PROLOGUE

“Let’s share something with each other,” said the health expert to the members of a community workshop. “What excuses do we find ourselves using for not eating more healthfully, not exercising regularly, and not behaving in other ways that promote health, such as using seat belts? I’ll start it off,” she continued, “by confessing that I sometimes skip exercising because I run out of time. What excuses do you use?” The answers came quickly:

“I never seem to have the energy to exercise.”
“My wife sprained her ankle jogging, and I know lots of other people who injured themselves exercising.”
“I don’t have the time to prepare healthful meals.”
“My grandparents ate high-fat diets and lived past 85.”
“My kids hate vegetables, and my husband insists on having meat for dinner.”
“Seat belts are uncomfortable to use and wrinkle my clothes.”
“I’ve had my habits for so long—it’s hard to change.”

People cite many reasons for not leading more healthful lifestyles. Some of the obstacles they describe can be overcome fairly easily, but others are more difficult. In most cases, people could find ways to overcome obstacles to healthful behavior if they believed it was important and were motivated to do so.

In this chapter, we discuss how nutrition, weight control, exercise, and safety habits are important to people’s health. We also examine what people do and do not do in these areas of their lifestyles, as well as why they behave as they do and how they can change unhealthful behaviors. As we study these topics, we will consider important questions and problems people have in leading healthy lives. Which foods are healthful, and which are not? What determines people’s preferences...
for different foods, such as sweets? Why do overweight individuals have such a hard time losing weight and keeping it off? What kinds of exercise benefit health? What hazards exist in our environments, and how can we protect ourselves from them?

NUTRITION

“You are what you eat,” as the saying goes. This saying has at least two meanings. Most commonly, it means that the quality of your diet can determine how you look, act, and feel. Another meaning is that the same five types of chemicals—water, carbohydrates, fats, proteins, vitamins, and minerals—that make up food also make up the human body and contribute to the cells’ metabolic processes (Holum, 1994; Peckenpaugh, 2007). In this section, we will examine both meanings, beginning with the components of food and their importance in metabolic processes.

COMPONENTS OF FOOD

Healthful diets provide optimal amounts of all essential nutrients for the body’s metabolic needs. Let’s consider the five types of chemical components, besides water, of food that provide specific nutrients for body functioning.

1. **Carbohydrates** include simple and complex sugars that are major sources of energy for the body. Simple sugars include glucose, which is found in foods made of animal products, and fructose, which is found in fruits and honey. Diets may also provide more complex sugars, such as sucrose (table sugar), lactose in milk products, and starch in many plants.

2. **Lipids or “fats”** also provide energy for the body. Lipids include saturated and polyunsaturated fats, as well as cholesterol. Nutritionists recommend that diets contain not more than 30% of calories (nor less than 10%) from fat. To calculate food’s percent of calories from fat, you need to know its number of calories and grams of fat. Multiply the grams of fat by 9 (because a gram of fat has 9 calories), and divide that value by the number of calories in the food.

3. **Proteins** are important mainly in the body’s synthesis of new cell material. They are composed of organic molecules called amino acids; about half of the 20 or so known amino acids are essential for body development and functioning, and must be provided by our diet.

4. **Vitamins** are organic chemicals that regulate metabolism and functions of the body. They are used in converting nutrients to energy, producing hormones, and breaking down waste products and toxins. Some vitamins (A, D, E, and K) are fat-soluble—they dissolve in fats and are stored in the body’s fatty tissue. The remaining vitamins (B and C) are water-soluble—the body stores very little of these vitamins and excretes excess quantities as waste.

5. **Minerals** are inorganic substances, such as calcium, phosphorus, potassium, sodium, iron, iodine, and zinc, each of which is important in body development and functioning. For example, calcium and phosphorus are components of bones and teeth, potassium and sodium are involved in nerve transmission, and iron helps transport oxygen in the blood.

Reading labels informs the consumer of the food’s content. Guidelines adopted in the 1990s for labeling packaged foods in the United States make nutritious choices easier for consumers.
Food also contains fiber, which is not considered a nutrient because it is not used in metabolism but is still needed in the process of digestion. People can get all the nutrients and fiber they need by eating diets that consist of a variety of foods from several basic groups, and you can see the relative amounts of foods from these groups to make a healthful diet in Figure 8-1. The way food is prepared is also important. Consider the potato: A baked or boiled potato by itself has few calories and almost no fat, but when French-fried or made into potato chips, its calorie and fat content skyrockets. People’s increased use of processed and fast foods has made their diets less healthful.

Most people who eat healthfully do not need to supplement their diets with vitamins and other nutrients—one carrot, for instance, provides enough vitamin A to last 4 days. A class of vitamins called antioxidants—including vitamins A (carotene), C, and E—reduce damage to cells from a process in metabolism called oxidation. Early evidence suggested that antioxidants may reduce the risk of several diseases, such as cancers and cardiovascular and eye diseases (Johnson, Meacham, & Kruskall, 2003). Newer research has found that taking vitamins C and E does not prevent cardiovascular disease (Sesso et al., 2008; Vivekananthan et al., 2003).

Some people who take supplements have an attitude of “the more the better.” But one can overdose taking some nutrients, leading to a “poisoning” if they accumulate in the body. For example, although vitamin D seems to protect against cancer (Garland et al., 2006), too much of vitamins A and D can pose serious health hazards to the liver and kidneys, respectively. Women who are pregnant have greater needs of all nutrients; although most of their extra nutrients can come from dietary adjustments, they should also take recommended supplements, such as of iron (Insel & Roth, 1998; Peckenpaugh, 2007).

Unprocessed foods are generally more healthful than processed foods, which often contain additives that benefit the food industry more than the consumer. Some additives lengthen the shelf life of the food, improve or maintain the texture of foods, or enhance the taste of foods, for example (Insel & Roth, 1998). Although most additives are not harmful, some cause allergic reactions or may be carcinogenic. For instance, some people are sensitive to monosodium glutamate (MSG, a flavor enhancer), experiencing heightened blood pressure and sweating when they consume it. Children may be very vulnerable to the effects of additives because their body systems are still forming and maturing rapidly and, pound-for-pound, they eat more than adults. Many people buy foods labeled “organic,” believing that they have less of harmful chemicals, which may be true, but organic foods do not appear to be more nutritious than conventional foods (Dangour et al., 2009).

**WHAT PEOPLE EAT**

Diets vary by gender and culture. A survey of nearly 20,000 university students in 23 countries showed that women report eating healthier diets—less fat and more fruit and fiber—than men in almost all countries, but there are marked national differences in dietary practices (Wardle et al., 2004). Table 8.1 lists countries with the most and least healthful practices. For most of the 20th century, American diets had a fairly consistent trend: people consumed more and more sugar, animal fats, and animal proteins, while consuming less and less fiber (Winikoff, 1983). Since the mid-1980s, dietary trends in
Countries with Low Practice

- Italy (57.9, 63.8)
- Korea (16.0, 33.3)

Table 8.2 compares the diets available for consumption in the United States and several countries in Europe and suggests that Americans consume much more calories and fats than Europeans do.

Why do people eat what they eat? The answer involves biopsychosocial factors (Peckenpaugh, 2007). One factor is inborn processes: for instance, newborn babies like sweet tastes and avoid bitter tastes. Brain chemicals can bias people to eat fatty foods and activate their brain pleasure centers when they do (Azar, 1994). Another factor is the person’s skills—for example, the ability to regulate or manage one’s food buying or eating (Anderson, Winett, & Wojcik, 2007). The more able people are in setting goals, planning, and monitoring the foods they consume, the healthier their diets are likely to be. Another factor is one’s environment or experience with foods; we’ll look at five environmental influences. First, newborns can learn to like foods they might otherwise avoid: a study tested newborns’ liking of pureed green beans, then had their breastfeeding mothers eat green beans daily for 8 days, and retested the babies’ liking of pureed green beans (Forestell & Mennella, 2007). At retesting, the infants ate more of the beans than they had originally, but infants in a control group that was formula fed showed no change in the amount they ate. Second, some foods are more available than others at home, work, or school, depending on cultural and economic conditions—and simply being exposed to a food may increase one’s liking of it (Hearn et al., 1998; Larson & Story, 2009). Third, the more fast-food restaurants in a neighborhood, the more fast-food people eat (Moore et al., 2009). Fourth, people observe in person and through TV commercials how others respond to a food and tend to become more attracted to it if they see others eat it and like it. Sweet, high-fat snack and convenience foods dominate the ads in popular American children’s TV shows and are available almost everywhere we go (Farley et al., 2010; Harrison & Marske, 2005). Fifth, portion sizes are often “supersized”—the larger the portions, the more people eat (Rolls, Morris, & Roe, 2002).

Enormous numbers of children around the world simply do not have nutritious diets available to them for proper growth and development. About half of children are stunted in growth from malnutrition in several countries, such as Ethiopia, Guatemala, and Angola (WHO, 2009). Children are much shorter if they live in very impoverished areas than in wealthier regions, even in the same countries (Meredith, 1978). Regional and social class differences in bodily growth result from many factors, including genetics, nutrition, and disease.

Table 8.1 Two Countries among the Highest and the Lowest in Percentage of Individuals with Healthful Practices for Each of Three Dietary Components (Fat, Fruit, and Fiber)*

<table>
<thead>
<tr>
<th>Healthful Practices</th>
<th>Countries with High Practice (% of males, females)</th>
<th>Countries with Low Practice (% of males, females)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary fat, avoid eating</td>
<td>Colombia (36.3, 55.7)</td>
<td>France (16.6, 38.2)</td>
</tr>
<tr>
<td></td>
<td>Thailand (34.5, 59.2)</td>
<td>Korea (11.3, 13.2)</td>
</tr>
<tr>
<td>Dietary fruit, eat daily</td>
<td>Italy (57.9, 63.8)</td>
<td>Japan (11.9, 12.1)</td>
</tr>
<tr>
<td></td>
<td>Spain (57.1, 64.0)</td>
<td>Korea (16.0, 33.3)</td>
</tr>
<tr>
<td>Dietary fiber, eat daily</td>
<td>Korea (38.7, 58.8)</td>
<td>Bulgaria (12.5, 25.4)</td>
</tr>
<tr>
<td></td>
<td>Thailand (64.6, 78.6)</td>
<td>France (10.9, 28.7)</td>
</tr>
</tbody>
</table>

*The percentages were intermediate for the United States (33.1, 50.4 for fat; 31.7, 35.5 for fruit; 21.2, 20.4 for fiber) and England (29.8, 49.5 for fat; 35.8, 44.1 for fruit; 26.0, 38.7 for fiber).

Source: Wardle et al., 2004, abstracted from Table 2.

Table 8.2 Average Quantities of Calories, Fat, and Protein Available for Consumption per Person per Day in the United States and Several European Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Calories (in kilocalories)</th>
<th>Fat (in grams)</th>
<th>Protein (in grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>3900</td>
<td>178</td>
<td>111</td>
</tr>
<tr>
<td>Germany</td>
<td>3848</td>
<td>142</td>
<td>100</td>
</tr>
<tr>
<td>Italy</td>
<td>3675</td>
<td>156</td>
<td>113</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3495</td>
<td>140</td>
<td>105</td>
</tr>
<tr>
<td>Sweden</td>
<td>3208</td>
<td>127</td>
<td>108</td>
</tr>
<tr>
<td>Turkey</td>
<td>3328</td>
<td>91</td>
<td>96</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3450</td>
<td>135</td>
<td>105</td>
</tr>
</tbody>
</table>

Sources: USBC, 2010, Table 211; WHO/Europe, 2010.
substances sold at health food stores. Although some of these products—such as whole grains—are clearly beneficial, many supplements and other products are of dubious worth (Peckenpaugh, 2007). Some people attempt to improve their diets by becoming vegetarians. There are degrees of vegetarianism, ranging from simply avoiding red meats to strictly using only plant foods and no animal products whatsoever. When people avoid all animal products, they must plan very carefully to assure that their diets, and especially their children’s, contain a balance of proteins and a sufficient amount of essential vitamins and minerals (Peckenpaugh, 2007).

In many nations of the world, dietary excesses are the main nutritional problem, especially in developing atherosclerosis, hypertension, and cancer.

Diet and Atherosclerosis

Cholesterol is the main dietary culprit in atherosclerosis, the deposit of fatty plaques in our blood vessels, illustrated in Figure 8-2. As we saw in Chapter 2, cholesterol is a fatty substance. Our bodies produce most of the cholesterol in blood, and our diets provide the remainder. Whether cholesterol forms plaques in our blood vessels depends on the presence of different types of lipoproteins, which consist of fat and proteins. There are several types of lipoproteins, but two are most important: low-density lipoprotein (LDL) is related to increased plaque deposits; high-density lipoprotein (HDL) is linked to decreased likelihood of plaque buildup (AHA, 2010, AMA, 2003).

Cholesterol carried by LDL is called “bad cholesterol” because it mixes with other substances to form plaques, whereas cholesterol carried by HDL is called “good cholesterol” because it seems to carry LDL away to be processed or removed by the liver. There are many other types of dietary fat, three of which are clearly linked to health. Triglycerides are in most fats people consume and increase the risk of heart disease, omega-3 fatty acids, which occur at high levels in fish, reduce serum triglycerides and raise HDL, and trans-fatty acids are in certain oils, such as margarine, increase LDL and lower HDL (Mozaffarian et al., 2006, Peckenpaugh, 2007). Because of the role of dietary fats in cardiovascular disease, communities have begun passing laws against the use of certain fats in preparing foods sold commercially.

