Cardiovascular Disease, Diabetes, and Cancer

REDUCING YOUR RISK

What’s the difference between good and bad cholesterol?

Does cardiovascular disease run in families?

What can I do to reduce my risk for diabetes?

If I’m already a smoker, will quitting now reduce my risk of lung cancer?

Is a tanning booth safer than the sun?

OBJECTIVES

- Discuss the incidence, prevalence, and outcomes of cardiovascular disease in the United States, including its impact on society.
- Understand prediabetes, diabetes, and metabolic syndrome; their risk factors; and what you can do to reduce your risks of developing them.
- Explain what cancer is, and describe the different types of cancer, including the risks they pose to people at different ages and stages of life.
- Discuss cancer’s risk factors, and outline strategies and recommendations for prevention, screening, and treatment.
Cardiovascular Disease: An Epidemiological Overview

In 2007, nearly 80 million Americans—one out of every three adults—had some type of cardiovascular disease (CVD), the broad term used to describe diseases of the heart and blood vessels. Although numbers continue to increase, it’s important to note that CVD has been the leading killer of U.S. adults in every year since 1900, with the exception of 1918, when a pandemic flu killed more people. We spend billions on research searching for prevention strategies, treatments and cures, and we have the most sophisticated media warnings and educational programs telling us what to do to avoid risks. Nevertheless, growing rates of obesity, hypertension, and diabetes contribute to the high incidence of CVD. Put into perspective, CVD claims more lives each year than the next four leading causes of death combined (cancer, chronic lower respiratory diseases, accidents, and diabetes), accounting for nearly 37 percent of all deaths in the United States.\(^1\) Although we’ve made advances in diagnosis and in pharmaceutical and surgical treatments, CVD continues to pose a serious threat to the health of all Americans, no matter their age, socioeconomic status, or gender (Figure 12.1). Consider the following facts:\(^2\)

- Over 147,000 Americans killed by CVD each year are under age 65.
- The probability at birth of eventually dying of CVD is 47 percent; of dying from cancer, 22 percent; from accidents, 3 percent; from diabetes, 2 percent; and from HIV, 0.7 percent.
- Among women, 1 in 30 deaths is from breast cancer; 1 in 2.6 is from CVD.
- If all forms of major CVD were eliminated, life expectancy would rise by almost 7 years; if all forms of cancer were eliminated, the gain would be 3 years.

The best defense against CVD is to prevent it from developing in the first place. How can you cut your risk? First, you need to take careful stock of just what your own risks are. From there, you need to take steps to reduce the risks that you can by changing certain behaviors. Controlling high blood pressure and reducing intake of saturated fats...
and cholesterol are two examples of things you can do to lower your chances of heart attack. By maintaining your weight, exercising, decreasing your intake of sodium, not smoking, and changing your lifestyle to reduce stress, you can lower your blood pressure. You can also monitor the levels of fat and cholesterol in your blood and adjust your diet to prevent arteries from becoming blocked. Having combinations of risk factors seems to increase overall risk by a factor greater than those of the combined risks. Happily, the converse is also true: reducing several risk factors can have a dramatic effect. Understanding how your cardiovascular system works will help you understand your risk and how to reduce it.

**try it NOW!**

Find out your risk of developing CVD! Right now, you can find out whether you are prone to CVD and take steps to modify your risk. The American Heart Association’s Risk Assessment Tool is an easy online tool that can evaluate your risks and provide practical guidance to help you address and reduce those risks. Visit www.americanheart.org/presenter.jhtml?identifier=3003499, and click on “Learn Your Risk” to begin using the tool now.

**Understanding the Cardiovascular System**

The cardiovascular system is the network of organs and vessels through which blood flows as it carries oxygen and nutrients to all parts of the body. It includes the heart, arteries, arterioles (small arteries), and capillaries (minute blood vessels). It also includes venules (small veins) and veins, the blood vessels through which blood flows as it returns to the heart and lungs.

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**cardiovascular system** A complex system consisting of the heart and blood vessels. It transports nutrients, oxygen, hormones, metabolic wastes, and enzymes throughout the body and regulates temperature, the water levels of cells, and the acidity levels of body components.

**atria** The two upper chambers of the heart, which receive blood.

**ventricles** The two lower chambers of the heart, which pump blood through the blood vessels.

**arteries** Vessels that carry blood away from the heart to other regions of the body.

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**The Heart: A Mighty Machine**

The heart is a muscular, four-chambered pump, roughly the size of your fist. It is a highly efficient, extremely flexible organ that manages to contract 100,000 times each day and pumps the equivalent of 2,000 gallons of blood to all areas of the body. In a 70-year lifetime, an average human heart beats 2.5 billion times. This number is significantly higher for hearts that must work to keep people moving who are out of shape and overweight.

Under normal circumstances, the human body contains approximately 6 quarts of blood. This blood transports nutrients, oxygen, waste products, hormones, and enzymes throughout the body. Blood also aids in regulating body temperature, cellular water levels, and acidity levels of body components, and in aiding bodily defense against toxins and harmful microorganisms. An adequate blood supply is essential to health and well-being.

The heart has four chambers that work together to circulate blood constantly throughout the body (Figure 12.2). The two upper chambers, called atria, are large collecting chambers that receive blood from the rest of the body. The two lower chambers, known as ventricles, pump the blood out again. Small valves regulate the steady, rhythmic flow of blood between chambers and prevent inappropriate backwash. The tricuspid valve (located between the right atrium and the right ventricle), the pulmonary valve (between the right ventricle and the pulmonary artery), the mitral valve (between the left atrium and left ventricle), and the aortic valve (between the left ventricle and the aorta) permit blood to flow in only one direction.

**Heart Function**

Heart activity depends on a complex interaction of biochemical, physical, and neurological signals. Here are the basic steps involved in heart function:

1. Deoxygenated blood enters the right atrium after having been circulated through the body.

2. From the right atrium, blood moves to the right ventricle and is pumped through the pulmonary artery to the lungs, where it receives oxygen.

3. Oxygenated blood from the lungs then returns to the left atrium of the heart.

4. Blood from the left atrium moves into the left ventricle. The left ventricle pumps blood through the aorta to all body parts.

Various types of blood vessels are required for different parts of this process. Arteries carry blood away from the heart; all arteries carry oxygenated blood, except for pulmonary arteries, which carry deoxygenated blood to the lungs, where the blood picks up oxygen and gives off carbon dioxide. As the arteries branch off from the heart,
Veins are vessels that carry blood back to the heart from other regions of the body. They divide into smaller blood vessels called arterioles, and then into even smaller blood vessels known as capillaries. Capillaries have thin walls that permit the exchange of oxygen, carbon dioxide, nutrients, and waste products with body cells. Carbon dioxide and other waste products are transported to the lungs and kidneys through veins and venules (small veins).

For the heart to function properly, the four chambers must beat in an organized manner. Your heartbeat is governed by an electrical impulse that directs the heart muscle to move when the impulse moves across it, which results in a sequential contraction of the four chambers. This signal starts in a small bundle of highly specialized cells, the sinoatrial node (SA node), located in the right atrium. The SA node serves as a natural pacemaker for the heart. People with a damaged SA node must often have a mechanical pacemaker implanted to ensure the smooth passage of blood through the sequential phases of the heartbeat.

The average adult heart at rest beats 70 to 80 times per minute, although a well-conditioned heart may beat only 50 to 60 times per minute to achieve the same results. When overly stressed, a heart may beat more than 200 times per minute. A healthy heart functions more efficiently and is less likely to suffer damage from overwork.

Types of Cardiovascular Disease

There are several types of cardiovascular disease (Figure 12.3):

- Atherosclerosis (fatty plaque buildup in the arteries)
- Coronary heart disease (CHD)
- Chest pain (angina pectoris)
- Irregular heartbeat (arrhythmia)
- Congestive heart failure (CHF)
- Congenital and rheumatic heart disease
- Stroke (cerebrovascular accident)

**Arterioles** Branches of the arteries.

**Capillaries** Minute blood vessels that branch out from the arterioles; their thin walls permit exchange of oxygen, carbon dioxide, nutrients, and waste products among body cells.

**Veins** Vessels that carry blood back to the heart from other regions of the body.

**Venules** Branches of the veins.

**Sinoatrial node (SA node)** Cluster of electricity-generating cells that acts as a natural pacemaker for the heart.
Methods of preventing and treating these diseases range from changes in diet and lifestyle to medications and surgery.

Atherosclerosis

Arteriosclerosis, thickening and hardening of arteries, is a condition that underlies many cardiovascular health problems and is believed to be the biggest contributor to disease burden globally. Atherosclerosis is actually a type of arteriosclerosis and is characterized by deposits of fatty substances, cholesterol, cellular waste products, calcium, and fibrin (a clotting material in the blood) in the inner lining of an artery. Hyperlipidemia (an abnormally high blood lipid level) is a key factor in this process, and the resulting buildup is referred to as plaque.

Often, atherosclerosis is called coronary artery disease (CAD) because of the resultant damage done to coronary arteries. According to current thinking, four factors are responsible for this damage: inflammation, elevated levels of cholesterol and triglycerides in the blood, high blood pressure, and tobacco smoke.\(^3\)

**Inflammatory Risks**  New research has led many experts to believe that atherosclerosis is an inflammatory disease, and inflamed vessels are more prone to plaque formation.\(^4\) What causes this inflammation in arterial walls? Although researchers aren’t sure, there is evidence that a pathogen may be at the root of it. The most likely culprits are Chlamydia pneumoniae (a sexually transmitted infection), Helicobacter pylori (which causes stomach ulcers), herpes simplex virus (a virus to which the majority of Americans have been exposed by age 5), and cytomegalovirus (another herpes virus transmitted through body fluids and infecting most Americans before age 40).

During an inflammatory reaction, C-reactive proteins (CRPs) tend to be present at high levels. Many scientists believe the presence of these proteins may signal elevated risk for angina and heart attack. In the near future, CRP tests might be given as routinely as cholesterol screening tests for heart disease.

Researchers have recently discovered another substance that may signal increased risk for CVD: homocysteine, an amino acid normally present in the blood. When present at high levels, homocysteine may be related to higher risk of coronary heart disease, stroke, and peripheral vascular disease.\(^5\) It is hypothesized that homocysteine works in much the same way as CRP, inflaming the inner lining of arteries and promoting fat deposits on the damaged walls and development of blood clots.

Folic acid and other B vitamins (such as B\(_6\) and B\(_{12}\)) help break down homocysteine in the body; however, conclusive

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**FIGURE 12.3** Percentage Breakdown of Deaths from Cardiovascular Disease in the United States

*Source:* From *Heart Disease and Stroke Statistics—2007 Update.* Reproduced with permission. © 2007, American Heart Association, Inc.

