6

Forming a Plan for Good Nutrition

Key Terms
- amino acids
- antioxidants
- botanicals
- calorie
- carotenoids
- complex carbohydrates
- Daily Values (DV)
- essential nutrients
- fiber
- folate
- foodborne illness
- Food Guide Pyramid (FGP)
- food labels
- free radicals
- hydrogenation
- legumes
- minerals
- monounsaturated fat
- nutrient density
- Olestra
- phytochemicals
- phytomedicinals
- polyunsaturated fat
- recommended dietary allowances (RDAs)
- saturated fat
- transfatty acids
- vitamins
- vitamin supplements

Objectives
After completing this chapter, you will be able to do the following:
- Describe the functions and purposes of the essential nutrients.
- Discuss ways to apply the Dietary Guidelines for Americans.
- Explain the role of nutrients that are not classified as essential, such as fiber, phytochemicals, and botanicals, but that are thought to have unique health benefits.
- Determine your personal RDA for protein, carbohydrates, fat, and saturated fat.

Goals for Behavior Change
- Decrease or increase your intake of the energy nutrients to meet dietary recommendations.
- Craft a nutrition profile that identifies your intake of essential nutrients and highlights your dietary strengths and shortcomings.
- Formulate a plan for implementing the Dietary Guidelines for Americans that addresses your dietary shortcomings.
- Identify and practice specific strategies for improving your diet.
Nutrition has captured the interest of Americans perhaps more than any other topic related to fitness and wellness. Whether concerning antioxidants or phytochemicals, homocysteine or cholesterol, omega-3 fatty acids or trans-fatty acids, HDLs or LDLs, nutrition issues make headlines in both scientific journals and popular magazines, and everybody seems to be an expert. So much is written by so many people that it is difficult to know what and whom to believe.

This chapter presents basic concepts of the science of nutrition, the study of nutrients and the way the body processes them, to guide you through the maze of nutrition information. The concepts presented here are within the framework of Dietary Guidelines for Americans and should provide you with a basis for sound nutritional planning.

Nutrition and Health

The relationship between nutrition and health has changed dramatically during the last fifty years. The deficiency diseases of the past, such as scurvy and rickets, have been replaced by diseases of dietary excess and imbalance. Chief among such excess is the disproportionate consumption of foods high in fat, often at the expense of foods high in complex carbohydrates, fiber, and other substances conducive to good health. Americans’ dietary practices contribute substantially to the burden of preventable illness and premature death and are associated with four of the ten leading causes of death.1 Coronary heart disease, stroke, and non-insulin-dependent diabetes mellitus have long been connected to nutrition. A growing body of research has also linked cancer to nutrition. It has been estimated, for example, that about 35 percent of all cancers are related to dietary factors, but a high intake of fruits and vegetables can cut cancer risk in half.2

Another important change in nutrition is the new attitude that previously established minimums for essential nutrients are insufficient to prevent today’s major health problems. The recommended dietary allowances (RDAs) of essential nutrients were established to prevent acute deficiency diseases and to guide the consumption of the more than fifty nutrients necessary to meet the needs of nearly all healthy people in the population. Now the RDAs are being revised to prevent or delay the onset of chronic diseases. The RDA for vitamin C is a good example. An intake of 60 mg of vitamin C is considered adequate to prevent the deficiency disease scurvy. Studies today are investigating the potential additional benefits of 200 to 500 mg of vitamin C in preventing heart disease and cancer.

Also changing is the definition of essential. Phytochemicals (plant chemicals), phytomedicinals (plants with medicinal benefits), and antioxidants (compounds that generally prevent the oxidation of substances in food or the body) are the nutrients of the twenty-first century. A countless number of studies exploring the benefits of these nutrients may have dramatic effects on future dietary guidelines.

Fortunately, improving your diet is not difficult. You don’t have to give up your favorite foods to achieve a healthy diet. For many people, cutting back on less healthful foods and making small dietary changes may profoundly affect health and wellness. It is never too late to benefit from dietary improvements. The easy availability of many healthy options makes dietary improvement a realistic goal for most Americans.

Essential Nutrients

Food is made up of six classes of nutrients: carbohydrates, fat, protein, vitamins, minerals, and water. These nutrients are called essential nutrients because they cannot be made by the body and, therefore, must be supplied through the diet. Some experts list fiber as
a seventh nutrient, although technically some fibers are carbohydrates and are usually listed with the carbohydrates. Carbohydrates, fat, and protein are called energy nutrients because they provide energy (calories) to the body. Because they are needed in large amounts, they are also called macronutrients. Vitamins and minerals are called micronutrients because they are required in small amounts to regulate chemical processes. Water and fiber are nonnutrients and are also part of a healthy diet.

**Calories**

Food energy is expressed in kilocalories. A calorie is the amount of heat required to raise the temperature of a gram of water by 1°C. A kilocalorie equals 1000 calories of heat energy. Common reference to kilocalories usually excludes the prefix kilo, mainly for convenience. A gram of carbohydrates provides 4 calories (kilocalories) of energy, a gram of protein also provides 4 calories, a gram of fat provides 9 calories, and a gram of alcohol (which is not an essential nutrient) provides 7 calories.

The recommended diet for Americans emphasizes complex carbohydrates as the main source of energy. About 55 percent of calories should come from carbohydrates, with at least 45 percent of these from complex carbohydrates and no more than 10 percent from sugar. No more than 30 percent of calories should come from fat; 15 percent of calories should come from protein. The typical American diet, however, excluding alcohol, consists of 34 percent fat, 50 percent carbohydrates, and 16 percent protein (figure 6-1). While significant improvements have been made, Americans’ diets are still high in fat calories and low in carbohydrate calories. You can tell how your calorie sources compare with dietary recommendations by completing Assessment Activities 6-3 and 6-4.

**Carbohydrates**

Carbohydrates are sugars and starches obtained from plants. The simplest form of carbohydrates is sugar, also called monosaccharide. Monosaccharides include glucose and fructose (fruit sugar). Fructose is the sweetest of simple sugars. Disaccharides are double sugars, meaning that they are pairs of monosaccharides chemically linked. In this group of sugars are sucrose, or table sugar; lactose, or milk sugar; and maltose, or malt sugar.

![Figure 6-1 Comparison of Recommended and Actual Diets](image-url)

Both diets are for Americans 20 years and older and exclude alcohol. Recommendations for carbohydrates and protein are minimums; the recommendation for fat is a maximum. Carbohydrates include sugars.
Starches, also called polysaccharides, are complex carbohydrates. Starches are the preferred source of carbohydrates because the foods that contain them also supply fiber, vitamins, and minerals. A diet high in starch is likely to be lower in fat, especially saturated fat and cholesterol, lower in calories, and higher in fiber. An added benefit of starch consumption over simple sugar consumption is that it helps the body maintain a normal blood-sugar level through a slower, more even rate of digestion and glucose absorption. It takes one to four hours for the body to digest starch. This is one reason athletes involved in endurance activities, such as marathons, load up on complex carbohydrates before competition.

All carbohydrates are broken down in the intestine and converted in the liver into glucose. Glucose is blood sugar that is carried to cells, where it is used for energy. Glucose in excess of the body’s need for energy is stored in limited amounts as glycogen in the muscles and the liver for future use; when glycogen stores are satisfied, glucose is converted to fat.

Many weight-conscious people mistakenly avoid starches, thinking that they are high in calories. Starch foods are often made fattening when they are prepared. For example, a baked potato without additives yields a modest 90 calories. Adding fat in the form of butter, sour cream, margarine, or cheese adds substantially to the calories of a potato.

**Recommended carbohydrate intake**

At least 55 percent of the calories in your diet should come from carbohydrates. Many experts believe this percentage should be much higher. An estimate of your carbohydrate intake can be determined by completing Assessment Activity 6-1.

Vegetables, fruits, and grain products are high in carbohydrates, vitamins, and minerals and generally low in fat, depending on how they are prepared and what is added to them at the table. Most Americans of all ages eat fewer than the recommended servings of these foods, even though they are associated with a lower risk of many chronic conditions.

All starchy foods are plant foods. Grains, such as rice, wheat, corn, millet, rye, barley, and oats, are the richest food source of starch. Legumes, including peanuts and dried beans, are another good source of starch. They also contain a significant amount of fiber and protein, both of which are discussed separately in this chapter.

**Protein**

Protein is different from carbohydrates and fats in that it contains nitrogen as well as carbon, hydrogen, and oxygen. Because of their unique chemical structures, proteins contain the basic materials that help the body form muscles, bones, cartilage, skin, antibodies, some hormones, and all enzymes.

The building blocks of protein are chemical structures called amino acids. There are approximately twenty amino acids: Eleven can be produced in the body, and nine must be supplied by the diet. The latter are called essential amino acid acids. A complete protein is one that contains all the essential amino acids. A high-quality protein is a complete protein that contains the essential amino acids in amounts proportional to the body’s need for them. Meat, fish, poultry, eggs, milk, and cheese are examples of high-quality, complete protein sources.

An incomplete protein does not contain all the essential amino acids in the proportions needed by the body. Generally, plant protein sources are incomplete. This fact has important implications for vegetans, people who limit their diets to plant sources, because protein synthesis operates on the all-or-none principle. That is, the body cannot make partial proteins, only complete ones. If an amino acid is supplied by one source in a smaller amount than is needed, the total amount of protein made from the other amino acids will be limited. It is necessary to combine protein sources from cereal and grains with legumes to obtain all essential amino acids from plant sources. The practice of combining amino acids from various plant sources is called protein complementing.

One plant protein source unique among sources of amino acids is legumes. Legumes come from plants with seed pods that split on two sides when ripe, such as black-eyed peas, chickpeas (garbanzo beans), lentils, soybeans, and black, red, white, navy, and kidney beans. Legumes are low in calories, sodium, and fat and high in fiber and minerals. They are a nutritionally dense food (see table 6-1).

The most common legume crop in the world is the soybean. The protein in soy is a complete protein—the most complete you can get from plant and vegetable sources—and just as good as animal protein. Soybeans are high not only in protein but also in folate, omega-3 fatty acids, and minerals. In cultures in which soy is the main source of protein, rates of cardiovascular disease and some kinds of cancers are relatively low. A possible reason for soy’s benefits is that, by eating more soy, people consume fewer animal products. Another reason is that soy protein may change levels of certain hormones, which in turn may cause the liver to make less cholesterol. Soybeans also contain phytoestrogens, estrogenlike plant substances. Phytoestrogens unique to soybeans are called isoflavones. Isoflavones are thought to help prevent breast cancer by blocking natural estrogens.
Soy is available in a variety of foods. Tofu, soy milk, soy nuts, and soy powder, which can be mixed into smoothies, scrambled into omelets, and baked into bread, are several examples.

**Recommended protein intake**

For most people, the recommended dietary allowance of protein is 0.36 grams per pound of body weight, or 54 grams for a 150-pound person and 72 grams for a 200-pound person. Growing children, pregnant or lactating women, and people recovering from illness require additional protein. Older adults may also need extra protein (see Wellness Across the Generations: Older Adults May Need More Protein). You can estimate your protein intake by completing Assessment Activity 6-1.

Exercise and other physical activities can change the body’s need for protein (nutrition needs associated with physical activity are discussed separately in this chapter), but enough protein is usually already consumed. When more protein is consumed than is needed by the body, it is converted into energy or stored as fat. The body is less efficient at converting protein to energy than at converting carbohydrates to energy. High protein intake may cause the body to excrete calcium and put excessive strain on the kidneys to excrete into the urine the excess nitrogen supplied by the protein. Although the kidneys of most healthy people can handle nitrogen excess easily, diseased kidneys have more difficulty. This is why people with kidney failure are placed on low-protein diets and why people who go on high-protein diets to lose weight (see Chapter 8) are encouraged to drink large quantities of water to flush the kidneys.

**Fat**

Fats are oils, sterols (such as cholesterol), waxes, and other substances that are not water soluble. Fat is an essential component of all cells. Fats help synthesize and repair vital cell transport and absorb fat-soluble vitamins. Fat stored as adipose tissue provides insulation and a ready source of energy.

<table>
<thead>
<tr>
<th>Soybeans</th>
<th>86</th>
<th>14</th>
<th>8</th>
<th>4</th>
<th>88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lentils</td>
<td>100</td>
<td>9</td>
<td>&lt;1</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>Kidney beans</td>
<td>88</td>
<td>8</td>
<td>&lt;1</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Black beans</td>
<td>41</td>
<td>8</td>
<td>&lt;1</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Chickpeas</td>
<td>82</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>40</td>
</tr>
</tbody>
</table>

Basic fat facts

Fat, also called lipid, is a compound made by chemically bonding fatty acids to glycerol to form glycerides. When three fatty acids are hooked to glycerol, the fat compound is a triglyceride. Almost 95 percent of fat stored in the body is a triglyceride, with the remaining 5 percent consisting of other glycerides and cholesterol. Scientific literature usually refers to triglycerides when it discusses fat. The fatty acids that make up triglycerides can be saturated, monounsaturated, or polyunsaturated.

Chemically, fats are chains of carbon atoms strung together with hydrogen atoms. If a fat is a saturated fat, the carbon chain carries all the hydrogen atoms it can. If it is an unsaturated fat, there is room in the carbon chain for more hydrogen. If the fat is a monounsaturated fat, there is room for two hydrogen atoms. If the fat is a polyunsaturated fat, there is room for four hydrogen atoms. If it is highly polyunsaturated, there is room for many more hydrogen atoms.

Many people mistakenly assume that the word polyunsaturated on a food label means that the fat in the food is not saturated, but because of food-processing techniques, this assumption may be incorrect. If the words hydrogenated or partially hydrogenated are on the food label, the food contains varying amounts of saturated fat. Because fats are less stable, they are prone to spoilage. Consequently, for many foods, manufacturers use a chemical process called hydrogenation, in which hydrogen atoms are added to the unsaturated or polyunsaturated fats to make them more saturated and more resistant to spoilage. This process of hydrogenating food yields a new type of fat not found in nature called transfatty acids (see Just the Facts: How Much Transfatty Acid Is in Food?). Transfatty acids are saturated fats commonly found in margarine, fried fast foods, cookies, cakes, and many other foods made with shortening. Some scientists believe that transfatty acids, even those originating from a polyunsaturated food source, are as detrimental to health as saturated animal fat. High levels of these fats are less effective in lowering total and LDL cholesterol than are the liquid oils from which they are made. Also they seem to depress HDL cholesterol.11

Saturated and unsaturated fats can be differentiated by their appearance. Saturated fat is typically solid at room temperature. Lard, fat marbled in meat, and hardened grease from a skillet are good examples. Polyunsaturated fats are usually liquid at room temperature. Examples are safflower and corn oils. Solid vegetable shortenings are partially hydrogenated and have a soft consistency. Coconut oil, palm kernel oil, and palm oil are exceptions. They are vegetable oils and are liquid at room temperature, but they are among the most saturated of fats.

Fish oils are among the most unsaturated fats available. They are roughly twice as unsaturated as vegetable oils. They do not harden, even at low temperatures. Their unsaturation has created special interest in relation to heart disease. Fatty acids in cold-water seafood, such as salmon, mackerel, sardines, herring, anchovies, whitefish, bluefish, swordfish, rainbow trout, striped bass, Pacific oysters, and squid, consist of omega-3 fatty acids, which are thought to be effective in lowering cholesterol and triglyceride levels and reducing clot-forming rates, thereby reducing the risk of heart disease. Canadian health experts believe omega-3s are important enough that Canada has specific recommendations for how much of these people should eat every day.12

Olestra

Olestra is a synthetic fat that has the flavor and taste of real fat but contains no calories. It cannot be digested or absorbed and, therefore, passes through the digestive system unaltered. It was approved by the Food and Drug Administration in 1998 for use in snack foods.

While consumption of Olestra in small amounts is unlikely to cause problems in healthy adults, several side effects have been reported. Olestra can cause abdominal cramps and loose stools. It also inhibits the absorption of the fat-soluble vitamins A, D, E, and K and the absorption of carotenoids, substances thought to aid the immune system in warding off some cancers, heart disease, and eye problems. To counter the effects of Olestra on the absorption of important nutrients, some snack foods are fortified with fat-soluble vitamins.

Relying on fat substitutes like Olestra can help reduce fat in your diet. It is important to remember, however, that just because a product has less fat does not mean it is also low in calories. Experts speculate that the reduction in calories associated with low-fat foods made with Olestra is unlikely to reduce obesity significantly because Olestra is not yet used in foods that contribute the most fat to our diets—high-fat meats.4 It will be years before the true effects of fat substitutes on the American diet are known.

Cholesterol

Cholesterol, a waxy substance that is technically a steroid alcohol found only in animal foods, is probably the most researched blood lipid. High levels of cholesterol are usually included among the major risk factors for cardiovascular disease. (For information on cholesterol, see Chapter 2.)
To determine how much transfatty acid is in food, it is necessary to have a complete breakdown of the food’s fat content. For example, a popular low-saturated fat margarine contains 10 grams of total fat, including 2 grams of saturated fat, 1.5 grams of polyunsaturated fat, and 2 grams of monounsaturated fat. Adding the amounts of these three fats and subtracting them from the total leaves about 4.5 grams unaccounted for. These grams probably represent transfatty acids. Because food labels don’t always provide a complete breakdown of fat content, it is difficult to assess the amount of transfatty acids contained in a particular food. Food composition tables such as shown in table 6-2 and nutrition software such as those available with this text provide sufficient information to help you estimate transfatty acid content.