How much cholesterol in the blood is too much? Normal levels of cholesterol increase with age in adulthood; they are measured in milligrams of cholesterol per 100 milliliters of blood serum. Experts once thought that long-term total serum cholesterol levels above 240 mg put people at high risk for heart disease or stroke, but they have refined this view (EPDET, 2001). “Bad” cholesterol (LDL) is the real culprit, and its risk depends on five other risk factors:

- Age (over 45 years for men, 55 for women)
- Cigarette smoking
- High blood pressure
- Low “good” cholesterol (HDL less than 40 mg)
- Family history of early cardiovascular disease

To determine one’s heart attack or stroke risk, count up the person’s risk factors and subtract 1 if his or her HDL is high (60 mg or higher). People with scores of 0 or 1 are at low risk and should keep LDL levels below 160 mg. People with higher scores should maintain much lower LDL levels, and those who already have heart disease should strive to keep LDL levels below 100 mg (AHA, 2010).
People’s cholesterol levels are determined partly by heredity and partly by their lifestyles (AHA, 2010; McCaffery et al., 2001). For instance, smoking cigarettes appears to increase LDL and decrease HDL levels (Muscat et al., 1991). Diet is an important factor: some foods, such as eggs, many milk products, and fatty meats, contain very high concentrations of cholesterol. Daily intake of cholesterol should not exceed 300 mg (Peckenpaugh, 2007); it should be much lower for people at moderate or high risk for cardiovascular disease. Children older than 5 years should follow diets like those recommended for adults; those whose parents or grandparents had heart disease at early ages should have their cholesterol levels and diets assessed because atherosclerosis can begin in childhood (DISC, 1995). If dietary changes do not lower adults’ cholesterol levels enough, physicians may prescribe medication. Statin drugs (some brand names: Crestor, Lipitor, Zocor) greatly reduce LDL and raise HDL levels (AMA, 2003; Nissen et al., 2006).

Does lowering LDL reduce cardiovascular illness? Yes. Studies have shown that large reductions in LDL produced with combined dietary and drug treatment, retard and slowly reverse atherosclerosis and reduce the risk of heart attacks (Karnik, 2001; Nissen et al., 2006). Dietary patterns, such as the “Mediterranean diet,” that conform to the recommendations in Figure 8-1 appear to reduce the risk of heart disease and metabolic syndrome (Buckland et al., 2009, Salas-Salvado et al., 2008). Most people can lower their cholesterol intake markedly if they will modify their eating habits, sometimes by making very simple changes, such as by substituting low-cholesterol foods, such as cereals, for just four eggs per week—an egg contains over 200 mg of cholesterol. Most cereals, breads, fruits, nuts, and vegetables contain little or no cholesterol. Other ways include switching to fish or poultry in place of red meats, broiling or baking foods instead of frying, using low-fat dairy products, and using low-cholesterol vegetable fats for cooking. But people should be wary of processed foods that don’t specify the type of vegetable oil they use—these products often contain saturated fats (coconut or palm oils) instead of the more expensive polyunsaturated fats, such as corn or soybean oils. Oils that derive from certain plants, such as olives, consist of monounsaturated fats that contain no cholesterol and appear to lower serum LDL, but not HDL (Insel & Roth, 1998; Peckenpaugh, 2007).

There is a curious caution on the health effects of lowering people’s cholesterol: although the evidence is inconsistent and inconclusive, some studies have found that markedly reduced serum cholesterol is associated with nonillness deaths, such as from accidents, suicide, and violence (Muldoon & Manuck, 1992; Muldoon, Manuck, & Matthews, 1990). But we don’t know why. Prospective studies have tested whether lowering cholesterol might, perhaps, increase people’s negative moods in the following months or years and found that it does not (Bovbjerg et al., 1999, Coutu, Dupuis, & D’Antono, 2001).

**Diet and Hypertension**

People with blood pressures exceeding 140 systolic/90 diastolic are classified as hypertensive. About one billion people around the world and 30% of American adults are hypertensive (Hajjar, Kochen, & Kochen, 2006, NCHS, 2009a). Although medication can lower blood pressure, the first methods doctors advise usually involve lifestyle changes, especially losing weight and restricting certain foods in the patient’s diet. People who are at risk for developing hypertension can effectively reduce their risk by making such changes (Blumenthal, Sherwood, & D’Antono, 2002).

Of all the substances in people’s diets that could affect blood pressure, sodium—such as in salt (sodium
Diet and Cancer

The role of diet in cancer is becoming clear: diets high in saturated fat and low in fiber and fish are associated with the development of cancer, particularly of the colon and prostate gland (ACS, 2009; Norat et al., 2005). Cancer experts advise people to maintain a healthy weight, consume little of fatty meats, and eat much fish, vegetables, fruits, and high-fiber breads and cereals to reduce their risk of cancer.

Do vitamins protect people from cancer? Many fruits and vegetables are rich in beta-carotene, which the body converts to vitamin A; these foods are also good sources of vitamin C. Early studies yielded results suggesting that these vitamins may protect people from cancers, but the current evidence is not definitive (Johnson, Meacham, & Kruskall, 2003). On the basis of the early findings, some people began to take high doses of vitamin A and C supplements. Nutritionists recommend against this, especially with vitamin A because it builds up in the body, and it is easy to overdose.

Interventions to Improve Diet

Dietary interventions take many forms. They can focus on a single nutritional component, such as cholesterol, or promote a healthy overall diet of low fat and high vegetable and fruit content. And they can be provided as counseling sessions with individuals who have a known dietary or health problem and as large-scale programs for members of a group or community, such as employees or school students, using written or computer materials and group meetings. The most effective dietary interventions today incorporate or address elements of the theories of health-related behavior we considered in Chapter 6—for example, the person’s perceived barriers and benefits of change (health belief model), self-efficacy (social-cognitive theory), and readiness to change (stages of change model) (Glanz, 2001). To maximize success, interventions can use behavioral and educational methods for the person, training and cooperation by members of the person’s household, support groups, and a long-term follow-up program (Carmody et al., 1982). They should also address the person’s strong preferences for high-fat, low-fiber foods and difficulties having healthful foods when not eating at home (Terry, Oakland, & Ankeny, 1991).

Let’s look at a couple of examples of dietary interventions, one that focused on reducing cholesterol and another that addressed the overall diet. The program to reduce cholesterol was part of the Multiple Risk Factor Intervention Trial (MRFIT) and was designed to modify the diets of thousands of men over a period of 6 years (Caggiula et al., 1981; Dolecek et al., 1986). The men were at risk of coronary heart disease because of high serum cholesterol levels, high blood pressure, and cigarette smoking. The intervention provided counseling and information each year about the benefits of and methods for modifying diets when the men and “their homemakers” attended group meetings. Compared with a control group with “usual care” from their physicians, the MRFIT program markedly modified the men’s diets and lowered their serum cholesterol levels. The men who most needed to modify their diets tended to do so and achieved the greatest gains. A meta-analysis of many similar interventions found that programs to reduce high serum cholesterol help people improve their diets and reduce cardiovascular risk (Brunner et al., 1997).

The intervention to modify overall diets recruited over 600 adult females from a large medical practice who were not already eating a low-fat diet and assigned them randomly to an intervention or control condition (Stevens et al., 2002). The intervention applied elements of the stages of change model, motivational interviewing, and social-cognitive theory to decrease fat and increase...
vegetable and fruit consumption. The women in the intervention received two individual counseling sessions that included a 20-minute computer program to assess and give feedback on their dietary habits. They also received two counseling phone calls and healthful recipes and hints on shopping, snacking, and eating in restaurants. Assessments after a few months revealed that the diets had improved—that is, contained much less fat and more vegetables and fruit—for women in the intervention but had gotten a little worse for those in the control condition.

What people include in their diets is clearly related to their risk of developing several major chronic diseases. Do people who receive an intervention and improve their intake of fat, vegetables, and fruit dislike their new diets? No, and across years they report greater life satisfaction and confidence that they can promote their health similar to people without the intervention (Corle et al., 2001). Other dietary problems that affect health arise from consuming too many calories. Research with animals has shown that reducing calorie intake by 30% from standard nutritious diets decreases metabolism, slows the aging process, and increases longevity (Lane et al., 1996). Eating too much food can be unhealthful, as we are about to see.

If you have not read Chapter 2, The Body's Physical Systems, and your course has you read the modules from that chapter distributed to later chapters, read Module 3 (The Digestive System) now.

WEIGHT CONTROL AND DIET

People in many cultures around the world are “weight conscious.” In the United States, individuals often start being concerned about their weight in childhood and adolescence, particularly if they are overweight and are teased and excluded from social groups (Rosen, 2002; Zeller & Modi, 2008). Many teens become greatly preoccupied with their physical appearance and would like to change how they look. They frequently express concerns about skin problems and wanting to have a better figure or more athletic body, to be taller or shorter, and to be the “right” weight. People with less-than-ideal bodies are often thought of as lazy and self-indulgent, and many of them wish or strive for bodies they are biologically unable to achieve (Brownell, 1991). Being very overweight puts teens—especially girls—at risk for developing depression and anxiety disorders (Anderson et al., 2007; Petry et al., 2008).

DESIRABLE AND UNDESIRABLE WEIGHTS

We judge the desirability of our weight with two criteria. One is attractiveness. Being the “wrong” weight often affects people’s self-esteem, and American females provide a clear example. A study of overweight 10- to 16-year-old Caucasians found that girls’ self-esteem declined sharply and consistently through those years, but boys’ self-esteem declined only during the early years (Mendelson & White, 1985). Perhaps as overweight boys get older, some degree of bulk is considered “manly.” And a survey of teenagers found that most of the girls and few boys were trying to lose weight, and many boys were trying to gain weight (Rosen & Gross, 1987). The greater concern among females than males about their weight—especially about being overweight—continues in adulthood (Forman et al., 1986). But cultural differences exist. Among overweight women in the United States, African Americans are more satisfied with their bodies than Whites are (Flynn & Fitzgibbon, 1998).

The other criterion for judging weight is healthfulness, based on data from studies of morbidity and mortality rates of men and women. Individuals who stay within certain weight ranges for their height have far lower rates of chronic illness and longer life spans than others do. Whether individuals do anything about their weight and what they do can have important implications for their health.

Overweight and Obesity

No matter how fit we are, our bodies have some fat—and they should. Having fat is a problem only when we have too much. The question is, how much is too much? Determining how much fat a person’s body has is not as easy as it may seem. Bulk or stockiness alone can be misleading since some stocky people simply have larger skeletal frames than others, or their bodies are more muscular. Until the mid-1990s, overweight was evaluated by the degree of excess over ideal weights given in tables. Today, these judgments are based on the body mass index (BMI): people are classified as overweight if their BMI is 25 or higher, and obese if their BMI equals or exceeds 30 (NCHS, 2009a). You can find your approximate BMI in Table 8.3 or calculate it exactly: for American measurements, multiply your weight in
pounds by 704.5 and divide twice by your height in inches
(for metric measurements, simply divide your weight
in kilograms twice by your height in meters). Although
the BMI doesn’t measure the amount of body fat an
individual has, professionals can use complex methods
that do (Perri, Nezu, & Viegener, 1992).

Sociocultural, Gender, and Age Differences in Weight Control

The prevalence of overly fat people varies with nationality,
sociocultural factors, gender, and age. Some national
differences can be seen in Table 8.4, which gives the
percentages of men and women who are obese in a variety of
countries—obesity rates are high in the United States and
low in Asian nations. And in most countries, obesity rates are higher among women than men.

Research has revealed a disturbing trend: among
children and the population as a whole in the United
States and other developed nations, the percentage
who are overly fat has increased substantially during
the last few decades (NCHS, 2009a; Wadden, Brownell,
& Foster, 2002). As Table 8.5 shows, the prevalence rates
of overweight for Americans has increased dramatically
for men and women and more than quadrupled for
children since the early 1970s. The reason is simple:
people are consuming more calories and engaging in
less physical activity than in the past. For instance,
in the three decades preceding 2000, Americans’ daily
consumption increased by 168 calories (7%) for men and
335 (22%) for women (CDC, 2004). Americans get heavier
throughout the early- and middle-adulthood years, with
the prevalence of overweight reaching and staying at
their highest levels from 50 to 75 years of age (NCHS,
2009a).

Table 8.3 Values of the Body Mass Index Calculated from Height and Weight, with Shading for Health-Related Categories: Underweight, Healthy Weight, Overweight, and Obese

<table>
<thead>
<tr>
<th>Height in ft. &amp; in.</th>
<th>Weight in Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>4’6”</td>
<td>130 140 150 160 170 180 190 200 210 220 230 240</td>
</tr>
<tr>
<td>4’8”</td>
<td>29 31 34 36 38 40 43 45 47 49 52 54</td>
</tr>
<tr>
<td>4’10”</td>
<td>27 29 31 34 36 38 40 42 44 46 48 50</td>
</tr>
<tr>
<td>5’0”</td>
<td>25 27 29 31 33 35 37 39 41 43 45 47</td>
</tr>
<tr>
<td>5’2”</td>
<td>24 26 27 29 31 33 35 37 38 40 42 44</td>
</tr>
<tr>
<td>5’4”</td>
<td>22 24 26 28 29 31 33 34 36 38 40 41</td>
</tr>
<tr>
<td>5’6”</td>
<td>21 23 24 26 27 29 31 32 34 36 37 39</td>
</tr>
<tr>
<td>5’8”</td>
<td>20 21 23 24 26 27 29 30 32 34 35 37</td>
</tr>
<tr>
<td>5’10”</td>
<td>19 20 22 23 25 27 29 30 32 34 35 37</td>
</tr>
<tr>
<td>6’0”</td>
<td>18 19 20 22 23 25 27 28 30 32 33 35</td>
</tr>
<tr>
<td>6’2”</td>
<td>17 18 19 21 22 24 26 27 28 30 31 33</td>
</tr>
<tr>
<td>6’4”</td>
<td>16 17 18 20 21 22 24 25 27 28 29</td>
</tr>
<tr>
<td>6’6”</td>
<td>15 16 17 19 20 21 22 23 24 25 27 28</td>
</tr>
</tbody>
</table>

Underweight BMI = below 18.5
Healthy weight BMI = 18.5–24.9
Overweight BMI = 25.0–29.9
Obese* BMI = 30 or more

*People with BMIs of 40 or more are described as extremely or morbidly obese.

