the (name food) provides _____ g of soy protein” must also appear as part of the health claim.
- A diet rich in potassium and a reduce risk of stroke.
- Margarines containing stanol esters and a reduced risk of cardiovascular disease (see Chapter 6 for more details on stanol esters).

A “may” or “might” qualifier must be used in any statement.

In addition, before a health claim can be made for a food product, it must meet two general requirements. First, the food must be a “good source” (before fortification) of dietary fiber, protein, vitamin A, vitamin C, calcium, or iron. The legal definition of “good source” appeared in Table 2–8. Second, a single serving of the food product cannot contain more than 13 g of fat, 4 g of saturated fat, 60 mg of cholesterol, or 480 mg of sodium. If a food exceeds any one of these amounts, no health claim can be made for it, despite its other nutritional qualities. For example, even though whole milk is high in calcium, its label can’t make the health claim about calcium and osteoporosis because whole milk contains 5 g of saturated fat per serving.

In addition, the product must meet criteria specific to the health claim being made. For example, a health claim regarding fat and cancer can be made only if the product contains 3 g or less of fat per serving, which is the standard for low-fat food.

The bottom line for health claims is honesty. FDA is vigilant in controlling the claims made about foods on supermarket shelves.

CONCEPT CHECK

The Nutrition Facts panel on a food label provides key information for helping track one’s food intake. Nutrient quantities are compared with the Daily Values and expressed on a percentage basis (% Daily Value). This information can be used to either increase or reduce intake of specific nutrients. Health claims on food labels are closely regulated by FDA. Fruits, vegetables, whole grains, soy, and rich sources of calcium are prominent among the foods that can make specific health claims.

exchange system A system for classifying foods into numerous lists based on the foods’ macronutrient composition and establishing serving sizes, so that one serving of each food on a list contains the same amount of carbohydrate, protein, fat, and energy content.

exchange The serving size of a food on a specific exchange list.

Exchange System: A Final Menu-Planning Tool

The **Exchange System** is a valuable tool for roughly estimating the energy, protein, carbohydrate, and fat content of a food or meal. This tool organizes many details of the nutrient composition of foods into a manageable framework. By using the Exchange System, you can plan daily menus to fall roughly within specific percentages of macronutrients without having to look up or memorize the nutrient values of numerous foods, so the time you spend now becoming familiar with the Exchange System will pay dividends in the future.

In the Exchange System, individual foods are placed into three broad groups: carbohydrate, meat and meat substitutes, and fat. Within these groups are lists that contain foods of similar macronutrient composition: various types of milk; fruit; vegetables; starch; other carbohydrates; meat and meat substitutes; and fat. These lists are designed so that, when the proper serving size is observed, each food on a list provides about the same amount of carbohydrate, protein, fat, and energy. This equality allows the exchange of foods on each list, hence the term **exchange system**.

The Exchange System was originally developed for planning diabetic diets. Diabetes is easier to control if the person’s diet has about the same composition day after day. If a certain number of **exchanges** from each of the various lists is eaten each day, that regularity is easier to achieve. However, because the Exchange System provides a quick way to estimate the energy, carbohydrate, protein, and fat content in any food or meal, it is a valuable menu-planning tool.



Many food products prominently feature health claims.

Becoming Familiar with the Exchange System

To use the Exchange System, you must know which foods are on each list and the serving sizes for each food.

Table 2-9 gives the serving sizes for foods on each exchange list, as well as the carbohydrate, protein, fat, and energy content per exchange. Note that the meat and milk lists are divided into subclasses, which vary in fat content and hence in the amount of energy they provide. Foods on the meat and fat lists contain essentially no carbohydrate; those on the fruit and fat lists lack appreciable amounts of protein; and those on the vegetables, fruit, and other carbohydrates lists contain essentially no fat. You need to study Table 2-9 to become familiar with the sizes of the exchanges (that is, serving sizes) on each list and the amounts of carbohydrate, protein, fat, and energy per exchange.

Before you can turn a group of exchanges into a daily meal plan, you must be aware of which foods are on each exchange list (Fig. 2-5). The entire U.S. Exchange System is presented in Appendix D, which you should consult frequently while exploring the system to discover its various peculiarities. For example, the starch list includes not only bread, dry cereal, cooked cereal, rice, and pasta but also baked beans, corn on the cob, and potatoes. These foods are not identical to those composing the bread, cereal, rice, and pasta group in the Food Guide Pyramid. The Exchange System is not concerned with the origin of a food, whether animal or vegetable. It is primarily concerned with the macronutrients carbohydrate, protein, and fat in each food on a specific list. For example, the carbohydrate composition of potatoes resembles that of bread more than that of broccoli, although potatoes are vegetables. In addition, several foods on the meat and meat substitutes list are not meats. The list of other carbohydrates includes jam, angel food cake, fat-free frozen yogurt, and foods, such as frosted cake, that count as both other carbohydrate exchanges and fat exchanges. Bacon appears in the fat list, rather than the high-fat meat category.

Free foods include bouillon, diet soda, coffee, tea, dill pickles, and vinegar, as well as herbs and spices. Most vegetables, such as cabbage, celery, mushrooms, lettuce, and zucchini, also can be considered free foods; their minimal energy contribution need not count in the calculations when they are eaten in moderation (one to two servings per meal or snack).