### Table 6-2  Fat Content of Selected Foods

<table>
<thead>
<tr>
<th>Food</th>
<th>Fat(g)</th>
<th>Total*</th>
<th>Saturated</th>
<th>Monounsaturated</th>
<th>Polyunsaturated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg, whole, raw</td>
<td>5.01</td>
<td>64</td>
<td>19</td>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>Butter (pat)</td>
<td>11.4</td>
<td>100</td>
<td>67</td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>Margarine, regular, hard (stick)</td>
<td>91.0</td>
<td>100</td>
<td>20</td>
<td>45</td>
<td>32</td>
</tr>
<tr>
<td>Cheese, cream (1 ounce)</td>
<td>9.9</td>
<td>90</td>
<td>57</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Cheese, cheddar (1 cup)</td>
<td>37.5</td>
<td>74</td>
<td>47</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Cheese, cottage (1 cup)</td>
<td>10.1</td>
<td>39</td>
<td>25</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Milk, whole (1 cup)</td>
<td>8.2</td>
<td>49</td>
<td>30</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Milk, skim (1 cup)</td>
<td>1.0</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>Trace‡</td>
</tr>
<tr>
<td>Frankfurter (2 ounces)</td>
<td>16.6</td>
<td>82</td>
<td>33</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Bologna, pork (slice)</td>
<td>4.6</td>
<td>72</td>
<td>26</td>
<td>36</td>
<td>8</td>
</tr>
<tr>
<td>Flounder, baked (0.8 ounce)</td>
<td>1.9</td>
<td>9</td>
<td>Trace</td>
<td>Trace</td>
<td>Trace</td>
</tr>
<tr>
<td>Fish sticks (1 ounce)</td>
<td>3.4</td>
<td>39</td>
<td>10</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Tuna, canned, oil-packed (3 ounces)</td>
<td>6.9</td>
<td>38</td>
<td>8</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Tuna, canned, water-packed (3 ounces)</td>
<td>2.1</td>
<td>7</td>
<td>Trace</td>
<td>Trace</td>
<td>Trace</td>
</tr>
<tr>
<td>Ground beef (3 ounces)</td>
<td>19.2</td>
<td>65</td>
<td>25</td>
<td>28</td>
<td>3</td>
</tr>
<tr>
<td>Steak, broiled, sirloin (2 ounces)</td>
<td>4.89</td>
<td>56</td>
<td>24</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>Pork chop, broiled (3 ounces)</td>
<td>22.3</td>
<td>62</td>
<td>23</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td>Chicken breast, fried, flour-coated (7 ounces)</td>
<td>17.4</td>
<td>36</td>
<td>10</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Beans, navy (1 cup)</td>
<td>2.1</td>
<td>4</td>
<td>Trace</td>
<td>Trace</td>
<td>3</td>
</tr>
<tr>
<td>Potato (baked)</td>
<td>0.06</td>
<td>1</td>
<td>Trace</td>
<td>Trace</td>
<td>4</td>
</tr>
<tr>
<td>Potato chips (1.5 ounces)</td>
<td>13.0</td>
<td>61</td>
<td>16</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>Ice cream, vanilla, regular (1 cup)</td>
<td>22.5</td>
<td>48</td>
<td>28</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Apple (raw, unpeeled)</td>
<td>0.5</td>
<td>6</td>
<td>1</td>
<td>Trace</td>
<td>2</td>
</tr>
<tr>
<td>Danish pastry</td>
<td>13.6</td>
<td>50</td>
<td>14</td>
<td>29</td>
<td>4</td>
</tr>
</tbody>
</table>

*includes undifferentiated fats
†rounded off to the nearest whole number
‡Trace, less than 0.9% of fat.
Recommended fat intake

To many people, fat has negative connotations and is viewed almost as a toxin, but as stated earlier, fat is an essential nutrient. During the first twelve months of life, fat is critical to the development of the brain, spine, and central nervous system. At least 50 percent of an infant’s calories must come from fat. However, the body’s need for fat drops dramatically after the first year. Experts recommend a diet that includes a total fat intake of no more than 30 percent of total calories. That percentage is considered a maximum; many experts believe it is too high.

Fat intake in excess of 30 percent of total calories is consistently associated with heart disease. Saturated fat is the major dietary contributor to total blood cholesterol levels, even more than cholesterol intake. Many associations have also been made between dietary fat and certain types of cancer, notably breast, prostate, and colon cancer. Another health problem related to high fat intake is obesity. Very little energy is used to transfer fat from foods to fat storage; the body requires only 3 calories to store 100 calories of dietary fat as fat tissue, compared with 23 to 27 calories to digest 100 calories of carbohydrates. Fat also yields more than twice as many calories as do protein and carbohydrates.

Just how low should your fat intake be? If 30 percent is good, it might stand to reason that 20, 15, or 10 percent would be even better. Surprisingly, the answer is controversial. Research conducted by Dean Ornish (see Chapter 2) has shown that a very low-fat diet (10 percent of calories from fat) combined with quitting smoking, exercising, and reducing stress can reverse atherosclerosis. On the other hand, some studies have found that cutting fat intake too much may actually increase health risks. Researchers from the University of Harvard University researchers documented the relationship between dietary fat intake and heart disease. They learned that the replacement of 5 percent of energy from saturated fat with energy from unsaturated fats reduced the risk of coronary heart disease by 42 percent. In addition, the replacement of 2 percent of energy from trans fatty acids with energy from unhydrogenated fats reduced the risk by 53 percent. Researchers concluded that replacing saturated and trans fatty acids with unhydrogenated monounsaturated and polyunsaturated fats is more effective in preventing heart disease than is reducing overall fat intake. It is possible that the important issue is not one of total fat; rather, it may be the type of fat that counts (see figure 6-2 for a comparison of dietary fats). Until the issue of quantity versus type is settled, the best advice is to reduce total fat intake to less than 30 percent and to concentrate on lowering saturated fat intake. Moderation is an important principle for fat intake just as it is for nutrition in general.

Most Americans have an excessive fat intake and are challenged to make changes in both the amount and type of fat eaten. Table 6-3 presents a quick reference of maximum fat intake for selected caloric intakes. You can estimate your personal maximum fat intake by completing Assessment Activity 6-2. You can also learn how fatty your eating habits are by completing Assessment Activity 6-5.

Saturated Fat. Experts agree that saturated fats need to be reduced in the American diet. Diets rich in saturated fats unquestionably increase the risk of heart disease and some cancers. Assessment Activity 6-2 will help you estimate your maximum saturated fat intake. It is recommended that no more than 8 percent of total calories come from saturated fat. This amounts to 9 grams per 1000 calories. Americans currently get 12 percent of their calories from saturated fat. People with heart disease, diabetes, or a high LDL cholesterol level should restrict saturated fat intake to no more than 7 percent of total calories.
Monounsaturated Fat. Monounsaturated fats are liquid at room temperature and include olive oil, canola oil, and peanut oil. When monounsaturated fats are substituted for saturated fats, a person’s blood fat profile usually improves and risk factors associated with heart disease and some forms of cancer are reduced. The recommendation for monounsaturated fats is 12 to 20 percent of total calories. This amounts to 13 to 22 grams per 1000 calories.

Although the diet of people in Mediterranean countries is higher in fat than that of Americans, the incidence of heart disease and stroke in those countries is much lower. The main difference is that the Mediterranean diet is high in monounsaturated fat, usually

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**Figure 6-2** Comparison of Dietary Fats

**Table 6-3** Maximum Fat and Saturated Fat Grams for Selected Caloric Intakes*

<table>
<thead>
<tr>
<th>Daily Calorie Intake</th>
<th>Total Fat Grams per Day</th>
<th>Total Saturated Fat Grams per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30% Level</td>
<td>26% Level</td>
</tr>
<tr>
<td>1000</td>
<td>33</td>
<td>29</td>
</tr>
<tr>
<td>1500</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>2000</td>
<td>67</td>
<td>58</td>
</tr>
<tr>
<td>2500</td>
<td>83</td>
<td>72</td>
</tr>
<tr>
<td>3000</td>
<td>100</td>
<td>87</td>
</tr>
</tbody>
</table>

*If a person on a 1500-calorie diet wants to restrict fat intake to no more than 26% of calories, the limit is 43 grams (1500 × 0.26 = 390 total fat calories; 390 ÷ 9 = 43). Saturated fat intake at the 8% level is restricted to 13 grams (1500 × 0.08 = 120 saturated fat calories; 120 ÷ 9 = 13).
from consumption of olive oil. This has prompted some scientists to suggest that Americans adopt this pattern of eating.

**Polyunsaturated Fat.** There are two main types of polyunsaturated (poly) fats: omega-6 and omega-3. The omega-6s make up 90 percent of poly fats in the American diet and come primarily from vegetable oils, such as soybean, corn, sunflower, and safflower oils. Omega-6 provides linoleic acid, an essential fatty acid. The omega-3s come primarily from seafood and provide linolenic acid, another essential fatty acid. The consumption of omega-6s and omega-3s is associated with cardiovascular benefits, including reduction of blood clotting, prevention of abnormal heart rhythms, and lowering of levels of total cholesterol and LDLs. Recommended intake of polyunsaturated fats is no more than 10 percent of total calories.\(^1\)\(^6\) This amounts to 11 grams per 1000 calories.

**Transfatty Acids.** Transfatty acids start out as unsaturated fats but become like saturated fats because of the hydrogenation process. In high amounts, these fatty acids are associated with risk factors similar to those linked to saturated fats. Consumption of transfatty acids should be held to a minimum.

**Vitamins**

Vitamins are organic compounds (they contain carbon) that are necessary in small amounts for good health. The body can break vitamins down, but it cannot produce them, so vitamins have to be supplied in the diet. Unlike carbohydrates, fats, and proteins, vitamins yield no energy. Instead, some serve as catalysts that enable energy nutrients to be digested, absorbed, and metabolized. Some vitamins also interact with minerals. For example, vitamin C facilitates iron absorption, vitamin D improves calcium absorption, and thiamin requires the mineral magnesium to function efficiently.

Vitamins are either water soluble or fat soluble (see tables 6-4 and 6-5). Water-soluble vitamins include vitamin B complex and vitamin C. They are present in the watery components of food, distributed in the fluid components of the body, excreted in the urine, needed in frequent small doses, and unlikely to be toxic except when taken in megadoses (very large quantities).

Fat-soluble vitamins include vitamins A, D, E, and K and are found in the fat and oily parts of food. Because they cannot be dissolved and absorbed in the bloodstream, these vitamins must be absorbed into the lymph with fat and transported in lipoproteins. When consumed in excess of the body’s need, fat-soluble vitamins are stored in the liver and fat cells. Their storage makes it possible for a person to survive for months or years without consuming them. At least three of the fat-soluble vitamins (A, D, and K) may even accumulate to toxic levels. Megadoses of these vitamins should be avoided.

**Antioxidant vitamins**

Three vitamins are classified as antioxidants—vitamins C, E, and the carotenoids. Antioxidants are protective substances because they help neutralize the activity of free radicals. Free radicals are naturally produced chemicals that arise from normal cell activity. Whenever the body uses oxygen or is exposed to a toxin, such as cigarette smoke, it forms free radicals. These unstable chemicals can damage cells throughout the body. They may damage a cell’s DNA in ways that lead to cancer, interact with cholesterol in the bloodstream and form oxidized LDL (see Chapter 2), cause cataracts and rheumatoid arthritis, and be a factor in the physiological changes associated with the aging process. Anything that interferes with the destructive effects of free radicals offers a health advantage. Vitamins C and E and beta-carotene are believed to prevent the oxidation of cholesterol and other molecules linked to the diseases mentioned previously, most notably heart disease and cancer. A common cooking practice illustrates this antioxidant effect: Some foods like bananas, peaches, apples, and potatoes quickly turn brown when exposed to air. However, when such foods are dipped in lemon or orange juice, the vitamin C in the juice acts as an antioxidant and prevents browning.

Should Americans take supplements of antioxidant vitamins? Information from the research community is inconclusive. Until 1994 the evidence in support of vitamin supplements was so compelling that many scientists were beginning to believe that antioxidant vitamin supplements could be a highly effective, relatively inexpensive, and risk-free form of preventive medicine.

Interest in antioxidant supplements was dampened, however, with what is now referred to as the Great Vitamin Scare of 1994. That’s when the six-year study on the effects of beta-carotene supplementation on more than 29,000 male smokers in Finland revealed that the incidence of cancer was 18 percent higher in the Finnish men who took the supplement than it was in those who didn’t. Rather than lowering the incidence of cancer, beta-carotene supplementation appeared to increase the risk of cancer.

The results of the Finnish study are troubling and should not be dismissed. Clearly, more studies are needed. Despite all the promising leads, the value of antioxidant supplements in preventing disease is still unproven. It may be several years before large-scale studies provide more definitive conclusions. Even then it is unlikely that studies will ever establish a cause-and-effect relationship between antioxidants and...
chronic diseases. There are too many factors to consider. For example, people who eat plenty of fruits and vegetables may also lead healthy lifestyles overall. Fruits and vegetables also contain thousands of plant chemicals (phytochemicals), many of which are just beginning to show promise against disease. Consequently, some scientists advocate patience until scientific consensus is reached, and they do not recommend taking supplements at this time. Other scientists believe that thousands of Americans may die prematurely of heart disease and cancer before a consensus develops and that the ground swell of evidence, despite some inconsistencies, supports taking antioxidants now, especially considering that only 36 percent of adults eat the recommended five to eight servings of fruits and vegetables each day.¹

Presently there is only one strategy to combat disease that no scientist would dispute: Eat more produce. Fruits and vegetables are high in fiber and low in fat and contain hundreds of substances that have the potential to improve health—not just the few compounds that have been isolated and packaged as supplements. In all the research that has been done on diet, antioxidants, and disease, the strongest and most consistent pattern has been that eating a variety of fruits and vegetables produces benefits.

In preparing food for consumption it is important to remember that vitamin content is easily compromised. Improper storage, excessive cooking, and exposure to heat, light, and air may reduce the vitamin content in food.

**Table 6-4 Thirteen Essential Vitamins: Recommended Intake**

<table>
<thead>
<tr>
<th>Fat-soluble vitamins</th>
<th>For Men</th>
<th>For Women</th>
<th>When Used as a Supplement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Vitamin A</td>
<td>1000 RE (5000 IU)</td>
<td>800 RE (4000 IU)</td>
<td>*</td>
</tr>
<tr>
<td>2. Vitamin D</td>
<td>5 mcg (200 IU)</td>
<td>5 mcg (200 IU)</td>
<td>400 IU</td>
</tr>
<tr>
<td>3. Vitamin E</td>
<td>10 mg (12–15 IU)</td>
<td>8 mg (12–15 IU)</td>
<td>200–400 IU</td>
</tr>
<tr>
<td>4. Vitamin K</td>
<td>70–80 mcg</td>
<td>60–65 mcg</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>

| Water-soluble vitamins | | | |
|------------------------| | | |
| 5. Vitamin C (ascorbic acid) | 60 mg | 60 mg | 100–200 mg |

**Vitamin B complex**

| 6. Thiamine (B-1) | 1.2–1.5 mg | 1.0–1.1 mg | Not recommended |
| 7. Riboflavin (B-2) | 1.4–1.7 mg | 1.2–1.3 mg | Not recommended |
| 8. Niacin | 13–19 mg | 13–19 mg | † |
| 9. Pyridoxine (B-6) | 2 mg | 1.6 mg | ‡ |
| 10. Pantothenic acid | 4–7 mg | 4–7 mg | Not recommended |
| 11. Vitamin B-12 | 2 mcg | 2 mcg | § |
| 12. Biotin | 30–100 mcg | 30–100 mcg | Not recommended |
| 13. Folate (folic acid) | 400 mcg | 400 mcg | # |

*Vitamin A may be toxic in high doses. Beta-carotene supplements may increase lung cancer risk in smokers.
†Niacin may be prescribed in larger doses to lower cholesterol.
‡Pyridoxine megadoses may cause numbness.
§Strict vegetarians and adults over 60 years old may need vitamin B-12 supplements.
||Folate comes from plants; folic acid is the human-made form used in vitamin pills and to fortify grains. Folic acid is twice as potent as folate (200 mcg of folic acid is roughly equivalent to 400 mcg of folate).
#Supplements of folate may be recommended before and during pregnancy.


**Vitamin C**

Vitamin C, also called *ascorbic acid*, is essential to the formation of collagen, a protein that is used to form all the connective tissues of your body. It is required in the breakdown and absorption of some amino acids and other minerals (such as iron) and in the formation of some hormones. It may also help the immune
system prevent infections. As an antioxidant it may play a role in prevention of atherosclerosis and some forms of cancer.

Contrary to popular opinion, vitamin C does not prevent the common cold. Scientifically controlled studies reveal no difference in the incidence of colds among vitamin C users and nonusers. On a positive note, however, some studies suggest that large doses (about 2000 mg a day) can reduce the severity and duration of a cold’s symptoms slightly. That much, however, might also cause diarrhea and kidney stones in susceptible people.17

The RDA of vitamin C is 60 mg, 70 mg during pregnancy, and 90 mg during lactation. For smokers the RDA is 100 mg because smoking appears to destroy some vitamin C. Advocates of increased vitamin C often recommend intakes of 200 mg or more.4 Still, an intake of 200 mg/day can be achieved by food intake. Megadoses (2000 mg) of vitamin C offer little benefit to the body and may be harmful. As a water-soluble vitamin, doses in excess of the body’s requirement are excreted through the kidneys. In other words, the body can only absorb so much. Side effects of large doses are diarrhea and abdominal discomfort. For those who absorb excess iron, supplements of vitamin C could be dangerous. Large intakes may also produce errors in the results of some diagnostic tests (such as the Hemoccult test which tests for glucose in urine).

### Table 6-5  Vitamins: Food Sources and Wellness Benefits

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Food Sources</th>
<th>Wellness Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fat-soluble vitamins</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Vitamin A</td>
<td>Liver, carrots, eggs, tomatoes, dark green and yellow-orange vegetables and some fruits</td>
<td>Healthy skin and mucous membranes, improved night vision, defense against infections; antioxidant benefits (from carotenoids)</td>
</tr>
<tr>
<td>2. Vitamin D</td>
<td>Fish oils and fortified milk; exposure to sunlight</td>
<td>Maintaining of blood levels of calcium and phosphorus; promotion of strong bones and teeth; possible reduction of risk of osteoporosis</td>
</tr>
<tr>
<td>3. Vitamin E</td>
<td>Plant oils (corn, soybean, safflower, etc.), nuts, seeds</td>
<td>Formation of red blood cells and utilization of vitamin K; antioxidant benefits</td>
</tr>
<tr>
<td>4. Vitamin K</td>
<td>Green vegetables, liver</td>
<td>Promotion of blood clotting; contribution to bone metabolism</td>
</tr>
<tr>
<td><strong>Water-soluble vitamins</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Vitamin C (Ascorbic Acid)</td>
<td>Citrus fruits, green vegetables</td>
<td>Promotion of healthy gums and teeth; iron absorption; maintaining of normal connective tissues; help in wound healing; antioxidant benefits</td>
</tr>
<tr>
<td><strong>Vitamin B complex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Thiamine (B-1)</td>
<td>Whole grains, legumes, liver, nuts</td>
<td>Carbohydrate metabolism; nerve function</td>
</tr>
<tr>
<td>7. Riboflavin (B-2)</td>
<td>Dairy products, liver, enriched grains, spinach</td>
<td>Energy metabolism; production of red blood cells; improved health of skin and eyes</td>
</tr>
<tr>
<td>8. Niacin</td>
<td>Nuts, grains, meat, fish, tuna, mushrooms</td>
<td>Energy metabolism, fat synthesis, fat breakdown; lowering of cholesterol (when prescribed in large doses)</td>
</tr>
</tbody>
</table>
More than 600 carotenoids are found in nature. They give fruits and vegetables their yellow, orange, and red colors. They’re also abundant in dark green vegetables. Three of the major carotenoids (alpha-carotene, beta-carotene, and beta-cryptoxanthin) can be converted by the body into vitamin A and are referred to as provitamin A. Until recently, beta-carotene was thought to offer the most health-protecting antioxidant effect. However, after studies showed that the incidence of lung cancer increased in smokers who took beta-carotene supplements, researchers concluded that beta-carotene was not the main protector.

One carotenoid currently being studied for its antioxidant potency is lycopene, the predominant carotenoid in the blood and in the prostate gland in males. It cannot be converted to vitamin A, but it has twice the antioxidant potency of beta-carotene. Benefits attributed to lycopene are a reduced risk of some cancers, especially those of the digestive tract and the prostate. The best source of lycopene is tomatoes. Cooked tomatoes, such as those found in sauces, are a better source than raw tomatoes and tomato juice because heat ruptures plant cell walls, releasing the carotenoid. Also, lycopene is a fat-soluble substance, so some fat, like that found in pizza and most pasta sauces, is needed for it to be absorbed. Currently, carotenoid supplements, including beta-carotene and lycopene, are not recommended. Carotenoids interact with one another, and supplemental doses of one carotenoid may impair the absorption of others. Instead, eat a variety of vegetables and fruits to get a mix of carotenoids. Five servings a day of fruits and vegetables that are mostly yellow-orange, red, or dark green are recommended. It is likely that carotenoids are more beneficial to health when they are consumed together from food than when packaged separately, as in a supplement.