Table 8.4 Percentages of Adult* Men and Women Who Are Obese (BMI = 30 or Higher) in Various Nations Around the World

<table>
<thead>
<tr>
<th>Country</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>20.5</td>
<td>25.5</td>
</tr>
<tr>
<td>Brazil</td>
<td>8.9</td>
<td>13.1</td>
</tr>
<tr>
<td>Canada</td>
<td>22.9</td>
<td>23.2</td>
</tr>
<tr>
<td>China</td>
<td>2.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Germany</td>
<td>20.5</td>
<td>21.1</td>
</tr>
<tr>
<td>Italy</td>
<td>7.4</td>
<td>8.9</td>
</tr>
<tr>
<td>India</td>
<td>1.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Netherlands</td>
<td>10.2</td>
<td>11.9</td>
</tr>
<tr>
<td>Singapore</td>
<td>6.4</td>
<td>7.3</td>
</tr>
<tr>
<td>South Africa</td>
<td>8.8</td>
<td>27.4</td>
</tr>
<tr>
<td>Sweden</td>
<td>11.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Turkey</td>
<td>na</td>
<td>22.7</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>22.3</td>
<td>23.0</td>
</tr>
<tr>
<td>United States</td>
<td>33.1</td>
<td>35.2</td>
</tr>
</tbody>
</table>

*Adults were usually defined as 15 and older; some countries used different lower age limits or applied upper limits. Although the data were collected recently, some are a few years older than others; na = data not available.
Sources: NCHS, 2009a, Table 75 (for the United States), WHO, 2009.
Table 8.5  Percentages of American Adult and Child Population Who Were Overweight (BMI = 25 or higher) in the Early 1970s and Today

<table>
<thead>
<tr>
<th>Years</th>
<th>Ages 6 to 11 Years</th>
<th>Ages 20 to 74 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Both Sexes</td>
<td>Men</td>
</tr>
<tr>
<td>1971–1974</td>
<td>4.0</td>
<td>54.7</td>
</tr>
<tr>
<td>2003–2006</td>
<td>17.0</td>
<td>72.6</td>
</tr>
</tbody>
</table>

Source: NCHS, 2009a, Tables 75 and 76.

Table 8.6  Percentage of White, Black, and Mexican American Men and Women Age 20 and Over Who Are Overweight (BMI = 25 or more) and Obese (BMI = 30 or more)

<table>
<thead>
<tr>
<th>Weight Status</th>
<th>White Male</th>
<th>White Female</th>
<th>Black Male</th>
<th>Black Female</th>
<th>Mexican Male</th>
<th>Mexican Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overweight</td>
<td>72.1</td>
<td>57.4</td>
<td>72.0</td>
<td>80.5</td>
<td>77.3</td>
<td>74.4</td>
</tr>
<tr>
<td>Obese</td>
<td>33.0</td>
<td>32.5</td>
<td>36.3</td>
<td>36.3</td>
<td>30.4</td>
<td>42.6</td>
</tr>
</tbody>
</table>

Source: NCHS, 2009a, Table 75.

Table 8.6 illustrates two important points about the body weights of American adults. First, the rates of overweight and obesity are extremely high across the three largest ethnic groups. Second, ethnic differences in overweight and obesity are clear and vary with gender. African American women have the highest rates of overweight and obesity, Mexican American women have the second-highest rate of obesity. The rates of obesity are similar for White men and women, Black men, and Mexican American men. White women have the lowest rates of overweight.

BECOMING OVERLY FAT

People add fat to their bodies by consuming more calories than they burn up through metabolism. Children who put on a lot of weight also eat much more fatty foods than others do (Robertson et al., 1999). The body stores excess calories as fat in adipose tissue, which consists of cells that vary in number and size (Logue, 1991). According to researcher Margaret Straw, the growth of adipose tissue throughout childhood and adolescence involves both an increase in cell size and in cell number. Thereafter, it appears that growth in adipose tissue is initially associated with an increase in cell size, if cell size becomes excessive, new adipose tissue is generated through an increase in the number of cells (1983, p. 223).

There are two main reasons why adults tend to gain weight as they get older. First, people often put on weight at certain times, such as during pregnancy or around holidays, without taking it all off; the balance accumulates across years (Amorim Adegboy, Linne, & Lourenco, 2008; Phelan et al., 2008). Second, physical activity and metabolism decline with age (Smith, 1984). To maintain earlier weight levels, people need to take in fewer calories and exercise more after weight gains and as they get older. Both biological and psychosocial factors affect weight control.

Biological Factors in Weight Control

Because the metabolic rates of individuals can differ greatly, some thin people consume many more calories than some heavy people do and still stay slim. Fat tissue is less metabolically active than lean tissue, so fatness itself can directly lower metabolic rate if fat tissue begins to replace lean tissue (Rodin, 1981, p. 362). This means that people who are obese may continue to gain weight even if they don’t increase caloric intake. Do heavy people eat more than normal-weight people? Yes, on average they do, and their diets contain more fats (Wing & Polley, 2001). Keep in mind that people’s self-reports of dietary intake without corroboration can be misleading. Underreporting dietary intake is very common and occurs more among heavy than normal-weight individuals, females than males, and people with little education (Klesges, Eck, & Ray, 1995; Lichtman et al., 1992).
Is heredity important in the development of obesity? Yes—for one thing, fatness of parents and their offspring are related (Whitaker et al., 1997). The chances of normal-weight children becoming obese by 30 years of age are low if their parents are of normal weight rather than obese. For obese children, the risk of being obese in adulthood is high even if they have normal-weight parents, and that risk doubles if their parents are obese. Of course, parent–child similarities may not be the result only of genetic factors: children learn many of their eating habits and physical activity patterns from their parents. But there is clearer evidence for the role of genetics:

- Twin and adoption studies have consistently found a genetic link in obesity (Wardle & Carnell, 2009; Wing & Polley, 2001).
- Evidence is mounting for a role of epigenetic processes in obesity (Waterland & Michels, 2007). Recall from Chapter 1 that environmental factors at critical times in the lifespan can produce chemical structures at DNA that can suppress a gene’s usual activity and be transmitted to one’s offspring.
- Researchers have identified specific genes in humans and animals that are linked to obesity (de Krom et al., 2009; Frayling et al., 2007; Wardle & Carnell, 2009). Two such genes are FTO, which affects the feeling of satiation and is linked to developing adipose tissue, and MC4R, which is associated with preferring and consuming high amounts of dietary fat.

But keep in mind three points about genetics and obesity. First, heredity is not destiny: a study found that people with the FTO gene who were very physically active were no heavier than others who did not have the gene (Rampersaud et al., 2008). This suggests that being physically active may overcome a genetic predisposition to be overweight. Second, we don’t know how many people have genes that promote weight gain or how much of their excess weight results from these genes. Third, the recent surge in obesity around the world could not have resulted only from changes in genes—environmental factors are important, too.

Part of the way heredity affects our weight seems to be described in set-point theory, which proposes that each person’s body has a certain or “set” weight that it strives to maintain (Keese, 1986; Wonderlich & Freiburger, 2004). The body tries to maintain its weight near the set-point by means of a thermostat-like mechanism that involves the hypothalamus. When a person’s weight departs from the set-point, the body takes corrective measures, increasing or decreasing eating and metabolism. According to the theory, people whose caloric intake is either drastically reduced or increased for a few months should show rapid corresponding weight changes initially, but the weight should then show slower changes and reach a limit. Studies have found that these predictions are correct and that people soon return to their original weight when they can eat what they want again (Leibel, Rosenbaum, & Hirsch, 1995; Sims, 1976; Wonderlich & Freiburger, 2004). But set-point theory is incomplete: it doesn’t explain, for instance, why some people who lose a lot of weight manage to keep it off.

How is the hypothalamus involved in regulating body weight? One way is by monitoring the blood for levels of two hormones, leptin and insulin, that increase or decrease in proportion to the amount of body fat the person has (Tortora & Derrickson, 2009). Leptin regulates circuits in the hypothalamus that stimulate and inhibit eating and metabolism. Insulin is produced by the pancreas and has a similar, smaller effect on the hypothalamus, but it also regulates the amount of sugar (glucose) in the blood, glucose’s conversion to fat, and the storage of fat in adipose tissue (Rodin, 1981, 1985). Obese people tend to have high serum levels of insulin—a condition called hyperinsulinemia—which increase one’s sensations of hunger, perceived pleasantness of sweet tastes, and food consumption. Taken together, these findings indicate that weight gain results from a biopsychosocial process in which physiological factors interact with psychological and environmental factors (Rodin, 1985).

It seems likely that the setting and function of the set-point in regulating weight depend on the number and size of fat cells in the body. Because the number of fat cells increases mainly in childhood and adolescence, the diets of individuals during that time in the life span are likely to be very important. Obese children have fat cells that are as large as those of adults (Knittle et al., 1981). As these children gain weight, they do so mainly by adding fat cells, which normal-weight children don’t do. Also, it appears that the number of fat cells can increase, but not decrease (Brownell, 1982). Individuals who develop too many fat cells—a condition called fat-cell hyperplasia—may be doomed to struggle against a high set-point for the rest of their lives. When fat-cell-hyperplastic adults try to lose weight, their fat cells shrink and send out metabolic signals similar to those during food deprivation. As a result, bodily mechanisms respond as though the person were starving, resulting in, among other things, an increase in hunger and a decrease in basal metabolism so that energy stores (i.e., fat) are maintained more efficiently. (Buck, 1988, p. 467)

This suggests that children’s dietary and exercise patterns may be critical in determining whether they become overly fat. Once a person’s set-point becomes established, changing it appears to be difficult. (Go to  )
Perhaps models in our social network affect our concept more if the partner was overweight (Salvy et al., 2009). An unfamiliar peer, and those who were overweight ate their eating partner ate a lot and was a friend rather than other research found that youths ate more at a meal if and exercise patterns gravitating toward one another. Seem to result simply from people with shared eating who and people with a close person in their social network to become obese themselves than people without close social ties to obese people (Christakis & Fowler, 2007). Another psychosocial factor in weight control is another factor is the person’s social network. A study found that individuals with a spouse or a same-sex sibling or friend who is obese are more likely in the next few years to become obese themselves than people without close social ties to obese people (Christakis & Fowler, 2007). And people with a close person in their social network who lost weight tended to lose weight. These links do not seem to result simply from people with shared eating and exercise patterns gravitating toward one another. Other research found that youths ate more at a meal if their eating partner ate a lot and was a friend rather than an unfamiliar peer, and those who were overweight ate more if the partner was overweight (Salvy et al., 2009). Perhaps models in our social network affect our concept of desirable body size, and we tend to adopt their eating patterns. If this is so, we’re generally unaware of these influences (Vartanian, Herman, & Wansink, 2008).

Other lifestyle factors are also important. For example, regularly drinking a lot of alcohol adds calories to the diet and reduces the body’s disposal of fat (Suter, Schutz, & lcquier, 1992, Tremblay et al., 1995). Being physically inactive lowers the rate at which the body burns calories. In adulthood, having a sedentary job may lead to overweight (Mummery et al., 2005). At all ages, watching TV can lead to weight gain by decreasing physical activity and by presenting mainly low-nutrient, sweet foods in shows and ads (Andersen, Crespo et al., 1998, Harris, Bargh, & Brownell, 2009, Story et al, 2008). In fact, watching some TV shows can reduce metabolic rates to below the person’s resting rate: a study compared obese and normal-weight children while they simply rested and while they watched a show (The Wonder Years). During the show, their metabolic rates dropped to 12% below resting rates for the normal-weight and 16% below for the obese children (Klesges et al., 1992).

Another psychosocial factor in weight control is the person’s sensitivity to food-related cues in the environment. Obese people are more sensitive than nonobese people to certain cues (Schachter, 1971). For example, compared with the amount normal-weight people eat, obese individuals eat more when food tastes good, but eat less when it tastes bad. This stronger responsiveness to food cues may explain why obese restaurant diners are more susceptible than nonobese diners to the influence of a waitress’s description or display of desserts (Herman, Olmstead, & Polivy, 1983). Because of this susceptibility to food-related cues, obese children may have difficulty controlling their eating at

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**HIGHLIGHT**

**Do “Fat-Bugs” Lead to Overweight?**

Obese people’s intestines are teeming with a type of bacteria, called Firmicutes, that lean people have in much smaller numbers (Bajzer & Seeley, 2006). Laboratory mice have the same pattern: obese mice have more of these bacteria than lean mice do. These bacteria are extremely efficient at drawing calories out of food, allowing the calories to be absorbed into the bloodstream. What happens to obese people’s Firmicute levels when they lose weight? Researchers tested this and found that the levels decline. What would happen if researchers were to transfer large numbers of bacteria from the guts of obese mice to normal-weight mice that have none of these bacteria? Researchers tested this, too, and found that the mice that received bacteria from obese mice gained more weight than a control group that received bacteria from lean mice.