TABLE 2-9 Nutrient Composition of Exchange System Lists (1995 Edition)

Groups/Lists	Household Measures*	Carbohydrate (g)	Protein (g)	Fat (g)	Energy (kcal)
Carbohydrate Group					
Starch	1 slice, ¾ cup raw, or ½ cup cooked	15	3	1 or less†	80
Fruit	1 small/medium piece	15	—	—	60
Milk	1 cup				
Nonfat/very-low-fat		12	8	0-3†	90
Low-fat		12	8	5	120
Whole		12	8	8	150
Other carbohydrates	Varies	15	Varies	Varies	Varies
Vegetables	1 cup raw or ½ cup cooked	5	2	—	25
Meat and Meat Substitutes Group					
	1 oz				
Very lean		—	7	0-1	35
Lean		—	7	3	55
Medium-fat		—	7	5	75
High-fat		—	7	8	100
Fat Group					
	1 tsp	—	—	5	45

Reproduction of the Exchange Lists in whole or in part, without permission of The American Dietetic Association or the American Diabetes Association, Inc. is a violation of federal law. This material has been modified from *Exchange List for Meal Planning*, which is the basis of a meal planning system designed by a committee of the American Diabetes Association and The American Dietetic Association. While designed primarily for people with diabetes and others who must follow special diets, the Exchange Lists are based on principles of good nutrition that apply to everyone. Copyright © 1995 by the American Diabetes Association and the American Dietetic Association.

*Just an estimate; see exchange lists for actual amounts

†Calculated as 1 g for purposes of energy contribution

FIGURE 2-5 Foods arranged according to the Exchange System lists.



Fruit exchange choices



Milk exchange choices



Fat exchange choices

Using the Exchange System to Develop Daily Menus

Now let's use the Exchange System to plan a 1-day menu. Let's target an energy content of 2000 kcal, with 55% coming from carbohydrates (1100 kcal), 15% from protein (300 kcal), and 30% from fat (600 kcal). This can be translated into 2 low-fat milk exchanges, 3 vegetable exchanges, 5 fruit exchanges, 11 starch exchanges, 4 lean meat exchanges, and 6 fat exchanges (Table 2-10).⁹ Note that this is only one of many possible combinations; the Exchange System offers great flexibility.

Table 2-11 arbitrarily separates these exchanges into breakfast, lunch, dinner, and a snack. Breakfast includes 1 low-fat milk exchange, 2 fruit exchanges, 2 starch exchanges, and 1 fat exchange. This total corresponds to 3/4 cup of cold cereal, 1 cup of reduced fat milk, 1 slice of bread with 1 teaspoon margarine, and 1 cup of orange juice.

Lunch consists of 2 fat exchanges, 4 starch exchanges, 1 vegetable exchange, 1 low-fat milk exchange, and 2 fruit exchanges. This translates into one slice of bacon with 1 teaspoon mayonnaise on two slices of bread, with tomato—in other words, a bacon and tomato sandwich. You can also add lettuce to the sandwich. This can be considered a free vegetable choice. Add to this meal a 9-inch banana (1 exchange = 1 small banana), 1 cup of reduced fat milk, and 6 graham crackers (2 1/2" by 2 1/2"). Later add a snack 3/4 oz of pretzels for another starch exchange.

Dinner consists of 4 lean meat exchanges, 1 fruit exchange, 2 vegetable exchanges, 1 fat exchange, and 2 starch exchanges. This total corresponds to a 4-ounce broiled steak (meat only, no bone), 1 medium baked potato (1 exchange = 1 small baked potato) with 1 teaspoon of margarine, 1 cup of broccoli, and 1 kiwifruit. Coffee (if desired) is not counted, since it contains no appreciable energy.

Finally, we have a snack containing 2 starch exchanges and 2 fat exchanges. This translates into 1 bagel with 2 tablespoons of regular cream cheese.

This 1-day menu is only one of many that are possible with the exchange lists. Apple juice could replace the orange juice; two apples could be exchanged for the banana. The choices are endless. Notice that an exchange diet is much easier to plan if you use individual foods, as was done here; however, the Exchange System tables list some combination foods to help you (see Appendix D). Using combination foods, such as pizza or lasagna, however, makes it more difficult to calculate the number of exchanges in a serving. For instance, lasagna typically has meat exchanges, vegetable exchanges, and starch exchanges. With experience, you will be able to tackle such complex foods. For now, using individual foods makes learning the Exchange System much easier.

CRITICAL THINKING

Leah is trying to lose a few extra pounds and is going to use the Exchange System to limit her energy intake to 1600 kcal/day. Her dietitian recommends that she begin with about 50% of her kcal from carbohydrate, 20% from protein, and 30% from fat. Design a 1-day sample menu for Leah. Hint: Use Table 2-10 as a starting place.

TABLE 2-10 Possible Exchange Patterns That Yield 55% of Energy as Carbohydrate, 30% as Fat, and 15% as Protein for Energy Intakes \geq 2000 kcal

kcal/Day							
Exchange List	1200*	1600*	2000	2400	2800	3200	3600
Milk (low fat)	2	2	2	2	2	2	2
Vegetable	3	3	3	4	4	4	4
Fruit	3	4	5	6	8	9	9
Starch	5	8	11	13	15	18	21
Meat (lean)	4	4	4	5	6	7	8
Fat	2	4	6	8	10	11	13

This is just one set of options. More meat could be included if less milk were used, for example.

*Energy intakes of 1200 and 1600 kcal contain 20% of energy as protein and less carbohydrate to allow for greater flexibility in diet planning.