**Vitamin E**

Vitamin E is a fat-soluble vitamin and plays a role in the formation of red blood cells and maintenance of nervous tissues, and it aids in the absorption of vitamin A. Claims that vitamin E improves the skin, heals scars, prevents stretch marks, slows the aging process, and increases fertility are more folklore than fact. The strongest evidence of the antioxidant benefits of vitamins exists for vitamin E. Vitamin E is a potent antioxidant that attaches to LDL cholesterol and helps prevent damage from free radicals. Large-scale studies, involving tens of thousands of participants who were followed for an average of four to eight years, found that those who took vitamin E supplements were significantly less likely to develop coronary heart disease than were those who did not take supplements of vitamin E. Supplemental doses of 100 to 250 IU per day for at least two years resulted in a 37 and 44 percent decrease in heart disease risk for men and women, respectively. The effect of consuming vitamin E from food versus obtaining comparable levels through supplements is difficult to determine because dietary vitamin E intake rarely reaches the 100 IU per day level, the minimum amount that appears to be protective. Vitamin E is found only in small amounts in a few foods. Low-fat diets are especially scarce in vitamin E. Although these studies are impressive, there still is not enough evidence to recommend vitamin E supplements for the general population. Some experts warn of the dangers of tampering with the body’s biochemistry; however, other experts recommend supplements of vitamin E because they believe it is not harmful and may be worthwhile. The people who stand to benefit the most from vitamin E supplements are those with coronary heart disease, diabetes, or high LDL cholesterol levels. If you choose to take a supplement, select
the natural form, rather than the synthetic, because it is absorbed more easily into the body. The label for natural vitamin E should read “d-alpha tocopherol.”

Folate, Vitamin B6, Vitamin B12

Folate is a part of the vitamin B complex and combines with vitamins B6 and B12 to form parts of DNA and RNA and to make heme, the iron-containing protein in red blood cells. These three also assist in the metabolism of amino acids. The terms folate, folic acid, and folacin are sometimes used incorrectly. Folate is the form that comes from plants; folic acid is the form found most often in your body and the form added to foods and supplements; folacin is a collective term for these and other forms of the vitamin. Folic acid is about twice as potent as folate. Vitamins B6 and B12 are plentiful in foods, and few people, with the possible exception of strict vegetarians, need to worry about deficiencies. With advancing age, some people have trouble producing stomach acids in sufficient quantities to separate vitamin B12 from foods. They have no trouble absorbing B12 from supplements because it is not attached to food, so older people may also need to supplement their diets with B12. Good sources of these vitamins are meat products, dairy products, eggs, spinach, whole-wheat bread, and breakfast cereals.

Folate, as its name implies, is found in foliage—leafy vegetables, such as lettuce and spinach. It is also found in citrus fruits, whole-grain bread, and cereals. Of the three B vitamins mentioned here, folate is the one in which Americans are most likely to fall short.

Because folate has been associated with a reduction in the chances of neurological birth defects, such as spina bifida, a woman planning a pregnancy may be advised by her physician to eat foods rich in folate and possibly to take a supplement. In an effort to reduce the incidence of these birth defects, new food fortification guidelines were established in 1998 that require food manufacturers to fortify certain grain products, such as flour, bread, and cereal, with folic acid.

Current interest in folate was sparked by recent studies that demonstrated that people whose blood levels were low in folic acid had high homocysteine levels. Homocysteine is an amino acid that plays a role in the formation of two other amino acids, cysteine and methionine. To work properly, these amino acids require three B vitamins—folate, B6, and B12. If these vitamins are in short supply, homocysteine levels might rise. High homocysteine levels are thought to increase the risk of heart disease (see Chapter 2). The compound has also been implicated in several other diseases, including cancer, diabetes mellitus, and neurological disorders.

The precise mechanism for the association between homocysteine levels and heart disease isn’t clear. High concentrations of homocysteine are thought to make the artery walls sticky, promoting plaque formation. Whatever the reason, one thing appears clear: High homocysteine levels are associated with low folic acid levels. In the absence of folate, along with vitamins B6 and B12, homocysteine concentrations circulate unabated. There is speculation from the scientific community that during the next several years homocysteine levels might replace cholesterol as a major risk factor of heart disease.

The best way to lower homocysteine concentrations is to consume enough B vitamins. Emphasis should be on folate, which is more effective than B6 and B12.5 Megadoses of folate should be avoided to prevent the possibility of a false negative for anemia (too few blood cells) caused by a vitamin B12 deficiency. If you take folate supplements, tell your physician so that the appropriate tests can be ordered.

Vitamin supplements

Advertisements proclaim that vitamins provide energy, promote wellness, and prevent disease and that taking more results in more energy and better health. Consequently, 25 to 33 percent of all Americans take one or more vitamin supplements in multiple and single doses, in both natural and synthetic forms.21 Vitamins do facilitate energy release from carbohydrates, fats, and proteins, but they do not provide energy. It is not possible to survive on water and vitamins.

The growing interest in vitamin supplements is primarily related to the antioxidant vitamins and folate. The relationship of these vitamins to health promotion and disease prevention, discussed previously, has sparked an unprecedented trend toward supplements. Despite this trend, however, strong definitive conclusions about supplements have not been advanced by the scientific community. The consensus among nutrition experts is that healthy adults who eat a variety of foods do not need them. These also advise that if you don’t think you’re getting enough vitamins in your food, taking a multivitamin pill with nutrients at RDA levels may offer some nutritional insurance, provided it is consumed in moderation and is not used as an excuse to eat a poor diet. According to the Center for Science in the Public Interest, if a supplement is needed, it is most likely to be folic acid, vitamin B12, vitamin D, vitamin E, or calcium.20 These supplements were identified because they are backed by years of supporting research and because Americans don’t consume enough whole grains, fruits, and vegetables.

Although healthy people don’t need vitamin supplements if they are eating a balanced diet, there are several situations in which a vitamin or mineral supplement may be called for:
• If you are age 65 or older, you may need supplements of vitamins B₆, B₁₂, and D because of the difficulty in absorbing these vitamins with advancing age. Women, especially those not taking estrogen, may require more calcium and vitamin D to protect against osteoporosis.

• If you are dieting, consuming fewer than 1000 calories a day, you may benefit from a vitamin and mineral supplement.

• If you have a disease of the digestive tract, it may interfere with normal digestion and absorption of nutrients and justify your use of vitamin and mineral supplements.

• If you smoke, you may need vitamin C supplements.

• If you drink excessive alcohol, you may suffer from poor nutrition and the alcohol may interfere with the absorption and metabolism of vitamins.

• If you are pregnant and lactating (breast-feeding), supplements of folic acid, iron, and calcium may be recommended for you.

• If you are a vegetarian who eliminates most animal products from your diet, you may need additional vitamin B₁₂. Calcium and vitamin D supplements may also be warranted if your milk intake and sun exposure are limited.

Vitamin supplements are sometimes needed by people with irregular diets or unusual lifestyles or by people following certain weight-reduction regimens or strict vegetarian diets. When taken as supplements, vitamins should be viewed as medicine and, therefore, should be recommended by a physician.

When shopping for supplements, it is easy to be misled by advertising hype and inaccurate labels. Americans spend billions annually for vitamin, mineral, and herbal supplements. Much of this expenditure goes toward products with no scientifically proven health value. More than one-third of American investment in vitamins is wasted on pills and powders whose potency has expired or on items diluted by additives that do little more than boost prices. Consequently, it is important for consumers to be discriminating in their purchase of supplements (see Real-World Wellness: Consumer Tips for Vitamin Supplements).

Minerals

Minerals are simple but important nutrients. As inorganic compounds, they lack the complexity of vitamins, but they fulfill a variety of functions. For example, sodium and potassium affect shifts in body fluids, calcium and phosphorus contribute to the body’s structure, iron is the core of hemoglobin (an oxygen-carrying compound in the blood), and iodine facilitates production of thyroxine (a hormone that influences metabolic rate).

There are twenty to thirty important nutritional minerals. Minerals should be consumed in smaller amounts than amounts of energy nutrients and water. Minerals that are present in the body and required in large amounts (more than 100 mg, or 0.02 teaspoon, per day) are called major minerals or macrominerals. They include, in descending order of prominence,
calcium, phosphorus, potassium, sulfur, sodium, chloride, and magnesium. Major minerals contribute 60 to 80 percent of all inorganic material in the human body.

Minerals that are required in small amounts (less than 100 mg per day) are called trace minerals or microminerals. There are more than a dozen trace minerals, the best known being iron, zinc, and iodine (see Just the Facts: Minerals).

Some minerals are similar to water-soluble vitamins in that they are readily excreted by the kidneys, do not accumulate in the body, and rarely become toxic. Others are like fat-soluble vitamins in that they are stored and are toxic if taken in excess.

Minerals are different from vitamins; they are indestructible and require no special handling during food preparation. The only precautions that need to be taken are to avoid soaking minerals out of food and throwing them away in cooking water.

Major minerals are abundant in the diet; therefore, deficiencies are highly unlikely, especially if a variety of foods is included. If a deficiency in major minerals does occur, it is most likely to be a calcium deficiency, especially among women. Four out of ten women ages 9 to 19, two out of three women ages 20 to 49, and three out of four women over 50 fall below the recommended allowance for calcium. The RDA of calcium for adults 19 to 50 years old is 1000 mg, and 1200 mg is recommended for those 51 and older. Here are some tips for increasing your calcium intake:

- Try to consume as much calcium as possible from food. Skim milk and low-fat dairy products are excellent sources of calcium and are also fortified with vitamin D.
- Use calcium supplements to compensate for a calcium shortfall. Getting enough calcium from food requires consuming the equivalent of a quart of milk per day. As a result, many people benefit from an over-the-counter calcium supplement.
- Calcium is best absorbed in doses of 500 mg or less taken with meals. The best type of calcium supplement is calcium carbonate, which is available in common antacids.
- Take calcium supplements with meals. Calcium is best dissolved and absorbed in stomach acids secreted during mealtime.
- Look for calcium-fortified foods. A cup of calcium-fortified orange juice, for example, contains about the same amount of calcium as a cup of milk and is absorbed more easily.
- Get the recommended intake of vitamin D. Vitamin D is necessary for the body to absorb calcium.
- If you’re taking other supplements or medicines, check with your physician or pharmacist. Calcium can interfere with the absorption of iron, zinc, and certain medicines.
- If you have a history of kidney stones, exercise caution in taking large doses of calcium. High calcium intake might increase the risk of stone formation.
Of the various trace minerals, iron is the most abundant. It is also one of concern to nutritionists because certain groups are at risk of having low iron levels. These include young children and early teens, menstruating women, and people with conditions that cause internal bleeding, such as ulcers or intestinal diseases.21

Iron deficiency in the diet is responsible for the most prevalent form of anemia in the United States. Iron deficiency hampers the body's ability to produce hemoglobin, a substance needed to carry oxygen in the blood. A lack of hemoglobin can cause fatigue and weakness and can even affect behavior and intellectual function. Proper infant feeding through use of iron-fortified milk or breast-feeding is the best safeguard against iron deficiency in infants. Among adolescents and adults, iron intake can be improved by increasing consumption of iron-rich foods, such as lean red meats, fish, certain kinds of beans, dried fruits, iron-enriched cereals and whole-grain products, and foods cooked in a cast-iron skillet. For some people, especially premenopausal women with inconsistent diets, iron supplements may be justified. In addition, consuming foods that contain vitamin C enhances the body's ability to absorb iron.

Iron deficiency is rare among healthy men and postmenopausal women. Even strict vegetarians can get iron in sufficient amounts by consuming legumes, dark-green leafy vegetables, and fortified breads and cereals. It is possible to get too much iron. Some studies report that high iron levels may be linked to heart disease, but the jury is still out on this issue. Also, some people have a rare genetic disorder called hemochromatosis, which permits an unhealthy buildup of iron. Iron overload may cause liver cancer, heart disease, diabetes, sterility, or other complications.

Zinc is another trace mineral that has received widespread publicity because of its link to the common cold. Early studies reported that zinc lozenges cured the cold within hours. More recent studies refute this claim and state that the one possible benefit is the shortening of the duration of a cold by about one day. While zinc is essential for proper functioning of the immune system, too much can interfere with the body's use and absorption of other essential minerals, such as iron and copper. Also, excess zinc can lower HDL cholesterol.24

**Water**

Next to air, water is the substance most necessary for survival. Most everything in the body occurs in a water medium. Although people can live without vitamins and minerals for extended periods, death results within a few days without water.

Water makes up about 60 percent of the body's weight. Every cell in the body is bathed in water of the exact composition that is best for it. Even tissues that are not thought of as "watery" contain large amounts of water. For example, water makes up about 75 percent of brain and muscle tissues; bone tissue and fat tissue are about 20 percent water. As a rule, the bodies of men contain more water than do the bodies of women because men have more muscle tissue and muscle tissue holds more water than fat tissue, which is more prominent in the bodies of women.

Water performs many functions. It is vital to digestion and metabolism because it acts as a medium for chemical reactions in the body. It carries oxygen and nutrients to the cells through blood, regulates body temperature through perspiration, and lubricates the joints. It removes waste through sweat and urine, protects a fetus, and assists in respiration by moistening the lungs to facilitate intake of oxygen and excretion of carbon dioxide. It also assists with constipation relief and provides satiety, thus serving as a deterrent to the overconsumption of food.

Starting your day with low-fat dairy products, such as milk and yogurt, is a good way to add calcium to your diet.
Although most water intake comes from beverages, solid foods also make a significant contribution. Most fruits and vegetables are more than 80 percent water, meats are 50 percent water, bread is 33 percent water, and butter is approximately 15 percent water.

How much water should you drink? People are advised to drink 8 to 12 cups of fluids a day. Another general rule of thumb is to drink a quart of water for every 1000 calories expended. More fluids are necessary before, during, and after physical activity (see Chapter 3). To determine when and how much fluid to drink, don’t rely on thirst. If you’re thirsty, the body has already lost too much fluid (see Real-World Wellness: How Can You Tell If You’re Getting Enough Water?).

Plain tap water is the preferred source of fluid. Tap water has an advantage over bottled water in that it often contains fluoride, an additive that impedes tooth decay. Chlorine is another additive to municipal water supplies that provides a public health safeguard by destroying bacteria. Because it is added in such small quantities, fears about chlorine causing cancer are unsubstantiated. Another advantage of tap water over bottled water is that it is subjected to much more rigorous testing. Municipal water supplies, which are regulated by the Environmental Protection Agency, are tested every day for disease-causing microbes and chemical contaminants. Bottled water, which is regulated by the Food and Drug Administration, may or may not be tested.

Under normal circumstances, too much water cannot be consumed because the body is efficient at getting rid of what it does not need. However, a sudden drinking binge in a short period early in the day will not satisfy the body’s needs later; the excess will be excreted by the kidneys. Water consumption should occur throughout the day.

Other Nutrients with Unique Health Benefits

In addition to the six classes of essential nutrients, many other substances in food contribute to health. Three of the most notable ones are phytochemicals, botanicals, and fiber. Interest in these substances has given rise to two recent trends: the use of nutraceuticals, natural ingredients to promote and maintain health, and chemoprevention, the use of nutritional interventions to prevent diseases (such as cancer) by bolstering the immune system. New discoveries and recent developments in these areas have outpaced the scientific community’s ability to monitor, test, and confirm various claims. Until these claims can be validated, the public should take a wait-and-see approach. While many of the chemical compounds in food promise to promote health or prevent disease, taken indiscriminately they may do more harm than good. The exception is fiber, for which most claims are backed by years of solid evidence. Some of the claims that have been studied and reported in the popular literature are highlighted here.

Phytochemicals

Phytochemicals are plant chemicals that exist naturally in all plant foods. Chemically they are not vitamins, minerals, fiber, or any of the energy nutrients. Rather they are the hundreds of thousands of active compounds found in small amounts in vegetables and fruits. Although phytochemicals have not been traditionally classified as essential nutrients, scientists believe that they might play an important role in preventing various diseases. For example, populations that consume higher amounts of fruits and vegetables have a lower risk of
cancer. Some phytochemicals have a structure similar to the body’s natural forms of estrogen. These compounds are called \textit{phytoestrogens} (or \textit{plant estrogens}), and when ingested by way of the diet, they may reduce the potentially harmful effect of the more potent, naturally occurring estrogens often associated with breast and prostate cancer. Although phytochemicals have largely been studied for their role in cancer prevention, current research is exploring their relationship to many other diseases, including cardiovascular disease, osteoporosis, diabetes, and hypertension.

There is a great deal of excitement in nutrition and food sciences about the potential of phytochemicals in health promotion. The reported health benefits of several phytochemicals are highlighted in table 6-6. As scientists continue to isolate, identify, and study specific plant chemicals, it is likely that the place of such chemicals in disease prevention will become more important. Some experts speculate that phytochemicals will be the “vitamins for the twenty-first century.”

\textbf{Botanicals (Phytomedicinals) (Herbs)}

Plants used medically are technically called \textit{botanicals} or \textit{phytomedicinals}. The popular literature usually refers to them as \textit{herbs}. Herbs number in the thousands; however, only twenty to thirty are backed by well-conducted research studies similar to those used to test over-the-counter drugs in the United States. Herbs, however, are not regulated as drugs; instead, they are classified as dietary supplements. Consequently, there is considerable debate about their effectiveness and safety. The names, food sources, and health claims of several popular herbs are presented in \textit{Just the Facts: Some Common Herbs Sold as Nutritional Supplements}. Herbs are not to be confused with hormone supplements, such as melatonin, DHEA (dehydroyepiandrosterone), and DMSO (dimethylsulfoxide). Unlike herbs, which are extracted from plants, these are synthetic compounds. The purported health benefits of these hormones have not yet been proved.

If you decide to take an herb, here are some tips:

- Check with your physician before taking herbs, especially for serious conditions. Inform your physician of herbs you are taking, just as you would for prescribed medicines. There are many potential interactions with other supplements and medicines.
- Avoid using herbs if you are pregnant or nursing.
- Check the label for the abbreviation \textit{USP}. This means that the manufacturer has met the stringent guidelines of the United States Pharmacopoeia, ensuring the quality, strength, purity, and consistency.

<table>
<thead>
<tr>
<th>Phytochemical</th>
<th>Food Source</th>
<th>Possible Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allyl sulfide</td>
<td>Garlic, onions, leeks, chives</td>
<td>Decreases reproduction of tumor cells; facilitates excretion of carcinogens; blocks nitrite formation in stomach</td>
</tr>
<tr>
<td>Caffeic acid</td>
<td>Fruits</td>
<td>Facilitates excretions of carcinogens</td>
</tr>
<tr>
<td>Capsaicin</td>
<td>Hot peppers</td>
<td>Acts as an antioxidant; inhibits carcinogenesis</td>
</tr>
<tr>
<td>Coumarin</td>
<td>Citrus fruit, tomatoes</td>
<td>Prevents blood clotting; stimulates anticancer enzymes</td>
</tr>
<tr>
<td>Dithiolthione</td>
<td>Cruciferous vegetables</td>
<td>Stimulates anticancer enzymes</td>
</tr>
<tr>
<td>Phytoestrogen (isoflavones)</td>
<td>Soybeans, dried beans</td>
<td>Help prevent breast cancer by stopping the estrogen produced by the body from entering cells</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>Fruits, vegetables, red wine, grape juice, green tea</td>
<td>Acts as an antioxidant</td>
</tr>
<tr>
<td>Phenolic acids (ellagic acid, ferulic acid)</td>
<td>Fruits, grains, nuts</td>
<td>Prevents DNA damage in cells; binds to iron, which may inhibit the mineral from creating free radicals; binds to nitrites in the stomach, preventing them from being converted into nitrosamines</td>
</tr>
<tr>
<td>Indoles, isothiocyanates, sulforaphane</td>
<td>Cruciferous vegetables</td>
<td>Stimulates anticancer enzymes</td>
</tr>
<tr>
<td>Limonene</td>
<td>Citrus fruits</td>
<td>Stimulates anticancer enzymes</td>
</tr>
<tr>
<td>Phytic acid</td>
<td>Grains</td>
<td>Binds to iron, which may inhibit the mineral from creating cancer-causing free radicals</td>
</tr>
</tbody>
</table>

\textit{Table 6-6 Health Benefits of Selected Phytochemicals}
Wellness Concepts and Applications

The letters NF, which stands for National Formulary, also ensure that the product meets minimum standards. Presently, only a handful of herbs have been subjected to review using USP standards.