These findings are intriguing, but there’s a lot we don’t know yet about the role of these “fat-bugs” in overweight. How much of one’s weight gain results from high levels of Firmicutes? Do set-point mechanisms, especially the role of leptin, influence the levels or functioning of these bacteria? Would removing or disabling Firmicutes in obese people help them lose weight?
home. Studies examining family behaviors at mealtimes have shown that parents give more encouragement for eating and offer food more often to heavier children than to slimmer ones (Baranowski & Nader, 1985). Another food-related cue that affects eating is the size of the dish and serving utensil the person uses: people serve themselves larger portions if the dish or utensil is larger (Wansink, van Ittersum, & Painter, 2006).

Immigrants to a new land encounter many changes in their lifestyles and food availability. How does this affect their weight? Researchers studied this issue in the United States longitudinally with about 4,500 immigrants. When these people arrived in the country, their rate of obesity was very low. But their weights increased over time, and after about 15 years, their prevalence of obesity almost equaled the high levels of people born and raised in America (Goel et al., 2004). Surely, a major reason for their increase in obesity is that they adopted their new culture’s unhealthy dietary and activity patterns.

Overweight and Health

In a study of overweight and normal-weight men and women, people were asked to rate their own health on a 10-point scale, where 1 equaled the “worst health” and 10 equaled the “best health” they could imagine (Laffrey, 1986). The ratings of the overweight and normal-weight individuals were about the same, averaging in the mid-7s. Are overweight and normal-weight people equally healthy?

To answer this question, we need to consider three factors, one of which is the degree of overweight. Research has clearly demonstrated that obesity is associated with high cholesterol levels and developing hypertension, heart disease, stroke, diabetes, and cancer (AHA, 2010; Bjørge et al., 2008; Calle et al., 2003; Kurth et al., 2003). This risk even applies to obese adolescents dying by the time they reach middle age. In general, the more severe the obesity, the greater the person’s risk of developing and dying from one of these diseases. Thus, a person whose BMI is over 32 has a much greater risk of morbidity and mortality from, say, heart disease than someone whose BMI is 26, whose risk may not be elevated very much. What’s more, the greater the BMI of overweight people, the more years they lose from their life span, as shown in Figure 8-3 (Fontaine et al., 2003). And adults’ medical costs are related to BMI: compared with costs for healthy-weight individuals, annual costs are 69% higher for severely obese and 43% higher for underweight people (Wang et al., 2003). Add to all of this the role of smoking: obese smokers have many times the risk of dying of cardiovascular disease before age 65 than normal-weight nonsmokers (Freedman et al., 2006).

The two other factors in the health risks of being heavy are people’s fitness and distribution of fat on the body. Among heavy people, those who are physically active and fit have much lower rates of death and of heart disease and diabetes than those who are sedentary (Blair & Brodney, 1999, Sui et al., 2007). Regarding body fat distribution, men’s fat tends to collect in the abdominal

![Figure 8-3](https://example.com/fig83.png)

**Figure 8-3** Years of life lost for obese Caucasian men and women in the United States as a function of their BMI in early adulthood. The number of years lost is the difference between the death ages for each BMI category and the life expectancies for same-age normal-weight people. Similar trends were found for African Americans, but the impact of BMI was less for the women and far greater for the men—for instance, among Blacks with BMIs at or above 45, the women lost about 5 years of life, and the men lost 20. (Abstracted from Fontaine et al., 2003, Figure 1.)
region, but heavy women have more of their fat on the thighs, hips, and buttocks. Research has found higher rates of hypertension, diabetes, coronary heart disease, and mortality among people with higher, rather than lower, ratios of waist to hip girth—that is, their waist measurements compared to their hip measurements (Wing & Polley, 2001). The heightened health risks when bodies are “rounded in the middle” may result from the unfavorable lipid levels and cardiovascular reactivity to stress these people show (Daniels et al., 1999; Goldbacher, Matthews, & Salomon, 2005).

**Preventing Overweight**

Each weekday morning, Amy and her son ride bikes to his school instead of taking a bus as part of a program to improve children’s fitness and weight control. Becoming obese presents disadvantages to health and social relationships in childhood and adulthood (Wadden, Brownell, & Foster, 2002). Is it true, as many people believe, that children tend to outgrow weight problems, or that they will find it easy to lose weight when they are interested in dating? Probably neither belief is true for most children (Brownell, 1986; Jeffery, 1998). Losing weight after becoming obese is not easy at any age, and this is one reason why it is important to try to prevent overweight.

Preventing overweight should begin early. Infant obesity and unusually fast weight increases are related to obesity in later childhood, adolescence, and adulthood (Baird et al., 2005). And obesity in childhood is likely to continue into adult life (Serdula et al., 1993). As Figure 8-4 depicts, the risk depends on the child’s age: the relationship to adult obesity is much stronger for obese 10- to 13-year-olds than infants. Normal-weight children don’t usually become obese adults. Another reason to begin early is to prevent the excess development of fat cells, which occurs in childhood and adolescence. Obese adults who were fat in childhood have the double burden of dealing with bigger fat cells and more of them. Parents who exercise control over the feeding process do in fact prevent weight gain in infants (Farrow & Blissett, 2006). Still, there’s a problem in preventing obesity in childhood: over one-third of parents of overweight children claim their child is “at about the right weight” (Jeffery et al., 2005; Maynard et al., 2003).

Most school nutrition programs have not been very successful at reducing future obesity, and those that have been tended to focus their efforts on females and students who volunteered to participate (Stice, Shaw, & Marti, 2006). Schools that simply provide menus with healthy alternative foods do not reduce the percentage of their students who are overweight (Veugelers & Fitzgerald, 2005). Children who are likely to need special preventive efforts to control their weight have a family history of obesity or have become overweight already (Jeffery, 1998). Efforts to help children control their weight need to focus on improving their diets and physical activity, involve cafeteria and educational facilities and staff, and enlist the cooperation of the parents (Baranowski & Hearn, 1997; Jeffery, 1998; Striegel-Moore & Rodin, 1985). Some researchers propose that societal law and policies should prevent obesity (Fabricatore & Wadden, 2006). For instance, laws in some communities now require labeling calories for foods in restaurant menus; when calories are labeled, patrons order fewer calories (Roberto et al., 2010).

Parents provide almost all the food that comes into the house, and most of the food their children eat. They also model and encourage eating and physical activity patterns. Nutritionists and other researchers have identified several ways parents can help their children avoid becoming overly fat (Peckenpaugh, 2007; Striegel-Moore & Rodin, 1985). These recommendations include:

- **Encourage regular physical activity and restrict TV watching.**
- **Don’t use unhealthful food rewards for eating a nonpreferred food** (e.g., “You may have dessert if you eat your peas”), use praise as the reward instead.
- **Decrease buying high-cholesterol and sugary foods of all kinds, including soft drinks,** for use in the home or elsewhere; avoid fast food restaurants.
- **Use fruits, nuts, and other healthful foods as regular desserts,** and reserve rich cakes and other less healthful desserts for special occasions or once-a-week treats.
- **Make sure the child eats a healthful breakfast** (with few eggs) each day and does not have high-calorie snacks at

![Figure 8-4](image-url)
night. Metabolism generally decreases later in the day, so calories consumed at night tend to become fat.

- Monitor the child's BMI on a regular basis.

Childhood is probably the ideal time to establish activity and dietary habits to prevent individuals from becoming overly fat. A potentially useful survey has been developed to assess modifiable nutrition and physical activity practices in families and predict a child's risk for obesity (Ihmels et al., 2009). Nurses at schools or pediatric clinics may be able to administer the survey and counsel parents on ways to lower the risk. (Go to www.)

**DIETING AND TREATMENTS TO LOSE WEIGHT**

Many millions of people around the world are dieting on any given day of the year, especially in the spring when they are getting ready to bare their bodies in the summer. In the United States alone, about 48% of the women and 34% of the men try to lose weight in a given year (Weiss et al., 2006). Some individuals try to lose weight because they are concerned about the health risks of being overly fat. Losing weight does in fact improve blood pressure and levels of lipids and lipoproteins (Reinehr et al., 2006; Weiss et al., 2006). Some individuals try to lose weight because they are concerned about the health risks of being overly fat. Losing weight does in fact improve blood pressure and levels of lipids and lipoproteins (Reinehr et al., 2006; Weiss et al., 2006). Some individuals try to lose weight because they are concerned about the health risks of being overly fat. Losing weight does in fact improve blood pressure and levels of lipids and lipoproteins (Reinehr et al., 2006; Weiss et al., 2006). Some individuals try to lose weight because they are concerned about the health risks of being overly fat. Losing weight does in fact improve blood pressure and levels of lipids and lipoproteins (Reinehr et al., 2006; Weiss et al., 2006). Some individuals try to lose weight because they are concerned about the health risks of being overly fat. Losing weight does in fact improve blood pressure and levels of lipids and lipoproteins (Reinehr et al., 2006; Weiss et al., 2006).

By American tastes, fatness is considered unattractive, particularly for females—and this confers important disadvantages for heavy people in social situations, such as dating. There is also a social stigma to being fat because many people blame heavy individuals for their condition, believing they simply lack willpower. Experiments have had high school and college girls rate the likeability and characteristics of girls they did not know (DeJong, 1980; Puhl & Latner, 2007). The ratings were less favorable for obese girls than for normal-weight girls and were especially low if the subjects thought the obese girl was to blame for her weight and was not trying to change it. The social aspects of overweight can be distressing to those who see themselves as being too heavy, and this often motivates them to try to lose weight. But many overweight individuals adopt these weight biases—and when they do, they are less likely to carry out self-management acts in a treatment program that could reduce their weight (Carels et al., 2009).

Most people try to reduce their weight on their own by “going on a diet.” In the United States, only about one-third of people who try to lose weight follow minimum guidelines to reduce calories and get 2 1/2 hours of exercise a week; many use poor dieting strategies, such as skipping meals and taking nonprescription supplements (Weiss et al., 2006). Using ineffective methods may account for a paradoxical finding: the more that teenage girls and boys try to control their weight, the greater their increases in weight in the long run (Field et al., 2003; Stice et al., 1999). Losing weight and keeping it off are difficult. The best approach for losing weight is to do it gradually and make lifestyle changes that the dieter and his or her family can accept and maintain permanently.

**HIGHLIGHT**

Which “Carbs” to Avoid

The turn of the century brought a diet craze: avoid carbohydrates (“carbs”). In the process of digestion, carbs increase glycemia, or level of sugar in the blood. Avoiding carbs as a general diet strategy ignores the fact that carbohydrates differ in the speed and intensity of conversion to sugar. The physical effect on the body of an amount of carbs in a serving combined with the speed and intensity of conversion can be expressed with a measure called the glycemic load (Brand-Miller et al., 2003). Foods that contain a lot of carbs per serving and raise blood sugar quickly and markedly have high glycemic loads; these foods require strong insulin responses and are digested quickly. In contrast, foods with low glycemic loads make lower insulin demands and spread them out, are digested slowly, and delay feelings of hunger. A study randomly assigned children to receive low or high glycemic-load breakfasts and found that those in the former condition ate less at lunch, where they could choose their diets freely (Warren, Henry, & Simonite, 2003).

Thus, not all carbs are equal in their effects, and we should try to avoid foods with high glycemic loads. Foods with low glycemic loads include most fruits, vegetables, nuts, and whole grains; foods with high glycemic loads include candies, russet potatoes (not new potatoes), and items containing refined grains, such as instant rice, corn flakes, and most cakes and pasta. Meats and most dairy products have low glycemic loads, but often contain high levels of cholesterol and saturated fats. Eating high-glycemic-load diets has been linked to the development of coronary heart disease, diabetes, and cancer (Mente et al., 2009; Miller & Gutschall, 2009; Peckenpaugh, 2007).
Chapter 8 / Nutrition, Weight Control and Diet, Exercise, and Safety

Losing weight is an important goal in many people's lives that brings great joy when it is clear that the effort worked.

People are more likely to succeed at losing weight if they have constructive social support from their families and others in their social network and if they have a high degree of self-efficacy or confidence that they can do it (Edell et al., 1987; Wing & Polley, 2001).

Although many overweight people succeed in making and sticking with the lifestyle changes needed to lose weight on their own, most do not (Rzewnicki & Forgays, 1987; Schachter, 1982). Many who do not succeed on their own feel they need help, and probably all people who seek help to lose weight have failed numerous times either to reduce or to maintain the new weight. What kinds of help do people seek, and what works?

Crash “Fad Diet” Plans

One kind of help millions of people try is the latest “crash” fad diet, which is often “guaranteed” to work in a short time. Some fad diets prescribe a strict dietary regimen with virtually no deviations permitted, and others have people eat certain types of food, such as only fruit, as in the “Beverly Hills diet,” or foods that are high in protein and fat and low in carbohydrates and sugar, as in the “Atkins Diet.” Some plans sell low-calorie liquid or solid replacements for part or all of the person’s diet, but provide little or no help in maintaining weight loss. To the extent that people stick to these diets, they lose similar amounts of weight with each diet across several months because they consume fewer calories (Dansinger et al., 2005; Sacks et al., 2009). No crash diet is a substitute for adopting a healthful lifestyle of exercise and moderately sized, balanced meals.