TABLE 2-11 Sample 1-Day 2000 kcal Menu Based on the Exchange System Plan*

Breakfast	
1 low-fat milk exchange	1 cup reduced-fat milk (some on cereal)
2 fruit exchanges	1 cup orange juice
2 starch exchanges	$\frac{3}{4}$ cup cold cereal, 1 piece whole-wheat toast
1 fat exchange	1 tsp soft margarine on toast
Lunch	
4 starch exchanges	2 slices whole-wheat bread, 6 graham crackers (2½" by 2½")
2 fat exchanges	1 slice bacon, 1 tsp mayonnaise
1 vegetable exchange	1 sliced tomato
2 fruit exchanges	1 banana (9 inches)
1 low-fat milk exchange	1 cup reduced-fat milk
Snack	
1 starch exchange	$\frac{3}{4}$ oz pretzels
Dinner	
4 lean meat exchanges	4 oz lean steak (well trimmed)
2 starch exchanges	1 medium baked potato
1 fat exchange	1 tsp soft margarine
2 vegetable exchanges	1 cup cooked broccoli
1 fruit exchange	1 kiwifruit
	Coffee (if desired)
Snack	
2 starch exchanges	1 bagel
2 fat exchanges	2 tbsp regular cream cheese

*The target plan was a 2000 kcal energy intake, with 55% from carbohydrate, 15% from protein, and 30% from fat. Computer analysis indicates that this menu yielded 2040 kcal, with 53% from carbohydrate, 16% from protein, and 31% from fat—in close agreement with the targeted goals.

CONCEPT CHECK

The Exchange System makes it possible to design and follow a precise diet that yields desired ratios of carbohydrate, fat, and protein, while accounting for total energy intake. When the set serving sizes are observed, all the foods within each of the various Exchange System lists yield similar contributions of carbohydrate, fat, protein, and energy. Because of their similar nutrient profiles, the foods in each group can be exchanged for one another.

EPILOGUE

The tools discussed in this chapter greatly aid in menu planning. Menu planning can start with the Food Guide Pyramid. The totality of choices made within the groups can then be evaluated using the Dietary Guidelines. Individual foods that make up a diet can be examined more closely using the comparison with the Daily Values listed on the Nutrition Facts panel of the product. For the most part, these Daily Values are in line with the Dietary Reference Intakes and related nutrient standards. The Nutrition Facts panel is especially useful in identifying nutrient-dense foods—foods

that are high in a specific nutrient, such as the vitamin folate, but low in comparison with the relative amount of energy provided, as well as foods that fill you up without providing a lot of calories. The latter are described as foods with low energy density. Once mastered, the Exchange System is helpful for formulating a menu plan that meets specific carbohydrate, fat, and protein goals. Generally speaking, the more you learn about and use these tools, the more they will benefit your diet.

SUMMARY

1. **Calories**, **nutrient density**, and **energy density** are three watchwords of diet planning.
2. Nutrient density is a useful concept. It reflects the nutrient content of a food in relation to its energy (kcal) content. Nutrient-dense foods are relatively rich in nutrients, in comparison with energy content.
3. Energy density of a food is determined by comparing energy content with the weight of food. A food that is rich in calories but that weighs relatively very little, such as nuts, cookies, fried foods in general, and fat-free snacks, is considered energy dense. Foods with low energy density include fruits, vegetables, and any food that incorporates much water during cooking, such as oatmeal.
4. Recommended Dietary Allowances (RDAs) are set for many nutrients. These amounts yield enough of each nutrient to meet the needs of healthy individuals within specific gender and age categories. Adequate Intake (AI) is the standard used when not enough information is available to set a revised RDA. Tolerable Upper Intake Levels (ULs) for nutrient intake have been set for some vitamins and minerals. All of the many dietary standards fall under the term **DRI**.
5. Daily Values are used as a basis for expressing the nutrient content of foods on the Nutrition Facts panel. Reference Daily Intakes (RDIs), which are derived from the 1968 nutrient standards, constitute the majority of the Daily Values. Daily Reference Values (DRVs) have been set for some nutrients with no such RDA, as is true for fat and dietary fiber; DRVs compose the rest of the Daily Values.
6. The Food Guide Pyramid is designed to translate nutrient recommendations into a food plan that exhibits variety, balance, and moderation. The best results are obtained by using low-fat or nonfat dairy products; including some vegetable proteins in addition to animal-protein foods; including citrus fruits and dark green vegetables; and emphasizing whole-grain breads and cereals.
7. Dietary Guidelines have been issued to help reduce chronic diseases in our population. The guidelines emphasize eating a variety of foods; performing regular physical activity; maintaining or improving weight; moderating consumption of fats, cholesterol, sugar, salt, and alcohol; eating plenty of grain products, fruits, and vegetables; and safely preparing and storing foods, especially perishable foods.
8. The Exchange System is valuable for estimating the carbohydrate, fat, protein, and energy content of a food or meal and for planning a diet to correspond to specific goals for carbohydrate, fat, protein, and energy intake.

Check out the Perspectives in Nutrition online learning center www.mhhe.com/perspectives5 for quizzes, flash cards, other activities, and web links designed to further help you learn about various tools for diet planning.

STUDY QUESTIONS

1. Describe the philosophy underlying the creation of the Food Guide Pyramid. What dietary changes would you need to make to meet the pyramid guidelines on a regular basis?
2. Describe the intent of the Dietary Guidelines. Point out one criticism for its general application to all American adults.
3. Based on the discussion of the Dietary Guidelines, suggest two key dietary changes the typical American adult should consider making.
4. What three key points should you make when explaining the significance of the DRIs to a friend?
5. How do RDAs and AIs differ from Daily Values in intention and application?
6. How would you explain the concepts of nutrient density and energy density to a fourth grade class?
7. Describe how the Exchange System can be used to help design a diet, based on what the system can predict and monitor.
8. Nutritionists encourage all people to read labels on food packages to learn more about what they eat. What four nutrients could easily be tracked in your diet if you were to read the Nutrition Facts panels regularly on food products?
9. Explain why consumers can confidence in health claims on food packages.
10. Relate the importance of variety in a diet to the discovery of various phytochemical in foods.

ANNOTATED REFERENCES

1. ADA Reports: Position of the American Dietetic Association: Functional foods. *JADA* 99:1278, 1999.

2. American Heart Association Conference Proceedings: Unified dietary recommendations. *Am J Clin Nutr* 100:450, 1999.

3. Beecher GR: Phytonutrients' role in metabolism: Effects on resistance to degenerative processes. *Am J Clin Nutr* 57(9):S3, 1999.