Do your homework. Read about the herb; ask your pharmacist for information. There are several Web sites that provide helpful information:

- United States Pharmacopoeia: www.usp.org/did/mgrphs/botanica
- American Botanical Council: www.herbalgram.org
- The Herb Research Foundation: www.herbs.org

- Monitor your body’s response. Start with a dose that is lower than that recommended. Stop taking an herb if you have an adverse reaction.

Some Common Herbs Sold as Nutritional Supplements

<table>
<thead>
<tr>
<th>Herb</th>
<th>Usual dosage</th>
<th>Possible benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bilberry</strong></td>
<td>240–480 mg dried berry extract of bilberry shrub</td>
<td>useful for simple diarrhea, varicose veins, hemorrhoids, glaucoma, night blindness, cataracts</td>
</tr>
<tr>
<td><strong>Echinacea</strong></td>
<td>15–30 drops of tincture from purple coneflower extracts, up to five times a day</td>
<td>immune booster for colds, flus, and respiratory infections</td>
</tr>
<tr>
<td><strong>Feverfew</strong></td>
<td>125 mg. of dried leaf extract</td>
<td>prevention and treatment of migraines and associated nausea</td>
</tr>
<tr>
<td><strong>Garlic</strong></td>
<td>3 cloves of dietary garlic daily or 1 tsp. dried garlic powder, or in oil or pill form</td>
<td>may promote antibacterial, antifungal, and antiviral activity including those associated with the common cold; may have cardiovascular benefits</td>
</tr>
<tr>
<td><strong>Ginger</strong></td>
<td>500 mg</td>
<td>treatment of motion sickness, nausea, indigestion</td>
</tr>
<tr>
<td><strong>Ginkgo</strong></td>
<td>120–160 mg from leaf extract of ginkgo tree, in divided doses</td>
<td>may improve memory and mental functioning; acts as an antioxidant; aids blood flow to the brain and to the legs</td>
</tr>
<tr>
<td><strong>Ginseng</strong></td>
<td>300 mg or one-half ginseng root extract in hot water</td>
<td>may enhance immunity</td>
</tr>
<tr>
<td><strong>Saw palmetto</strong></td>
<td>320 mg of dried fruit extract from sabal in one to two doses</td>
<td>may improve urinary flow in men with enlarged prostate</td>
</tr>
<tr>
<td><strong>St. John’s Wort</strong></td>
<td>300 mg dried leaf and flower extract</td>
<td>may alleviate mild to moderate depression</td>
</tr>
<tr>
<td><strong>Valerian</strong></td>
<td>400–450 mg of extract 30 minutes before bedtime</td>
<td>may treat insomnia, mild anxiety, restlessness</td>
</tr>
</tbody>
</table>

Just the Facts

of the product. The letters NF, which stands for National Formulary, also ensure that the product meets minimum standards. Presently, only a handful of herbs have been subjected to review using USP standards.
Don’t expect miracles. Herbs take longer to work than prescribed and over-the-counter medicines. Take specific herbs for specific needs. Avoid taking herbs continuously.

**Fiber**

One advantage of a high-starch diet is that it will likely be high in fiber unless the foods are refined or highly processed.

Fiber (formerly called roughage) is a general term that refers to the substances in food that resist digestion. The amount of fiber in a food is determined by its plant source and the amount of processing it undergoes. In general, the more a food is processed, the more the fiber is broken down or removed and the lower its fiber content.

There are two kinds of fiber: soluble fiber dissolves or swells in hot water, and insoluble fiber does not dissolve in water. Every plant food usually contains a mixture of fiber types.

**Soluble fiber**

Soluble fiber appears to have several favorable effects. Because it forms gel in water, it adds bulk and thickness to the contents of the stomach and may slow emptying, thus prolonging a sense of fullness which may help dieters control their appetites. Studies have shown that soluble fiber also lowers blood-cholesterol levels. Soluble fiber binds with certain digestive acids made from cholesterol in the liver and then escorts the acids away in the stool. The liver responds by drawing cholesterol from the blood to make more acids, which lowers blood cholesterol. According to most studies, LDL cholesterol drops from 3 to 7 percent when a person changes from a low-fiber diet to a high-fiber diet.30 Diets high in carbohydrates and fiber, especially soluble fiber, improve blood-glucose control, lower insulin requirements, and decrease blood cholesterol and blood pressure in people with diabetes. Soluble fiber also slows the absorption of sugars from the small intestine, another benefit for those with type II (non-insulin-dependent) diabetes.31

Good sources of soluble fiber are fruits, vegetables, and grains. Specific fiber-rich foods are prunes, peaches, oranges, apples, legumes, dried beans, cauliflower, zucchini, sweet potatoes, and oat and corn bran (table 6-7).

**Insoluble fiber**

Insoluble fiber adds bulk to the contents of the intestine. This speeds the transit time (time of passage) of a meal’s remnants through the small and large intestines. This in turn appears to offer the following important health benefits:

- It helps prevent constipation because insoluble fiber attracts water into the digestive tract, thus softening the stool. Softer stools reduce the pressure in the lower intestine, creating less likelihood that rectal veins will swell and cause hemorrhoids.
- It stimulates muscle tone in the intestinal wall, which helps to prevent diverticulosis, a condition that occurs when the intestine bulges out into

<table>
<thead>
<tr>
<th>Table 6-7 Fiber Content of Selected Foods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td><strong>Fruits</strong></td>
</tr>
<tr>
<td>Apple, with peel</td>
</tr>
<tr>
<td>Banana</td>
</tr>
<tr>
<td>Blackberries (1 cup)</td>
</tr>
<tr>
<td>Dates, chopped (1 cup)</td>
</tr>
<tr>
<td>Grapes</td>
</tr>
<tr>
<td>Orange</td>
</tr>
<tr>
<td>Peach, peeled</td>
</tr>
<tr>
<td>Pear, with skin</td>
</tr>
<tr>
<td>Prunes, dried, pitted (10)</td>
</tr>
<tr>
<td>Raisins, seedless (1 cup)</td>
</tr>
<tr>
<td><strong>Breads</strong></td>
</tr>
<tr>
<td>Oatmeal (1 cup)</td>
</tr>
<tr>
<td>Pumpernickel (1 slice)</td>
</tr>
<tr>
<td>Rye (1 slice)</td>
</tr>
<tr>
<td>Wheat (1 slice)</td>
</tr>
<tr>
<td>Whole wheat (1 slice)</td>
</tr>
<tr>
<td>White (1 slice)</td>
</tr>
<tr>
<td><strong>Cereals</strong></td>
</tr>
<tr>
<td>Bran Chex (2/3 cup)</td>
</tr>
<tr>
<td>Bran flakes (2/3 cup)</td>
</tr>
<tr>
<td>Cheerios (1 1/4 cup)</td>
</tr>
<tr>
<td>Corn flakes (1 cup)</td>
</tr>
<tr>
<td>Grapenuts (1 1/4 cup)</td>
</tr>
<tr>
<td>Raisin Bran (1/2 cup)</td>
</tr>
<tr>
<td>Rice Krispies (1 cup)</td>
</tr>
<tr>
<td>Shredded Wheat (1 biscuit)</td>
</tr>
<tr>
<td>Life (2/3 cup)</td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
</tr>
<tr>
<td>Lima beans (1 cup)</td>
</tr>
<tr>
<td>Green beans (1 cup)</td>
</tr>
<tr>
<td>Cauliflower (1/2 cup)</td>
</tr>
<tr>
<td>Corn, canned (1/2 cup)</td>
</tr>
<tr>
<td>Garbanzo beans (1 cup)</td>
</tr>
<tr>
<td>Greens (1 cup)</td>
</tr>
<tr>
<td>Navy beans (1 cup)</td>
</tr>
<tr>
<td>Baked potato, with skin</td>
</tr>
<tr>
<td>Tomato</td>
</tr>
<tr>
<td>Carrot</td>
</tr>
</tbody>
</table>
pockets, possibly leading to diverticulitis, a condition in which the pockets become infected and sometimes rupture.

- It may reduce the risk of colon cancer. A shorter transit time reduces the exposure of the intestines to cancer-causing agents in the food. Insoluble fiber also stimulates the secretion of mucus in the colon. Mucus coats the colon wall and may provide a barrier that keeps cancer-causing agents from reaching the colon’s cells.

The best source of insoluble fiber is wheat bran. Other good sources are whole grains, dried beans and peas, and most fruits and vegetables, especially those eaten with the skin.

If you are not accustomed to eating fiber-rich foods, gradually add them to your diet over four to six weeks, following these suggestions:

- Eat whole-wheat bread rather than white bread.
- Look for whole grains, such as whole wheat, on food labels. Whole grains contain the entire seed of a plant, including the bran, germ, and endosperm. Foods that are “made with whole wheat flour” are mostly refined. Wheat flour and unbleached wheat flour are not whole grain.
- Add 2 to 3 tablespoons of 100 percent bran to low-fiber foods, such as breakfast cereal, pudding, and applesauce.
- Substitute brown rice, millet, and bulgur wheat for white rice and potatoes.
- Snack on popcorn instead of potato chips.
- Eat whole fruit instead of drinking juice.
- Use raspberries as a topping for ice cream and yogurt.
- Snack on an unpeeled apple or pear.
- Choose bran flakes over cornflakes.
- Top your salads and casseroles with a whole-grain cereal, such as shredded wheat.
- Eat the skin on your potato.
- Include beans in soups and vegetable salads.
- Eat oats, legumes, and fruits for insoluble fiber.

How much fiber?

Most Americans consume 16 grams of fiber per day. The daily recommendation is 25 grams for a 2000-calorie diet and 30 grams for a 3000-calorie diet. Most Americans have trouble meeting this recommendation because of their heavy intake of meat products. Meat provides little or no fiber; consequently, only vegetarians are likely to get enough fiber. Eating naturally high-fiber foods, such as whole grains, fruits, vegetables, and beans, is a good way to increase fiber intake. Starting or ending the day with a high-fiber cereal is another convenient way to increase your consumption not only of fiber but also of many vitamins and minerals. Check the food labels which identify the amount of fiber per serving.

As with most other nutrients, fiber can be consumed in excess. Indiscriminate consumption of fiber may interfere with the body’s ability to absorb other essential nutrients. A person who eats bulky foods but has only a small capacity may not be able to take in enough food energy or nutrients. A high intake of dietary fiber, such as 60 grams per day, also requires a high intake of water.

**Putting Nutrition to Work**

Nutrition is a complex science and involves the study of thousands of nutrients and a countless number of possible interactions, all of which take place at the cellular level. Many of the results of nutritional practices, good or bad, take years or even decades to become apparent. Fortunately, it isn’t necessary to be a biochemist to understand and follow nutritional practices that promote health and prevent the early onset of many health problems. The benchmark for developing a plan for good nutrition is the *Dietary Guidelines for Americans*. These guidelines, which were first published in 1980, are evaluated and revised every five years. The fourth and most recent version of these dietary guidelines is listed here:

- Eat a variety of foods.
- Balance the food you eat with physical activity—maintain or improve your weight.
- Choose a diet with plenty of grain products, vegetables, and fruits.
- Choose a diet low in fat, saturated fat, and cholesterol.
- Choose a diet moderate in sugars.
- Choose a diet moderate in salt and sodium.
- If you drink alcoholic beverages, do so in moderation.

**Eat a Variety of Foods**

Variety is the first dietary guideline because it is the cornerstone of a healthy diet. Foods contain combinations of nutrients and other healthful substances, and no single food or food group can supply all of the RDAs of essential nutrients. For example, broccoli is loaded with vitamin C but contains no vitamin B₁₂; flounder provides vitamin B₁₂ but no vitamin C. You should consume a variety of foods within each food group. Six flavors of gourmet ice cream are not what the experts have in mind when they recommend eating many different types of foods. It would be better to consume some low-fat milk, yogurt, cheese, and other dairy products over the course of several days than to focus on one dairy food. You can even have an occasional serving of gourmet ice cream. A diet that is
diverse is more likely to provide an adequate distribution of essential nutrients. It also helps to minimize exposure to toxins, both natural and synthetic, that may be present in one type of food.

Food guide pyramid

The best way to ensure variety in your diet is to use the Food Guide Pyramid (figure 6-3) as the foundation for food selection (see Real World Wellness: How Varied Is Your Diet?). The Food Guide Pyramid (FGP) portrays dietary guidelines in picture form and provides a structure for dietary planning by recommending the number of servings for each food group. The largest area of the pyramid is the base, which calls for six to eleven servings of grain products. Foods from this group make up about 40 percent of the daily diet. The next largest areas of the FGP are the fruit and vegetable groups. Together, grain products, fruits, and vegetables make up nearly three-fourths of the recommended diet.

The top of the pyramid allows for a smaller number of servings from meat or meat substitutes and dairy products. About 25 percent of the servings in your daily diet should come from foods in these groups. No recommendations are given for the number of servings of fats, oils, and sweets. The advice is to consume these sparingly.

As helpful as the FGP is for meal planning, it has received some criticism. One important omission is any reference to fluid intake. This is a serious oversight because most Americans do not get enough water each day (see Real World Wellness: How Can You Tell If You’re Getting Enough Water?). The American Medical Association (AMA) believes strongly that inadequate or inappropriate fluid intake is a significant contributor to poor health. Another criticism is of its lack of guidance for people who don’t eat a typical American diet. For that reason, other food pyramids have been developed that meet the needs of alternative diets, such as those of vegetarians. One such version is presented later in this chapter (see p. 180).

The FGP identifies a range of servings for the food groups. The number of servings that fits your needs depends on your required number of calories. Your calorie requirements depend on many factors, including age, gender, height, weight, activity level, health status, and pregnancy (see Wellness Across the Generations: The Nutrient Gap). Three calorie levels along with the corresponding recommended number of servings are presented in table 6-8.

Serving size

What counts as a serving depends on the food and how it is prepared. Sorting through serving sizes can be confusing. One ounce of a ready-to-eat cereal, for example,
Fats, oils, and sweets
Use sparingly.

Milk, yogurt, and cheese
2–3 servings

Vegetables
3–5 servings

Bread, cereal, rice, and pasta
6–11 servings

Meat, poultry, fish, dry beans, eggs, and nuts
2–3 servings

Fruits
2–4 servings

**KEY**
- Fat (naturally occurring and added)
- Sugars (added)

These symbols show fats, oils, and added sugars in foods.

---

**Figure 6-3  Food Guide Pyramid**

Children, teenagers, and adults under 25 years of age should choose three servings from the milk, yogurt, and cheese group.

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**Real-World Wellness**

**How Varied Is Your Diet?**

I seem to choose the same foods every week in the cafeteria and to prepare only a limited number of dishes for dinner. Does my diet have enough variety?

Dietary Guidelines for Americans emphasizes variety, but just what is variety? Ten foods a day? Twenty? According to researchers at Tufts University, people who average seventy-one to eighty-three foods over the course of fifteen days have more nutritious diets than those who choose fewer than fifty-eight items. Fortunately, you don’t have to track your food selections for fifteen days to assess variety. Three days will suffice. Circle the following foods that you eat during the next three days. If you can circle twenty-eight, you are probably doing well. If your number is closer to fourteen, improving the variety of your food selections should become a goal.

- cheese
- ice cream/milk-based desserts
- milk
- yogurt
- other dairy
- beans and legumes
- beef
- eggs
- fish
- lamb, veal, game
- liver/organ meats
- nuts and seeds
- pork
- poultry
- processed meats
- green leafy vegetables
- orange and yellow vegetables
- potatoes and other root crops
- tomatoes and tomato products
- other vegetables
- berries
- citrus fruits
- fruit juices
- melons
- other fruit
- cold breakfast cereals
- hot breakfast cereals
- pasta
- rice
- white bread
- whole-wheat bread
- other grains
- candy
- margarine, butter, and oils
- salty snacks
- soft drinks
- sweet baked goods and desserts
It has been estimated that as many as 25 percent of Americans 60 and older are malnourished. They do not suffer from nutritional diseases like scurvy or pellagra; rather, they consume insufficient amounts of key nutrients that have a direct effect on health and body function. Older adults usually expend less energy to meet the demands of their lifestyle than do their younger peers and therefore require fewer calories. This presents a dilemma because as their need for energy decreases, their need for nutrients increases or stays the same. Unfortunately, a decrease in caloric intake is usually associated with a decrease in key nutrients. There is a gap between what older adults need and what they get from food, as shown in the following chart:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>What They Need (Age 50+)</th>
<th>How They’re Doing</th>
<th>Why Adults Age 50+ Need It</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>1200 mg</td>
<td>The average intake is 400–600 mg</td>
<td>The capacity to absorb calcium declines with age</td>
</tr>
<tr>
<td>Folate</td>
<td>400 µg</td>
<td>Only one-fourth of older adults get 400 µg</td>
<td>Reducing homocysteine levels becomes more important as heart disease risks increase</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>1.1 mg, women 1.3 mg, men</td>
<td>Only one-third get enough</td>
<td>The body’s need is the same throughout adulthood</td>
</tr>
<tr>
<td>Vitamin B₆</td>
<td>1.5 mg, women 1.7 mg, men</td>
<td>50–90% don’t get enough</td>
<td>The body’s metabolism changes with age</td>
</tr>
<tr>
<td>Vitamin B₁₂</td>
<td>2.4 µg</td>
<td>20% of adults over 60 and 40% over 80 are deficient</td>
<td>Increased difficulty in absorbing vitamin B₁₂ comes with age</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>0–600 IU, ages 51–70; 600 IU, 71+</td>
<td>The average intake is 100–125 IU</td>
<td>Decreased ability of skin to synthesize vitamin D from sunlight comes with age</td>
</tr>
<tr>
<td>Protein</td>
<td>See Wellness Across the Generations: Older Adults May Need More Protein</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

counts as a serving. This is equivalent to 1/2 cup of cooked cereal. One slice of bread is equivalent to one-half of a bagel. The fruit group is more confusing. One whole piece of fruit is the same as 1/2 cup of chopped fruit or 3/4 cup of fruit juice. The only sure way to determine serving size is to check food package labels. You can also refer to Just the Facts: What Counts as a Serving?