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![Cross section of a normal coronary artery. (b) A coronary artery narrowed by plaque.](image_url)
evidence that folic acid reduces risk is not available, and authorities such as the American Heart Association do not currently recommend taking folic acid supplements to lower homocysteine levels and prevent CVD. Other possible causes of inflammation include elevated low-density lipoproteins, free radicals caused by cigarette smoking, high blood pressure, and diabetes mellitus (see "Diabetes: Disabling, Deadly, and on the Rise," later in this chapter).

In an effort to combat the effects of inflammation, an explosive amount of research is being published to assess the potential role of anti-inflammatory drugs, such as aspirin, ibuprofen, statins, and a new generation of "super-aspirins" in CVD prevention.

**Metabolic Syndrome**  A group of obesity-related health risk factors, metabolic syndrome dramatically increases the risk of heart disease and diabetes. Also known as syndrome X or MetS, metabolic syndrome is believed to increase the risk for atherosclerotic cardiovascular disease by as much as threefold. Affecting over 26 percent of adults or 50 million people, this disease has gained increasing attention worldwide. Two of the main characteristics of metabolic syndrome are weight gain, particularly in the abdominal area, and insulin resistance, which means that cells don’t work properly in handling blood glucose levels. Scientists indicate that when three or more of the following are present, the diagnosis is metabolic syndrome:

- Abdominal obesity (waist measurement of more than 40 inches in men or 35 in women)
- Elevated blood fat (triglycerides greater than 150)
- Low levels of "good" high density lipoprotein cholesterol (HDL): less than 40 in men and less than 50 in women
- Blood pressure greater than 130/85 mm Hg
- Elevated fasting glucose greater than 100 mg/dL (a sign of insulin resistance)

**Coronary Heart Disease**

Of all the major cardiovascular diseases, coronary heart disease (CHD) is the greatest killer, accounting for nearly one in five deaths in the United States. Of the nearly 1 million people who suffer a heart attack each year, over 38 percent will die from it. A myocardial infarction (MI), or heart attack, involves an area of the heart that suffers permanent damage because its normal blood supply has been blocked. This condition is often brought on by a blood clot in a coronary artery or an atherosclerotic narrowing that blocks an artery. When blood does not flow readily, there is a corresponding decrease in oxygen flow. If the blockage is extremely minor, an otherwise healthy heart will adapt over time by enlarging existing blood vessels and growing new ones to reroute blood through other areas.

When heart blockage is more severe, however, the body is unable to adapt on its own, and outside lifesaving support is critical. The hour following a heart attack is the most crucial period—over 40 percent of heart attack victims die within this time. See the Skills for Behavior Change box on page 352 to learn what to do in case of a heart attack.

**Angina Pectoris**

Atherosclerosis and other circulatory impairments often reduce the heart’s blood and oxygen supply, a condition known as ischemia. People with ischemia often suffer from varying degrees of angina pectoris, or chest pain. In fact, an estimated 2.6 million men and 4.2 million women suffer mild to crushing forms of chest pain each day, many of whom take powerful medications to control their symptoms. Symptoms may range from slight indisposition, to pain upon slight exertion, to a feeling that the heart is being crushed. Generally, the more serious the oxygen deprivation, the more severe the pain. Although angina pectoris is not a heart attack, it does indicate underlying heart disease.

Currently, there are several methods of treating angina. In mild cases, rest is critical. The most common treatments for more severe cases involve drugs that affect either the supply of blood to the heart muscle or the heart’s demand for oxygen. Pain and discomfort are often relieved with nitroglycerin, a drug used to relax (dilate) veins, thereby reducing the amount of blood returning to the heart and thus lessening its workload. Patients whose angina is caused by spasms of the coronary arteries are often given drugs called calcium channel blockers, drugs that prevent calcium atoms from passing through coronary arteries and causing heart contractions. They also appear to reduce blood pressure and slow heart rate. Beta blockers, the other major type of drugs used to treat angina, control potential overactivity of the heart muscle.

**Arrhythmias**

Over 4 million Americans have experienced some type of arrhythmia, an irregularity in heart rhythm; about 480,400 of arrhythmia episodes have resulted in death. A person who complains of a racing heart in the absence of exercise or anxiety may be experiencing tachycardia, the medical term for abnormally fast heartbeat. On the other end of the continuum is bradycardia, or abnormally slow heartbeat.
A sporadic, quivering pattern of heartbeat that results in extreme inefficiency in moving blood through the cardiovascular system. If untreated, fibrillation may be fatal.

Not all arrhythmias are life-threatening. In many instances, excessive caffeine or nicotine consumption can trigger an arrhythmia episode. However, severe cases may require drug therapy or external electrical stimulus to prevent serious complications.

**Congestive Heart Failure**

When the heart muscle is damaged or overworked and lacks the strength to keep blood circulating normally through the body, its chambers are often taxed to the limit. **Congestive heart failure (CHF)** affects over 5 million Americans and dramatically increases risk of premature death. The heart may be injured by a number of health conditions, including rheumatic fever, pneumonia, heart attack, or other cardiovascular problems. In some cases, the damage is due to radiation or chemotherapy treatments for cancer. These weakened muscles respond poorly, impairing blood flow out of the heart through the arteries. The return flow of blood through...
the veins begins to back up, causing congestion in body tissues. This pooling of blood enlarges the heart, makes it less efficient, and decreases the amount of blood that can be circulated. Fluid begins to accumulate in other body areas, such as the vessels in the legs, ankles, or lungs, where it can leak into surrounding tissues and cause swelling or difficulty in breathing.

Today, CHF is the single most frequent cause of hospitalization in the United States. If untreated, it can be fatal. However, most cases respond well to treatment that includes diuretics (“water pills”) to relieve fluid accumulation; drugs, such as digitalis, that increase the pumping action of the heart; and drugs called vasodilators, which expand blood vessels and decrease resistance, allowing blood to flow more easily and making the heart’s work easier.

**Congenital and Rheumatic Heart Disease**

Approximately 1 out of every 125 children is born with some form of **congenital heart disease** (disease present at birth). These forms may be relatively minor, such as slight murmurs (low-pitched sounds caused by turbulent blood flow through the heart) due to valve irregularities that some children outgrow. Other congenital problems involve serious complications in heart function that can be corrected only with surgery. Their underlying causes are unknown but may be related to hereditary factors; to maternal diseases, such as rubella, that occur during fetal development; or to chemical intake (particularly alcohol) by the mother during pregnancy. Because of advances in pediatric cardiology, the prognosis for children with congenital heart defects is better than ever.

**Rheumatic heart disease** can cause similar heart problems in children. It is attributed to rheumatic fever, an inflammatory disease that may affect many connective tissues of the body, especially those of the heart, joints, brain, or skin, and that is caused by an unresolved *streptococcal infection* of the throat (strep throat). In a small number of cases, this infection can lead to an immune response in which antibodies attack the heart as well as the bacteria. Many of the 82,000 annual operations on heart valves in the United States are related to rheumatic heart disease.

**Stroke**

Like heart muscle, brain cells must have a continuous adequate supply of oxygen in order to survive. A **stroke** (also called a cerebrovascular accident) occurs when the blood supply to the brain is interrupted. Strokes may be caused by clot that obstructs a blood vessel or an **aneurysm** (a weakening in a blood vessel that causes it to bulge and in severe cases burst, or hemorrhage). When any of these events occurs, oxygen deprivation kills brain cells, which do not have the capacity to heal or regenerate. Some strokes are mild and cause only temporary dizziness or slight weakness or numbness. More serious interruptions in blood flow may impair speech, memory, or motor control.

Other strokes affect parts of the brain that regulate heart and lung function and kill within minutes. According to the American Heart Association’s latest statistics, every year nearly 6 million Americans suffer strokes, 157,000 of whom die as a result. Strokes cause countless levels of disability and suffering, and they account for 1 in 15 deaths, surpassed only by CHD and cancer. About one in ten major strokes is preceded days, weeks, or months earlier by **transient ischemic attacks (TIAs)**, brief interruptions of the blood supply to the brain that cause only temporary impairment. Symptoms of TIA include dizziness, particularly when first rising in the morning, weakness, temporary paralysis or numbness in the face or other regions, temporary memory loss, blurred vision, nausea, headache, slurred speech, or other unusual physiological reactions. TIAs are often indications of an impending major stroke.

Warning signs of stroke include the following:

- Sudden weakness or numbness of the face, arm, or leg on one side of the body
- Sudden dimness or loss of vision, particularly in only one eye
- Loss of speech, or trouble talking or understanding speech
- Sudden, severe headaches with no known cause
- Unexplained dizziness, unsteadiness, or sudden falls, especially with any of the previously listed symptoms

If you experience any of these symptoms, or if you are with someone who does, seek medical help immediately. The earlier treatment starts, the more effective it will be.

One of the greatest medical successes in recent years has been the decline in the fatality rates from strokes, a rate that has dropped by one-third in the United States since the 1980s and continues to fall. Improved diagnostic procedures, better surgical options, clot-busting drugs injected soon after a stroke has occurred, and acute care centers specializing in stroke treatment and rehabilitation have all been factors. Increased awareness of risk factors for stroke, especially high blood pressure, knowledge of warning signals, and an emphasis on prevention also have contributed. It is estimated that more than half of all strokes could be avoided if more people followed the recommended preventive standards.

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**congenital heart disease** Heart disease that is present at birth.

**rheumatic heart disease** A heart disease caused by untreated streptococcal infection of the throat.

**stroke** A condition occurring when the brain is damaged by disrupted blood supply.

**aneurysm** A weakened blood vessel that may bulge under pressure and, in severe cases, burst.

**transient ischemic attack (TIA)** Brief interruption of the blood supply to the brain that causes only temporary impairment; often an indicator of impending major stroke.
Compounds that facilitate the transport of cholesterol in the blood to the body’s cells and cause the cholesterol to build up on artery walls.

high-density lipoproteins (HDLs)  Compounds that facilitate the transport of cholesterol in the blood to the liver for metabolism and elimination from the body.

Unfortunately, people who survive a stroke do not always make a full recovery. Some 50 to 70 percent of stroke survivors regain functional independence, but 15 to 30 percent are permanently disabled and require assistance. Today stroke is a leading cause of serious long-term disability and contributes a significant amount to Medicaid and Medicare expenses for older Americans, particularly women.

### Reducing Your Risk for Cardiovascular Disease

Factors that increase the risk for cardiovascular problems fall into two categories: those we can control and those we cannot. Fortunately, we can take steps to minimize many risk factors.