4. Bruce B and others: A diet high in whole and unrefined foods favorably alters lipids, antioxidant defenses and colon function. *JAMA* 284:19:61, 2000.

5. Campbell TC, Chen J: Diet and health in rural China: Lessons learned and unlearned. *Am J Clin Nutr* 34:116, 1999.

6. Chidley E: Let food be your medicine. *Am J Clin Nutr* p. 28, December 1999.

7. Clairmont MA: Nutraceuticals, phytochemicals and functional foods: A field of dreams for dietitians. *JADA* p. 36, April 2000.

8. de Lorgeril and others: Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction: Final report of the Lyon Diet Heart Study. *Am J Clin Nutr* 99:779, 1999.

9. JAMA Patient Page: A healthy diet. *JAMA* 283:2198, 2000.

10. JAMA Patient Page: Why you should eat more fruits and vegetables. *JAMA* 282:1304, 1999.

11. Kantor LS: A dietary assessment of the US food supply. *Am J Clin Nutr* p. 4, January 22, 1999.

12. Kurtzweil P: Staking a claim to good health. *Am J Clin Nutr* p. 16, November-December 1998.

13. Laudan R: Birth of the modern diet. *Am J Clin Nutr* p. 76, August 2000.

14. McBean LD: Functional foods: An overview. *JAMA* 282:70:31, 1999.

15. Milner JA: Functional foods: The US perspective. *JAMA* 284:71(Suppl):1654S, 2000.

16. Mukhtar H, Ahmad N: Tea polyphenols: Prevention of cancer and optimizing health. *JAMA* 284:71(Suppl):1698S, 2000.

17. Raloff J: Chocolate hearts: Yummy and good medicine? *Am J Clin Nutr* 157:188, 2000.

18. Rao AV, Agarwal S: Role of the antioxidant lycopene in cancer in heart disease. *JAMA* 284:19:563, 2000.

19. Rolls BJ: The role of energy density in the overconsumption of fat. *JAMA* 284:130:268S, 2000.

20. Sloan EA: The top ten functional food trends. *JAMA* 284(4):33, 2000.

21. Tea and health. *Am J Clin Nutr* 72(2):218-220, 2000.

22. Ten tips for putting healthy eating into practice. *Am J Clin Nutr* 72(4):418-420, 2000.

23. The new foods: Functional or dysfunctional? *JAMA* 281(12):1500-1501, 1999.

24. Truswell AS: Dietary goals and guidelines: National and international perspectives. In Shils ME and others (eds.): *Nutrition in Clinical Medicine*, 9th ed. Baltimore MD: Williams & Wilkins, 1999.

25. Vesper H and others: Sphingolipids in food and the emerging importance of sphingolipids to nutrition. *Lipids* 34(12):1239, 1999.

26. Weisburger JH: Approaches for chronic disease prevention based on current understanding of underlying mechanisms. *JAMA* 284(17):1710S, 2000.

27. Whole fruits and vegetables. *Am J Clin Nutr* 72(6):1180-1181, 2000.

28. Willett WC: The dietary pyramid: Does the foundation need repair? *Am J Clin Nutr* 68:218, 1998.

29. Yates AA: Process and development of dietary reference intakes: Bases, need, and application of recommended dietary allowances. *JAMA* 280(1):S5, 1998.

TAKE ACTION

I. DOES YOUR DIET MEET NUTRIENT NEEDS, FOOD GUIDE PYRAMID RECOMMENDATIONS, AND THE DIETARY GUIDELINES?

Complete either Part I or Part II. Then complete Parts III, IV, and V. (For help in following the instructions for this activity, see the sample assessment in Appendix E.)

Part I

Manual RDA Analysis

- Take the information from the 1-day food-intake record you completed in Chapter 1 and record it on the blank form provided in Appendix E or by your instructor. Be sure to record the food or drink ingested and the amount (e.g., weight) consumed. Note: Your instructor may require you to keep the food record for more than 1 day.
- Review the various nutrient standards on the inside cover of this book and choose the appropriate recommendations for your gender and age. Write the appropriate value for each nutrient on the line on the form labeled "Nutrient Need." The values for sodium and potassium from the table on the inside cover of the book are labeled "Estimated Sodium, Chloride, and Potassium Requirements of Healthy Persons."
- Look up the foods and drinks that you listed on the form in the food composition table, Appendix A. Record on the form the amounts of each nutrient and the kcal present in them, based on the serving size and the number of servings you ate. For example, if you drank 2 cups of milk and the serving size listed in Appendix A is 1 cup, double all nutrient values as you record them. If the food is not listed, choose a substitute, such as cola for root beer.
- For each food and drink, add the amounts in each column and record the results on the line labeled "Totals."
- Compare the totals with your nutrient needs. Divide the total for each nutrient by the specific amount and multiply that by 100. Record the result on the line labeled "% of Nutrient Needs."
- Keep this assessment for use in subsequent activities in other chapters.

Part II

Computer Diet Analysis

- Obtain copies of the computer software from your instructor. Load the software into the computer.
- Choose RDAs and related nutrient standards based on your age and gender.
- Enter the information from the 1-day food intake record you kept in Chapter 1. Be sure to enter each food and drink and the specific amount you ate.
- This software program will give you the following results:
 - The appropriate DRI (or related standard) for each nutrient
 - The total amount of each nutrient and the kcal consumed for the day
 - The percentage of intake compared with needs for each nutrient you consumed
- Keep this assessment for use in subsequent activities in other chapters.