Exercise

Physical activity is an important component in controlling weight. One of its benefits is that it increases metabolism, thereby helping the body to burn calories. Unfortunately, dieters often fail to exercise as part of reducing because they notice that it takes a lot of exercise to use up a few hundred calories—for instance, they would have to jog about half an hour to burn off the 400 or so calories in a milkshake. But studies of dieting obese individuals have revealed a variety of benefits of exercise in weight control. One benefit of exercise occurs in the first few months: it focuses weight reduction mostly on body fat, while preserving lean tissue (Andersen et al., 1999). When overweight people combine exercise with reduced caloric intake, they lose more weight than with dieting alone, and the greater the exercise intensity, the greater the loss (Goldberg & King, 2007). After losing weight, continued physical activity helps maintain the reduced weight, especially if the activity is vigorous.

Lifestyle Interventions Using Behavioral and Cognitive Methods

People who try to lose weight usually find that changing their eating patterns is very hard to do. Why? A major reason is that they don’t know how to control antecedents and consequences in their environments that maintain their eating patterns. Behavioral methods have been developed to help dieters gain the control they need. Richard Stuart (1967) conducted a pioneering study of the utility of behavioral techniques, such as self-monitoring and stimulus control, in helping several obese women lose weight over a 12-month period. The results were impressive: each of the eight women who stayed with the program lost weight fairly consistently throughout the year, losing from 26 to 47 pounds.

The dramatic success of Stuart’s program led to the incorporation of behavioral methods in programs called lifestyle interventions, which are designed to modify diet and exercise in overweight people (Fabricatore & Wadden, 2006). Meta-analyses have shown that lifestyle interventions are very effective in helping overweight and obese adolescents lose weight (Epstein et al., 2007; Kitzmann et al., 2010). Research findings suggest three conclusions about lifestyle interventions (Fabricatore
& Wadden, 2006). First, these programs decrease initial body weight by 7% to 10% in 4 to 6 months. Second, lifestyle interventions are most effective in lowering weight and maintaining the loss when they provide meal replacements or structured meal plans, such as with menus and shopping lists. Third, although on average obese people who complete a behavioral program for weight control gain much of it back in the first year, many maintain their lower weight.

What techniques do lifestyle interventions for weight loss use? They are typically given in a group format with weekly meetings when participants submit records of their eating, are weighed, and receive information and feedback (Fabricatore & Wadden, 2006; Wing & Polley, 2001). And they usually include the following components:

- **Nutrition and exercise counseling.**
- **Self-monitoring** by having the person keep careful records of the foods eaten, where, with whom, and under what circumstances.
- **Stimulus control** techniques, such as shopping for food with a list, storing food out of sight, and eating at home in only one room.
- **Altering the act of eating**, for example, by chewing the food very thoroughly before swallowing and putting utensils down on the table between mouthfuls.
- **Behavioral contracting**, or setting up a system of rewards for sticking to the diet.

Two other features are important in lifestyle interventions for weight loss. First, having family or friends working as a team in the program enhances its success (Kitzmann et al., 2010; Wing & Jeffery, 1999). Having these people as weight-loss support partners is most successful if the partners lose weight, too (Gorin et al., 2005). Second, rewarding overweight individuals for not engaging in sedentary activities, such as watching TV or playing computer games, and unplugging the TV and computer are very helpful in promoting weight loss (Epstein et al., 2004).

Cognitive methods have also been used in weight loss programs. **Motivational interviewing**, which we’ve discussed in earlier chapters, is applied to increase the person’s commitment to and self-efficacy for change, it is helpful in promoting weight loss (Burke, Arkowitz, & Menchola, 2003). Another method, called **problem-solving training**, is designed to teach people strategies to help them deal with everyday difficulties they encounter in sticking to their diets (Perri, Nezu, & Viegener, 1992). Individuals often have difficulty sticking to a diet at family celebrations, when eating at restaurants, and when under stress, for instance. The skills learned in problem-solving training enable people to find solutions to these difficulties. Overweight people who can generate these kinds of solutions tend to lose more weight and have fewer lapses than do others (Drapkin, Wing, & Shiffman, 1995).

**CLINICAL METHODS AND ISSUES**

**Problem-Solving Training to Control Weight**

The cognitive method called problem-solving training can help people deal with a variety of behavioral and emotional difficulties by teaching them how to generate solutions to specific problems in their lives (Sarafino, 2001). For example, when people try to follow a low calorie diet, they often have trouble eating healthfully when they eat outside their own households, such as at restaurants, work, or sporting events. Here are some common problems these dieters face and examples of solutions they might produce.

**Problem:** I eat vending machine and restaurant food too much. How can I curb this?

**Solutions:** Prepare lunch and take it to work; eat with others who do the same. Take low calorie snacks with you to work, movies, sporting events, shopping malls, etc.

**Problem:** When I know I will be eating out, how can I choose a restaurant that will make it easier to stick to my diet?

**Solutions:** Identify restaurants in advance that have healthy selections. Avoid going to all-you-can-eat buffet restaurants that have tempting high calorie selections.

**Problem:** When faced with a restaurant menu that includes high calorie foods, how can I restrict the calories I eat?

**Solutions:** Learn about high and low calorie ingredients and preparation methods, such as frying versus grilling, and ask the waiter questions. Skim the menu to reject high calorie selections; read only low calorie options. If ordering a salad, ask for the dressing on the side; use only a little. If others are having dessert, either share one with another person or order fruit or sherbet. Ask about portion size; if too large, ask for smaller.
Self-Help and Worksite Weight-Loss Programs

There are dozens of commercial self-help organizations for weight control, and most of the largest ones provide group or individual support sessions; some of them, such as Jenny Craig and Weight Watchers, require members to buy their meal replacement products (Tsai & Wadden, 2005). Different self-help organizations have their own mix of methods to help people lose weight. Weight Watchers has members use behavioral methods, prepare their own meals, and attend group meetings for information and social support. Although little research has been done on the success of self-help groups, the evidence for Weight Watchers is the strongest so far, showing that this program produces moderate weight losses for those who complete them (Heshka et al., 2003; Tsai & Wadden, 2005). But dropout rates for self-help groups may be high, sometimes over 50% in the first 6 weeks alone (Stunkard, 1987).

Worksite weight-loss programs have been introduced and evaluated in a variety of businesses and industries. These programs generally used behavioral techniques, but were not very successful (Foreyt & Leavensley, 1991). High dropout rates and small weight losses have been common, suggesting that inadequate motivation is a major flaw. These problems can be reduced in two ways: gearing the program to the workers’ stages of readiness to change and providing incentives for participation (Gomel et al., 1993). Using teams in weight-loss competitions at worksites provides incentives and increases the amount of weight lost (Brownell et al., 1984; Wing & Polley, 2001). Also, a company might offer a prize for the team achieving the greatest percentage of a weight-loss goal. To help the teams do well, the company could provide information about nutrition, exercise, and behavioral methods, such as self-monitoring, stimulus control, and rewards.

Medically Supervised Approaches

Some approaches for losing weight involve medical procedures or require supervision by a physician. Because of the risks and side effects, these methods are recommended only for patients who are obese and have failed to control their weight with diet and exercise. One medical approach uses prescribed drugs, two of which are sibutramine, which suppresses appetite, and orlistat, which decreases intestinal absorption of ingested fat. Each of these drugs produces moderate weight loss, and combining pharmacological and behavioral treatments is more effective than either alone (Han & Yanovski, 2008; Phelan & Wadden, 2002; Snow et al., 2005). Another medical approach for losing weight involves placing the patient on a protein-sparing modified fast regimen that contains fewer than 800 calories per day (Han & Yanovski, 2008). Although this approach is safe, it requires vigilant medical supervision and promotes only short-term weight loss.

The most drastic medical approaches for losing weight involve bariatric surgery, procedures that change the structure of the stomach or intestines (AMA, 2003). The two most common forms of bariatric surgery alter the stomach. One form simply installs a band around the upper part of the stomach to create a little chamber with a small opening to the rest of the stomach. Because the chamber holds only an ounce or so, the person feels full after ingesting a small amount. The second form reduces the size of the stomach by literally stapling part of it up. Although bariatric surgery markedly reduces weight, it entails some surgical risk and possible side effects (Han & Yanovski, 2008; Snow et al., 2005). As a result, these methods are recommended only for patients who are extremely obese (BMI of 40 or more). Most bariatric surgery programs require psychological screening, and they may reject the procedure for patients with certain characteristics, such as current mental illness or heavy drinking (Bauchowitz et al., 2005). Another surgical procedure called liposuction sucks adipose tissue from the body with a tube, but is not a weight reduction method—its function is strictly cosmetic, “body sculpting.” It is used for removing fat from specific regions of the body, such as the thighs or abdomen. Although the procedure is usually safe, complications can include blood clots or even death (AMA, 2003).

We have considered methods for losing weight that range from adjusting one’s diet and exercising to using surgical procedures. When overweight people decide which approaches to use, they should first try to alter their diets and exercise conscientiously on their own, perhaps with behavioral methods and a support partner. If that doesn’t work, the next steps might be to join a reputable self-help group and then to get psychological or medical help.

Relapse after Weight Loss

The problem of relapse after completing treatment to lose weight is similar to that which many people experience after quitting smoking, drinking, or using drugs. The situations in which people who have lost weight overeat usually involve food cues, such as being at a restaurant or having a special meal, negative emotions, such as stress or depression, and boredom (Wing & Polley, 2001). Individuals who maintain their reduced weight for a few years stand a very good chance of maintaining that
When considering weight gain in the years after losing weight, keep in mind that people generally gain weight as they get older—1 or 2 pounds a year in middle-aged Americans, on average. A fair assessment of weight loss success should also take into account the weight dieters didn’t gain that other people do (Perri, Nezu, & Viegener, 1992).

Can we prevent relapse after weight loss? Michael Perri and his colleagues (1988) demonstrated that follow-up treatment programs can diminish the relapse problem after people lose weight, allowing them to maintain most of their loss. The treatment had two critical components: frequent therapist meetings to deal with problems individuals were having in maintaining their weight and social influences of other members who met as a group. Most lifestyle interventions today continue contact after people lose weight (Fabricatore & Wadden, 2006). Perri and colleagues (2001) later found that problem-solving training after weight loss with behavioral methods was also effective in helping clients maintain the loss.

Most people who lose weight do not use effective ways to maintain the loss. If you wanted to lose weight and keep it off, what methods could you use? Here are some:

- When losing the weight, use behavioral techniques—such as self-monitoring and stimulus control—to help you diet and increase exercise. Choose a reasonable final weight goal, and plan to lose weight gradually, such as a pound a week or less.
- After reaching your weight goal, permanently eat a low-calorie-and-fat diet. Pay attention to calories and use structured meal plans (Fabricatore & Wadden, 2006; Phelan et al., 2009). For carbohydrates, choose ones that have low glycemic loads. Stick to this diet fairly consistently throughout the week, including weekends (Gorin et al., 2004).
- Continue to exercise—it’s a strong predictor of long-term weight maintenance (Phelan et al., 2009; Wing & Polley, 2001). Weigh yourself each time you exercise.
- Avoid situations that prompt lapses, and reward good behavior. Occasional lapses are not a problem as long as you get back on track as soon as possible.
- Get social support from family and friends for maintaining your weight loss. Join a self-help or support group if you find that you have too many lapses.

**ANOREXIA AND BULIMIA**

Although gaining weight by overeating is a very common problem with psychosocial impacts, it is not a psychiatric disorder. In contrast, two less common eating problems—**anorexia nervosa** and **bulimia nervosa**—are included as psychiatric disorders in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) of the American Psychiatric Association (2000). People with these disorders use extreme ways to keep their weight down. Anorexia is illustrated in the following case study of a 19-year-old, 5’3” tall coed named Frances who had been 20 pounds overweight 6 years earlier. She weighed 83 lbs upon admission to therapy. She reported eating very little food each day (estimated to be less than 500 kcal). She exercised for at least 3 hours each day by attending aerobics classes and running. When she did consume a normal meal, she purged it via self-induced vomiting … . She never binged (i.e., ate large quantities of food). She was obsessed with fears of weight gain. (Williamson, Cubic, & Fuller, 1992, p. 367)

When she was younger, she had been teased by peers and repeatedly criticized by her mother for being overweight. As Frances’s case shows, **anorexia nervosa** is an eating disorder that involves a drastic reduction in food intake and an unhealthy loss of weight. People with this disorder are characterized by a weight at least 15% below normal (BMI at or less than 17.5), an intense fear of gaining weight, and a distorted idea of their body shape (Keel, 2010; Kring et al., 2010). The starvation in anorexia may be so extreme as to cause or contribute to the person’s death—for instance, by causing kidney failure, cardiac arrest, extremely low blood pressure, or cardiac arrhythmias (due to low levels of electrolytes, such as potassium) (Kring et al., 2010).
ASSESS YOURSELF

Your Weight Control Patterns

For each of the following questions, put a check mark in the preceding space if your answer is “yes.”

- Do you watch your calorie intake more carefully than anyone else you know?
- Is your BMI less than 19?
- Do you think gaining a few pounds during a holiday season would be a terrible thing?
- Have you ever eaten so much so quickly that you felt as though you had lost control of your eating?
- If yes, has this happened more than about 10 times in the past year?
- Have you ever eaten a lot and then tried to “purge” the food by using laxatives, diuretics, or self-induced vomiting?
- If yes, has this happened more than about 10 times in the past year?