### Risks You Can Control

**Avoid Tobacco** In spite of massive campaigns to educate us about the dangers of smoking, and in spite of increasing numbers of states and municipalities that have enacted policies to go “smoke-free,” cigarette smoking remains the leading cause of preventable death in the United States, accounting for approximately one of every five deaths.17 These statistics are particularly surprising given the fact that smoking rates have declined by 49 percent among people aged 18 and older since 1965.18 The risk for cardiovascular disease is 70 percent greater for smokers than for nonsmokers. Smokers who have a heart attack are more likely to die suddenly (within one hour) than are nonsmokers. Evidence also indicates that chronic exposure to environmental tobacco smoke (ETS, or secondhand smoke) increases the risk of heart disease by as much as 30 percent, with over 35,000 nonsmokers dying from ETS exposure each year.19

How does smoking damage the heart? There are two plausible explanations. One is that nicotine increases heart rate, heart output, blood pressure, and oxygen use by heart muscles. Because the carbon monoxide in cigarette smoke displaces oxygen in heart tissue, the heart is forced to work harder to obtain sufficient oxygen. The other explanation is that chemicals in smoke damage and inflame the lining of the coronary arteries, allowing cholesterol and plaque to accumulate more easily. This additional buildup constricts the vessels, increasing blood pressure and forcing the heart to work harder.

When people stop smoking, regardless of how long or how much they’ve smoked, their risk of heart disease declines rapidly.20 By 3 years after they quit, the risk of death from heart disease and stroke for people who had smoked a pack a day or less is almost the same as for people who have never smoked. Although the exact reasons are unknown, new findings from the Lung Health Study indicate that lung function improves more in women than in men after sustained smoking cessation.21

### Cut Back on Saturated Fat and Cholesterol

Cholesterol is a soft, fatty, waxy substance found in the bloodstream and in your body cells. Although we hear only the bad things about it, in truth cholesterol plays an important role in the production of cell membranes and hormones and in other body functions. However, when it gets too high, risks for CVD escalate. Nearly 36 percent of adults in the United States aged 18 and above have been told they have high cholesterol, and vast numbers of others have never been tested yet probably have higher than normal levels. Less than half of people who should be on cholesterol-reducing medications are on them, and many who are on them are unable to reach their LDL and HDL goals.22

Just like the TV ads say, you get cholesterol from two primary sources—from your body (which involves genetic predisposition) and from food. Unfortunately, much of your cholesterol level is predetermined: 75 percent of blood cholesterol is produced by your liver and other cells, and the other 25 percent comes from the foods you eat. It’s the 25 percent that you can control that may be the tipping point in determining your CVD risks.

Why all the fuss about fats and cholesterol? Diets high in saturated fat are known to raise cholesterol levels, send the body’s blood-clotting system into high gear, and make the blood more viscous in just a few hours, increasing the risk of heart attack or stroke. Switching to a low-fat diet lowers the risk of clotting; even a 10 percent decrease in total cholesterol levels may result in an estimated 30 percent reduction in the incidence of heart disease.23

A fatty diet also increases the amount of cholesterol in the blood, contributing to atherosclerosis. In past years, cholesterol levels between 200 and 240 milligrams per 100 milliliters of blood (mg/dL) were considered normal. Recent research indicates that levels between 180 and 200 mg/dL are more desirable and that a level of 150 mg/dL would be even better in reducing CVD risk. People with multiple risk factors for CVD are advised to follow even more stringent guidelines.24 See Table 12.1 for recommended levels.

It isn’t just the total cholesterol level that you should be concerned about. Cholesterol comes in two main varieties: low-density lipoprotein (LDL) and high-density lipoprotein (HDL).

Low-density lipoprotein, often referred to as “bad” cholesterol, is believed to build up on artery walls. In contrast, high-density lipoprotein, or “good” cholesterol, appears to remove cholesterol from artery walls and transport it to the liver for metabolism and elimination.

### What’s the difference between good and bad cholesterol?

See Table 12.1 for recommended levels.
walls, thus serving as a protector. In theory, if LDL levels get too high or HDL levels too low, cholesterol will accumulate inside arteries and lead to cardiovascular problems. Scientists now believe that there are other factors that may also increase CVD risk, such as lipoprotein-associated phospholipase A₂ (Lp-PLA₂), an enzyme that circulates in the blood and attaches to LDL. Lp-PLA₂ plays an important role in plaque accumulation and increased risk for stroke and coronary events, particularly in men. Studies suggest that the higher the Lp-PLA₂ level, the higher the risk of developing CVD.²⁵

**Triglycerides**, another type of fat in the blood, also appear to promote atherosclerosis. As people get older, heavier, or both, their triglycerides and cholesterol levels tend to rise. Although some CVD patients have elevated triglyceride levels, a causal link between high triglyceride levels and CVD has yet to be established. It may be that high triglyceride levels do not directly cause atherosclerosis but, rather, are among the abnormalities that speed its development.

Current guidelines suggest that you should reduce consumption of saturated fat (which comes mostly from animal products) to less than 7 percent of your total daily caloric intake and minimize your consumption of *trans* fat, which is found in partially hydrogenated products such as margarine, fast foods, and packaged foods. By cutting your intake of saturated fats and *trans* fats, and consuming fewer than 200 milligrams per day of cholesterol, you can significantly reduce your risks. Although it is wise to cut back on saturated fat, be aware that some fat is necessary to overall health. (For a complete discussion of this topic, see Chapter 9.)

**Monitor Your Cholesterol Levels** To get an accurate assessment of your total cholesterol and LDL and HDL levels, consider having a lipoprotein analysis done by a reputable health provider. In general, LDL is more closely associated with cardiovascular risk than is total cholesterol. However, most authorities agree that looking only at LDL ignores the positive effects of HDL. Perhaps the best method of evaluating risk is to examine the ratio of HDL to total cholesterol, or the percentage of HDL in total cholesterol.

The goal is to manage the ratio of HDL to total cholesterol by lowering LDL levels, raising HDL, or both. Of the more than 100 million Americans who need to worry about their cholesterol levels, almost half, particularly those at the low-to-moderate risk levels, should be able to reach their LDL and HDL goals through lifestyle changes alone. People who are at higher risk or those for whom lifestyle modifications are not effective may need to take cholesterol-lowering drugs while they continue modifying their lifestyle. Among the most commonly prescribed drugs are statins, which are very effective in reducing LDL levels. Folic acid and niacin drugs are often prescribed for people with low HDL and high triglyceride levels.

**Modify Other Dietary Habits** The National Heart, Lung, and Blood Institute (NHLBI) guidelines recommend the following dietary changes to reduce CVD risk:

- Consume 5 to 10 milligrams per day of soluble fiber from sources such as psyllium seeds, oat bran, fruits, vegetables, and legumes (see Chapter 9). Even this small dietary modification may result in a 5 percent drop in LDL levels.
- Consume about 2 grams per day of plant sterols or sterol derivatives from substances such as Benecol or Take Control margarine. These were the first widely available sources of sterols, but many other choices are available. This amount of plant sterols has the potential to reduce LDL by another 5 percent.

**triglycerides** The most common form of fat in the body; excess calories are converted into triglycerides and stored as body fat.

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**TABLE 12.1 Classification of LDL, Total, and HDL Cholesterol (mg/dl) and Recommended Levels for Adults**

<table>
<thead>
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<th><strong>LDL Cholesterol</strong></th>
<th><strong>HDL Cholesterol</strong></th>
<th><strong>Total Cholesterol</strong></th>
<th><strong>Triglycerides</strong></th>
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<tr>
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<td></td>
<td>350</td>
<td>≥500</td>
</tr>
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</table>

**Optimal** | **Near optimal/above optimal** | **Borderline high** | **High** | **Very high** |


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Just when it seems most of your favorite treats carry health risks, there is new evidence that a class of antioxidants known as flavonoids, which are found in fruits, teas, red wine, and cocoa, may protect you from risks for cardiovascular diseases, diabetes, cancer, and other ailments. Sound too good to be true? Consider results from these studies:

- At an international conference of the American Association for Cancer Research, reports of a study of 1,434 women with breast cancer and 1,440 healthy women supported a potential link between flavonoid intake and reduced risk for breast cancer. Women who consumed the most flavonoids had a 45 percent lower risk of breast cancer compared to those who consumed the least. Another study of 66,384 women reported that those women who consumed the most flavonoids had a lower risk of ovarian cancer than those who consumed the least flavonoids.

- Results of a 12-year study of 38,077 men with no prior history of CVD suggested that drinking 1 to 2 drinks per day, 3 to 4 days per week, decreased the risk of a heart attack by as much as 32 percent. In the same study, it was found that light alcohol consumption reduced the risk of stroke by 20 percent.

- A joint Norwegian-U.S. study of nearly 35,000 postmenopausal women reported that high dietary intake of several classes of flavonoids reduced the risk of mortality from cardiovascular disease and stroke by between 10 and 22 percent.

The reason for the effects observed in these studies is unclear. Some studies indicated that flavonoids impact CVD risk through an anti-inflammatory action. Other research suggests that the cancer-related health benefits come not from the flavonoids themselves, but from enzymes the body produces to metabolize and excrete the flavonoids. These enzymes may also act against mutagens and carcinogens and inhibit tumor growth. Recently, however, a large review of studies indicated that flavonoids may not exert such strong or direct effects after all.

In spite of the promising nature of some of these studies, most experts warn that nondrinkers should not begin drinking to improve overall health. Likewise, balanced nutrition should not be abandoned for daily chocolate bars. Until more research has established the nature and extent of these protective mechanisms, health experts continue to promote the “five a day” minimum consumption of fruits and vegetables and limited consumption of alcohol and chocolate.


Maintain a Healthy Weight No question about it—body weight plays a role in CVD. Researchers are not sure whether high-fat, high-sugar, high-calorie diets are a direct risk for CVD or whether they invite risk by causing obesity, which strains the heart, forcing it to push blood through the many miles of capillaries that supply each pound of fat. A heart that has to continuously move blood through an overabundance of vessels may become damaged.

Overweight people are more likely to develop heart disease and stroke even if they have no other risk factors. If you’re heavy, losing even 5 to 10 pounds can make a significant difference. This is especially true if you’re an “apple” (thicker around your upper body and waist) rather than a “pear” (thicker around your hips and thighs). See Chapter 10 for tips on weight management.

Exercise Regularly Inactivity is a clear risk factor for CVD. The good news is that you do not have to be an exercise fanatic to reduce your risk. Even modest levels of low-intensity physical activity—walking, gardening, housework, dancing—are beneficial if done regularly and over the long term. Exercise can increase HDL, lower triglycerides, and reduce coronary risks in several ways. For more information on the health benefits of exercise, see Chapter 11.
Excessive body weight increases the risk of developing CVD. Weight management should be a primary goal for CVD prevention.