Part III

Evaluation of Nutrient Intakes as a Percentage of Nutrient Needs

Remember that you don't necessarily need to consume your estimated nutrient needs every day. A general standard is meeting needs averaged over 5 to 8 days. It is best not to exceed 200% (two times greater) or the UL (if set) to avoid potential toxic effects for some nutrients.

- For which nutrients did your intakes fall below estimated nutrient needs?
- Did you exceed the minimum requirements for sodium? to what degree?
- For which nutrients did you exceed your needs by greater than 200% (two times greater) or the UL (if set)?
- What dietary changes could you make to correct or improve your dietary profile? If you're not sure, Chapters 5 through 12 will help guide your decisions.

TAKE ACTION

Part IV

Food Guide Pyramid

Using the same food-intake record used in Part I or II, place each food item in the appropriate group of the Food Guide Pyramid in Appendix E. That is, for each food item, indicate how many servings it contributes to each group based on the amount you ate (see Table 2-6 for serving sizes). Note that many of your food choices may contribute to more than one group. For example, toast with margarine contributes to two categories: (1) the breads, cereals, rice, and pasta group and (2) fats, oils, and sweets. After entering all the values, add the number of servings consumed in each group. Finally, compare your total in each food group with the recommended number of servings shown in Figure 2-3. Enter a minus sign (-) if your total falls below the recommendation or a plus sign (+) if it equals or exceeds the recommendation.

Part V

Further Diet Evaluation

Do the weaknesses, if any, suggested in your nutrient analysis (see Part III) correspond to missing servings in the Food Guide Pyramid chart? If so, consider changing your food choices based on the Food Guide Pyramid to help improve your nutrient profile. Finally, indicate whether your day's diet did or did not conform to the following items in the Dietary Guidelines:

Aim for Fitness

- Aim for a healthy weight.
- Be physically active each day.

Build a Healthy Base

- Let the pyramid guide your food choices.
- Choose a variety of grains daily, especially whole grains.
- Choose a variety of fruits and vegetables daily.
- Keep foods safe to eat.

Choose Sensibly

- Choose a diet that is a low in saturated fat and cholesterol and moderate in total fat.
- Choose beverages and foods to moderate your intake of sugars.
- Choose and prepare foods with less salt.
- If you drink alcoholic beverages, do so in moderation.

If your diet comes up short on any of these evaluations, take appropriate action to improve your eating patterns.

Yes	No
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

II. APPLYING THE NUTRITION FACTS LABEL TO YOUR DAILY FOOD CHOICES

Imagine that you are at the grocery store, looking for a quick meal before a busy evening. In the frozen food section, you find two brands of frozen cheese manicotti (see labels a and b). Which of the two brands would you choose? What information on the Nutrition Facts label in the figure contributed to this decision?

Nutrition Facts
Serving Size 1 Package (260g)
Servings Per Container 1

Amount Per Serving
Calories 390 **Calories from Fat** 160

% Daily Value*

Total Fat 18g **27%**
Saturated Fat 9g **45%**
Cholesterol 45mg **14%**
Sodium 880mg **36%**
Total Carbohydrate 38g **13%**
Dietary Fiber 4g **15%**
Sugars 12g

Protein 17g

Vitamin A 10% • Vitamin C 4%
Calcium 40% • Iron 8%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

(a)

Nutrition Facts
Serving Size 1 Package (260g)
Servings Per Container 1

Amount Per Serving
Calories 230 **Calories from Fat** 35

% Daily Value*

Total Fat 4g **6%**
Saturated Fat 2g **10%**
Cholesterol 15mg **4%**
Sodium 590mg **24%**
Total Carbohydrate 28g **9%**
Dietary Fiber 3g **12%**
Sugars 10g

Protein 19g

Vitamin A 10% • Vitamin C 10%
Calcium 35% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium		3,500mg	3,500mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

(b)

NUTRITION *Perspective*

ETHNIC INFLUENCES ON THE AMERICAN DIET

Human societies have developed under widely varying conditions. These conditions affected which foods were available (e.g., rice vs. wheat) and how long each food could be stored (e.g., tropical vs. temperate climates). This, in turn, influenced the dietary patterns of these various cultures. Then as these various cultures migrated to new locations, the migrants kept some traditional dietary habits, or *foodways* changed some habits; and abandoned others. As people migrate and mingle with those of other cultures, their cuisines tend to mingle as well. Note that about 25% of all restaurants in the United States have an ethnic theme. Recent changes in affluence and technology also affect dietary habits, some for better and some for worse.

In this Nutrition Perspective, we will examine how the cuisines of various cultures throughout the world have affected the American diet. Examining the nutritional attributes of a number of ethnic diets will help you understand that no single cuisine is either completely healthful or unhealthful. The trick to finding healthful food is to evaluate individual dishes carefully. Let's look at six cuisines that contribute to food "American style." Note that almost all Americans sample at least one of these on a regular basis.

NATIVE AMERICANS

The size and varied geography of the American continent meant that different foods were available to people living in different locations. Some of these people were hunter-gatherers, depending on wild vegetation and wild game for subsistence. Others learned to grow vegetable crops. Depending on where they lived, Native American groups cultivated early forms of such plant foods as tomatoes, sweet potatoes, squash, vanilla, and cocoa. Their diets tended to be low in sodium and fat and high in dietary fiber. In the far north, populations subsisted on fish, sea mammals, other game, and a few plants, such as seaweed, willow leaves, and berries.

Studies have shown that the diseases that affected these societies differed significantly from the diseases common in American society today. For example, Alaskan natives who still eat the traditional diet have heart disease rates lower than those in the general United States population. Younger generations of Alaskan natives, however, who usually do not eat the traditional diet, have developed heart disease at rates similar to those in the U.S. population in general. These and other studies indicate that, as societies become more uniform, so, too, do disease patterns.