How many “yes” answers did you give? A high number suggests that you may have an eating disorder. If your number is: from 3 to 5, you may want to consider getting professional help, especially if your situation seems to be getting worse; 6 or more, you should seek help right away. You can find help through your college’s counseling office or by contacting professional organizations, such as the American Psychological Association and the American Psychiatric Association, which are in Washington, DC. (Based on material in Brownell, 1989; Kring et al., 2010; Logue, 1991.)

Bulimia nervosa is characterized by recurrent episodes of binge eating, generally followed by purging by self-induced vomiting, laxative use, or other means to prevent gaining weight, such as excessive exercise (Becker, 2010; Kring et al., 2010). These episodes often occur when feelings of positive affect are low and stress and negative emotions are high (Smyth et al., 2007). People with bulimia nervosa appear to experience chronic high stress levels (Ludescher et al., 2009). This disorder can cause a wide range of medical problems, including inflammation of the digestive tract and cardiac problems, such as arrhythmias. Bulimic individuals are aware that their eating pattern is abnormal, are fearful of having lost control of their eating, and tend to be depressed and self-critical after a bulimic episode. Many people exhibit some bulimic behaviors, such as purging, but are not classified as bulimic because they engage in these behaviors infrequently.

It is difficult to know how prevalent eating disorders are. A study that compared women’s medical records with returned surveys on eating disorders to the researchers found that many of those who did not return the survey did in fact have eating disorders (Beglin & Fairburn, 1992). Thus, existing data are likely to be underestimates. Estimates of prevalence for the general population in Western cultures are 0.5–1.0% for anorexia and 1–2% for bulimia, with more than 90% of diagnosed cases being females, and these disorders are becoming increasingly common in other cultures (Becker, 2010; Keel, 2010; Kring et al., 2010). Anorexia is especially common among dance students, models, and athletes who feel pressured to control their weight (French & Jeffery, 1994).

Why People Become Anorexic and Bulimic

What causes the eccentric eating habits of anorexia and bulimia? The answer is still unclear, and researchers have suggested biological, psychological, and cultural factors that may be involved. There is evidence for genetic and physiological links to these disorders (Becker, 2010; Keel, 2010; Kring et al., 2010). For example, studies have examined the occurrence of anorexia and bulimia in twins and found that these disorders are far more likely to appear in both twin members if they are identical twins rather than fraternal twins. Other research findings indicate that the functioning of neuroendocrine and neurotransmitter processes may be abnormal in eating-disordered individuals.

Cultural factors may provide the answer to two obvious questions about these eating disorders. Why is the prevalence of anorexia and bulimia particularly high among White females, and why has it increased in recent years? In the United States, Black girls have lower prevalence rates of eating disorders than White girls, partly because they tend to be less concerned about their weight even when they are heavy (Abrams, Allen, & Gray, 1993). Beauty plays a central role in the sex-role stereotype of women in many cultures, and Western
cultures have witnessed recent changes in their ideals about female beauty (Striegel-Moore, 1997). Years ago, the "ideally beautiful woman" had a figure that was more rounded, with larger bust and hip measurements. After 1960 or so, the ideal figure of a woman became much thinner, and the social pressures on women to be slender increased. Caucasian females are more likely than males to wish they were thinner and to diet, and these gender differences begin to show up by age 11 or so (Cohen, Brownell, & Felix, 1990). In social interactions with other children, parents, and teachers, girls more than boys are given the message: thin is better (Attie & Brooks-Gunn, 1987). And once the message is clear, they reach puberty, when girls add an average of over 20 pounds of fat to their bodies while boys add muscle. This is a no-win situation for adolescent girls. How do they deal with it?

When adolescents—especially females—start trying to control their weight, they typically adjust their diets in a normal manner, but for many teens the methods they use become more extreme, involving occasional fasting or purging. A study found that about 13% of 15-year-olds engaged in some form of purging behavior, mainly on a monthly basis or less, with the rate for females being twice as high as that for males (Killen et al., 1986). Prospective evidence indicates that individuals who become anorexic and bulimic typically start out dieting normally but have relatively strong concerns about their weight, and then begin using more extreme methods (French & Jeffery, 1994; Killen et al., 1994). Dieters with strong weight concerns may come to rely more and more on fasting and purging because these methods keep weight off, and this pattern becomes entrenched in those who become bulimic, especially if they were overweight in childhood (Fairburn et al., 2003). The development of eating disorders has been linked to the prior experience of chronic stress and other psychiatric difficulties, often with a major life event in the weeks before the disorder's onset (Rojo et al., 2006).

Why does disordered eating become so compulsive? People who are extremely concerned about their weight tend to see themselves as round-faced and pudgy, even when others do not. Studies using ingenious apparatuses, such as special projectors, have shown that the great majority of women overestimate their size and generally perceive themselves to be one-fourth larger than they really are (Thompson, 1986). Although men make similar errors, they do so to a much lesser degree—and, unlike women, many of these men may want to be larger. Body size overestimation is very pronounced among anorexic individuals, and the idea that they are overweight persists long after they have become slim. When they are reduced to skin and bones, anorexic individuals still claim to be "too fat" and greatly overestimate their size (Askevold, 1975; Crisp & Kalucy, 1974). Another factor that ties in here is the relatively high levels of the personality trait of perfectionism that people with anorexia and bulimia tend to have (Becker, 2010; Keel, 2010). That is, no matter how hard these individuals strive to achieve their "perfect" body, they are never satisfied. Interventions delivered on computers or in person can reduce the risk of developing eating disorders in people who are very dissatisfied with their body shapes (Franko et al., 2005; Stice, Shaw, & Marti, 2007).

Treatments for Anorexia and Bulimia

Because anorexia nervosa involves a severe and health-threatening underweight condition, the first priority in treating this disorder is to restore the person's body weight and nutrition to as near normal as possible. This is often done in a hospital setting. Treatment with behavioral techniques is effective for putting weight on (Kring et al., 2010). But keeping the weight on is difficult; about half of previously treated anorexics continue to...
have eating problems and often show other social and emotional difficulties, such as depression. The main form of psychological therapy for anorexia involves the patient’s family and often focuses on the dynamics of mealtime interactions; drugs to treat depression or other disorders are also used (Keel, 2010; Kring et al., 2010).

Psychotherapy is more effective for bulimia than anorexia, particularly when it includes behavioral and cognitive methods (Becker, 2010; Hay et al., 2009; Kring et al., 2010). These methods—such as self-monitoring, reinforcement, and cognitive restructuring—focus on reducing binging and purging behaviors; sometimes drugs are added to these approaches to decrease depression. Treatment is less effective for clients with bulimia who have very high initial rates of binging and purging and a history of substance abuse (Wilson, Loeb et al., 1999).

We have discussed the problems people have in controlling their weight through adjustments in their diets. We have also seen that exercise can play an important role in reducing body fat and, thereby, can enhance people’s health. The next section examines exercise as a means of becoming fit and keeping well.

**EXERCISE**

Sometimes it seems like a fitness boom has occurred in many nations. For instance, the proportion of Americans who exercise doubled in the 20 years after the early 1960s (Serfass & Gerberich, 1984). Joggers and bicyclists today can be seen on roads and paths in cities and out in the country, and fitness clubs have sprung up everywhere. But in the United States and most other industrialized countries, adults’ lifestyles still include very little or irregular physical activity (Brownson, Boehmer, & Luke, 2005; Sallis & Owen, 1999). We’ve all heard that exercise is healthy. We’ll see why in this section. (Go to .)

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**THE HEALTH EFFECTS OF PHYSICAL ACTIVITY**

If you asked fitness-conscious people why they exercise, they’d probably give a variety of reasons: “Exercising helps me keep my weight down,” “I like it when I’m in shape—and so does my boyfriend,” “It helps me unwind and relieves my tension,” “Being in shape keeps me sharp on my job,” “I don’t get sick as often when I’m fit,” and “It makes people’s hearts stronger, so they live longer.” These answers describe psychosocial and physical health benefits of exercising and are, for the most part, correct.

**Psychosocial Benefits of Exercise**

Three psychosocial benefits of exercise have been shown in many studies. First, engaging in regular vigorous exercise is associated with lower feelings of stress and anxiety, as we discussed in Chapter 5. Second, people who engage in a fitness program with aerobic exercise show improved cognitive processes, such as in making fewer errors and having better memory (Quick et al., 1997; Smith et al., 2010). Third, participating in regular exercise is linked to enhanced self-concepts of individuals, especially children (Dishman, 1986; Sallis & Owen, 1999). Self-concept enhancements may occur because these people are able to maintain an attractive appearance and engage successfully in sports activities, as a result, they receive many social advantages that accrue with being fit.

But keep in mind two issues about psychosocial benefits from exercise. First, most studies on stress and self-concept used correlational or retrospective methods, making it difficult to determine cause-effect relationships. Some evidence suggests that part of the self-reported benefits may have resulted from a placebo effect of the subjects’ expecting that psychosocial benefits would occur (Desharnais et al., 1993). Second, the extent to which individuals experience these benefits appears to depend on their genetic makeup (Mata, Thompson, & Gotlib, 2010).

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**HIGHLIGHT**

**Types and Amounts of Healthful Exercise**

All physical activities—even just fidgeting—use energy and burn calories. Exercise is a special class of physical activity in which people exert their bodies in a structured and repetitive way for the sake of health or body development. There are several types of exercise, each with its own form of activity, physical goals, and effects.

**Isotons, Isometrics, and Isokinetics**

**Isotonic exercise** builds strength and endurance by the person’s moving a heavy object, exerting most of the muscle force in one direction. This type of exercise includes weight lifting and many calisthenics. In doing push-ups, for example, most of the exertion occurs in raising the body.

(continued)
HIGHLIGHT (Continued)

**Isometric exercise** builds mainly strength rather than endurance—the person exerts muscle force against an immovable object. For example, in the “chair lift,” the person sits in a standard unupholstered chair, grasps the sides of the seat with both hands, and pulls upward, straining the arm muscles. The seat doesn’t move.

**Isokinetic exercise** builds strength and endurance—the person exerts muscle force to move an object in more than one direction, such as forward and back. Isokinetic exercise usually requires special equipment, such as Nautilus machines.

**Aerobics**

The word *aerobic* literally means “with oxygen.” What does oxygen have to do with exercise? When we exert ourselves physically, the energy for it comes from the metabolic process of burning fatty acids and glucose in the presence of oxygen. Continuous exertion at high intensity over many minutes requires a great deal of oxygen. Being “fit” means the person consumes a high *volume of oxygen* (VO$_2$) per heartbeat during exertion.

The term *aerobic exercise* refers to energetic physical activity that requires high levels of oxygen over an extended time, say, 20 minutes. Aerobic activities generally involve rhythmical actions that move the body over a distance or against gravity—as occurs in fast dancing, jogging, bicycling, swimming, or certain calisthenics. Performing aerobic activity with sufficient intensity and duration on a regular basis increases the body’s ability to extract oxygen from the blood and burn fatty acids and glucose.

**An Ideal Exercise Program for Health**

How much and what kinds of exercise are best for fitness? The answer depends on the individual’s age, current health and physical capacity, goals, interests, and opportunities, such as whether facilities or partners are available (Insel & Roth, 1998). Almost all individuals need to begin with a moderate *starter program* and progress in a gradual manner toward fitness; people who are elderly or less fit should progress more slowly than others. Starting gradually avoids muscle soreness and injury and allows the body to adapt to increasing physical demands.

Americans spend an average of 6 hours a day performing physical activities (Matthews et al., 2008). An ideal exercise program would add the equivalent of 30 minutes a day of moderate-intensity physical activity, such as walking briskly (USDA, 2005). This translates to about 3 hours of exercise a week, which can be divided into three to six sessions, each having three phases (Blair et al., 1992; Insel & Roth, 1998).

1. **Warmup.** Each session should include two types of warmup activities: (1) stretching and flexibility exercises, for various major muscle groups, such as of the neck, back, shoulders, abdomen, and legs; and (2) strength and endurance exercises, such as push-ups, pull-ups, and lifting.

2. **Aerobic.** The next 20 minutes or more involves rhythmical exercise of large muscle groups, performed vigorously, raising the heart (pulse) rate to a moderately high target range. One way to estimate the target range for an adult is to use a formula based on the person’s age: the *minimum* heart rate equals 160 pulse beats per minute minus the person’s age; the *maximum* is 200 minus age (La Place, 1984). Thus, 30-year-olds would maintain their heart rate between 130 and 170 beats per minute during aerobics.

3. **Cool-down.** The last few minutes of exercise should taper off in intensity to return the body to its normal state. These exercises can include calisthenics or walking.

Although this ideal seems fairly rigid, there is room for variation. For instance, individuals who exercise at the upper end of their target range can use fewer or shorter exercise periods each week. People can also tailor the program to their goals and interests by varying the exercises they perform during each phase and across sessions, such as by varying the aerobics they do: jogging on one day, skipping rope on another, swimming on another, and so on. If they want to firm their abdomens, they can focus on appropriate activities during the warmup and cool-down phases.

**Is the Ideal Necessary to Benefit Health?**

Not all people can or will get the ideal amount and type of physical activity. Can they benefit from less? Absolutely, and the activity needn’t be “exercise”—it can be riding a bike or gardening, for instance—and it can occur in, say, 10-minute periods rather than all at once (Phillips, Kiernan, & King, 2001). Although the greatest health benefits accrue with vigorous activity, avoiding an almost completely sedentary lifestyle is critical.
Physical Benefits of Exercise

Of the many physiological effects that physical activity produces, one effect is especially intriguing: vigorous exercise seems to increase the body’s production of endorphins, which are morphinelike chemical substances. Studies have shown that endorphin levels in the blood are higher after exercise than before (Carr et al., 1981). Some researchers claim that the euphoric “runner’s high” that many individuals feel after a very vigorous aerobic workout results from high levels of endorphins reaching the brain, which then decreases stress and sensations of pain. But evidence for these possibilities is unclear (Phillips, Kiernan, & King, 2001).