**Moderation**

Moderation is another important characteristic of the healthy diet. There is a place in the diet for almost any food if it is consumed prudently—the FGP doesn’t label food “good” or “bad.” Some foods do have a higher nutrient density than others, meaning they yield a higher ratio of nutrients to calories, but all foods contribute to nutrition (see Just the Facts: Nutrient Density). Moderation means exercising good judgment regarding quantity and frequency. It doesn’t mean avoidance. The idea that a particular food is good or bad can be destructive to anyone trying to eat more healthfully. For example, a person with rigid attitudes who thinks that cheesecake is “bad” and then indulges in eating it might think, “I am bad, I have no willpower, and I am a weak person.” The behavioral result might be a cheesecake binge, since the forbidden nature of the food makes it harder to resist. A more positive approach is to understand that cheesecake is not “bad” and that eating a slice does not make the eater a bad person.

Another reason for moderation is that even foods that are nutritionally dense can be consumed in excess. The interaction of the various substances in food can cause one nutrient to overpower or nullify the effects and benefits of another. The body’s processes may be compromised or the nutrients in foods may interfere
with the desired effects of medicines. Here are several examples of the negative effects of excessive consumption of various nutrients:

- Too much protein from animal sources may cause the body to lose extra calcium.35
- Botanicals such as garlic, ginger, and ginseng, when combined with vitamin E, fish oils, or blood thinning medicines (e.g., aspirin, Coumadin), may inhibit the blood-clotting mechanism of the body and cause internal bleeding.36
- Megadoses of vitamin A can cause birth defects.37 Large doses can negate vitamin C’s normal antioxidant effect.38
- Excessive intake of vitamin D causes too much calcium to move from the bones to the blood and then to the urine through which it is excreted from the body.39
- High intake of folate may mask the symptoms of pernicious anemia, a condition associated with a vitamin B₁₂ deficiency.39
- Excess niacin may aggravate glucose intolerance associated with non–insulin-dependent diabetes.39
- Foods high in vitamin K, such as broccoli, spinach, and turnip greens, may neutralize the effectiveness of blood-thinning medicines.39
- Foods high in tyramine, such as cheese and sausage, can cause a sudden rise in blood pressure in people taking some antidepressant medicines.40

These examples are not meant to discourage your consumption of a particular food. Each food offers a unique contribution to health. Vitamin D, for instance, is required for calcium metabolism; however, too much of it may result in a depletion of calcium. Moderation is an important concept that applies to essential nutrients just as it applies to nutrients with bad reputations. Choosing foods from the FGP, with an emphasis on variety and moderation, not only satisfies the body’s need for essential nutrients but also helps prevent problems associated with dietary excess.

### Balance Food Intake with Physical Activity—Maintain or Improve Your Weight

The achievement and maintenance of a desirable body weight and composition are complex issues and are treated separately in this text. For a complete discussion of the principles of balancing food intake with physical activity for maintaining desirable body composition, refer to Chapters 7 and 8.
Chapter 6  Forming a Plan for Good Nutrition

Choose a Diet with Plenty of Grain Products, Vegetables, and Fruits

Grain products (bread, cereal, rice, and pasta) are emphasized in the FGP because they are rich in vitamins, minerals, complex carbohydrates, antioxidants, phytochemicals, and fiber. Most Americans of all ages eat fewer than the recommended number of servings from these three food sources.1

Clearly, the FGP emphasizes plant foods over animal products. This represents a dramatic change from the way many Americans eat. For example, in planning meals Americans often think first of the entrée, which is typically a meat dish. This is usually true whether we’re eating at home or dining out. The FGP challenges us to reverse this approach by thinking of plant products first.

The vegetarian alternative

The importance of a plant-based approach to eating is evidenced by the fact that Dietary Guidelines for Americans now officially recognizes a vegetarian diet as a healthful and acceptable way of meeting all nutritional needs.41 Some vegetarians avoid all animal products, including dairy products, poultry, eggs, and fish. Others include eggs and milk products but exclude fish, poultry, and red meat. There are many variations of vegetarian diet. The more common types are presented in table 6-9.

With the exception of vegans, most types of vegetarians have little trouble getting all of the essential nutrients, including protein. Milk products, eggs, fish, and poultry are sources of complete, high-quality protein. Vegans, who eat all-plant diets, need to be discriminating in their food selections because most plants are sources of incomplete protein. One notable exception, as mentioned earlier, is soy protein. Vegans who don’t consume soy products need to combine complementary foods, such as grains and legumes, to obtain all of the essential amino acids.

The nutritional problem most likely to occur in a strict vegetarian diet is a deficiency in vitamin B12, which occurs naturally only in animal products. Vegans can get vitamin B12 by taking a supplement or consuming food that has been fortified with B12. Vitamin D is another potential problem to the vegan if he or she has limited exposure to the sun. Milk products, which are fortified with vitamin D, are about the only dietary source of vitamin D. However, the body can produce adequate amounts of this vitamin if the skin receives sufficient exposure to sunlight. During periods of limited sunlight exposure, vegans may need to take vitamin D supplements. Other essential nutrients richly supplied by animal products and thus of concern to vegans, such as riboflavin, iron, zinc, and calcium, can be easily derived from a variety of plant sources.

Figure 6-4, a food pyramid for ovolactovegetarians, presents a helpful plan for people trying to avoid meats. The recommended number of servings of grains, fruits, vegetables, and milk products is identical to the recommended amounts in the Food Guide Pyramid. The major difference is the exclusion of meat in favor of legumes, nuts, seeds, and eggs. Lactovegetarians can omit eggs from this pyramid.

Here are some practical tips for adding fruits, vegetables, and grains to the diet that should be helpful for people opting for a meatless meal, choosing to eat vegetarian for a day, or favoring vegetarianism as a lifestyle:

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Calculating the Nutrient Density of Pizza (Cheese)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>RDA %</th>
<th>Calories</th>
<th>Nutrient Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>28%</td>
<td>354</td>
<td>53%</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>19%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thiamin</td>
<td>25%</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>188</td>
<td>188</td>
</tr>
</tbody>
</table>

Nutrient density = 53% (188 ÷ 354 × 100)

A key strategy for eating well is to select foods that offer significant amounts of nutrients but small numbers of calories. If a particular food has a high ratio of nutrients to calories, it is a nutritionally dense food. You can determine the nutrient density of food by adding the percentages of the RDA for the essential nutrients and dividing by the number of calories per serving (see the following example). The higher the score, the higher the nutrient density. The concept of nutrient density can help the health-conscious and weight-conscious person make informed choices.

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The importance of a plant-based approach to eating is evidenced by the fact that Dietary Guidelines for Americans now officially recognizes a vegetarian diet as a healthful and acceptable way of meeting all nutritional needs.41 Some vegetarians avoid all animal products, including dairy products, poultry, eggs, and fish. Others include eggs and milk products but exclude fish, poultry, and red meat. There are many variations of vegetarian diet. The more common types are presented in table 6-9.

With the exception of vegans, most types of vegetarians have little trouble getting all of the essential nutrients, including protein. Milk products, eggs, fish, and poultry are sources of complete, high-quality protein. Vegans, who eat all-plant diets, need to be discriminating in their food selections because most plants are sources of incomplete protein. One notable exception, as mentioned earlier, is soy protein. Vegans who don’t consume soy products need to combine complementary foods, such as grains and legumes, to obtain all of the essential amino acids.

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</tr>
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<td>Calcium</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>188</td>
<td>188</td>
</tr>
</tbody>
</table>

Nutrient density = 53% (188 ÷ 354 × 100)
### Table 6-9 Types of Vegetarians

<table>
<thead>
<tr>
<th>Type</th>
<th>What Is Excluded from Diet</th>
<th>What Is Included in Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegans</td>
<td>All animal products</td>
<td>Fruits, vegetables, grains, legumes, nuts, and seeds</td>
</tr>
<tr>
<td>Lactovegetarians</td>
<td>Eggs, fish, poultry, and meat</td>
<td>Milk products and fruits, vegetables, grains, legumes, nuts, and seeds</td>
</tr>
<tr>
<td>Ovolactovegetarians</td>
<td>Fish, poultry, and meat</td>
<td>Eggs (ova), milk products (lacto), plus fruits, vegetables, grains, legumes, nuts, and seeds</td>
</tr>
<tr>
<td>Pescevegetarians</td>
<td>Poultry and meat</td>
<td>Fish (pesco), eggs, milk products, fruits, vegetables, grains, legumes, nuts, and seeds</td>
</tr>
<tr>
<td>Pollovegetarians</td>
<td>Red meat</td>
<td>Poultry (pollo), fish, eggs, milk products, fruits, vegetables, grains, legumes, nuts, and seeds</td>
</tr>
</tbody>
</table>

These symbols show fats, oils, and added sugars in foods:
- Fat (naturally occurring and added)
- Sugars (added)

- Lactovegetarians can omit eggs from this pyramid.
- Include one dark green or leafy variety daily.
- One serving of a vitamin- and mineral-enriched cereal is recommended.
- Contains about 75 g of protein and 1650 calories.
- Base serving sizes on those listed for the Food Guide Pyramid.

**Figure 6-4** Food Pyramid for Ovolactovegetarians
• Have a smoothie (blend fruit juice, ice, and a banana).
• Add fruit to cereal.
• Eat cereal as a snack.
• Eat vegetable snacks.
• Aim for a colorful plate, with dark-green, yellow, and red vegetables.
• Increase the number of vegetables in a salad by adding tomatoes, carrots, cucumbers, peppers, spinach, or broccoli.
• Eat a vegetable pizza.
• Make a soup with leftover vegetables.
• Eat an all-vegetable meal.
• Mix legumes with a salad.
• Try a new fruit or vegetable.
• Top fat-free frozen yogurt with low-fat granola and berries.
• Top salad with whole-wheat cereal.

A properly selected vegetarian diet has many health benefits (see Just the Facts: Health Benefits of a Vegetarian Diet). People who have health conditions associated with diets high in fat and saturated fat and low in folate, carotenoids, phytochemicals, and antioxidants stand to benefit from a plant-based diet.

Another strategy for increasing your consumption of grain products, vegetables, and fruits is to cultivate a taste for ethnic food. The typical diets of many other countries favor grains, fruits, and vegetables and place less emphasis on animal fats. However, watch out for the Americanization of ethnic foods. For example, the traditional Italian pasta dish comes with a tomato-based sauce containing small amounts of meat or meatballs on the side, served with crusty Italian bread or pizza with an extra-thick crust and a mere sprinkle of tomato sauce, herbs, and cheese. Americanized, the same dish comes with less pasta, more creamy sauces, and more meat, served with buttery garlic toast or pizza with a thin crust, pepperoni, sausage, olives, and extra cheese. For additional comparisons, see Just the Facts: Do You Eat Real Ethnic Food?

A diet that emphasizes the first two of the seven Dietary Guidelines for Americans will go a long way in helping to meet the remaining guidelines. A diverse diet with plenty of grains, fruits, and vegetables is usually low in fat, saturated fat, and cholesterol and moderate in sodium and sugars, depending on how the food is prepared and what is added to it at the table.

Choose a Diet Low in Fat, Saturated Fat, and Cholesterol

Some dietary fat is needed for good health. Fats supply energy and essential fatty acids and promote absorption of the fat-soluble vitamins. Whether from plant or animal sources, fat contains more than twice the number of calories as its carbohydrate or protein equivalents. Fats are represented in the apex of the FGP; Dietary Guidelines for Americans calls for no servings of fat because the body’s need for essential fatty acids is easily satisfied by foods in the other food groups. Perhaps one of the greatest shortcomings of the American diet is the abundance of fat. Compounding this problem is the reality that fat is usually consumed at the expense of fruits, vegetables, and grains. For many people, reducing both the amount and type of dietary fat eaten is a formidable challenge. Table 6-3 presents a quick reference of maximum fat intake for selected caloric intakes. You can estimate your personal maximum fat intake by completing Assessment Activity 6-2. You can learn how fatty your eating habits are by completing Assessment Activity 6-5.

Tips for reducing dietary fat

Here are some suggestions for reducing total dietary fat consumption, lowering saturated fat intake, and replacing saturated fats with unsaturated fats:
• Assess your fat intake. Complete the assessments at the end of this chapter along with those in HealthQuest to determine your fat intake. Compare your fat intake with the recommendations in table 6-3.
Read labels and become familiar with the fat content of food. Try to identify foods that should be consumed in limited amounts; also identify foods that are low in fat (see table 6-2).

Become familiar with sources of saturated, monounsaturated, and polyunsaturated fats (see figure 6-2).

Check for the presence of transfatty acids by reading the fine print on food labels. Look for the words hydrogenated or partially hydrogenated to identify foods that should be consumed in limited amounts.

Limit meat, seafood, and poultry to no more than 5 to 7 ounces per day.

Eat chicken or turkey (without the skin) or fish instead of red meat in most meals.

Substitute one or two meals of fish per week for red meats. Choose fish high in omega-3 fatty acids and low in saturated fat, such as Atlantic cod, haddock, salmon, shrimp, scallops, sardines, tuna, red snapper, and trout.

Choose lean cuts of meat, trim all the visible fat, and throw away the fat that cooks out of the meat.

Substitute meatless or low-meat main dishes for regular entrees.

Substitute legumes for meat one or two times per week.

Eat a vegetarian diet at least one day a week.

Use no more than 5 to 8 teaspoons of fats and oils per day for cooking, baking, and preparing salads.

Choose foods that contain fewer than 3 grams of fat per 100-calorie serving.

Choose foods that contain less than 1 gram of saturated fat per 100-calorie serving.

Use low-fat dairy products (whole milk has more than eight times the fat calories as skim milk).
• Substitute pureed fruit, such as applesauce, when cooking from a recipe that calls for cooking oil (equal substitution).
• Use soft margarine in place of hard margarine.
• Use liquid or spray margarine when possible.
• Serve dressings and condiments (for salads, potatoes, etc.) on the side. Try to cut these servings in half.
• Avoid fried foods. Substitute another cooking method (baking, grilling, broiling, or roasting) for frying.
• Eat more vegetables and fruits.
• Eat low-fat foods that have a high satiety value, such as whole grains and high-fiber foods.
• Substitute olive oil or canola oil for margarine, butter, or lard.
• Try to add diversity to your diet. Cultivate a taste for low-fat ethnic foods.
• Avoid a “forbidden fruit” approach to food selection. Any food can be enjoyed in moderation. If you consume an unusually high-fat food or meal, try to compensate with more prudent choices during the week.

Choose a Diet Moderate in Sugars

Sugars are carbohydrates. During digestion, all carbohydrates except fiber break down into sugars. Americans eat sugars in many forms, and most people enjoy the taste of sugars. Some sugars are used as natural preservatives, thickeners, and baking aids in foods. Most of the simple sugar eaten by Americans has been added to foods and beverages during processing and manufacturing. A food is likely to be high in sugars if one of the following terms is listed first or second in the ingredients list on a food label: brown sugar, corn sweetener, corn syrup, fructose, fruit juice concentrate, glucose (dextrose), high-fructose corn syrup, honey, invert sugar, lactose, maltose, molasses, raw sugar, sucrose (table sugar), or syrup. Many foods contain a combination of sugars.

Nutritionists recommend that sugar consumption be limited to 10 to 15 percent of total calories. On average, Americans get 18 percent of their calories from sugar. Intake of sugar by children may exceed 50 percent of total calories.4

The major health problem associated with a high sugar intake is dental caries (cavities). The main offenders are foods that are sweet and gummy. They stick to the teeth and supply bacteria with a steady source of carbohydrate from which to make acids that can dissolve tooth enamel. Foods that promote caries are termed cariogenic.

Contrary to popular belief, there is little or no evidence that high sugar intake causes hyperactivity in children, heart disease, diabetes, or obesity. If that were the case, most Americans would have all of these conditions. The major nutritional problem of a high-sugar diet occurs when sugar is substituted for more nutritionally dense foods. When this happens, the result may be insufficient vitamin and mineral intake.
Choose a Diet Moderate in Salt and Sodium

Salt contains about 40 percent sodium by weight and is widely used in the preservation, processing, and preparation of foods. Sodium is an essential mineral, but it is one that Americans consume in excess. Average daily consumption of sodium is 4000 milligrams, which is eight times the minimum requirement of 500 milligrams (one-tenth of a teaspoon) and almost double the 2400 milligrams considered adequate.\(^4\) The main health problems associated with consumption of too much sodium are hypertension, osteoporosis, and stomach cancer.\(^4\) Of the three, hypertension, discussed in Chapter 2, is the most common problem. Sodium contributes to the development of osteoporosis because it pulls calcium from bones and causes the kidneys to excrete calcium. Sodium contributes to stomach cancer because it irritates the stomach lining, causing cells to replicate themselves, increasing the odds of cancer-cell initiation.

The majority of salt consumed is in the form of hidden salt added during the processing of food. Less than one third comes from the salt shaker.\(^4\) Just how much salt is in a processed food can be determined by reading the package label.

Taste buds cannot always judge salt content. Some foods that taste salty may be lower in salt content than foods that do not. For example, peanuts taste salty because the salt is on the surface where the taste buds immediately detect it. However, cheese contains more salt than peanuts or potato chips, and chocolate pudding contains even more salt. To cut down on salt consumption, you should do the following:

- Avoid adding salt before tasting food.
- Add little or no salt to food at the table.
- Season food with sodium-free spices, such as pepper, allspice, onion powder, garlic, mustard powder, sage, thyme, and paprika.
- Avoid smoked meats and fish.
- Cut down on canned and instant soups.
- Read labels for sodium content, especially on frozen dinners or pizza, processed meat, processed cheese, canned or dried soup, and salad dressing. When shopping for canned and processed foods, select foods with no more than 200 mg of sodium per 100 calories.
- Eat plenty of fruits and vegetables high in potassium, calcium, and magnesium. These minerals may help keep blood pressure down.

Drink Alcoholic Beverages in Moderation

Dietary Guidelines for Americans recommends that alcoholic beverages be limited to one drink per day for women and two drinks per day for men.\(^5\) (A drink is defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of 80-proof spirits.) The allowance for women is smaller because women, on average, are smaller than men, they have less muscle and, therefore, less water than men (so alcohol does not get diluted as well in their bodies), and they have less of an enzyme that breaks down alcohol before it reaches the bloodstream. A maximal level of alcohol consumption has not been set for women during pregnancy, so pregnant women and women who have a high chance of becoming pregnant should not use alcohol.

From a health perspective, alcohol has both advantages and serious risks. On the one hand, it is associated with drunk-driving injuries and deaths, cirrhosis of the liver, and a host of social ills caused by alcoholism. On the other hand, when consumed in moderate amounts as recommended by the Dietary Guidelines, it offers protection from heart disease and stroke in some people, even more so than does abstinence. Population studies show a 30 percent reduction in coronary risk among moderate drinkers, compared with abstainers. The data are similar in men and women and in various ethnic groups.\(^4\)

Moderate consumption of alcohol is thought to be especially beneficial for people who are at risk for cardiovascular disease and stroke. Several theories have been advanced to explain this benefit: Alcohol may improve blood levels of high-density lipoproteins, and it may serve as a blood thinner by inhibiting the blood-clotting mechanism often associated with atherosclerosis. Contrary to popular belief, wine does not appear to offer any advantage over other forms of alcohol.