HISPANIC-AMERICANS

When Spanish colonists arrived in what is now called Latin America, they brought foods, flavors, and cooking techniques, which they combined with locally available foods. Several cuisines developed from those combinations, influenced also by the arrival of other groups. Thus, the Cuban cuisine combined native foods with those of both Spanish and Chinese immigrants, whereas the Puerto Rican cuisine combined native foods with Spanish and African contributions. In Mexico, the Spanish influence mingled with that of local Native American cuisines.

The Mayans, Aztecs, and other populations in Mexico grew corn, beans, and chili peppers; these were the basis of Mexican cuisine. They also grew such fruits as avocados, papayas, and pineapples. By the end of the fifteenth century, wheat, chickpeas, melons, radishes, grapes, and sugar cane had been brought to the New World. Rice, citrus fruits, and some kinds of nuts came soon afterward. The Spanish also introduced beef, lamb, and chicken. Native inhabitants had previously eaten mostly fish and wild game. Spices such as cinnamon, black pepper, cloves, thyme, marjoram, and bay leaves were introduced and became part of the cuisine.

Mexican cuisine today shows regional variety. In southern Mexico, savory sauces and stews and corn tortillas reflect the native heritage. The Gulf states are renowned for delicious seafood dishes prepared with tomatoes, herbs, and olives, whereas Yucatan cuisine follows Mayan tra-



Our cooking habits often reflect our ethnic heritage.

dition, with such specialties as wild turkey and fish flavored with lime juice. Fresh produce adds color, flavor, and nutrition to authentic Mexican dining. Markets in the United States are beginning to offer some of these plant foods, such as chayote, squash, jicama root, plantains, and cactus leaves and fruit. Traditional Mexican cooking is healthful in that it is high in complex carbohydrates, beans, fruits, and vegetables, particularly those rich in vitamins A and C. This pattern is reflected in the Latin American Diet Pyramid issued by Oldways Preservation & Exchange Trust in 1996 (Fig. 2-6). For more information on this and other ethnic diet pyramids, see the web site <http://www.oldwayspt.org>.

Today, true Mexican cooking bears little resemblance to the dishes usually found in “Mexican” restaurants. Usually it is neither oily nor heavy and is based primarily on rice and beans. Restaurant Mexican food tends to use larger portions of meat, as well as adding portions of high-fat sour cream, guacamole, and cheese to many dishes.

NORTHERN EUROPEAN-AMERICANS

Immigrants from Western Europe are responsible for the “meat-and-potatoes” presentation of traditional American home cooking.¹³ The first large group of settlers from Europe—the English, French, and Germans—brought their traditional foodways with them. As all cooks and cultures must do, these immigrants adapted to the foods available in the regions in which they settled. Native Americans shared foods, which are now staples of the American diet: corn and corn products, such as popcorn and hominy; some kinds of squash; and tomatoes.

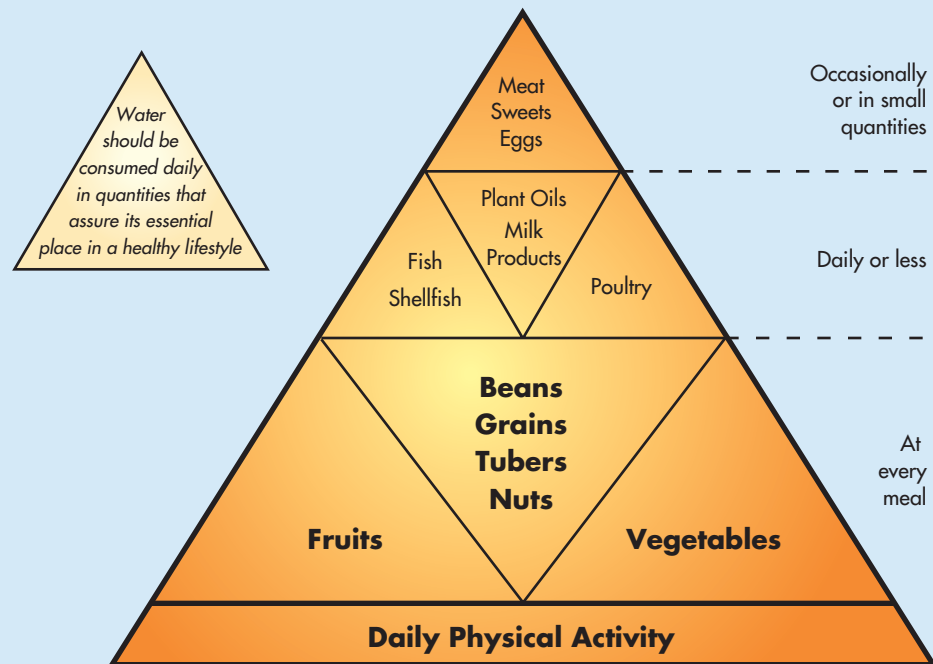
However, because the immigrants often settled in regions of the “new land” that most closely resembled their homes in Europe, they were able to grow many familiar foods and retain many of their traditional foodways. One of these foodways involved the way food is presented.

A sizable portion of meat arranged with vegetables and potatoes in separate portions on a plate is the European pattern, compared with other cuisines in which a mixture of starch, vegetables, and a much smaller portion of protein (such as a stir-fry) is more typical. The meat on the “American” dinner plate may be, for example, sausage or roast beef, the potatoes may be boiled or mashed, and the vegetable may be sauerkraut or green peas. Whatever the choices, the Western European pattern is still followed by many in this country.

This traditional pattern provides abundant protein and nutrients from dairy and meat products. However, the protein also contains saturated fat, and the large portions of protein and starch may mean that insufficient amounts of whole grains, vegetables, and fruits are eaten.