**Control Your Blood Pressure**

**Hypertension** refers to sustained high blood pressure. In general, the higher your blood pressure, the greater your risk for CVD. Hypertension is known as the “silent killer” because it usually has no symptoms. Its prevalence has increased by over 30 percent in the last 10 years; today 65 million adults in the United States have blood pressure above the recommended level.27

Blood pressure is measured in two parts and is expressed as a fraction—for example, 110/80, or “110 over 80.” Both values are measured in millimeters of mercury (mm Hg). The first number refers to systolic pressure, or the pressure being applied to the walls of the arteries when the heart contracts, pumping blood to the rest of the body. The second value is diastolic pressure, or the pressure applied to the walls of the arteries during the heart’s relaxation phase. During this phase, blood is reentering the chambers of the heart, preparing for the next heartbeat.

Normal blood pressure varies depending on weight, age, physical condition, gender, and race. Systolic blood pressure tends to increase with age, whereas diastolic blood pressure increases until age 55 and then declines. As a rule, men have a greater risk for high blood pressure than women until age 55, when their risks become about equal. After age 75, women are more likely to have high blood pressure than men.28

For the average person, 110/80 is a healthy blood pressure level. High blood pressure is usually diagnosed when systolic pressure is 140 or above. Diastolic pressure does not have to be high to indicate high blood pressure. When only systolic pressure is high, the condition is known as isolated systolic hypertension (ISH), the most common form of high blood pressure in older Americans. See Table 12.2 for a summary of blood pressure values and what they mean.

Treatment of hypertension can involve dietary changes (reducing sodium and calorie intake), weight loss (when appropriate), the use of diuretics and other medications (only when prescribed by a physician), regular exercise, and the practice of relaxation techniques and effective coping and communication skills.

**Manage Stress** Some scientists have noted a relationship between CVD risk and a person’s stress level, behavior habits, and socioeconomic status. These factors may influence established risk factors. For example, people under stress may start smoking or smoke more than they otherwise would. A large study funded by the National Heart, Lung, and Blood Institute found that impatience and hostility, two key components of the Type A behavior pattern, increase young adults’ risk of developing high blood pressure. Other related factors, such as competitiveness, depression, and anxiety, did not appear to increase risk. The research was the first to study these factors as a group rather than individually and has clear implications for prevention.29

**Table 12.2 Blood Pressure Classifications**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Systolic Reading (mm Hg)</th>
<th>Diastolic Reading (mm Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120–139</td>
<td>80–89</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1</td>
<td>140–159</td>
<td>90–99</td>
</tr>
<tr>
<td>Stage 2</td>
<td>≥160</td>
<td>≥100</td>
</tr>
</tbody>
</table>

Note: If systolic and diastolic readings fall into different categories, treatment is determined by the highest category. Readings are based on the average of two or more properly measured, seated readings on each of two or more health care provider visits.


**hypertension** Sustained elevated blood pressure.

**systolic pressure** The upper number in the fraction that measures blood pressure, indicating pressure on the walls of the arteries when the heart contracts.

**diastolic pressure** The lower number in the fraction that measures blood pressure, indicating pressure on the walls of the arteries during the relaxation phase of heart activity.
Risks You Cannot Control

There are, unfortunately, some risk factors for CVD that we cannot prevent or control. The most important are these:

- **Heredity.** A family history of heart disease appears to increase risk significantly. Whether the increase is due to genetics or environment is unresolved.
- **Age.** The risk for CVD increases with age for both sexes. Seventy-five percent of all heart attacks occur in people over age 65.
- **Gender.** Men are at greater risk for CVD until about age 60. Women under 35 have a fairly low risk unless they smoke or have high blood pressure, kidney problems, or diabetes. Hormonal factors appear to reduce risk for women, although after menopause or after estrogen levels are otherwise reduced (e.g., because of hysterectomy), women’s LDL levels tend to go up, which increases their chances for CVD.
- **Race.** African Americans have a 45 percent greater risk for hypertension and thus a greater risk for CVD than whites. In addition, they are less likely to survive a heart attack.

New Weapons Against Heart Disease

The victim of a heart attack today has many options that were not available a generation ago. Medications can strengthen heartbeat, control arrhythmias, remove fluids in case of congestive heart failure, and relieve pain. New surgical procedures are saving many lives.

Techniques for Diagnosing Heart Disease

Several techniques are used to diagnose heart disease, including electrocardiogram, angiography, and positron emission tomography scans. An electrocardiogram (ECG) is a record of the electrical activity of the heart. Patients may undergo a stress test, such as walking or running on a treadmill while their hearts are monitored. A more accurate method of testing for heart disease is angiography (often referred to as cardiac catheterization), in which a needle-thin tube called a catheter is threaded through heart arteries, a dye is injected, and an X-ray image is taken to discover which areas are blocked. A more recent and even more effective method of measuring heart activity is positron emission tomography (PET), which produces three-dimensional images of the heart as blood flows through it. During a PET scan, a patient receives an intravenous injection of a radioactive tracer and is then monitored at rest and during exercise. As the tracer decays, it emits positrons that are picked up by the scanner and transformed by a computer into color images of the heart. Newer single-photon emission computed tomography (SPECT) scans provide an even better view. Other tests include the following:

- **Radionuclide imaging** (includes thallium test, multiphase gated angiography [MUGA] scan, and acute infarct scintigraphy). In these procedures, substances called radionuclides are injected into the bloodstream. Computer-generated pictures can then show them in the heart. These tests can show how well the heart muscle is supplied with blood, how well the heart’s chambers are functioning, and which part of the heart has been damaged by a heart attack.
- **Magnetic resonance imaging (MRI).** This test uses powerful magnets to look inside the body. Computer-generated pictures can show the heart muscle and help physicians identify damage from a heart attack, diagnose congenital heart defects, and evaluate disease of larger blood vessels such as the aorta.
- **Ultrafast computed tomography (CT).** This is an especially fast form of X-ray imaging of the heart designed to evaluate bypass grafts, diagnose ventricular function, and measure calcium deposits.
- **Digital subtraction angiography (DSA).** This modified form of computer-aided imaging records pictures of the heart and its blood vessels.

Bypass Surgery versus Angioplasty

Coronary bypass surgery has helped many patients who suffered coronary blockages or heart attacks. In coronary bypass surgery, a blood vessel is taken from another site in the patient’s body (usually the saphenous vein in the leg or the internal mammary artery) and implanted to “bypass” blocked arteries and transport blood. Bypass patients typically spend 4 to 7 days in the hospital to recuperate. Death rates are generally much lower at medical centers where surgical teams and intensive care teams see large numbers of patients.

Another procedure, angioplasty (sometimes called balloon angioplasty), carries fewer risks and may be more effective than bypass surgery in selected cases. As in angiography,
a thin catheter is threaded through blocked heart arteries. The catheter has a balloon at the tip, which is inflated to flatten fatty deposits against the artery walls, allowing blood to flow more freely. A stent (a meshlike tube) may be inserted to prop open the artery. In about 30 percent of patients, the treated arteries become clogged again within 6 months. Some surgeons argue that given this high rate of recurrence, bypass may be a more effective treatment. Today, newer forms of laser angioplasty and atherectomy, a procedure that removes plaque, are being done in several clinics.

Research suggests that in many instances, drug treatments may be just as effective in prolonging life as invasive surgical techniques, but it is critical that doctors prescribe an aggressive drug treatment program and that patients comply with it.

Aspirin for Heart Disease: Can It Help?

Research indicates that low doses of aspirin (80 milligrams daily or every other day) are beneficial to heart patients because of the drug’s blood-thinning properties. Higher levels do not provide significantly more protection. Aspirin has even been advised as a preventive strategy for people with no current heart disease symptoms. However, major problems associated with chronic aspirin use are gastrointestinal intolerance and a tendency for some people to have difficulty with blood clotting, and these factors may outweigh aspirin’s benefits in some cases. People taking aspirin face additional risks from emergency surgery or accidental bleeding. Aspirin should be taken as a preventative measure only if your physician recommends it.

Cardiac Rehabilitation

Every year, nearly 1 million people survive heart attacks. Over 7 million more have unstable angina, and about 650,000 undergo bypass surgery or angioplasty. Heart failure is the most common discharge diagnosis for hospitalized Medicare patients and the fourth most common diagnosis among all patients hospitalized in the United States. Most of these patients are eligible for cardiac rehabilitation (including exercise training and health education classes on good nutrition and CVD risk management), needing only a doctor’s prescription for these services. However, many Americans do not have access to these programs. Even larger numbers are finding it difficult to afford them in light of skyrocketing costs for prescription drugs. Whereas some patients must choose between home health care and cardiac rehabilitation, others stay away from such programs because of cost, transportation, or other factors. Perhaps the biggest deterrent is fear that exercise may cause another attack. The benefits of cardiac rehabilitation (including increased stamina and strength and faster recovery), however, far outweigh the risks when these programs are run by certified health professionals.

Diabetes: Disabling, Deadly, and on the Rise

Diabetes is a serious, widespread, and costly chronic disease, affecting not just the 21 million Americans who live with it, but also their families and communities. Since 1980, diagnosed diabetes has increased over 50 percent among U.S. adults, giving it the dubious distinction of being the fastest growing chronic disease in American history. One study by the Centers for Disease Control and Prevention indicated that diabetes seems to be increasing even more dramatically among younger adults—it is up by almost 70 percent among those in their thirties.

What causes this serious disease? In healthy people, the pancreas, a powerful enzyme-producing organ, produces the hormone insulin in sufficient quantities to allow the body to use store glucose (blood sugar). When the pancreas fails to produce enough insulin to regulate sugar metabolism or when the body fails to use insulin effectively, a disease known as diabetes mellitus occurs (Figure 12.4). Diabetics exhibit hyperglycemia, or elevated blood sugar levels, and high glucose levels in their urine. Other symptoms include excessive thirst, frequent urination, hunger, tendency to tire easily, wounds that heal slowly, numbness or tingling in the extremities, changes in vision, skin eruptions, and, in women, a tendency toward vaginal yeast infections. Of the 21 million people in the United States today who have diabetes, nearly 6 million are unaware of their condition.

The more serious form, type 1 diabetes (also known as insulin-dependent diabetes), is an autoimmune disease in which the immune system destroys the insulin-making beta cells. It most often appears during childhood or adolescence. People with type 1 diabetes typically must depend on insulin injections or oral medications for the rest of their lives because insulin is not present in their bodies.

**insulin** A hormone produced by the pancreas; required by the body for the metabolism of carbohydrates.

**diabetes mellitus** A disease in which the pancreas fails to produce enough insulin or the body fails to use insulin effectively.