Regardless of alcohol’s potential health benefits, experts don’t recommend alcohol consumption for everyone. Some people have medical, religious, and personal reasons for abstaining. People with uncontrolled hypertension, liver disease, pancreatitis, or strong family histories of addiction should avoid alcohol. The same is true for women during pregnancy. Also, some medicines may have a potentiating effect when taken with alcohol. For women there is also some concern about the link between moderate consumption of alcohol and breast cancer. It is important to remember that the health benefits associated with alcohol come from a moderate level of consumption. Alcohol consumption in excess of that recommended in Dietary Guidelines can cause a variety of health problems that outweigh the potential benefits. As is the case with many health issues, moderation serves as the guiding principle for alcohol consumption.
Other Nutrition Issues of Concern

Nutrition and Pregnancy

Good nutrition is crucial to a successful pregnancy, and a healthy pregnancy starts before conception. Alcohol consumption, smoking, an inadequate diet, dietary excesses of some nutrients, drug abuse, and the interactions of a host of medicines are some of the factors that may threaten a pregnancy even before conception is known or confirmed. Poor health habits throughout pregnancy, especially during the first three months, can harm the mother and developing baby. Although genetic and environmental influences introduce some risk factors beyond the mother’s control, there is a considerable amount of medical advice about weight gain and the nutritional needs unique to pregnant women.

Weight gain

Adequate weight gain for a mother is one of the best predictors of pregnancy outcome. A weight gain of 25 to 35 pounds yields optimal health for both mother and fetus if pregnancy lasts at least thirty-eight weeks. To accommodate the extra demands for energy, the expectant mother needs to increase her caloric intake by about 300 calories daily, particularly after the third month of pregnancy. Inadequate weight gain can lead to many problems. It is important to monitor weight throughout the pregnancy. Large fluctuations in the recommended weight-gain pattern should be brought to the attention of the health care provider.

Nutrient needs

The RDAs for many nutrients increase during pregnancy:

- The protein RDA increases by 10 to 15 grams daily.
- Extra vitamin D is needed to absorb and distribute extra calcium for developing fetal bones. Approximately 20 to 30 minutes of sun exposure several times a week, a quart of vitamin D–fortified milk, or a vitamin D supplement that contains 5 µg (200 IU) should suffice.
- Because of its role in DNA synthesis, folate is a crucial nutrient during pregnancy. The RDA for folate during pregnancy increases to 600 µg per day. Folate deficiencies have been linked to some neural tube birth defects, such as spina bifida. The increased need for folate can be achieved through the diet or a prenatal vitamin and mineral supplement.
- Iron intake should double during the final six months of pregnancy to achieve the RDA of 30 milligrams per day. The extra iron is needed to synthesize the additional hemoglobin required during pregnancy and to provide iron for the developing fetus. Women often need an iron supplement if their typical iron intake is marginal. Iron deficiencies during pregnancy may threaten the health of both the baby and the mother.
- Calcium is needed during pregnancy for skeletal and tooth development of the fetus, especially during the last three months, when growth of these tissues is most prolific. The RDA for calcium is 1300 mg. A prenatal supplement usually contains 200 mg of calcium.
- The zinc RDA increases 25 percent (to 15 milligrams) during pregnancy to satisfy the requirements for growth and development of the fetus. Foods rich in protein also supply zinc. Zinc deficiencies increase the chance of a low-birth-weight baby.
- Prenatal supplements may contribute to a successful pregnancy for some women and, with the possible exception of vitamin A, provide benefits that outweigh potential risks. Because of its role in cell differentiation, megadoses of vitamin A from both supplements and dietary sources are associated with birth defects, particularly when the vitamin A is consumed during the first three months of pregnancy. It is recommended that women set their limit of vitamin A according to the RDAs.

Slight modifications of the recommended servings in the Food Guide Pyramid should satisfy women’s unique nutritional needs during pregnancy. The major differences involve adding a serving of food from two food groups: the milk group and the meat group. Women who practice either ovolactovegetarianism or lactovegetarianism generally do not have difficulty meeting their nutritional needs during pregnancy. Vegans, on the other hand, must plan their diets carefully to ensure adequate amounts of protein, vitamin D, vitamin B6, iron, calcium, zinc, and vitamin B12. Vegans need to increase their intake of grains, beans, nuts, and seeds to supply the required amounts of nutrients. Still, supplements of vitamin B12, iron, and calcium along with a multipurpose prenatal supplement will probably also be necessary.

Nutrition and Physical Activity

The relationship between physical activity and nutrition is obvious. The ability to engage in physical activity, whether it is low intensity and recreational or high intensity and competitive, is influenced by dietary intake. Conversely, nutritional needs change depending on the type, intensity, and duration of activity.
Nutrition and athletic performance are complex subjects involving not only the science of nutrition but also the sciences of biochemistry and physiology. While a presentation of the intricacies of sports nutrition is beyond the scope of this text, the following information should help you plan to meet your nutrient needs when you participate in regular physical activities.

### Type of activity and energy source
The body’s use of carbohydrates, fats, and protein for energy depends on the type of activity and the level of physical fitness. For high-intensity, anaerobic activities lasting for only a minute or less, such as a 100-yard sprint, carbohydrates are the major fuel source. For aerobic activities lasting from several minutes to four or five hours, a combination of carbohydrates, fats, and protein provides fuel for work. If the activity is intense, involving 75 percent or more of maximum oxygen consumption (such as of a runner trying to achieve a personal best in a 1-mile run), carbohydrates will be in greater demand. If the activity is moderately intense, using 40 to 60 percent of maximum (such as jogging or brisk walking), fats and carbohydrates are used evenly. If the activity lasts more than a few minutes and is less intense, using less than 30 percent of maximum (such as easy walking), fat becomes a major source of energy. Energy from protein is minimal during most activities because protein functions as a fuel source primarily after carbohydrate fuel is depleted, such as might occur in activities of long duration (such as long-distance running), and then its contribution accounts for only about 10 percent of the energy. In general, carbohydrates are the main fuel source for both anaerobic and high-intensity aerobic activities; fat is the main fuel source for prolonged, low-intensity exercise; and protein is a minor fuel source, primarily for endurance activities.

### Recommended sources of energy
The diet of a physically active person should favor carbohydrates. The body is capable of converting carbohydrates to a usable form of energy more quickly and more efficiently than it can fats or protein. As a general rule, dietary intake of carbohydrates should account for 55 to 70 percent of the energy. Tables 6-10 and 6-11 present some high-carbohydrate meal options that are appropriate as preactivity meals. An increase in carbohydrate intake should be accompanied by a decrease in fat intake. Fat should account for about 15 to 30 percent of energy, depending on the percentage of carbohydrate calories; protein should provide the remaining 15 percent.

### Protein supplement
Many physically active people, especially athletes, have the mistaken notion that intense physical activities impose a greater than usual demand for protein. This idea...

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**Table 6-10 Two High-Carbohydrate Preactivity* Meals**

<table>
<thead>
<tr>
<th></th>
<th>Calories</th>
<th>Protein (grams)</th>
<th>Fat (grams)</th>
<th>Carbohydrate (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Menu 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White bread, 2 slices</td>
<td>123</td>
<td>4</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Peanut butter, 1 tbsp.</td>
<td>95</td>
<td>4</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Grape jelly, 1 tbsp.</td>
<td>56</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>2% milk, 1 cup</td>
<td>125</td>
<td>8</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Orange, 1 medium</td>
<td>60</td>
<td>1</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td><strong>Meal total:</strong></td>
<td>459</td>
<td>17</td>
<td>15</td>
<td>66</td>
</tr>
<tr>
<td><strong>Menu 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetable lo mein (soft noodles with stir-fried vegetables), 2 cups</td>
<td>352</td>
<td>11</td>
<td>15</td>
<td>47</td>
</tr>
<tr>
<td>Fresh papaya, 1 cup</td>
<td>54</td>
<td>1</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Herbal iced tea sweetened with honey, 12 oz.</td>
<td>56</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td><strong>Meal total:</strong></td>
<td>462</td>
<td>12</td>
<td>15</td>
<td>74</td>
</tr>
</tbody>
</table>

*A preactivity meal should provide 1 to 4 grams of carbohydrate per kilogram of body weight, moderate amounts of protein, and small amounts of fat.*
stems partly from the perception that, if a modest amount of a nutrient is good for you, large amounts must be even better and partly from the fact that protein is needed for the synthesis of new tissue. Both of these ideas can lead to mistaken conclusions. What athletes and others who are engaged in intense activities need is not extra protein but extra carbohydrates. The body’s need for protein is biologically driven (see the previous discussion of recommended protein intake), and any excess in this amount if inefficiently converted to energy or stored as fat.

Two exceptions to this protein guideline occur for athletes engaged in endurance sports and athletes starting weight-training programs. The recommendations for protein range from 1.2 to 1.6 grams of protein per kilogram of body weight for the endurance athlete and 2.0 to 2.5 grams per kilogram of body weight for the weight-training athlete.4 This represents a two- to threefold increase of the RDA for protein. Experts disagree about the importance of excessive protein intake for weight training.

**Vitamins and minerals**

Vitamin and mineral needs of the physically active person are about the same as those of the sedentary person. People who exercise usually eat more than sedentary people do and therefore get more vitamins and minerals as a matter of course. Contrary to popular belief, especially among athletes, there is no need to take vitamin and mineral supplements if adequate servings of food from the FGP are consumed. The American Medical Association, the American Dietetic Association, the American Institute of Nutrition, the Food and Nutrition Board, and the National Council Against Health Fraud have published position statements affirming that, with rare exception, there are no benefits of supplements that exceed the RDAs.47 Megadoses of vitamins and minerals may, in fact, be counterproductive.

If a mineral deficiency occurs, it is most likely to involve iron and calcium, especially for women athletes. A deficiency of either of these minerals not only impairs athletic performance but also may lead to serious medical conditions. Dietary intake of these two minerals should be monitored regularly.

**Fatty acids and activity**

Most of the body’s energy reserve is in its fat stores. When fat stores are broken down, fatty acids move through the bloodstream and enter muscle cells, where they are converted to energy. Well-trained muscles have a greater capacity to execute this conversion process and the ability to burn more fat. Thus, improved physical fitness causes more fat to be used for energy.4,47 Also, the body’s use of fat stores is affected by the duration of the activity. Prolonged activities (lasting more than 20 minutes) cause fat storage to be tapped for energy, particularly when the activity remains at a low-intensity level. Unlike carbohydrate stores, which are limited, an unlimited amount of fatty acids is available to sustain energy needs of low-intensity activities. Weight-conscious people interested in physical activity as a strategy for using fat, therefore, are better served by low-intensity to moderately intense activities that can be endured for a long period of time.

**Fluid intake and activity**

Consuming the right amount of fluids before, during, and after physical activity, which is addressed in Chapter 3, is crucial for the regulation of body temperature and the dissipation of heat.

**Food Safety**

Today, Americans face a paradox: We are urged to eat more fruits, vegetables, fish, and poultry but we are warned about contamination and foodborne illness. Recently, 25 million pounds of ground beef were recalled because of possible *E. coli* bacteria contamination; 200 Michigan schoolchildren developed stomach pains and jaundice from contaminated strawberries
that had been grown in Mexico; an outbreak of infectious diarrhea was traced to raspberries imported from Guatemala; dozens of cases of bloody diarrhea and one death were caused by a batch of organic apple juice made from California apples; and four children died from contaminated hamburgers cooked at a fast-food restaurant. Current estimates suggest that up to 33 million cases of foodborne illness occur in the United States each year, causing about 9,000 deaths. These accidents can cause serious illness, even fatal, in infants, the elderly, and the sick.

Here is a short list of organisms that are common culprits of foodborne illnesses, along with their food sources and symptoms:

- **Staphylococcus** toxins are usually present in meats, poultry, egg products, tuna, potato and macaroni salads, and cream-filled pastries. Symptoms occur two to six hours after exposure and include diarrhea, vomiting, nausea, and abdominal cramps. Recovery normally takes place in twenty-four to thirty-six hours.

- **Salmonella** infections are associated with eggs, poultry, meat, dairy products, seafood, and fresh produce. Symptoms usually occur within six to forty-eight hours and include nausea, vomiting, abdominal cramps, diarrhea, fever, headache, and sometimes a rash. Salmonella infections may be quite serious, even fatal, in infants, the elderly, and the sick.

- **Clostridium botulinum**, usually referred to as **botulism**, occurs in an anaerobic environment, such as in canned goods, and affects low-acid foods like green beans, mushrooms, spinach, olives, and beef. Symptoms occur twelve to thirty-six hours after exposure and affect the central nervous system. Paralysis and death may follow. Infected food usually has an odor. Avoid canned foods that show any signs of damage.

- **Campylobacter jejuni** contamination is linked to raw and undercooked poultry, unpasteurized milk, and untreated water. Symptoms usually occur in two to five days and include diarrhea, fever, abdominal pain, nausea, headache, and muscle pain. Infections may last seven to ten days.

- **E. coli O157:H7** is typically present in undercooked and raw ground beef, raw milk, lettuce, untreated water, and unpasteurized fruit juices. Symptoms include severe abdominal pain and cramping and diarrhea (first watery, then bloody).

- **Listeria monocytogenes** is associated with soft cheeses, poultry, fish, and raw meats and vegetables. The illness causes flu-like symptoms, including fever, and may progress to fatal infections of the blood and central nervous system.

- **Hepatitis A virus** comes from contaminated fecal material from people who harvest, process, or handle food, including workers on farms, in food-processing plants, and in restaurants. Symptoms, which may not occur for several weeks, include fever, nausea, abdominal discomfort, and sometimes jaundice. The infection is usually mild, though symptoms can be severe.

With the exception of hepatitis A, the organisms listed are bacterial. For most of them, treatment consists of hydration and the administration of antibiotics. Other types of organisms are involved in foodborne illnesses. Parasites such as **Trichinella spiralis** (found in pork and wild game) and tapeworms (found in beef, pork, and fish) also infect many people. The same is true of fungi, which produce mold spores that yield toxins such as aflatoxin.

Most foodborne illnesses can be prevented by observing some basic rules for storing, handling, and preparing food. Following these simple rules represents a surprisingly formidable challenge to most Americans: According to recent surveys, only 1 percent of households would pass the inspection required of restaurants. In your own home, follow these safety rules:

- Avoid cross-contamination: Do not prepare foods in an unclean sink and do not allow utensils that have come into contact with an unclean surface to touch food.
- Wash hands when first starting to handle food and after handling garbage or dirty dishes.
- Use separate cloths, sponges, and towels for washing dishes, wiping counters and tabletops, wiping hands, and drying clean dishes.
- Measure the temperature of cooked or held foods to make sure they’re hot enough to destroy bacteria (see Just the Facts: How Hot Is Hot Enough?). Studies reveal that 50 percent of the public eat raw or undercooked eggs, 23 percent eat undercooked hamburger, and 17 percent eat raw clams and oysters.
- Do not consume foods whose “use-by” dates have expired.
- Transfer leftovers from deep pots and casseroles to shallow pans before refrigeration in order to speed cooling (and thereby slow bacterial growth).
- Quickly freeze or refrigerate all ground meat and other perishable foods after shopping.
- Wash hands, utensils, and work areas with hot soapy water after contact with raw meat to keep bacteria from spreading. Also wash your hands after using the bathroom, diapering a child, using the telephone, handling garbage, or touching your face, your hair, or other people.
- Keep the refrigerator temperature below 40°F (37°F is optimal). Keep the freezer at or below 0°F.
Wash whole produce. This includes melons and citrus fruits before cutting them open, to prevent the transfer of bacteria from the fruit’s skin to the edible part.

Wash or sanitize cutting boards between each use.

Store meat products in separate containers from fruits and vegetables.

Flip steaks with tongs or a spatula rather than with a fork during cooking. Unlike ground beef, in which bacteria are mixed throughout the meat during the grinding process, steak harbors bacteria only on the surface. Sticking a fork into meat before it is cooked injects the interior with bacteria from the outside.

Cook fish until it flakes with a fork.

Put your sponge or scouring pad in the dishwasher every time you run it. Or microwave your sponge on high for thirty to sixty seconds.

Don’t store raw foods on the refrigerator shelf above ready-to-eat foods.

Don’t thaw frozen food on the kitchen counter or at room temperature. Thaw frozen food in the refrigerator or microwave.

Don’t eat hamburgers or any form of ground beef until the juices run yellow, with no trace of pink left. (The color of the meat isn’t a reliable indicator of doneness. Check the juice.)

Don’t let juice from raw meat, poultry, or fish drip on your hands or any fresh foods in your grocery cart.

Don’t consume unpasteurized milk and juice or consume foods made with raw eggs.

Don’t use tasting utensils that have touched food under preparation.

Don’t grill, barbecue, broil, or pan-fry meats, poultry, or fish at extremely high temperatures. (Grills can reach temperatures in excess of 640°F. Ovens roast at a temperature of 350°F.) Cooking meats at high temperatures promotes the formation of heterocyclic amines, HCAs. HCAs are thought to be carcinogenic. Boiling, steaming, poaching, stewing, and microwaving do not produce HCAs.

Don’t serve or transport cooked food on the plate used for raw meat.

Don’t store raw fish in your refrigerator for more than twenty-four hours. Raw poultry or ground beef will keep for one to two days and raw red meat for three to five.

**Nutrition Strategies and Disease Prevention**

This chapter emphasizes dietary practices that promote health and wellness, but the connections between food and disease must not be overlooked. Many of these connections have been referred to in the presentation of various nutrients and dietary guidelines, starting with the introduction to the chapter and ending with the previous section on food safety. Still, it is important to highlight some of the major diet and disease connections, with an emphasis on prevention. Remember that the interaction between food and disease is complex, and twenty to forty years may be needed to determine a relationship between disease and diet. With this in mind, here are some strategies that may prevent or reduce the risks associated with several chronic conditions:

- **Heart disease.** Reduce saturated fat intake to no more than 8 percent of calories and total fat to no more than 30 percent and increase monounsaturated
fat to 15 percent. Reducing fat consumption has the added advantage of lowering cholesterol levels. Cholesterol intake should be limited to 300 mg per day. Other strategies include reducing homocysteine levels by consuming plenty of folate, ingesting 25 grams of fiber, especially soluble fiber, and eating at least five servings of fruits and vegetables per day. Vitamin E supplements may also be helpful.

- **Hypertension.** Dietary strategies thought to be effective in reducing or preventing high blood pressure include limiting sodium intake to no more than 2400 mg, consuming potassium-rich fruits and vegetables, and obtaining calcium by eating two to three servings of low-fat dairy products per day.

- **Diabetes mellitus.** Strategies that apply to heart disease also apply to the management of blood sugar levels. Two additional tactics are to maintain a desirable weight, especially for people with non-insulin-dependent diabetes, and restrict intake of simple sugars and highly processed carbohydrates, such as white flour.

- **Osteoporosis.** Consume at least 1200 mg of calcium and 400 IU of vitamin D daily.

- **Cancer.** Many strategies that apply to heart disease also apply to cancer. In addition, consumption of cruciferous vegetables, such as cabbage, broccoli, brussels sprouts, and cauliflower, is thought to help prevent cancer of the gastrointestinal and respiratory tracts. Consumption of fruits and vegetables rich in carotenoids has been linked to a reduction in cancers of the ovaries, bladder, larynx, esophagus, and lung. Cancers of the stomach and esophagus are less common among people whose diets are rich in ascorbic acid, or vitamin C. To reduce the risks of breast cancer, limit alcohol consumption to fewer than seven drinks per week. The risks of colon cancer can be minimized by limiting the intake of red meat to two or three servings per week, consuming lean cuts of meat or no meat at all, and eating at least 25 grams of fiber, including insoluble fiber, per day. Prostate cancer risk can be reduced by following these guidelines and by eating several servings of cooked tomato products each week.