Exercise can enhance many aspects of people’s physical fitness throughout the life span. In childhood, aerobic exercise improves agility and cardiovascular function (Alpert et al., 1990). What about much later in the life span, when people generally show a gradual decline in their flexibility, strength, and endurance? This decline occurs partly because many individuals get less exercise as they get older. Compared with people who are sedentary in mid-life, individuals who have physically active lifestyles have higher physical function years later (Hillsdon et al., 2005). And an 18-year longitudinal study of men who were over 50 years of age at the start of the study and who engaged in aerobic exercise regularly found that their work capacity decreased only slightly across the 18 years, whereas men in the general population tend to show a 1–2% decrease per year (Kasch, Wallace, & Van Camp, 1985). Also, the resting blood pressure and percentage of body fat of these men did not show the increases that usually occur during these years. The evidence clearly indicates that engaging in aerobic exercise curbs the usual decline in fitness that people experience as they get older (Buchner et al., 1992).

The physical benefits from regular exercise are reflected also in people’s health and longevity, even if they are overweight (Carlsson et al., 2007; Koster et al., 2009; Leitzmann et al., 2007). Vigorous exercise produces the greatest gains, but even taking brisk walks or expending energy in everyday activities, such as climbing stairs, can benefit longevity (Kuulaja et al., 1998; Manini et al., 2006). The main health benefits of exercise relate to preventing cardiovascular problems and some forms of cancer (Phillips, Kiernan, & King, 2001; Sallis & Owen, 1999). Many studies have found that people who regularly engage in vigorous physical activity are less likely to develop and die from coronary heart disease (CHD) than those who lead relatively sedentary lives (Powell et al., 1987; Weinstein et al., 2008). Although no experimental research has been done in which humans were randomly assigned to exercise and nonexercise conditions, research with animals and prospective studies with humans indicate that the link between physical activity and reduced risk of CHD is probably causal. Table 8.7 describes ways by which fitness and physical activity protect individuals against cardiovascular disease.

The risk of developing cancer has been linked to low physical activity. The evidence is fairly strong for colon cancer and more modest for other cancers, such as the breast and prostate (Sallis & Owen, 1999). Although the reason for this link is unclear, part of it may involve the beneficial effect of both immediate and long-term exercise on the immune system. One study tested healthy, physically active adults and found that vigorous exercise sessions increased their natural killer cell number and function (Fiatarone et al., 1989).

### Are There Health Liabilities to Exercise?

Not all effects of exercise are beneficial—there can be hazards as well. One hazard occurs when people jog or bicycle in traffic, of course, risking a collision. But the most common problems that arise involve injury to bones or muscles from other kinds of accidents and from overstraining the body (Sallis & Owen, 1999). For instance, high impact exercises, such as jogging and tennis, can injure joints and lead to arthritis. Many injuries happen to people who do not exercise regularly or are beginners, mainly from overtaxing their bodies and from unsafe exercise conditions, such as having improper shoes. Exercising too long in very hot weather can lead to heat exhaustion—with symptoms of dizziness, rapid and

### Table 8.7 How Physical Activity/Fitness Protects Cardiovascular Health

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
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<tbody>
<tr>
<td>Blood pressure</td>
<td>People who are active and fit have lower systolic and diastolic blood pressure than those who are not, and they are less likely to develop hypertension (Blair et al., 1992; Haskell, 1984). Exercise lowers blood pressure in people with and without hypertension (Braith et al., 1994; Kokkinos et al., 1995; Martinez-Gomez et al., 2009).</td>
</tr>
<tr>
<td>Lipids</td>
<td>Physical activity improves serum lipid levels—it raises HDL and lowers LDL and triglycerides (Szapary, Bloedon, &amp; Foster, 2003).</td>
</tr>
<tr>
<td>Reactivity to stress</td>
<td>Fit individuals show lower heart rate and blood pressure reactivity to stress than unfit people do (Forcier et al., 2006).</td>
</tr>
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weak pulse, and headache—or a more severe condition called heat stroke, which can be fatal.

Sudden cardiac death can occur when exercising. Autopsy reports for individuals who had died in association with exercising typically reveal that the cause was cardiac arrest, and most of them had cardiovascular problems that existed prior to the attack (Northcote, Flannigan, & Ballantyne, 1986). Most of these problems could have been detected by medical screening, which does in fact reduce the risk of sudden death (Corrado et al., 2006). Cardiac arrest from exercising is unlikely—one case per 1.5 million sessions of physical exertion—and occurs much less frequently in people who exercise five times rather than once a week (Albert et al., 2004). Physicians and physical therapists can prescribe exercise programs for people with specific health problems, such as diabetes and CHD.

Another health hazard that relates to exercise is people’s use of anabolic steroids—male hormones that build tissue—to increase muscle size and strength. Many more males than females use steroids, and most users are athletes (AMA, 2003; Strauss & Yesalis, 1991). Using steroids for an extended period has several negative health effects. It raises LDL and lowers HDL serum cholesterol and is related to liver and kidney tumors and to heart attacks and strokes. It also has a permanent masculinizing effect in women, increasing facial hair and lowering the voice, for instance. In males, it increases acne and balding and decreases the size and firmness of testes, at least temporarily. Some who use steroids share needles with others, putting each other at risk for HIV infection (DuRant et al., 1993).

Conclusions regarding the health effects of exercise are fairly clear. Frequent physical activity, especially vigorous exercise, is psychologically and physically healthful, particularly for preventing heart disease. People who begin exercise programs should guard against overtaxing their bodies, exercise under safe conditions with proper skills, and have periodic medical examinations to determine whether any underlying risks exist. Although more people exercise today than was the case decades ago, most adults in industrialized countries do not get enough regular and energetic physical activity.

WHO GETS ENOUGH EXERCISE, WHO DOES NOT—AND WHY?

Most people in the United States and other developed nations do not get enough exercise. Many individuals who could be physically active in their normal lifestyles choose not to be—they may take rest breaks rather than sustaining an activity or opt to use a machine instead of doing a task manually. The high physical activity of early childhood declines sharply during adolescence: for instance, only half of American teenagers are vigorously active on a regular basis (Duncan et al., 2007; Marcus et al., 2000). Teens with high levels of physical activity tend to have high activity levels in adulthood, too (Telama et al., 2005). Because little is known about people’s everyday physical activities, we will emphasize factors associated with doing and not doing exercises.

Gender, Age, and Sociocultural Differences in Exercise

Physical activity varies across cultures. Probably most people around the world have lifestyles that provide regular, vigorous, and sustained activity naturally, without actually doing exercises. They commute to work by bicycle, for instance, or have jobs that involve energetic work, as farmers, laborers, and homemakers often do.

Demographic patterns give a portrait of who exercises in the United States. Adults who exercise tend to have more income and education than those who don’t exercise and are more likely to be men than women and White than Black or Hispanic (NCHS, 2009a). Also, adults who exercise tend to have exercised regularly in the past (Dishman, 1991). Similar patterns exist in other industrialized countries, such as Australia (Sallis & Owen, 1999). Another factor is age—as adults get older, most tend to engage less and less in physical activity, not so much because of declining physical functioning but because of changes in their beliefs and attitudes (Sarkasian et al., 2005; Vertinsky & Auman, 1988). They often have exaggerated expectations of decreased physical ability, risk of injury, fear of failure, and others’ disapproval regardless of exercise in old age, and these ideas are particularly strong among many of today’s elderly women.

Women seem to learn from past sex-role experiences that men are more socially and physically suited to vigorous activity than females. Although both male and female older people tend to underrate their physical capabilities and exaggerate their health risks in performing energetic exercise after middle age, women are especially prone to these beliefs (Vertinsky & Auman, 1988; Woods & Birren, 1984). Health care workers and organizations for the elderly have many opportunities to dispel incorrect beliefs about health risks, change sex-role stereotypes regarding exercise, and encourage active lifestyles.

Reasons for Not Exercising

When individuals are asked why they don’t exercise, the most common reason they give is that they cannot find the time (Dishman, 1991; Godin et al., 1992). Actually, of course, most people could have the time but choose
to use it in other ways. People also report not exercising because they have no convenient place to do it or because the weather or other environmental conditions make it unpleasant or impossible.

Whether people exercise is also related to the amount of stress in their lives, social influences, and their beliefs. People who exercise regularly tend to skip sessions when they experience high levels of stress (Stetson et al., 1997). Social influences on exercise involve modeling, encouragement, and reinforcement by peers and family. Adults who exercise tend to have spouses who encourage them to do so, and children and adolescents who exercise or engage in sports tend to have friends or family who also do so (Dishman, Sallis, & Orenstein, 1985; Gottlieb & Baker, 1986; Sallis et al., 1988). People's beliefs can influence exercising in at least four ways:

- People with high self-efficacy for their ability to perform and maintain exercise are more likely to do it and stick with it than those with low self-efficacy (Anderson et al., 2006; Armitage, 2005; Sniehotta, Scholz, & Schwarzer, 2005).

- Perceived susceptibility to illness can spur people to exercise. People who received information describing their level of fitness or indicating they might be susceptible to health problems that could be prevented through exercise were more likely to start exercising than others who did not get such information (Godin, Desharnais et al., 1987; Wurtele & Maddux, 1987).

- Perceived barriers reduce exercise; enjoying exercise increases it (Rhodes, Fiala, & Conner, 2009; Sallis et al., 2007; Salmon et al., 2003). The barriers can be personal, such as feeling tired or having work commitments, or environmental, such as cost, weather, or safety. But keep in mind that people who are overweight and sedentary tend to perceive barriers to physical activity when there are none (Gebel, Bauman, & Owen, 2009).

- Compared to people who believe they failed to stick with an exercise program, those who believe they succeeded are more likely to resume exercising in the future, even if they had dropped out of the program (Shields, Brawley, & Lindoever, 2005).

A study found evidence of a biopsychosocial sequence that influences whether people will continue to exercise after starting. Genetic factors influence the amount of exertion individuals perceive as they exercise, which affects the mood they feel after exercising, which influences their intention to exercise in the future (Bryan et al., 2007). Individuals who experience positive moods after exercising tend to stick with it.

People who do not exercise tend to have other risk factors for developing serious illnesses, such as by being overweight or smoking cigarettes. From the standpoint of performing health-protective behavior, people whose health would benefit most from physical activity seem to be the most resistant to starting or maintaining an exercise program. Quitting smoking may help; a study of smokers found that those who quit were more likely to start exercising than those who didn't (Perkins et al., 1993).

**PROMOTING EXERCISE BEHAVIOR**

A person who spends time watching youngsters play is likely to have the impression that children are innately very active—running, jumping, and climbing—and that they do not need to be encouraged to exercise, as older individuals do. Some children seem to find physical activity naturally reinforcing (Epstein et al., 1999). Although most children and adolescents are more active than adults, many children are not active enough (Marcus et al., 2000). School-based programs are effective at increasing the amount of time children spend in physical activity and fitness, but are less successful in increasing the percentage of children who are active in leisure time (Dobbins et al., 2009). People of all ages could benefit from school, park, and worksite recreation programs and facilities, such as parks and trails, to promote exercise (Giles-Corti et al., 2005; Sallis et al., 2006).

To obtain the full health benefits of physical activity, people need to exercise or be very active as a permanent part of their normal lifestyles. Few people in industrialized societies achieve this ideal. Of individuals who are already exercising regularly at any given time, about half will quit in the coming year (Dishman, Sallis, & Orenstein, 1989). Table 8.8 presents several strategies that help people start and continue exercising. These strategies can be applied by individuals who decide on their own to start or by organized interventions to promote exercise in target populations, such as school children, workers, or the elderly.

Note five additional points. First, we can promote physical activity by giving rewards for increased exercising and for decreased sedentary behavior (Epstein, Saelens, & O’Brien, 1995). Second, physicians can increase physical activity in sedentary patients by giving verbal advice and written plans for specific behaviors and goals (Grandes et al., 2009). Third, sedentary people who are willing to increase their activity are more likely to stick with an exercise routine that requires a high frequency (5 or more days per week) than a high intensity (Perri et al., 2002). Fourth, individuals in an exercise program who are more likely than others to reach and maintain moderately high exercise levels have higher incomes and exercise self-efficacy, are more fit, and are more likely to
People of all ages can benefit from exercise programs. These children are in a physical education class.

see neighbors being physically active (King et al., 2006).

Fifth, people are more likely to stick with an exercise program if they can deal with lapses or setbacks constructively, such as by expecting them and attributing them to temporary factors (Schwarzer et al., 2008).

Interventions can promote exercise with various populations, particularly if they include behavioral methods to modify the antecedents and consequences of physical activity (Sallis & Owen, 1999). Interventions since the late 1980s that have included strategies like those in Table 8.8 have reported higher rates of exercise adherence and fewer dropouts than earlier programs (Marcus et al., 2000). Two other strategies appear to increase success. First, providing contact by telephone to assess progress and give advice when there are problems improves interventions’ success (Marcus et al., 2000). Second, an important factor in people’s starting and sticking with an exercise routine is their readiness to do so.