**hyperglycemia** Elevated blood sugar levels.
In type 2 diabetes (non-insulin-dependent diabetes), insulin production is deficient or the body is unable to utilize available insulin. Type 2 diabetes accounts for 90 to 95 percent of all diabetes cases and most often appears after age 40. However, type 2 diabetes is now being diagnosed at younger ages, even among children and teens. This form of diabetes is typically linked to obesity and physical inactivity, both of which can be modified to control diabetes and improve health. If people with type 2 diabetes change their lifestyle, they may be able to avoid the need for oral medications or insulin indefinitely.

A third type of diabetes, gestational diabetes, can develop in a woman during pregnancy and affects 2 to 5 percent of all pregnant women. Although once believed to be only a transient event that disappeared after pregnancy, today experts realize that women with gestational diabetes have a significantly increased risk of progressing to type 2 diabetes within 5 to 10 years after giving birth. This is particularly true for women who do not lose all of their gestational weight gain and for those who have additional pregnancies and weight “creep” with each subsequent one.

Understanding Risk Factors
Diabetes tends to run in families. Being overweight, coupled with inactivity, dramatically increases the risk of type 2 diabetes. Older persons and mothers of babies weighing over 9 pounds also run an increased risk. Approximately 80 percent of all type 2 patients are overweight at the time of diagnosis. Weight loss, better nutrition, control of blood glucose levels, and regular exercise are important factors in lowering blood sugar and improving the efficiency of cellular use of insulin. These improvements can help prevent overwork of the pancreas and the development of diabetes. In fact, recent findings show that...
A neoplasm is a new growth of tissue serving no physiological function and results from uncontrolled, abnormal cellular development.

**CHAPTER 12 Cardiovascular Disease, Diabetes, and Cancer**

Unhealthy eating habits and a sedentary lifestyle can lead to type 2 diabetes even among children.

modest, consistent physical activity and a healthy diet can cut a person’s risk of type 2 diabetes by a significant amount. For unknown reasons, African Americans, Hispanics, and Native Americans have the highest rates of type 2 diabetes in the world—much higher than that of whites.

### Preventing Complications

Depending on the type and severity of the disease, diabetes can cause many complications and increase the severity of other existing conditions, including the following:

- **Cardiovascular disease.** Heart disease and stroke cause about 65 percent of deaths among people with diabetes. More than 70 percent of people with diabetes have hypertension.

- **Eye disease and blindness.** Each year, 12,000 to 24,000 people become blind because of diabetic eye disease. In fact, it is the leading cause of new blindness in America today.

- **Kidney disease.** Each year almost 45,000 people with diabetes develop kidney failure; each year over 100,000 are in treatment for this condition.

- **Amputations.** Over 60 percent of nontraumatic amputations of lower limbs are due to diabetes. Foot care programs that include regular examinations and patient education could prevent up to 85 percent of these amputations.

- **Pregnancy complications.** Poorly controlled diabetes can cause major birth defects in 5 to 10 percent of all pregnancies and causes 15 to 20 percent of all spontaneous abortions.

- **Flu- and pneumonia-related deaths.** Each year, 10,000 to 30,000 people with diabetes die of complications from flu or pneumonia. They are roughly three times more likely to die of these complications than people without diabetes.

### An Overview of Cancer

For Americans of all age groups, cancer continues to be the second leading cause of death, even though cancer-related mortality rates have declined over the last decade. Five-year survival rates (the relative rates for survival in persons who are living cancer-free 5 years after diagnosis) are up dramatically from the virtual death sentences of many cancers in the early 1900s and the 40 to 50 percent survival rates of the 1960s to 1970s. Today, of the approximately 1.5 million people diagnosed each year, about 66 percent will still be alive 5 years from now. Many will be considered “cured,” meaning that they have no subsequent cancer in their bodies 5 years after diagnosis and can expect to live a long and productive life. Some cancers have excellent prognosis for cure; others remain difficult to diagnose and treat because they are often not found until late in their progression. Survival rates for some cancers, such as pancreatic and liver, ovarian, and certain aggressive types of cancer, continue to be low.

### What Is Cancer?

Cancer is the name given to a large group of diseases characterized by the uncontrolled growth and spread of abnormal cells. Think of a healthy cell as a small computer, programmed to operate in a particular fashion. Under normal conditions, healthy cells are protected by a powerful overseer, the immune system, as they perform their daily functions of growing, replicating, and repairing body organs. When something interrupts normal cell programming, however, uncontrolled growth and abnormal cellular development result in a neoplasm, a new growth of tissue serving no physiological function. This neoplastic mass often forms a clumping of cells known as a tumor.

- **cancer** A large group of diseases characterized by the uncontrolled growth and spread of abnormal cells.

- **neoplasm** A new growth of tissue that serves no physiological function and results from uncontrolled, abnormal cellular development.

- **tumor** A neoplastic mass that grows more rapidly than surrounding tissue.
Not all tumors are malignant (cancerous); in fact, most are benign (noncancerous). Benign tumors are generally harmless unless they grow to obstruct or crowd out normal tissues. A benign tumor of the brain, for instance, is life threatening when it grows enough to restrict blood flow and cause a stroke. The only way to determine whether a tumor is malignant is through biopsy, or microscopic examination of cell development.

Benign and malignant tumors differ in several key ways. Benign tumors generally consist of ordinary-looking cells enclosed in a fibrous shell or capsule that prevents their spreading to other body areas. Malignant tumors are usually not enclosed in a protective capsule and can therefore spread to other organs. This process, known as metastasis, makes some forms of cancer particularly aggressive in their ability to overcome bodily defenses. By the time they are diagnosed, malignant tumors have frequently metastasized throughout the body, making treatment extremely difficult. Unlike benign tumors, which merely expand to take over a given space, malignant cells invade surrounding tissue, emitting clawlike protrusions that disturb the RNA and DNA within normal cells. Disrupting these substances, which control cellular metabolism and reproduction, produces mutant cells that differ in form, quality, and function from normal cells.

**Table 12.3**

<table>
<thead>
<tr>
<th>Tumor</th>
<th>Birth to 39 (%)</th>
<th>40 to 59 (%)</th>
<th>60 to 69 (%)</th>
<th>70 and Older (%)</th>
<th>Birth to Death (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All sites†</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.42 (1 in 70)</td>
<td>8.69 (1 in 12)</td>
<td>16.58 (1 in 6)</td>
<td>39.44 (1 in 3)</td>
<td>45.31 (1 in 2)</td>
</tr>
<tr>
<td>Female</td>
<td>2.03 (1 in 49)</td>
<td>9.09 (1 in 11)</td>
<td>10.57 (1 in 9)</td>
<td>26.60 (1 in 4)</td>
<td>37.86 (1 in 3)</td>
</tr>
<tr>
<td><strong>Urinary bladder‡</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.02 (1 in 4381)</td>
<td>0.41 (1 in 241)</td>
<td>0.96 (1 in 105)</td>
<td>3.41 (1 in 29)</td>
<td>3.61 (1 in 28)</td>
</tr>
<tr>
<td>Female</td>
<td>0.01 (1 in 9527)</td>
<td>0.13 (1 in 782)</td>
<td>0.26 (1 in 379)</td>
<td>0.96 (1 in 105)</td>
<td>1.14 (1 in 87)</td>
</tr>
<tr>
<td><strong>Breast</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.48 (1 in 210)</td>
<td>3.98 (1 in 25)</td>
<td>3.65 (1 in 27)</td>
<td>6.84 (1 in 15)</td>
<td>12.67 (1 in 8)</td>
</tr>
<tr>
<td><strong>Colon and rectum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.07 (1 in 1342)</td>
<td>0.93 (1 in 107)</td>
<td>1.67 (1 in 60)</td>
<td>4.92 (1 in 20)</td>
<td>5.79 (1 in 17)</td>
</tr>
<tr>
<td><strong>Leukemia</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.16 (1 in 640)</td>
<td>0.22 (1 in 452)</td>
<td>0.35 (1 in 286)</td>
<td>1.17 (1 in 86)</td>
<td>1.49 (1 in 67)</td>
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<tr>
<td>Female</td>
<td>0.12 (1 in 820)</td>
<td>0.14 (1 in 694)</td>
<td>0.20 (1 in 491)</td>
<td>0.75 (1 in 132)</td>
<td>1.05 (1 in 95)</td>
</tr>
<tr>
<td><strong>Lung and bronchus</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.03 (1 in 3146)</td>
<td>1.09 (1 in 92)</td>
<td>2.61 (1 in 38)</td>
<td>6.76 (1 in 15)</td>
<td>8.02 (1 in 12)</td>
</tr>
<tr>
<td>Female</td>
<td>0.04 (1 in 2779)</td>
<td>0.85 (1 in 117)</td>
<td>1.84 (1 in 54)</td>
<td>4.52 (1 in 22)</td>
<td>6.15 (1 in 16)</td>
</tr>
<tr>
<td><strong>Melanoma of the skin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.13 (1 in 775)</td>
<td>0.53 (1 in 187)</td>
<td>0.56 (1 in 178)</td>
<td>1.32 (1 in 76)</td>
<td>2.04 (1 in 39)</td>
</tr>
<tr>
<td>Female</td>
<td>0.21 (1 in 467)</td>
<td>0.42 (1 in 237)</td>
<td>0.29 (1 in 347)</td>
<td>0.62 (1 in 163)</td>
<td>1.38 (1 in 73)</td>
</tr>
<tr>
<td><strong>Non-Hodgkin lymphoma</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.14 (1 in 735)</td>
<td>0.45 (1 in 222)</td>
<td>0.57 (1 in 176)</td>
<td>1.56 (1 in 64)</td>
<td>2.14 (1 in 47)</td>
</tr>
<tr>
<td>Female</td>
<td>0.08 (1 in 1200)</td>
<td>0.32 (1 in 313)</td>
<td>0.44 (1 in 229)</td>
<td>1.30 (1 in 77)</td>
<td>1.83 (1 in 55)</td>
</tr>
<tr>
<td><strong>Prostate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.01 (1 in 10373)</td>
<td>2.59 (1 in 39)</td>
<td>7.03 (1 in 14)</td>
<td>13.83 (1 in 7)</td>
<td>17.12 (1 in 6)</td>
</tr>
<tr>
<td>Female</td>
<td>0.16 (1 in 631)</td>
<td>0.29 (1 in 346)</td>
<td>0.14 (1 in 695)</td>
<td>0.20 (1 in 512)</td>
<td>0.73 (1 in 138)</td>
</tr>
<tr>
<td><strong>Uterine cervix</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.06 (1 in 1652)</td>
<td>0.70 (1 in 142)</td>
<td>0.81 (1 in 124)</td>
<td>1.28 (1 in 78)</td>
<td>2.49 (1 in 40)</td>
</tr>
</tbody>
</table>

*For people free of cancer at beginning of age interval.
†All sites exclude basal and squamous cell skin cancers and in situ cancers except urinary bladder.
‡Includes invasive and in situ cancer cases.