FIGURE 2-6 The traditional healthy Latin American Diet Pyramid. A variety of diet pyramids have been developed by Oldways Preservation & Exchange Trust. These pyramids reflect the typical diets of rural peoples in the region—in this case, Latin America. Text accompanying the Latin American Pyramid, as is true for the other Oldways ethnic pyramids, states that alcohol may be consumed with meals, but consumption should be avoided during pregnancy and whenever it would put the individual or others at risk. As you will notice throughout this Nutrition Perspective, all pyramids developed by governmental or private organizations always have fruits, vegetables, and grains at the base. The Latin American Diet Pyramid then adds nuts and beans to this base; other pyramids also slightly alter the base.

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Alcohol may be consumed by adults in moderation and with meals, but consumption should be avoided during pregnancy and whenever it would put the individual or others at risk.

AFRICAN-AMERICANS

Involuntary immigrants to the New World, people from West Africa struggled to survive under harsh conditions. Their ability to adapt familiar foodways to new conditions became a lasting influence on today's American cuisine.

The "soul food" of African-Americans is the basis of the regional cuisines of the American South. Many understand "soul food" to consist mainly of barbecued meat, fried chicken, sweet potatoes, and chitterlings. In fact, true soul food includes a wide range of dishes created by African-American cooks. They used traditional methods and foods brought from Africa, such as yams, okra, and peanuts, as well as what was available in the New World. African-American women, cooking for their families, created dishes that they often adapted for the plantation owner's table as well, creating the basis of Southern cuisine. The combination of these African-American foodways with Native American, Spanish, and French traditions produced the Cajun and Creole cuisines enjoyed today in Louisiana and throughout the nation.

Pork and corn products were the basis of soul food. The plantation owner ate the better parts of the pig. As with other foods, slaves learned to make the less desirable parts of the pig, such as entrails, feet, ears, and head, palatable. Corn was ground for corn bread. Unrefined yellow cornmeal was mixed with water and lard to make "hoecake," baked on a hoe blade by cooks who had neither ovens nor cooking utensils for their own use. The plantation owner probably ate white cornbread made from refined cornmeal.

Among other dishes still considered soul food staples are greens, usually cooked with a small portion of smoked pork. The greens used include collards, mustard, turnip, or dandelion greens, and kale. Black-eyed peas, first brought to the New World by slaves, are also cooked with pork. Sweet potatoes and yams were and remain basic soul foods; sweet potato pie is the soul food equivalent of pumpkin pie.

Today's traditional African-American cuisine has both nutritional benefits and deficits. The variety of fruits, vegetables, and grain products used provides ample vitamins, minerals, and dietary fiber. For instance, African-Americans in general consume more cruciferous vegetables, and fruits and vegetables containing vitamins A and C than do Caucasian Americans. However, cured pork products contribute undesirable levels of sodium as well as saturated fat. Traditional reliance on frying, especially with lard, also adds much fat to the diet. Boiling

vegetables for long periods depletes water-soluble vitamins. Dairy products may not be used enough, especially by older people who follow traditional dietary customs. This avoidance is based in part on the difficulty many African-American adults experience in digesting lactose; see Chapter 5 for details.

To help guide African-Americans toward a healthy food plan, Hebni Nutrition Consultants has developed a Soul Food Pyramid. It differs from the Food Guide Pyramid primarily by emphasizing lactose-reduced dairy products in the milk, yogurt, and cheese group and placing very-high-fat meats, such as bacon and sausage, in the fats, oils, and sweets category. To obtain a copy of the Soul Food Pyramid, call/Fax 407-345-7999.

ASIAN-AMERICANS

Okinawa, an island southwest of Japan, boasts some of the oldest, healthiest people in the world. Their diet of fresh vegetables, minimal amounts of meat (mainly pork and fish), and moderate fat (lower than American diets but higher than traditional Japanese fare) has influenced the eating habits of Japan and the United States alike. Studies prove that the Okinawan diet of more fresh versus pickled vegetables, more fiber, less salt, and a little more fat than traditional Japanese cuisine has protected them from premature death from problems such as stroke. Since this discovery, the Japanese diet has become more like that of the Okinawans.

This idea of large portions of vegetables and grains, and small portions of meat, is becoming known in the United States, but people are having difficulty complying with this more disciplined way of eating. Also influenced by Japanese cuisine is the growing popularity of soy products, such as tofu, soy milk, and miso, as well as use of flavors such as soy sauce, cilantro, and ginger.

More than 200 different vegetables are used in Chinese cuisine; bok choy and other forms of Chinese cabbage are perhaps the most widely eaten vegetables in the world. In the southeastern coastal region of China, home of the Cantonese cuisine, the number of dishes may be as high as 50,000. Rice is the core of the diet in southern China, whereas, in the temperate North, wheat is used in noodles (China is the original home of pasta), bread, and dumplings. Popular dishes include hot pots (stews containing many ingredients) and stir-fried mixtures of vegetables and small amounts of meat or fish cooked in a lightly oiled, very hot pan.

An Asian Diet Pyramid has been proposed to reflect the Asian dietary pattern (Fig. 2-7). Like the Latin American Diet Pyramid, the bulk of the diet consists of grains, fruits, vegetables, and plant sources of protein, such as legumes, nuts, and seeds.

The Asian Pyramid does fall short in calcium but otherwise can form the basis of a healthy diet. Overall, most attention should be paid to the bottom portion of whichever pyramid you choose, and if dairy products are not included on a daily basis, other rich sources of calcium should be sought (see Chapter 11 for options).

Chinese immigration to America began with the California gold rush in the middle of the nineteenth century. Chinese workers brought with them food-preparation methods that tend to preserve nutrients, as well as a variety of sauces and seasonings, such as gingerroot, garlic, rice wine, scallions, and sesame seeds and oil. Although many of the traditional foodways have been preserved, North American restaurant versions of Chinese cuisine, whether Cantonese, Szechwan, or Mandarin, are usually not authentic. Chinese-American restaurant food is often prepared with far more fat than in true Chinese cooking, which tends to use flavorful but fat-free sauces and seasoning. The restaurant versions of Chinese dishes also contain much larger portions of protein.