Table 8.8 Strategies to Promote Exercising

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preassessment</td>
<td>Before people begin an exercise program, they need to determine their purposes for exercising and the benefits they can expect. They should also assess their health status, preferably through a medical checkup.</td>
</tr>
<tr>
<td>Exercise selection</td>
<td>The exercises included in the program should be tailored to meet the health needs of the individual and his or her interests and purposes, such as firming up certain parts of the body. People are more likely to stick with the program if it includes exercises that they enjoy doing.</td>
</tr>
<tr>
<td>Exercise conditions</td>
<td>Before people start an exercise program, they should determine when and where they will exercise and arrange to get any equipment they will need. Some people seem to adhere to a program if they pick a fixed time for exercising and refuse to schedule anything else at that time; others can be more flexible and still make sure to exercise about every other day. The exercise conditions should be safe and convenient.</td>
</tr>
<tr>
<td>Goals</td>
<td>Most people adhere to a program more closely if they write out a specific sequence of goals and consequences for exercise behavior in a behavioral contract. The goals should be graduated, beginning at a modest level. They should also be measurable—as body weight or number of push-ups would be—rather than vague, such as “to feel good.”</td>
</tr>
<tr>
<td>Consequences</td>
<td>Exercise should lead to reinforcement. Some individuals may need tangible reinforcers to maintain their exercise behavior in the early stages of the program. After these people get in shape, many will find that the enjoyment of exercise and the physical benefits are sufficient rewards.</td>
</tr>
<tr>
<td>Social influence</td>
<td>People are more likely to start and stick with an exercise program if these efforts have the support and encouragement of family and friends. Exercising with a partner or in groups sometimes enhances people’s motivation to continue in a program.</td>
</tr>
<tr>
<td>Record keeping</td>
<td>People can enhance their motivation to exercise by keeping records of their weight and performance. Seeing on paper how far they have progressed can be very reinforcing.</td>
</tr>
</tbody>
</table>

Sources: Dishman, Sallis, & Orenstein, 1985; Oldridge, 1984; Sallis & Owen, 1999; Serfass & Gerberich, 1984.
in terms of the stages of change model (see Chapter 6). People who are at the contemplation stage—that is, they’re already considering the change—are more likely to start exercising and to exercise vigorously once they do than are people at the precontemplation stage (Armstrong et al., 1992). Interventions that provide telephone and print information tailored to the motivational readiness of individuals to exercise are more effective than nontailored programs (Marcus et al., 1998).

SAFETY

Unsafe conditions threaten people’s health in virtually all environments—in traffic, at home, on the job, and at the beach—producing huge numbers of illnesses, injuries, and deaths each year. In most cases, these health problems could have been avoided if the victim or other people had used reasonable safety precautions. Sometimes people don’t know how to prevent injury, as is often the case for elderly individuals who become injured when they fall, but safety training can reduce these injuries (Tinetti et al., 1994). Let’s see what is known about the hazards people face and how to help people live safer lives.

ACCIDENTS

Each year in the United States, over 34 million injuries or poisonings occur that require medical attention (USBC, 2010). Some of these events are serious enough to cause long-term disability or death. More than 121,000 Americans die each year from unintentional injuries in accidents (USBC, 2010). By far the most frequent of these accidental fatalities involve traffic mishaps. Nearly 5,800 people die in accidents at their jobs each year, and thousands of other workers are seriously injured (NCHS, 2009a). The industries with the highest mortality and injury rates include transportation and warehousing, manufacturing, construction, and mining. Government data reveal that accidental injury is:

- The fifth most frequent cause of death in the American population as a whole.
- The leading cause of death of individuals under age 45.
- Responsible for over 30% of all deaths of children 1 to 14 years of age (USBC, 2010).

Accidents are a global health problem: for instance, thousands of people die in traffic accidents in the European Union each year (WHO/Europe, 2010). Another way to see the relative impact of injury versus disease is to estimate the years of life lost by the victims of these causes of death. Using age 65 as a standard, we’d subtract the age of death of each person who dies earlier and then sum the years lost for injuries and disease separately. Calculations like these reveal that the total number of years lost from unintentional and intentional (that is, homicide or suicide) injuries in the United States is about the same as from the total of the three most frequent causes of death in America: heart disease, cancer, and stroke (USDHHS, 1995). Over 60% of all injury deaths are unintentional.

How can accidental injuries be prevented? We will focus on injuries in traffic mishaps because they account for about half of all accidental deaths and researchers have done many studies on methods to prevent traffic injuries. One approach to reduce traffic accidents capitalizes on perception research on reducing drivers’ errors and reaction time: mounting an extra brake light above the trunk of vehicles reduced rear-end collisions by 50% (Robertson, 1986). Another approach addresses the role of cell phones in accidents: the risk of traffic mishaps is four times as likely during or shortly after the driver uses a phone, even a hands-free phone (McEvoy et al., 2005). As a result, laws against drivers using cell phones are being enacted. Other ways to reduce traffic accidents focus on the driver’s age: traffic-accident death rates in the United States increase dramatically during adolescence, as depicted...
Part III / Lifestyles to Enhance Health and Prevent Illness

A program to increase seat belt use was presented to children in preschools, using a theme character called “Bucklebear” (Chang et al., 1985). The children in several other preschools served as a control group who were matched to the experimental subjects for their prior seat belt use. Observations in the preschool parking lots 3 weeks after the program ended found that over 44% of the “Bucklebear” children and only about 22% of the control children were using seat belts. Other programs have addressed the use of bicycle helmets or car safety restraints, some included incentives for the parents, such as discounts to buy helmets (Tremblay & Peterson, 1999). After one of these programs, children in the community increased helmet use markedly and had fewer head injuries over the next several years.

ENVIRONMENTAL HAZARDS

A 1987 newspaper poll in New Jersey asked people, “Do you use sunscreen in the summer?” One young man answered, “No. I don’t use anything—never have, never will,” and a young woman said, “Never, because the sun’s not too hot in New Jersey.” Another young woman said she uses only the weakest sunscreen because, “I want to have a gorgeous tan.” Ever since the French fashion designer Coco Chanel made tanning fashionable, people in many parts of the world have come to believe tans

Parents can teach their children to use sunscreen.
are attractive and healthful. This belief develops by early adolescence (Broadstock, Borland, & Gason, 1992).

Today we know that excessive exposure to the sun’s ultraviolet rays makes the skin age and can cause skin cancers, particularly in people who are fair skinned and burn easily (AMA, 2003; Harrison et al., 1994). Keep in mind that sunlamps and sunbeds have the same effect, and the more exposure to them, the greater the chance of getting cancer (Westerdahl et al., 1994). Although most cases of skin cancer can be easily treated and cured, others cannot, especially if they are discovered late (ACS, 2009). Dermatologists and other health care practitioners recommend that most people use sunscreens (SPF of 15 or more) when exposed to the sun for more than, say, an hour or so. But only about a third of American children and adolescents use sunscreen, and over 80% report having had a sunburn in the past year (Geller et al., 2002). Girls use sunscreen more than boys do, but they also use tanning beds more. Because skin appearance is a main motivator for tanning, researchers have tested interventions with appearance information to promote sunscreen use. One approach used message framing and found that information has a greater influence on the likelihood of sunscreen use if it has gain-framed messages (“Using sunscreen increases your chances of maintaining healthy, young looking skin”) than loss-framed messages, which might state that not using sunscreen can cause cancer and prematurely aged skin (Detteiler et al., 1999). Another approach showed college students ultraviolet photographs of their skin, which reveal normally invisible damage from sun radiation, and found that these students later used tanning beds less than others who did not see such photographs (Gibbons et al., 2005).

Ultraviolet radiation is only one of many environmental hazards people need to guard against. Many harmful chemicals and gases exist in households, worksites, and general communities. Some of these hazards and their effects are (AMA, 2003):

- **Lead poisoning**, which can damage children’s nervous system and impair intelligence if they ingest it, such as by mouthing objects painted with lead-based paints, drinking water from a plumbing system with poorly soldered lead joints, or drinking acidic beverages from lead-glazed ceramics.
- **Radium**, a radioactive odorless gas that can cause lung cancer with long-term exposure, enters dwellings from the ground; ventilating a basement can reduce radon pollution.
- **Asbestos** is a substance that was used in buildings and equipment as a fire retardant. People who have regular contact with it risk developing lung cancer.
- **Radiation poisoning**, which can occur with one very high-level exposure or long-term lower exposure, causes cancer. It can be released into the environment from many sources, such as nuclear testing sites and power plants, hospitals, and military facilities. A massive radiation release occurred in 1986 at the Soviet nuclear power plant in Chernobyl.

People who work with hazardous materials need to know what the substances are, what dangers they pose, and how to use them safely. Some states in America have enacted “Right to Know” laws that require (1) employers to notify and train employees regarding the safe use of hazardous materials and (2) community agencies to provide information about the exposure of residents to hazardous materials. If people know a danger exists, they can try to take protective action (for example, by drinking bottled water), become involved in community change, and notify their physician so that appropriate tests can be done (Winett, King, & Altman, 1989).

People are becoming increasingly concerned about the chemicals and gases that pervade our lives. They should be vigilant—but they should also be aware of three things. First, not every chemical or gas is harmful. Second, exposure to toxic or carcinogenic substances poses little risk when the contact is infrequent and the dosage is small (Ames & Gold, 1990; Cohen & Ellwein, 1990). Third, some harmful substances may have benefits that outweigh their dangers. For example, chlorinating water has all but erased many of the waterborne infections that once threatened enormous numbers of lives. But chlorinated water often has very small amounts of the carcinogen **chloroform** in it. Given these circumstances, the benefits of chlorinating appear to outweigh the risks.

**SUMMARY**

In addition to water, food contains five types of chemical components: carbohydrates, lipids or “fats,” proteins, vitamins, and minerals. People can get all the nutrients and fiber they need from diets that include grains, fruits, vegetables, milk products, and meats and fish. People’s food preferences are determined by biological and psychosocial factors.

Diet is associated with the development of atherosclerosis, hypertension, and cancer. Cholesterol leads to atherosclerosis. Whether plaques form in our blood vessels
Part III / Lifestyles to Enhance Health and Prevent Illness

depends on the presence of two types of cholesterol-carrying proteins: low-density lipoprotein and high-density lipoprotein. Low-density lipoprotein is often called "bad cholesterol" because it is the main culprit in plaque buildup. Genetic factors and the foods people eat determine serum cholesterol levels. Interventions can be effective in helping people reduce dietary cholesterol substantially. High blood pressure can result from consuming too much sodium.

Many people are very conscious of and concerned about their weight. Most concerns among Americans are with being too fat, rather than too thin, particularly among females. If people's body mass index (BMI) is 25 or more, they are overweight; if their BMI is 30 or more, they are considered obese. People become fat because they consume more calories than they burn up through metabolism. Heredity plays a role in weight control, probably by affecting the set-point for body weight. The set-point mechanism involves the hypothalamus and serum leptin and insulin levels. Psychosocial factors also affect weight control, especially in the role of emotions in binge eating.

Obesity is associated with the development of many illnesses, such as hypertension, coronary heart disease, and diabetes. These health risks decrease with fitness and increase as the degree of obesity increases and when fat is concentrated in the abdominal region. Prevention of overweight should begin in childhood to avoid fat-cell hyperplasia. People can control their weight by exercising and eating diets that are low in calories, fat, and carbohydrates with high glycemic loads.

Most heavy people try to reduce their weight on their own by going on a diet. Those who are not able to lose weight on their own often seek help, such as through self-help groups and weight-loss programs. Behavioral and cognitive methods are more effective than other approaches. Relatively extreme cases may warrant drastic procedures with medical supervision, including placing the patient on a very-low-calorie diet, using appetite-suppressing drugs, or performing surgery. Although many people who lose weight keep most of that weight off, others do not; relapse can be reduced with follow-up programs.

Anorexia nervosa is an eating disorder that results in an unhealthy and extreme loss of weight. Bulimia nervosa is an eating disorder that involves recurrent episodes of binge eating and purging. Both of these disorders occur mainly in adolescence and early adulthood, and are much more prevalent in females than in males. Treatment is more difficult and less successful for anorexia than for bulimia.

Isotonic, isometric, and isokinetic exercises have different procedures and effects. Aerobic exercise refers to energetic physical activity that involves rhythmic movement of large muscle groups and requires high levels of oxygen over a period of half an hour or so. Engaging regularly in vigorous exercise increases people's life span and protects them against coronary heart disease, by improving lipid levels and reducing blood pressure and stress reactivity.

Tens of thousands of Americans die each year in accidents, especially traffic mishaps. Death rates for traffic accidents increase dramatically during adolescence. People also need to guard against many environmental hazards, including excessive exposure to sunlight and harmful chemicals and gases.

**KEY TERMS**

<table>
<thead>
<tr>
<th>lipoproteins</th>
<th>obese</th>
<th>glycemic load</th>
<th>isokinetic exercise</th>
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<tbody>
<tr>
<td>low-density lipoprotein</td>
<td>set-point theory</td>
<td>anorexia nervosa</td>
<td>aerobic exercise</td>
</tr>
<tr>
<td>high-density lipoprotein</td>
<td>leptin</td>
<td>bulimia nervosa</td>
<td></td>
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<tr>
<td>body mass index</td>
<td>insulin</td>
<td>isotonic exercise</td>
<td></td>
</tr>
<tr>
<td>overweight</td>
<td>binge eating</td>
<td>isometric exercise</td>
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</tbody>
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**Note:** If you read Module 3 (from Chapter 2) with the current chapter, you should include the key terms for those modules.