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**malignant** Very dangerous or harmful; refers to a cancerous tumor.

**benign** Harmless; refers to a noncancerous tumor.

**biopsy** Microscopic examination of tissue to determine whether a cancer is present.

**metastasis** Process by which cancer spreads from one area to different areas of the body.

**mutant cells** Cells that differ in form, quality, or function from normal cells.
What Causes Cancer?

After decades of research, most cancer epidemiologists believe that cancers are, at least in theory, preventable and that many could be avoided by suitable choices in lifestyle and environment. Many specific causes of cancer are well documented, the most important of which are smoking, obesity, and a few viruses. However, wide global variations in common cancers, such as those of the breast, prostate, colon, and rectum, remain unexplained (Figure 12.5).

Most research supports the idea that cancer is caused by environmental factors (such as chemicals, radiation, viruses, and certain medical treatments), lifestyle factors (such as poor diet, inactivity, obesity, and alcohol consumption), and internal factors (such as hormones, immune conditions, and inherited mutations). Causal factors may act together or in sequence to promote cancer development.

Cellular Change/ Mutation Theories

One theory proposes that cancer results from spontaneous errors that occur during cell reproduction. Perhaps cells that are overworked or aged are more likely to break down, causing genetic errors that result in mutant cells.

Another theory suggests that cancer is caused by some external agent or agents that enter a normal cell and initiate the cancerous process. It is believed that 75 to 85 percent of all deaths from cancer are related to environmental factors. These include radiation, chemicals, hormonal drugs, immunosuppressant drugs (drugs that suppress the normal activity of the immune system), and other toxins. Such substances are considered possible carcinogens (cancer-causing agents); perhaps the most common carcinogen is the tar in cigarettes. The greater the dose or exposure to environmental hazards, the greater the risk of disease. People who are forced to work, live, and pass through areas that have high levels of environmental toxins may be at greater risk for several types of cancers.

A third theory emerged from research on certain viruses believed to cause tumors in animals. Scientists discovered oncogenes, suspected cancer-causing genes. Although oncogenes are typically dormant, scientists theorize that certain conditions such as age, stress, and exposure to carcinogens, viruses, and radiation may activate them. Once activated, they cause cells to grow and reproduce in an out-of-control manner. Scientists are uncertain whether only people who develop cancer have oncogenes or whether we all have genes that can become oncogenes under certain conditions.

Risks for Cancer—Lifestyle

Anyone can develop cancer; however, most cases affect adults beginning in middle age. In fact, nearly 76 percent of cancers are diagnosed at ages 55 and over. Lifetime risk refers to the probability that an individual, over the course of a lifetime, will develop cancer or die from it. In the United States, men have a lifetime risk of about one in two; women have a lower risk of one in three.42

Relative risk is a measure of the strength of the relationship between risk factors and a particular cancer. Basically, relative risk compares your risk if you engage in certain known risk behaviors with that of someone who does not engage in such behaviors. For example, if you are a man and smoke, your chances of getting lung cancer are about 23 times greater than those of a nonsmoker.43

Over the years, researchers have found that people who engage in certain behaviors show a higher incidence of cancer. In particular, diet, sedentary lifestyle (and resultant obesity), consumption of alcohol or cigarettes, stress, and other lifestyle factors seem to play a role. Table 12.4 summarizes the different types of cancers for which each of these factors has been shown to increase the relative risk of cancer development. Keep in mind that a high relative risk does not guarantee cause and effect. It merely indicates the likelihood of a particular risk factor being related to a particular outcome.
TABLE 12.4 Lifestyle Risk Factors Contributing to Different Cancers

<table>
<thead>
<tr>
<th>Lifestyle Risk Factor</th>
<th>Increased Cancer Susceptibility</th>
</tr>
</thead>
</table>
| Overweight/obesity   | ■ Breast cancer in postmenopausal women  
                        ■ Colon cancer  
                        ■ Thyroid cancer  
                        ■ Ovarian cancer  
                        ■ Cervical cancer  
                        ■ Prostate cancer  
                        ■ Endometrial cancer  
                        ■ Pancreatic cancer  
                        ■ Multiple myeloma  
                        ■ Hodgkin’s disease  
                        ■ Cancer of the gallbladder  
                        ■ Adenocarcinoma of the esophagus  
                        ■ Cancer of the kidney |
| Sedentary lifestyle  | ■ Colon cancer  
                        ■ Breast cancer |
| Tobacco              | ■ Lung cancer  
                        ■ Cancers of the nasal cavity, lip, and oral cavity  
                        ■ Esophageal cancer  
                        ■ Pancreatic cancer  
                        ■ Uterine cancer  
                        ■ Cervical cancer  
                        ■ Cancer of the thyroid  
                        ■ Bladder cancer  
                        ■ Stomach cancer  
                        ■ Cancer of the nasopharynx |
| Alcohol              | ■ Cancers of the mouth, pharynx, and larynx  
                        ■ Liver cancer  
                        ■ Esophageal cancer  
                        ■ Breast cancer |

Smoking and Cancer Risk Of all the potential risk factors for cancer, smoking is among the greatest. In the United States, tobacco is responsible for nearly one in five deaths annually, accounting for at least 30 percent of all cancer deaths and 87 percent of all lung cancer deaths.44

In the last 20 years, lung cancer rates in Great Britain and the United States have shown a decline; however, lung cancer rates among men are still increasing in most developing countries and in Eastern Europe, where consumption of cigarettes remains high and is increasing in some areas. Figure 12.6 demonstrates the correlation between smoking and lung cancer. See Chapter 8 for more on the risks of tobacco use.

Nutrition, Physical Activity, Obesity, and Cancer Risk Mounting scientific evidence suggests that about one-third of the cancer deaths that occur in the United States each year may be due to additional lifestyle-related causes, such as diet and physical activity factors.45 For people who don’t use tobacco, dietary choices and physical activity are the most important modifiable determinants of cancer risk. Cancer is more common among people who are overweight and risk increases as obesity increases. Several studies indicate a relationship between a high body mass index (BMI) and death rates from cancers of the esophagus, colon, rectum, liver, stomach, kidney, and pancreas. Women with a high BMI have a higher mortality rate from breast, uterine, cervical, and ovarian cancers; men with a high BMI have higher death rates from prostate and stomach cancers. In a study of over 900,000 U.S. adults, 34 percent of all cancer deaths were attributable to overweight and obesity. Numerous other studies support this link.46

Risks for Cancer—Biological and Genetic Factors

Certain cancers, particularly those of the breast, stomach, colon, prostate, uterus, ovaries, and lungs, appear to run in families. For example, a woman runs a much higher risk of breast cancer if her mother or sisters (primary relatives) have had the disease, particularly at a young age. Hodgkin’s disease and certain leukemias show similar familial patterns. Can we attribute these familial patterns to genetic susceptibility or to the fact that people in the same families experience similar environmental risks? To date, the research in this area is inconclusive. The complex interaction of hereditary predisposition, lifestyle, and environment...
on the development of cancer makes it impossible to determine a single cause.

Families with the following history are the most likely to have hereditary factors that increase their cancer risks:

- Family members diagnosed with cancer at a younger age than usual for that cancer
- Three or more generations diagnosed with similar cancers
- Three or more cancers on the same side of the family
- Family members diagnosed with two or more different kinds of cancer, such as a woman who has had both breast and ovarian cancer.

It’s important to note that even when different family members are diagnosed with the same cancer, it is not always due to an inherited problem. Biological sex also affects the likelihood of developing certain forms of cancer. However, although gender plays a role in certain cases of cancer, other variables such as lifestyle and occupational exposures are probably more significant.

Reproductive and Hormonal Risks for Cancer The effects of reproductive factors on breast and cervical cancer have been well documented. Late menarche, early menopause, early first childbirth, and high parity (having many children) have been shown to reduce a woman’s risk of breast cancer. Estrogen supplementation in the form of oral contraceptives or hormone replacement therapy increase the risk.

Breast cancer is much more common in most Western countries than in developing countries. This is partly—perhaps largely—accounted for by dietary effects (consuming a diet high in calories and fat), combined with later first childbirth, having fewer children, shorter breast-feeding, higher obesity rates, and a longer life expectancy (people in developing countries may not live long enough to develop cancer).

Risks for Cancer—Occupational and Environmental Factors Overall, workplace hazards account for only a small percentage of all cancers. However, various substances are known to cause cancer when exposure levels are high or prolonged. One is asbestos, a fibrous material once widely used in the construction, insulation, and automobile industries. Nickel, chromate, and chemicals such as benzene, arsenic, and vinyl chloride have been shown definitively to be carcinogens for humans. Also, people who routinely work with certain dyes and radioactive substances may have increased risks for cancer. Working with coal tars, as in the mining profession, or with inhalants, as in the auto-painting business, is hazardous. So is working with herbicides and pesticides, although the evidence is inconclusive for low-dose exposures. Several federal and state agencies are responsible for monitoring such exposures and ensuring that businesses comply with standards designed to protect workers.

Radiation: Ionizing and Nonionizing Ionizing radiation (IR)—radiation from X rays, radon, cosmic rays, and ultraviolet radiation (primarily ultraviolet B, or UVB radiation)—is the only form of radiation proven to cause human cancer (see the section on skin cancer). Incidents such as the Chernobyl nuclear accident in the 1980s focused attention on the potential risks of ionizing radiation. Evidence that high-dose IR causes cancer comes from studies of atomic bomb survivors, patients receiving radiotherapy, and certain occupational groups (for example, uranium miners). Virtually any part of the body can be affected by IR, but bone marrow and the thyroid are particularly susceptible. Radon exposure in homes can increase lung cancer risk, especially in cigarette smokers. To reduce the risk of harmful effects, diagnostic medical and dental X rays are set at the lowest dose levels possible.

Although nonionizing radiation produced by radio waves, cell phones, microwaves, computer screens, televisions, electric blankets, and other products has been a topic of great concern in recent years, research has not demonstrated excess risk to date. People worry that cell phones, in particular, beam radiofrequency energy that can penetrate the brain’s outer edge, raising questions about cancers of the head and neck, brain tumors, or leukemia. Most research, including the biggest ever study of the potential link between cancer and cell phone use, indicates that having an analog cell phone glued to your ear for hours may do little more than cause a sore ear and run up a hefty bill. However, the National Cancer Institute (NCI) and the American Cancer Society (ACS) recommend that more research is necessary, particularly as phones switch from analog to digital signals and more and more people use wire- less earbuds and other devices for longer periods of time.