### Food Labels

The FDA oversees the labeling of food products other than meat and poultry. With the passage of new label laws in 1992, virtually all processed and packaged foods are required to have uniform labels. These foods include processed meat and poultry, which are regulated by the USDA. Guidelines for voluntary labeling of raw vegetables and fruits and fish are also available and will likely be displayed in most supermarkets.

**Food labels** must indicate the manufacturer and the packer or distributor, declare the quantity of contents either by net weight or by volume, and list the common name of each ingredient in descending order of prominence. Information about those nutrients most closely associated with chronic disease risk factors—that is, the amount of total fat, saturated fat, cholesterol, sodium, sugar, dietary fiber, total carbohydrate, and protein—must also be included.

Labels are divided into two parts (figure 6-5) and present information according to generic standards called **Daily Values** (DVs). Daily Values are benchmarks for evaluating the nutrient content of foods. They express this content as a percentage of a 2000-calorie diet (Recommended Dietary Allowances are not used as the standards because they are age and gender specific). Information in the top part of a label will vary according to the contribution one serving of that food makes to the Daily Values listed in the bottom part of the label.

The DV standards located on the bottom panel are the same on all food labels and are based on two calorie levels: 2000 and 2500 (table 6-12). This means that total fat intake should be fewer than 65 grams for a 2000-calorie diet and fewer than 80 grams for a 2500-calorie diet. Dividing the nutrient content listed in the top panel by the DVs listed in the bottom panel yields the percent Daily Value for one serving. For example, a serving of Mac’ n’ Cheese contains 15 grams of fat, or 23 percent of the Daily Value of 65 g for a person on a 2000-calorie diet. With the application of simple arithmetic, you can calculate the Daily Value percents for any food with a breakdown of nutrient content.

Standard food labels are useful if daily caloric intake is approximately 2000 or 2500 calories and if the goal is to conform to minimum dietary recommendations. If your diet calls for significantly more or less of a nutrient, your DVs will differ. If that is the case, simply keep track of the total amount of a nutrient. For example, if you are on a 1500-calorie diet and are trying to limit fat intake to 20 percent, keep a running total of fat grams to determine when 33 g have been reached.

In the past, manufacturers often used labeling ploys to deceive consumers. Currently, laws limit labels to the following health claims:

- **High-calcium foods** may reduce the risk of osteoporosis.
- A diet low in saturated fat and cholesterol may lower the risk for heart disease.
- A low-fat diet may reduce the risk of some cancers.
- A low-sodium diet has been linked with reduced incidence of hypertension.
Nutrition information is now required on virtually all processed food products.

The % Daily Value shows how a food fits into an overall daily diet but does not necessarily represent goals for diet planning. Upper limits are a better way to view the concept of 100% Daily Value, except for carbohydrate, dietary fiber, vitamins, and minerals.

Protein generally will not show a % Daily Value because determining % Daily Value would require expensive testing of protein quality of the product by the manufacturer.

Although the Dietary Guidelines recommend that Americans moderate their consumption of sugars, no specific recommendation for a maximum daily intake (in grams) has been made, so no Daily Value for sugars is available.

**Figure 6-5** Food Label Showing Daily Values

Food labels provide information about those nutrients most associated with chronic disease risk factors.

**Table 6-12** Standardized Daily Values on Food Labels

<table>
<thead>
<tr>
<th>Calorie Levels</th>
<th>2000</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total fat</td>
<td>&lt; 65 g</td>
<td>&lt; 80 g</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>&lt; 20 g</td>
<td>&lt; 25 g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>&lt; 300 mg</td>
<td>&lt; 300 mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>&lt; 2400 mg</td>
<td>&lt; 2400 mg</td>
</tr>
<tr>
<td>Total carbohydrates</td>
<td>300 g</td>
<td>375 g</td>
</tr>
<tr>
<td>Fiber</td>
<td>25 g</td>
<td>30 g</td>
</tr>
</tbody>
</table>

- High-fiber foods may reduce the risk of heart disease and certain forms of cancer.
- Vitamins A and C in fruits and vegetables may reduce the risk of some types of cancer.
- Folate may reduce the risk of neural tube birth defects.
- Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, may reduce the risk of coronary heart disease.
- Sugar alcohols (e.g., sorbitol, xylitol, mannitol) may reduce the risk of dental caries.
- Soluble fiber from whole oats may reduce the risk of coronary heart disease.
- Soluble fiber from psyllium seed husks may reduce the risk of coronary heart disease.
The FDA has defined commonly used words describing calories, sodium, sugar, fiber, fat, and cholesterol in food. For example, when the word free is highlighted on a package in reference to calories, it means that the product yields fewer than 5 calories per serving; in reference to sodium, it means the product contains fewer than 5 milligrams; and in reference to fat, it means the product contains less than 0.5 grams. When light or lite is used on a package label, it means that the product has one-third fewer calories or 50 percent less fat than a similar product. Low calorie foods can have no more than 40 calories per serving; low-fat foods can have no more than 3 grams of fat per serving. Healthy means that a food meets the criteria for low fat and low saturated fat, does not exceed maximum levels for sodium and cholesterol, and contains at least 10 percent Daily Value for at least one of the following: vitamins A and C, calcium, iron, protein, or fiber. The word organic now can be used only on raw products that are grown without added hormones, pesticides, or synthetic fertilizers and on processed foods that contain 95 percent organic ingredients.

Freshness dates have also been defined. Phrases such as Best Before, Better If Used Before, or Best If Used By tell how long food will retain its best flavor or quality. The food is still safe to eat after the printed date, but it might become stale or change somewhat in taste or texture. The Expiration, Use By, or Use Before date, which appears on refrigerated foods, provides the deadline for consumption. A product past its expiration date is no longer of sufficient quality and should not be eaten. The Sell By date is usually found on highly perishable foods with a particularly short shelf life, such as meat, milk, or bread. It indicates the last day the product should appear on a supermarket shelf. If stored properly, most foods will remain safe to eat for about a week after the Sell By date.

Serving sizes are not standardized. Nevertheless, the FDA has set serving sizes for 139 food and drink categories according to information obtained from surveys of what people actually eat. Consequently, serving sizes are more realistic than ever before, and they permit comparison shopping.

Even with the improvements in label laws, the unwitting consumer can still be misled. A brand of margarine changed its name from Brand . . . Light to Brand . . . Light Taste—manufacturers can still use light to describe taste, texture, or color. The makers of a brand of brownie mix claim that it is low fat. But the fine print says that the low-fat designation pertains only to each serving of the mix. Once an edible brownie is created by adding vegetable oil, its fat-gram content more than triples. Some foods promise fruit or other ingredients but deliver only flavor. One brand of strawberry frozen yogurt has no real strawberries despite pictures on the label of real strawberries; a brand of blueberry pancakes has no berries. Clearly, although labels have improved dramatically during the past several years, they still fall short in several areas. Deception in old labels was more obvious; today’s labels challenge consumers to apply a higher level of discrimination to sort between fact and fantasy.

Changes in American Eating Patterns

Changes in the American family are mirrored in the trend toward convenience-food eating. For many families, time is a precious commodity that has a dramatic influence on how, where, when, and what people eat. Family meals at home are being replaced by a quick-stop, eat-on-the-go trend. Dining out has become a part of the quintessential American lifestyle, with one of every three people eating away from home at any one mealtime. Not only do many people eat away from home, but they also skip meals. For example, college students typically eat two meals a day and make up the difference by eating many snacks. One-fourth of adults skip breakfast, which is the appropriate meal to replace the carbohydrate stores used during the night’s sleep. It should be of little surprise, therefore, that midmorning sluggishness is a common mental and physical disposition of students and workers alike.

Snacking

Snacking refers to consuming food between the three main meals of the day. Most Americans have at least one snack per day, and snack foods represent one of the fastest-growing markets in the food industry. From a nutrition point of view, snacking is neither good or bad. The three meals a day standard is based more on social custom than on physiology. The key issue is not the time or frequency of eating but what is eaten. Nutritionally dense foods eaten as snacks are just as good for health as they are when consumed as meals. The converse is also true; foods low in nutrient density eaten at mealtime are just as worthless as when they are eaten as snacks. With the exception of foods restricted for medical reasons, all foods can contribute to a healthful diet. Problems occur when a person’s diet is dominated by foods low in nutrient density. Rather than rule out snacking, consume snack foods that enhance wellness. The most direct way to improve snacking behavior is the most obvious one: Purchase and make nutritionally dense foods available (see Real World Wellness: Snack Ideas).

From a nutritional viewpoint, the criticisms of fast-food eating are the same as those of the rest of the American diet: too much fat, too many calories, too
much sodium, and not enough complex carbohydrates and fiber. The average meal of a cheeseburger, milk shake, and fries supplies about 1500 calories, 43 percent of which come from fat. Chicken and fish are just as fatty as other protein sources offered by fast-food restaurants because they are breaded and fried. Frying has the same effect on potatoes. Milk shakes get most of their calories from sugars. The Food Composition Table located in the appendix of this text along with nutrition software like HealthQuest provide detailed information that can be used to compare many fast-food menu items.

Eating at fast-food restaurants does not have to be a nutritionally worthless activity. Many restaurants are now aware that Americans are becoming more knowledgeable about the nutrient content of food and are demanding wholesome, safe, and nutritious foods. Consequently, there has been a trend toward more nutritious menus, including salad, pasta, and potato bars. Guided by good judgment in the choice of foods, an occasional meal at a fast-food chain does not have to compromise a well-balanced diet.

Prepackaged Convenience Dinners
Prepackaged convenience dinners have also become part of the American diet. Consumers spend billions of dollars a year on them, and food manufacturers are constantly turning out new lines. The challenge for health-conscious consumers is to determine which ones fit easily into a nutritious diet.

Prepackaged convenience dinners can be evaluated by applying the following criteria:

• There should be no more than and preferably fewer than 30 percent of calories from fat.
• There should be no more than 200 milligrams of sodium per 100 calories.
• They should meet at least 40 percent of the RDA for vitamins A and/or C.

Just because a dinner meets these criteria does not necessarily mean that it provides every nutrient. Some meals are likely to be deficient in some nutrients, so foods that will compensate must be added.

Planning a Nutrition Strategy for Wellness
It is not necessary to be a nutritionist to form a nutrition strategy that works for you. A nutrition plan will work only if it is personalized. Several strategies should be helpful in personalizing your nutrition plan.

Assess Your Nutrition
You should take an honest look at your eating choices and analyze your nutrition profile through Assessment Activities 6-3, 6-4, and 6-6 to determine whether you are doing the following:

• Eating a variety of foods every day from the Food Guide Pyramid
• Avoiding high-fat foods (more than the equivalent of 3 grams of fat per 100 calories)
Wellness Concepts and Applications

Nurturing Your Spirituality

Enjoy Your Food—the Missing Dietary Guideline

The fast-paced, eat-on-the-run trend among Americans comes with a high price: Fewer and fewer people spend time preparing good, home-cooked meals, and even fewer use mealtime as a time for relaxing and social bonding. Other cultures recognize that mealtime is a key social time of the day and reflect this value in the dietary recommendations health experts offer their citizens:

- In Japan, immediately following the guideline to avoid too much sodium comes the advice “Happy eating makes for a happy family life; sit down and eat together and talk; treasure family taste and home cooking.”
- In Great Britain, the first guideline is “Enjoy your food.”
- Korea tells its citizens to “Enjoy meals and keep harmony between diet and daily life.”
- In Norway, people are told, “Food and joy equal health.”
- In Vietnam, the advice is to “Serve a healthy family meal that is delicious and served with affection.”

The greatest nutrition challenge for Americans may not be to reduce fat intake or cut back on sodium. It may be to construct a positive view of food and of mealtime. One highly respected nutrition publication reminds us, “Healthful eating is about more than eating the right mix of nutrients. It’s also about sustaining well-being in a way that can’t be measured on a blood test but that is just as important to overall health as vitamins and minerals.”

Make Small Adjustments

The principle of changing health behavior is that the smaller the change, the longer it lasts (see Chapter 1). For example, rather than vowing to abstain from eating ice cream, reduce the amount or number of servings at first and substitute a low-fat brand. If your diet is heavy in salt, you can gradually substitute sodium-free seasonings. If you have a sweet tooth, you can try low-sugar snacks. If you eat for fullness, you can prepare less food or leave food on your plate. You should plan an approach that builds on the cumulative effect of many small successes.

Think of balancing your diet over a long period rather than in just a day or a meal. Try to meet the dietary guidelines over several days or a week. For example, every meal does not need to contain less than 30 percent fat. Keep portions of favorite high-fat foods small, and limit other sources of fat. Check labels to get an idea of what nutrients you are consuming, but don’t keep a calculator by your plate. If you eat foods from the Food Guide Pyramid, you will get all the vitamins, minerals, and protein you need.

Choose Foods for Wellness

Choosing foods for wellness means following the Dietary Guidelines for Americans. Your diet should

- Be low in saturated fat (maximum of 8 percent)
- Emphasize complex carbohydrates, such as bread, potatoes, and pasta
- Provide eight to twelve glasses of water throughout the day
- Provide iron and calcium
- Emphasize fresh fruits and vegetables
- Be low in sugar, salt, alcohol, and caffeine

Finally, make sure when choosing foods for wellness to enjoy what you eat (see Nurturing Your Spirituality: Enjoy Your Food—the Missing Dietary Guideline).

Summary

- The six classes of nutrients are carbohydrates, fat, protein, vitamins, minerals, and water. The nutrients that provide energy in the form of calories are carbohydrates, fat, and protein.
- The recommended diet for Americans in Dietary Guidelines for Americans emphasizes complex carbohydrates as the major source of energy. A diet high in complex carbohydrates is likely to be lower in fat, lower in calories, and higher in fiber.
• A complete protein is one that provides all of the amino acids in amounts proportional to the body’s need for them. Protein sources from animals are complete proteins. Plant sources of complete protein, such as soy protein, come from the legume family.
• One of the greatest shortcomings of the American diet is its excessive intake of fat, especially saturated fat.
• The amount of saturated, monounsaturated, and polyunsaturated fat in foods varies considerably. Most food contains a mixture of these fats.
• The process of hydrogenation increases the saturated fat content of polyunsaturated and monounsaturated fats and yields small amounts of fat not found in nature called trans fatty acids.
• Dietary fat intake should favor foods high in monounsaturated fats, such as olive oil, canola oil, and peanut oil.
• The consumption of antioxidant vitamins, especially in fruits and vegetables, is associated with a reduced risk of heart disease and cancer.
• Adequate folate consumption is thought to lower the concentration of homocysteine, an amino acid associated with an increased risk of heart disease.
• Two minerals of special concern today are calcium and iron. Most women fall short of the RDA for calcium. People at risk for low iron levels include young children, early teens, menstruating women, and people with health conditions that cause internal bleeding.
• People are advised to drink eight to twelve cups of fluids a day. Plain tap water is the preferred fluid.
• Phytochemicals are plant chemicals found naturally in foods. They play an important role in preventing many diseases.
• Many botanicals are thought to have health benefits. Because they are considered nutritional supplements and are not regulated with the same rigor as drugs, there is debate about their effectiveness and safety. Twenty to thirty botanicals are backed by well-conducted research.
• Insoluble fiber benefits the body by adding bulk to the stool, thus speeding the transit of food through the body, which reduces the chance of developing colon cancer, and lowering blood-cholesterol levels. Soluble fiber also benefits the body by lowering blood cholesterol levels.
• A good nutritional plan is one that consists of a variety of foods from the Food Guide Pyramid.

Review Questions

1. What is meant by “Nutritional diseases of the past have been replaced by diseases of dietary excess and imbalance”?
2. What was the rationale for revising the Recommended Dietary Allowances for essential nutrients?
3. Identify three nutrients that most Americans do not consume in sufficient amounts.
4. How many calories are supplied by carbohydrates, fat, and protein? What percent of total calories should come from each of these sources? How does Americans’ intake of energy nutrients compare with dietary recommendations?
5. Why are carbohydrates the preferred source of energy?

6. What is the difference between a high-quality, complete protein and a low-quality, incomplete protein?
7. What plant sources of protein are unique in that they are considered complete proteins?
8. What are the differences between saturated, monounsaturated, and polyunsaturated fats? What are some food sources of each? What percent of fat calories should come from each type?
9. What are trans fatty acids? Why should they be avoided?
10. List five dietary practices that will help lower consumption of fat, especially saturated fat.
11. What are the similarities and differences between water-soluble and fat-soluble vitamins?

12. Which vitamins are classified as antioxidants? What is the relationship between antioxidants and health?

13. What role does folate play in preventing disease?

14. Identify three situations or circumstances that would justify use of a vitamin or mineral supplement.

15. What are phytochemicals? How are they different from botanicals? How do they contribute to health?

16. What two minerals are Americans most likely to be consuming in insufficient amounts? Which segments of the population are most likely to be affected?

17. Explain why thirst is not a good indicator of how much water to drink.

18. What are the major health benefits associated with insoluble fiber? Soluble fiber?

19. What is the rationale for the assertion that variety and moderation are the most important principles for a healthy diet?

20. List three negative health effects associated with excessive intake of nutrients considered good for health when taken in recommended amounts.

21. Distinguish between the different types of vegetarianism. Which types are most likely to require some form of vitamin or mineral supplementation? What are the health benefits of a vegetarian diet?

22. Identify four nutrients that pregnant women require in larger amounts than those in the RDAs.

23. How do the intensity and duration of physical activities affect the way the body uses carbohydrates, fat, and protein for energy? What type of physical activity is most conducive to burning fat calories?

24. List six things a person can do to help prevent unnecessary exposure to foodborne illnesses.

25. Distinguish between Recommended Dietary Allowances and Daily Values.

26. What are the main criticisms of snacking and fast-food eating?

Suggested Readings:


Margolis, S., and L. B. Wilder. 1998. Nutrition and Longevity. Baltimore, Md.: The Johns Hopkins Medical Institutions. This monograph was published as part of the highly respected White Papers for the lay public by The Johns Hopkins Medical Institution. It provides an update of the Dietary Guidelines for Americans, offering practical methods of implementation. It includes coverage of timely topics such as antioxidants, folate, and phytochemicals.

Reinhardt, M. W. 1998. The Perfectly Contented Meat-Eater’s Guide to Vegetarianism: A Book for Those Who Really Don’t Want to Be Hassled About Their Diet. New York: Continuum Pub. Group. This entertaining, informative, thought-provoking book is not only for strict vegans but also for committed meat eaters and every type of eater in between. Sprinkled with humor, the text provides clever insights about vegetarianism and some good hints for meat eaters about getting used to not eating meat.

Rosenfeld, I. 1996. Doctor, What Should I Eat? Nutrition Prescriptions for Ailments in Which Diet Can Really Make a Difference. New York: Warner Books. The author takes the position that almost every major medical condition is either caused by or affected by what a person eats. The book reviews all the findings about food and specific bodily breakdowns in alphabetical order, from acne to vaginal yeast infection. Topics include vitamin benefits, immune system boosters, sugars, antioxidants, and food remedies. The book identifies the right foods to treat or prevent scores of health care problems.

Assessing Your Carbohydrate Intake Goal

Directions: Complete the following steps to determine your goal for carbohydrate intake in grams to meet the Recommended Dietary guidelines of 55 percent of total calories from carbohydrate (including sugar and complex carbohydrate).