ITALIAN-AMERICANS

Authentic Italian cuisine, like Asian cuisine, is more diverse than most Americans realize. Foods of different regions reflect Italy's varied geography and climate. Northern Italy, the more affluent part of the country, is the principal producer of meat and dairy products, such as butter and cheese. Rice dishes, such as risotto, are popular there. Fish is more important in regions near the sea, and lighter foods, such as fresh vegetables prepared with herbs, garlic, and olive oil,



Stir-fry is commonly used in Chinese cooking.

Two issues addressed by various ethnic diet pyramids developed by Oldways Preservation & Exchange Trust but not specifically included as part of the Food Guide Pyramid diagram are physical activity and alcohol intake. The ethnic diet pyramids recommend daily physical activity. Alcohol may be consumed by adults in moderation with meals, but consumption should be avoided during pregnancy and whenever it would put the individual or others at risk. The booklet accompanying the Food Guide Pyramid does address alcohol intake, suggesting that adults have no more than one to two drinks per day.

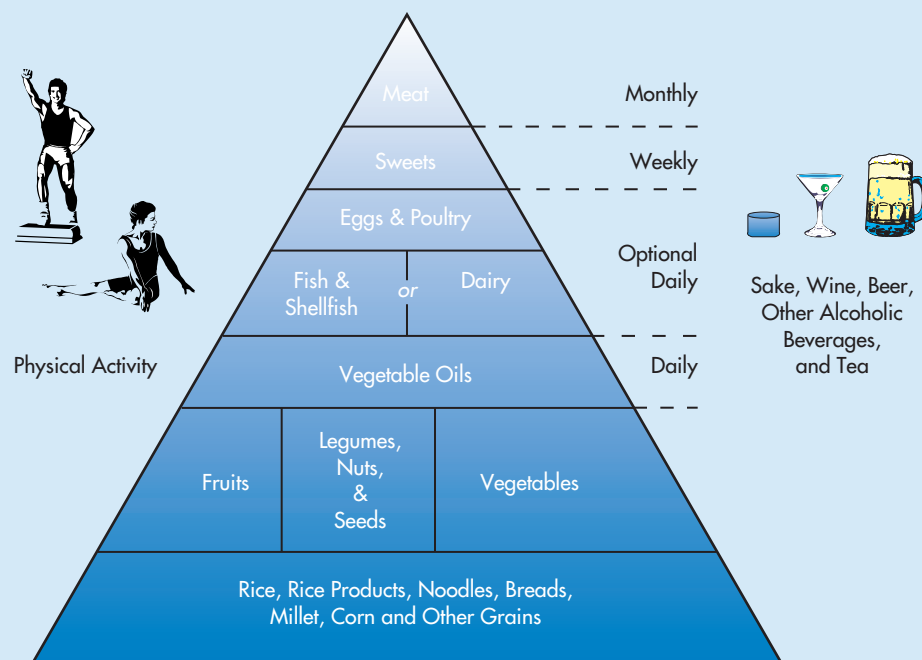


FIGURE 2-7 Asian Diet Pyramid.
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are characteristic. The poorer regions south of Rome, as well as the island of Sicily, have a diet rich in grains, vegetables, dried beans, and fish, with little meat or oil. Compared with northern Italians of the same class, southern Italians eat less beef, veal, chicken, and butter and more bread, pasta, vegetables, fruit, and fish.

Pasta is the heart of the Italian diet. Italians eat six times more of this simple wheat and water product than do North Americans, although Americans have also learned to enjoy this nutritious dish. Pasta in America, however, often means spaghetti, with a tomato-based sauce that includes meatballs or sausage. In contrast, Italians eat pasta in a variety of shapes and with a variety of sauces, often excluding meat.

Most of the Italian-American cuisine found in restaurants offers foods more common to the north of Italy, including veal, cheese, and cream and pesto sauces for pasta. Pizza, a southern Italian dish, is the exception, and it is fast becoming the most frequently consumed food in the United States. Pizza in this country is served on a variety of flour crusts topped with anything from high-fat meats, such as pepperoni, to vegetables or even fruit, combined with a variety of cheeses, tomatoes, and oregano for seasoning. Purists in Naples, however, insist that classic pizza consists only of a thin crust, tomato, basil, and mozzarella cheese.

Although some components of the Italian diet contain substantial amounts of saturated fat, nutritionists now know that other components, such as pasta, olive oil, and vegetables, contribute to healthy diets. One approach to Italian-American cuisine could be the Mediterranean Diet Pyramid (Fig. 2-8). This is a plan based on food choices like those traditionally found in the simple cuisines of Greece and southern Italy. The Mediterranean Diet Pyramid allows up to 35% of total calories as fat in the diet, compared with the typical recommendation of not more than 30%. However, it recommends consuming the type of fat consumed in the Mediterranean region: olive oil. A cheaper version, which has a similar fat profile, is canola oil (see Chapter 6 for details).⁸



Olive oil is a principal fat source in the Mediterranean diet.

ETHNIC DIETS AND PRESENT TRENDS

Only six ethnic diets have been described here; see Table 2-12 for a summary of their advantages and disadvantages. Many other cuisines have also influenced the American diet, and new arrivals continue to bring their traditions and foodways to this country. For example, social upheavals have increased the immigration of Russians and other Eastern European peoples to the United States. On the other side of the world, continuing unrest in Southeast Asia

has brought peoples from that area here. Restaurants serving traditional Russian or Thai fare, for instance, are offering new foodways to those willing to experiment.