Chemicals in Foods Among the food additives suspected of causing cancer is sodium nitrate, a chemical used to preserve and give color to red meat. The actual carcinogen is not sodium nitrate but nitrosamines, substances formed when the body digests sodium nitrate. Sodium nitrate has not been banned, primarily because it kills Clostridium botulinum, the bacterium that causes the highly virulent foodborne disease botulism. It should also be noted that the bacteria found in the human intestinal tract may contain more nitrates than a person could ever take in from eating cured meats or other nitrate-containing food products. Nonetheless, concern about the carcinogenic properties of nitrates has led to the introduction of meats that are free of nitrates or contain reduced levels of the substance.

Much of the concern about chemicals in foods centers on the possible harm caused by pesticide and herbicide residues. Although some of these chemicals cause cancer at high doses in experimental animals, the very low concentrations found in some foods are well within established government safety levels. Continued research regarding pesticide and herbicide use is essential, and scientists and consumer groups stress the importance of a balance between chemical use and the production of high-quality food products. Prevention efforts should focus on policies to protect consumers, develop low-chemical pesticides and herbicides, and reduce environmental pollution.
Risks for Cancer—Social and Psychological Factors

Many researchers claim that social and psychological factors play a major role in determining whether a person gets cancer. Stress has been implicated in increased susceptibility to several types of cancers. Although medical personnel are skeptical of overly simplistic solutions, we cannot rule out the possibility that negative emotional states contribute to illness. People who are under chronic, severe stress or who suffer from depression or other persistent emotional problems show higher rates of cancer than their healthy counterparts. Sleep disturbances, diet, or a combination of factors may weaken the body’s immune system, increasing susceptibility to cancer. Although psychological factors may play a part in cancer development, lifestyle habits such as tobacco use are far more important.

Infectious Diseases and Cancer

According to recent estimates, 17 percent of new cancers worldwide in 2006 were attributable to infection. Infections are thought to influence cancer development in several ways, most commonly through chronic inflammation, suppression of the immune system, or chronic stimulation.

Hepatitis B, Hepatitis C, and Liver Cancer

Viruses such as hepatitis B (HBV) and C (HCV) are believed to stimulate the growth of cancer cells in the liver because they are chronic diseases that inflame liver tissue. This may prime the liver for cancer or make it more hospitable for cancer development. Global increases in hepatitis B and C rates and concurrent rises in liver cancer rates seem to provide evidence of such an association.

Human Papillomavirus and Cervical Cancer

Nearly 100% of women with cervical cancer have evidence of human papillomavirus (HPV) infection, believed to be a major cause of cervical cancer. Fortunately, only a small percentage of HPV cases progress to cervical cancer. Today, a new vaccine is available to help protect young women from becoming infected with HPV and developing cervical cancer. For more on this recent news, see the discussion of HPV in Chapter 13.

Risks for Cancer—Medical Factors

Some medical treatments increase a person’s risk for cancer. One famous example is the prescription drug diethylstilbestrol (DES), widely used from 1940 to 1960 to control problems with bleeding during pregnancy and reduce the risk of miscarriage. Not until the 1970s did the dangers of this drug become apparent. Although DES caused few side effects in the millions of women who took it, their daughters were found to have an increased risk for cancers of the reproductive organs. Another example is the use of estrogen in treating menopausal symptoms. Estrogen use is now recognized to contribute to multiple cancer risks—and to provide fewer benefits than originally believed. Ironically, another medical factor is chemotherapy, which while being used to treat one cancer may increase the patient’s risk of other forms of cancer.

**DID you KNOW?**

In 2005, for every $1 spent in the United States on tobacco control efforts, the tobacco industry spent over $24 to promote its products. While industry marketing expenses continue to rise, tobacco control spending has declined to just $597.5 million in 2007.

<table>
<thead>
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<th>Year</th>
<th>Tobacco industry marketing expenditures*</th>
<th>Tobacco prevention funding†</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>9.59</td>
<td>0.68</td>
</tr>
<tr>
<td>2002</td>
<td>12.47</td>
<td>0.75</td>
</tr>
<tr>
<td>2005</td>
<td>13.11</td>
<td>0.54</td>
</tr>
</tbody>
</table>

*Marketing includes advertising and promotional expenditures.
†Tobacco prevention funding is by fiscal year totals based on estimates calculated by the Campaign for Tobacco-Free Kids.


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**what do you THINK?**

How do we determine whether a behavior or substance is a risk factor for a disease? Although a direct causal relationship between lung cancer and smoking has not been proved, the evidence supporting such a relationship is strong. Must a clearly established causal link exist before consumers are warned about risk? How does the consumer know what to believe?
Types of Cancers

As mentioned earlier, the term cancer refers not to a single disease, but to hundreds of different diseases. They are grouped into four broad categories based on the type of tissue from which the cancer arises:

- **Carcinomas.** Epithelial tissues (tissues covering body surfaces and lining most body cavities) are the most common sites for cancers. These cancers affect the outer layer of the skin and mouth as well as the mucous membranes. They metastasize through the circulatory or lymphatic system initially and form solid tumors.

- **Sarcomas.** Sarcomas occur in the mesodermal, or middle, layers of tissue—for example, in bones, muscles, and general connective tissue. They metastasize primarily via the blood in the early stages of disease. These cancers are less common but generally more virulent than carcinomas. They also form solid tumors.

- **Lymphomas.** Lymphomas develop in the lymphatic system—the infection-fighting regions of the body—and metastasize through the lymphatic system. Hodgkin’s disease is an example. Lymphomas also form solid tumors.

- **Leukemias.** Cancer of the blood-forming parts of the body, particularly the bone marrow and spleen, is called leukemia. A nonsolid tumor, leukemia is characterized by an abnormal increase in the number of white blood cells.

**Figure 12.7** shows the most common sites of cancer and the number of deaths annually from each type.

### Lung Cancer

Lung cancer is the leading cause of cancer death for both men and women in the United States, killing an estimated 160,390 Americans in 2007, even as rates for men and women have decreased in recent decades as a result of declines in smoking and policies that prohibit smoking in public places. Although reduction in smoking rates bodes well for cancer and CVD statistics, there is growing concern about the increasing number of youth, particularly young women, and persons of low income and low educational status who continue to pick up the habit.

#### Symptoms and Treatment

Symptoms of lung cancer include a persistent cough, blood-streaked sputum, chest pain, and recurrent attacks of pneumonia or bronchi-
Although you may be predisposed to some types of cancer because of genetic, biological, and/or environmental causes, there are many more that you may be able to prevent through lifestyle changes and risk reduction strategies. If you carefully assess your risks, you can then make behavior changes that may make you less susceptible to various cancers. The following questions will give you an indication of your susceptibility. Of course, no single instrument can serve as a complete risk assessment or diagnostic guide. These questions merely serve as the basis for personal introspection and thoughtful planning about ways to reduce your risk.

Read each question, and circle the number corresponding to each yes or no. Be honest and accurate to get the most complete understanding of your cancer risks. You should not interpret individual scores for specific questions as a precise measure of relative risk, but the totals in each section give a general indication of your risk.

**SECTION 1: BREAST CANCER**
1. Do you check your breasts at least monthly using breast self-exam (BSE) procedures? 1 2
2. Do you look at your breasts in the mirror regularly, checking for any irregular indentations/lumps, discharge from the nipples, or other noticeable changes? 1 2
3. Has your mother, sister, or daughter been diagnosed with breast cancer? 2 1
4. Have you ever been pregnant? 1 2
5. Have you had a history of lumps or cysts in your breasts or underarm? 2 1
Total points _____

**SECTION 2: SKIN CANCER**
1. Do you spend a lot of time in the sun, either at work or at play? 2 1
2. Do you use sunscreens with an SPF rating of 15 or more when you are in the sun? 1 2
3. Do you use tanning beds or sun booths regularly to maintain a tan? 2 1
4. Do you examine your skin once a month, checking any moles or other irregularities, particularly in hard-to-see areas such as your back, genitals, neck, and under your hair? 1 2
5. Do you purchase and wear sunglasses that adequately filter out harmful sun rays? 1 2
Total points _____

**SECTION 3: CANCERS OF THE REPRODUCTIVE SYSTEM**

**Men**
1. Do you examine your penis regularly for unusual bumps or growths? 1 2
2. Do you perform regular testicular self-examinations? 1 2
3. Do you have a family history of prostate or testicular cancer? 2 1
4. Do you practice safer sex and wear condoms with every sexual encounter? 1 2
5. Do you avoid exposure to harmful environmental hazards such as mercury, coal tars, benzene, chromate, and vinyl chloride? 1 2
Total points _____

**Women**
1. Do you have a regularly scheduled Pap test? 1 2
2. Have you been infected with the human papillomavirus, Epstein-Barr virus, or other viruses believed to increase cancer risk? 2 1
3. Has your mother, sister, or daughter been diagnosed with breast, cervical, endometrial, or ovarian cancer (particularly at a young age)? 2 1
Total points _____
4. Do you practice safer sex and use condoms with every sexual encounter?  
5. Are you obese, taking estrogen, and/or consuming a diet that is very high in saturated fats?

Total points _____

SECTION 4: CANCERS IN GENERAL

1. Do you smoke cigarettes on most days of the week?  
2. Do you consume a diet that is rich in fruits and vegetables?  
3. Are you obese, and/or do you lead a primarily sedentary lifestyle?  
4. Do you live in an area with high air pollution levels and/or work in a job where you are exposed to several chemicals on a regular basis?  
5. Are you careful about the amount of animal fat in your diet, substituting olive oil or canola oil for animal fat whenever possible?  
6. Do you limit your overall consumption of alcohol?  
7. Do you eat foods rich in lycopene (such as tomatoes) and antioxidants?  
8. Are you “body aware” and alert for changes in your body?  
9. Do you have a family history of ulcers or of colorectal, stomach, or other digestive system cancers?  
10. Do you avoid unnecessary exposure to radiation?

Total points _____

Analyzing Your Scores

Take a careful look at each question for which you received a score of 2. Are there any areas in which you received mostly 2s? Did you receive total points of 6 or higher in sections 1 to 3? Did you receive total points of 11 or higher in section 4? If so, you have at least one identifiable risk. The higher the score, the more risks you may have. However, rather than focusing just on your score, focus on which items you might change. Review the suggestions throughout this chapter, and list actions that you could take right now that might help you reduce your risk for these cancers.

MAKE it happen!

ASSESSMENT: The Assess Yourself activity above identifies certain behaviors that can contribute to increased cancer risks. If you have identified particular behaviors that may be putting you at risk, consider steps you can take to change these behaviors and improve your future health.

MAKING A CHANGE: To change your behavior, you need to develop a plan. Follow the steps below and complete your Behavior Change Contract to take action.

1. Evaluate your behavior, and identify patterns you are following and specific things you are doing. What can you change now? What can you change in the near future?