1. Caloric Intake
   Your body weight multiplied by 15 equals caloric intake for body weight (approximate number of calories consumed daily, assuming that you are not in a weight-loss or weight-gain program):
   
   \[
   \text{lbs.} \times 15 = \text{calories}
   \]

2. Carbohydrate Calories
   Your caloric intake multiplied by 55 percent equals recommended carbohydrate calories:
   
   \[
   \text{calories} \times 55\% = \text{carbohydrate calories}
   \]

3. Carbohydrate (Grams)
   Your recommended carbohydrate calories divided by 4 equals recommended carbohydrate in grams. Transfer this result to Assessment Activity 6-3, Part C, DRV column:
   
   \[
   \frac{\text{calories}}{4} = \text{g}
   \]

EXAMPLE: For a person weighing 185 pounds:

\[
\begin{align*}
\text{Body weight:} & \quad 185 \text{ lbs.} \\
1. \text{Caloric intake:} & \quad \frac{2775 \text{ Kcal}}{15} \\
2. \text{Recommended carbohydrate calories:} & \quad \frac{1526 \text{ Kcal}}{0.55} \\
3. \text{Recommended carbohydrates:} & \quad 382 \text{ g}
\end{align*}
\]

This amounts to approximately 14 ounces of carbohydrate \((382 \div 28 = 14 \text{ ounces})\). (28 grams = 1 ounce)

Assessing Your Protein RDA

Directions: Adults under 55 require 0.36 grams of protein per pound of body weight. Some experts recommend that people 55 years old and older consume 0.45 grams per pound. For example, a 20-year-old person who weighs 150 pounds needs 54 grams of protein: \(150 \times 0.36 = 54\). A 60-year-old person who weighs 150 pounds needs 67.5 grams: \(150 \times 0.46 = 67.5\).

Complete the following steps to determine your RDA for protein:

\[
\begin{align*}
\text{Your weight:} & \quad \text{lbs.} \\
\geq 55 \text{ years old:} & \quad \times 0.45 \\
< 55 \text{ years old:} & \quad \times 0.36 \\
\text{Protein RDA:} & \quad \text{grams}
\end{align*}
\]
Assessing Your Maximum Fat Intake

Directions: Complete the following steps to determine your estimated maximum fat intake in grams to stay within the dietary guidelines of 30 percent of total calories from fat.

1. Caloric Intake
Your body weight multiplied by 15 equals caloric intake for body weight (approximate number of calories consumed daily, assuming that you are not in a weight-loss or weight-gain program):

   _____ lbs. × 15 = _____ calories

2. Maximum Fat Calories
Your caloric intake multiplied by 30 percent equals maximum fat calories:

   _____ calories × 0.30 = _____ calories

3. Maximum Fat (Grams)
Your maximum fat calories divided by 9 equals maximum fat in grams. Transfer this result to Assessment Activity 6-3, Part C, DRV column:

   _____ calories ÷ 9 = _____ g

EXAMPLE: For a person weighing 185 pounds:

   Body weight: 185 lbs.
   × 15
   1. Caloric intake: 2775 Kcal
      × 0.30
   2. Maximum fat calories: 832.5 Kcal
      ÷ 9
   3. Maximum fat: 92.5 g

This amounts to approximately 3 ounces of saturated fat (92.5 ÷ 28 = 3.3 ounces).

Assessing Your Maximum Saturated Fat Intake

Directions: Complete the following steps to determine your estimated maximum saturated fat intake in grams to stay within the dietary guidelines of 10 percent of total calories from fat.

1. Caloric Intake
Your body weight multiplied by 15 equals caloric intake for body weight (approximate number of calories consumed daily, assuming that you are not in a weight-loss or weight-gain program):

   _____ lbs. × 15 = _____ calories

2. Maximum Saturated Fat Calories
Your caloric intake multiplied by 8 percent equals maximum saturated fat calories:

   _____ calories × 0.08 = _____ calories

3. Maximum Saturated Fat (Grams)
Your maximum saturated fat calories divided by 9 equals maximum saturated fat in grams. Transfer this result to Assessment Activity 6-3, Part C, DRV column:

   _____ calories ÷ 9 = _____ g

EXAMPLE: For a person weighing 185 pounds:

   Body weight: 185 lbs.
   × 15
   1. Caloric intake: 2775 Kcal
      × 0.08
   2. Maximum saturated fat calories: 222 Kcal
      ÷ 9
   3. Maximum saturated fat: 24.7 g

This amounts to less than 1 ounce of saturated fat (24.7 ÷ 28 = 0.88 ounces).
One way to determine if you are getting sufficient quantities of the proper nutrients is to keep a record of your diet. Ideally, this record will cover a time span of at least one week. However, in this exercise you are asked to assess your dietary selections for only one day. Therefore, choose a day that is representative of your overall nutritional practices. (Your instructor may ask you to conduct a two- or three-day assessment. In this case photocopy additional copies of the assessment forms as needed.)

Directions There are two options for completing this assessment: (1) use the HealthQuest software that accompanies the textbook or (2) analyze your diet manually by following the instructions and completing the forms in Assessment Activities 6-3 and 6-4. Whichever option you choose, record all of the foods and beverages that you consume during one day with the exception of vitamin or mineral supplements. Be specific regarding the amount eaten, how it is cooked, and so on. List condiments and seasonings, such as mustard, ketchup, and butter, and dressings and trimmings, such as lettuce, onions, marshmallows, and sugar. The more detailed your record, the more accurate it will be and the more you will learn from it. Remember, the quality of the results is dependent on the quality of the information entered. A carefully and thoroughly prepared dietary recall will yield a quite accurate nutritional profile.

Instructions for Mosby’s HealthQuest Once foods have been listed, you are ready to use the HealthQuest program to generate your personal nutrition assessment report. Follow the instructions for installing the program on your personal computer. Enter your new User Profile information. When you have completed data entry, print and arrange the results in the following order:
1. User profile with Instant Analysis information: recommended carbohydrate, fat, protein, total caloric intake, and BMI
2. Nutrient summary of macronutrients, vitamins, minerals (ABC button)
3. Nutrient spreadsheet (Spreadsheet button)
4. Food pyramid breakdown of servings for one day (Pyramid button)
5. Bar graph showing dietary intake analysis of nutrients and percent RDA (Bar graph button for RDA analysis)
6. Pie chart comparing breakdown of carbohydrates, fat, protein with recommendations (Left pie chart button)
7. Pie chart showing breakdown of fat (Right chart button)
8. Major source of nutrients for those vitamins and minerals that do not meet the RDAs in #2
9. Summary paragraph describing what you learned about your dietary strengths and deficiencies and what changes are needed to improve your nutrition profile

Instructions for Conducting a Manual Nutrition Assessment Complete Parts A, B, C, and D. Then proceed to Assessment Activity 6-4.

Part A: Recording Your Nutrient Intake
1. Use the following form to record your dietary selections for one day. Photocopy extra copies of the form as needed.
2. Refer to the Food Composition Table in the appendix and record appropriate values in the spaces provided. For foods not included in the appendix, refer to package labels, if available, to determine nutritive values.
3. Add the values for each nutrient and enter the result in the total column.
### Part B: Are You Meeting the RDA?

1. Transfer the values in the Total column in Part A to the Total column in Part B for the following nutrients.
2. Fill in the RDA column with your protein RDA results from Assessment Activity 6-1. For the remaining nutrients, look up your corresponding RDA in Table 6-4.
3. Subtract the RDA from your totals and indicate your status in the appropriate column. A positive value means that you are meeting the RDA for that nutrient; a negative value means that you are deficient in that nutrient.
4. For nutrients with a negative value, identify several specific foods that will eliminate the deficiency. Refer to the Food Composition Table in the appendix.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Total</th>
<th>RDA</th>
<th>Status</th>
<th>Food Prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thiamin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riboflavin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niacin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td>1000 mg (ages 19–50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1200 mg (51+)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Foods for One Day: List in column headings. Photocopy extra copies as needed.
Chapter 6  Forming a Plan for Good Nutrition

Part C: Are You Meeting the DVs?
1. Transfer the values in the total column from part A to the total column in Part C for the following nutrients. (Refer to Assessment Activities 6-1 and 6-2 for your personal DV for fat, saturated fat, and carbohydrate.)

2. Compare the DV listed with your totals. Indicate your status by subtracting the DV value from your value. Note that some values are maximum and should not be exceeded; others are goals that serve as minimums.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Total</th>
<th>DV*</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat</td>
<td></td>
<td>(maximum)**</td>
<td></td>
</tr>
<tr>
<td>Saturated fat</td>
<td></td>
<td>(maximum)**</td>
<td></td>
</tr>
<tr>
<td>Cholesterol</td>
<td>300 mg</td>
<td>(maximum)</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>2400 mg</td>
<td>(maximum)</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td></td>
<td>(goal)***</td>
<td></td>
</tr>
<tr>
<td>Fiber</td>
<td>25 g</td>
<td>(goal)</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>3500 mg</td>
<td>(goal)</td>
<td></td>
</tr>
</tbody>
</table>

*DV based on 2000-calorie diet.
**See Assessment Activity 6-2
***See Assessment Activity 6-1

Part D: What Did You Learn?
Write a summary paragraph describing what you learned about your dietary strengths and deficiencies and what changes are needed to improve your nutrition profile.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
How Does Your Diet Compare with the Recommended Diet?

Directions: The recommended guidelines suggest that carbohydrate calories should make up at least 55 percent of the diet (including complex carbohydrates and sugar), fat calories should be less than 30 percent, and protein calories should be 15 percent. The purpose of this assessment is to compare your diet with these recommendations. First convert your caloric intake to percentages as follows.

Percent Carbohydrate Calories  Your carbohydrate intake (refer to total carbohydrate intake from Part I, Assessment Activity 6-3) multiplied by 4 equals your carbohydrate calories:

\[ \text{Carbohydrate intake} \times 4 = \text{carbohydrate calories} \]

Your carbohydrate calories divided by total calories (refer to Part I, Assessment Activity 6-3) multiplied by 100 equals percent carbohydrate calories:

\[ \frac{\text{carbohydrate calories}}{\text{total calories}} \times 100 = \% \]

Draw a bar on the graph to indicate percentage of carbohydrate calories.

EXAMPLE: For a person on a 2000-calorie diet who consumed 175 grams of carbohydrate:

\[ 175 \times 4 = 700 \text{ carbohydrate calories} \]
\[ \frac{700}{2000} = 0.35 \]
\[ 0.35 \times 100 = 35\% \]

Percent Protein Calories  Your protein intake (refer to total protein intake from Part I, Assessment Activity 6-3) multiplied by 4 equals protein calories:

\[ \text{Protein intake} \times 4 = \text{protein calories} \]

Your protein calories divided by total calories (refer to Part I, Assessment Activity 6-3) multiplied by 100 equals percent protein calories:

\[ \frac{\text{protein calories}}{\text{total calories}} \times 100 = \% \]

Draw a bar on the graph to indicate percentage of protein calories.

EXAMPLE: For a person on a 2000-calorie diet who consumed 100 grams of protein:

\[ 100 \times 4 = 400 \text{ protein calories} \]
\[ \frac{400}{2000} = 0.20 \]
\[ 0.20 \times 100 = 20\% \]

Percent Fat Calories  Your fat intake (refer to total fat intake from Part I, Assessment Activity 6-3) multiplied by 9 equals your fat calories:

\[ \text{Fat intake} \times 9 = \text{fat calories} \]

Your fat calories divided by total calories (refer to Part I, Assessment Activity 6-3) multiplied by 100 equals percent fat calories:

\[ \frac{\text{fat calories}}{\text{total calories}} \times 100 = \% \]
Draw a bar on the graph to indicate percentage of fat calories.

**EXAMPLE:** For a person on a 2000-calorie diet who consumed 100 grams of fat:

\[ 100 \times 9 = 900 \text{ fat calories} \]
\[ 900 \div 2000 = 0.45 \]
\[ 0.45 \times 100 = 45\% \]

**Example Profile** The following graph shows the percentages for the example as the yellow bar below the recommended amount, which is shown as a red bar.

**Your Profile** Complete the bars with amounts calculated for your diet:
Fat has earned a bad reputation because of the health problems it contributes to in high-fat diets. The following questionnaire will help you think about the amounts and types of fat that you generally eat. For each general type of food or food habit, circle the category that is more typical for your diet. If you never or almost never eat any items of a particular food type, just skip it.

### Assessment Activity 6-5

**Do You Have Fatty Habits?**

<table>
<thead>
<tr>
<th>Food Type/Habit</th>
<th>High Fat</th>
<th>Medium Fat</th>
<th>Low Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken</td>
<td>Fried with the skin</td>
<td>Baked, broiled, or barbecued with the skin</td>
<td>Baked, broiled, or barbecued without the skin</td>
</tr>
<tr>
<td>Fat present on meats</td>
<td>Usually</td>
<td>Sometimes</td>
<td>Never</td>
</tr>
<tr>
<td>Fat used in cooking</td>
<td>Butter, lard, bacon grease, chicken fat</td>
<td>Margarine, oil</td>
<td>Nonstick cooking spray or no fat used</td>
</tr>
<tr>
<td>Additions to rice, bread, potatoes, vegetables, etc.</td>
<td>Butter, lard, bacon grease, chicken fat, coconut oil</td>
<td>Margarine, oil, peanut butter</td>
<td>Butter-flavored granules or no fat used</td>
</tr>
<tr>
<td>Pizza toppings</td>
<td>Sausage, pepperoni, extra cheese, combination</td>
<td>Canadian bacon</td>
<td>Vegetables such as peppers, onions, and mushrooms</td>
</tr>
<tr>
<td>Sandwich spreads</td>
<td>Mayonnaise or mayonnaise-type dressing</td>
<td>Light mayonnaise, oil and vinegar</td>
<td>Mustard, fat-free mayonnaise</td>
</tr>
<tr>
<td>Milk and milk products (e.g., yogurt)</td>
<td>Whole-milk and whole-milk products</td>
<td>Low-fat milk products and milk products</td>
<td>Skim milk and milk products</td>
</tr>
<tr>
<td>Sandwich side orders</td>
<td>Chips, potato salad, macaroni salad with creamy dressing</td>
<td>Coleslaw, pasta salad with clear dressing</td>
<td>Vegetable sticks, pretzels, pickle</td>
</tr>
<tr>
<td>Salad dressings</td>
<td>Blue cheese, Ranch, Thousand Island, other creamy type</td>
<td>Oil and vinegar, clear-base dressing</td>
<td>Oil-free dressing, lemon juice, flavored vinegar</td>
</tr>
<tr>
<td>Typical meat portion</td>
<td>6–8 oz. or more</td>
<td>4–5 oz.</td>
<td>2–3 oz.</td>
</tr>
<tr>
<td>Sandwich fillings</td>
<td>Beef or pork hot dogs, salami, bologna, pepperoni, cheese, tuna or chicken salad</td>
<td>Turkey hot dogs, 85% fat-free lunch meats, corned beef, peanut butter, hummus (chickpea paste)</td>
<td>95% fat-free lunch meats, roast turkey, roast beef, lean ham</td>
</tr>
<tr>
<td>Ground meats</td>
<td>Regular ground beef, sausage meat, ground meat, ground pork (about 30% fat)</td>
<td>Lean ground beef, ground chuck, turkey sausage meat (20–25% fat)</td>
<td>Ground turkey, extra-lean ground beef, ground round (about 15% fat)</td>
</tr>
<tr>
<td>Deep-fried foods (e.g., french fries, onion rings, fish or chicken patties, egg rolls, tempura)</td>
<td>Eat every day</td>
<td>Eat once a week</td>
<td>Eat once a month or never</td>
</tr>
<tr>
<td>Bread for sandwiches</td>
<td>Croissant</td>
<td>Biscuit</td>
<td>Whole wheat, French, tortilla, pita or pocket bread, bagel, sourdough, or English muffin</td>
</tr>
<tr>
<td>Cheeses</td>
<td>Hard cheeses (such as cheddar, Swiss, provolone, Jack, American, processed)</td>
<td>Part-skim mozzarella, part-skim ricotta, low-fat cheeses</td>
<td>Nonfat cheese, nonfat cottage cheese, no cheese</td>
</tr>
<tr>
<td>Frozen desserts</td>
<td>Premium or regular ice cream</td>
<td>Ice milk or low-fat frozen yogurt</td>
<td>Sherbet, Italian water ice, nonfat frozen yogurt, frozen fruit whip</td>
</tr>
</tbody>
</table>
Once you have completed the questionnaire, count the number of circles in each column and calculate your score as follows: Multiply the number of choices in the left-hand (high-fat) column by 2 and multiply the number of choices in the middle (medium-fat) column by 1; then add these two values together. Based on your total score, rate yourself as follows:

<table>
<thead>
<tr>
<th>Less than 10</th>
<th>Excellent fat habits</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 20</td>
<td>Good fat habits</td>
</tr>
<tr>
<td>20 to 30</td>
<td>Fat habits needing improvement</td>
</tr>
<tr>
<td>Over 30</td>
<td>Very high-fat diet</td>
</tr>
</tbody>
</table>

If your score is 20 or higher, try to substitute more foods from the middle (medium-fat) column or, better still, the right (low-fat) column for foods in the left-hand (high-fat) column.

<table>
<thead>
<tr>
<th>Food Type/Habit</th>
<th>High Fat</th>
<th>Medium Fat</th>
<th>Low Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee lighteners</td>
<td>Cream, liquid or powdered creamer</td>
<td>Whole milk</td>
<td>Low-fat or skim milk</td>
</tr>
<tr>
<td>Snacks</td>
<td>Chips, pies, cheese and crackers, nuts, donuts, chocolate, granola bars</td>
<td>Muffins, toaster pastries, unbuttered commercial popcorn</td>
<td>Pretzels, vegetable sticks, fresh or dried fruit, air-popped popcorn, bread sticks, jelly beans, hard candy</td>
</tr>
<tr>
<td>Cookies</td>
<td>Chocolate coated, chocolate chip, peanut butter, filled sandwich type</td>
<td>Oatmeal</td>
<td>Ginger snaps, vanilla wafers, graham crackers, animal crackers, fruit bars</td>
</tr>
</tbody>
</table>

Scoring: \((\underline{\text{_________}} \times 2) + (\underline{\text{_________}} \times 1) + (\underline{\text{_________}} \times 0) = \text{Total score: ____________})
Assessment Activity 6-6

Eating Behaviors to Consider

**Directions:** Answer the following questions to reveal information about your eating habits, how you developed certain tastes, and your attitude about various foods:

1. When was the last time you tried a new food? What was the food? What were the circumstances? ____________

2. What new foods have you learned to eat during the past year? __________________________________________

3. Name the foods that have been on your “will not try” list (that is, foods that you will not eat under any circumstances). _________________________________________________________________________________________

4. What special events do you celebrate in some way with food?____________________________________________

5. Where is your favorite place to eat? __________________________________________________________________

6. If you were to go on an eating binge, what foods would you be most likely to eat? __________________________

7. Describe in detail your favorite meal._________________________________________________________________

8. Do you consider yourself a slow eater, moderately fast eater, or gulper? What do you think is responsible for your eating pattern? _______________________________________________________________________________

9. To what extent, if any, are your eating habits related to stress? Emotions? _________________________________

10. What do you consider to be your good eating habits? Poor eating habits? _________________________________