2. Select one pattern of behavior that you want to change.

3. Fill out the Behavior Change Contract found at the front of your book. It should include your long-term goals for change, your short-term goals, the rewards you’ll give yourself for reaching these goals, potential obstacles along the way, and strategies for overcoming these obstacles. For each goal, list the small steps and specific actions that you will take.

4. Chart your progress in a journal. At the end of a week, consider how successful you were in following your plan.
CANCER: UNDERSTANDING YOUR PERSONAL RISK (continued)

What helped you be successful? What made change more difficult? What will you do differently next week?

5. Revise your plan as needed. Are the short-term goals attainable? Are the rewards satisfying?

EXAMPLE: Keisha’s assessment showed that although she was taking precautions to reduce her cancer risk in most areas, she was not doing what she should about her breast cancer risk. Her score in this area was 8 because she did not regularly examine her breasts, her mother had been diagnosed with breast cancer 2 years ago, and she had never been pregnant. Keisha decided she needed to learn how to examine her breasts and to make a plan to ensure she does it every month. After studying this textbook’s illustrations, she made an appointment with her gynecologist. While she was there, she asked the doctor to confirm that she was doing the examination correctly.

Next, Keisha decided that she would take the first 10 minutes of her morning once a month to do the exam and that she would give herself a reward for each month that she examined herself on schedule. On her way to campus after doing the exam, she would treat herself to a latte and a scone. After she stuck with her schedule for 6 months in a row, she would buy herself a new outfit. She also resolved to talk to her younger sister about the importance of the exam.

CANCER: UNDERSTANDING YOUR PERSONAL RISK

ASSESS yourself

What helped you be successful? What made change more difficult? What will you do differently next week?

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Tis. Treatment depends on the type and stage of the cancer. Surgery, radiation therapy, and chemotherapy are all options. If the cancer is localized, surgery is usually the treatment of choice. If it has spread, surgery is combined with radiation and chemotherapy. Unfortunately, despite advances in medical technology, many people still are diagnosed at later stages, making treatment more difficult. Newer tests, such as low-dose CT scans, molecular markers in sputum and improved biopsy techniques, have helped improve diagnosis, but we still have a long way to go. In spite of improvements in diagnosis and treatment, the 5-year survival rates for lung cancer are only 16% for all stages and rise to 49% if diagnosed in the earliest stages.

Prevention Smokers, especially those who have smoked for over 20 years, and people who have been exposed to industrial substances such as arsenic and asbestos or to radiation are at the highest risk for lung cancer. Exposure to secondhand cigarette smoke increases the risk for nonsmokers. Apparent increases in lung cancer among nonsmokers have caused increasing concern about the hazards of secondhand smoke, leading health advocates to argue vigorously for smoking bans.

Researchers theorize that 90 percent of all lung cancers could be avoided if people did not smoke. Substantial improvements in overall prognosis have been noted in smokers who quit at the first signs of precancerous cellular changes and allowed their bronchial linings to return to normal.

Breast Cancer

In 2007, approximately 178,480 women and 2,030 men in the United States were diagnosed with invasive breast cancer for the first time. In addition, 62,030 new cases of in situ breast cancer, a more localized cancer, were diagnosed. About 40,460 women (and 450 men) died, making breast cancer the second leading cause of cancer death for women, even as rates continue to level off.

Detection and Symptoms The earliest signs of breast cancer are usually observable on mammograms, often before lumps can be felt. However, mammograms are not foolproof. Hence, regular breast self-examination (BSE) is also important (Figure 12.8). Symptoms may include persistent breast changes, such as a lump in the breast or surrounding lymph nodes, thickening, dimpling, skin irritation, distortion, retraction or scaliness of the nipple, nipple discharge, or tenderness.

Risk Factors and Prevention The incidence of breast cancer increases with age. Although there are many possible risk factors, those that are well supported by research include family history of breast cancer, menstrual periods that started early and ended late in life, obesity after menopause, recent use of oral contraceptives or postmenopausal hormone...
How to Examine Your Breasts

The best time for a woman to examine her breasts is when the breasts are not tender or swollen. Women who are pregnant, breast-feeding, or have breast implants can also choose to examine their breasts regularly.

1. Lie down and place your right arm behind your head. The exam is done while lying down, not standing up, because when lying down the breast tissue spreads evenly over the chest wall and it is as thin as possible, making it much easier to feel all the breast tissue.

2. Use the finger pads of the three middle fingers on your left hand to feel for lumps in the right breast. Use overlapping dime-sized circular motions of the finger pads to feel the breast tissue.

FIGURE 12.8 Breast Awareness and Self-Examination

Note that the American Cancer Society recommends the use of mammography and clinical breast exam in addition to self-examination.

Source: From “How to Examine Your Breast.” Copyright © American Cancer Society. Reprinted by the permission of the American Cancer Society, Inc.

therapy, never having children or having a first child after age 30, consuming two or more drinks of alcohol per day, and higher education and socioeconomic status.\(^5^7\) Genes appear to account for approximately 5 to 10 percent of all cases of breast cancer. Screening for mutations in the BRCA1 and BRCA2 genes is recommended for women with a family history of breast cancer.

International differences in breast cancer incidence correlate with variations in diet, especially fat intake, although a causal role for these dietary factors has not been firmly established. Sudden weight gain has also been implicated. Research also shows that regular exercise, even some cated. Research also shows that regular exercise, even some

forms of recreational exercise, can reduce risk.\(^5^8\) Light pressure is needed to feel the tissue closest to the skin; medium pressure to feel a little deeper; and firm pressure to feel the tissue closest to the chest and ribs. A firm ridge in the lower curve of each breast is normal. If you’re not sure how hard to press, talk with your doctor or nurse. Use each pressure level to feel the breast tissue before moving on to the next spot.

4. Move around the breast in an up-and-down pattern, starting at an imaginary line drawn straight down your side from the underarm and moving across the breast to the middle of the chest bone. Be sure to check the entire breast area going down until you feel only ribs and up to the neck or collar bone (clavicle).

There is some evidence to suggest that the up-and-down pattern (sometimes called the vertical pattern) is the most effective pattern for covering the entire breast without missing any breast tissue.

5. Repeat the exam on your left breast, using the finger pads of the right hand.

6. While standing in front of a mirror with your hands pressing firmly down on your hips, look at your breasts for any changes of size, shape, contour, or dimpling. (Pressing down on the hips contracts the chest wall muscles and enhances any breast changes.)

7. Examine each underarm while sitting up or standing and with your arm only slightly raised so you can easily feel in this area. (Raising your arm straight up tightens the tissue in this area and makes it difficult to examine.)

Colon and Rectal Cancers

Colorectal cancers (cancers of the colon and rectum) continue to be the third most common cancer in both men and women, with over 153,760 cases diagnosed in 2007.\(^6^0\) Although colon cancer rates have increased steadily in recent decades, many people are unaware of their risk.

Risk Factors Anyone can get colorectal cancer, but people who are over age 50, who are obese, who have a family history of colon and rectal cancer, a personal or family history of polyps (benign growths) in the colon or rectum, or inflammatory bowel problems such as colitis run an increased risk. Other possible risk factors include diets high in fat or low in fiber, smoking, sedentary lifestyle, high alcohol consumption, and low intake of fruits and vegetables.

Symptoms and Treatment In its early stages, colorectal cancer has no symptoms. Bleeding from the rectum, blood in the stool, and changes in bowel habits are the major warning signals. Because colorectal cancer tends to spread slowly, the prognosis is quite good if it is caught in the early stages. However, only 21 percent of all Americans over age 50
Skin Cancer

If you are one of the millions of people each year who try to get a “healthy tan,” think again. Early signs of sun damage (photodamage) include sunburn, tanning, and increased freckling. This damage is cumulative, and it is followed by wrinkling, premature aging and age spots, cataracts and other forms of eye damage, sagging of the skin, and the most serious consequence: skin cancer.

Skin cancer is the most common form of cancer in the United States today, affecting over 1 million people every year (one in five of all adults). In 2007, an estimated 10,850 people died of skin cancer (8,110 from malignant melanoma and 2,740 from other forms of skin cancer). Malignant melanoma, the deadliest form of skin cancer, is beginning to occur at a much higher rate in women under age 40. In fact, the highly virulent malignant melanoma has become the most frequent cancer in women aged 25 to 29 and runs second only to breast cancer in women aged 30 to 34.61

A virulent cancer of the melanocytes (pigment-producing cells) of the skin.

malignant melanoma
Anyone who overexposes himself or herself without adequate protection is at risk for skin cancer. The risk is greatest for people who fit the following categories:

- Have fair skin; blonde, red, or light brown hair; blue, green, or gray eyes
- Always burn before tanning or burn easily and peel readily
- Don’t tan easily but spend lots of time outdoors
- Have previously been treated for skin cancer or have a family history of skin cancer
- Use no or low-SPF sunscreens

Although sun exposure risks have been widely reported, over 60 percent of Americans 25 years and under report that they are “working on a tan” at some point during the year. Despite the red flag, why do people continue to tan? Recent research suggests a connection between high levels of ultraviolet light and endorphins. Those who tan in the sun or artificially may experience a short “high” for this reason, and tanning can become a type of addiction.

Preventing skin cancer is a matter of limiting exposure to harmful ultraviolet (UV) rays found in sunlight. What happens when you expose yourself to sunlight? Biologically, the skin responds to photodamage by increasing its thickness and the number of pigment cells (melanocytes), which produce the “tan” look. The skin’s cells that ward off infection are also prone to photodamage, lowering the normal immune protection of our skin and priming it for cancer. Photodamage also causes wrinkling by impairing the elastic substances (collagens) that keep skin soft and pliable. See Table 12.5 for practical tips on staying safe in the sun.

**SUNLESS TANNERS AND BRONZERS**

Although spray-on and lotion sunless tanners and bronzers are in vogue, there is no clear definition of the nature of these products, and even less protection for consumers because there are no enforceable regulations governing their use. The Skin Cancer Foundation posts a list of products that have earned their “Seal of Recommendation” on their site, www.skincancer.org.

Typically, sunless tanners refer to products that provide a tanned appearance without exposure to the sun or UV radiation and lasting for several days. Bronzers include a variety of products that allow you to achieve a temporary tan via tinted lotions or powders that wash off readily. Neither product has any ability to protect your skin from the damaging rays of the sun.

One ingredient commonly used in sunless tanners is the color additive dihydroxyacetone (DHA). DHA interacts with the dead surface cells in the outermost layer of the skin to darken skin color. DHA has been approved by the FDA for use in coloring the skin since 1977 and has typically been sold in lotions and creams. Complaints from consumers have been lodged against these products, most of which cite rashes, coughing, sneezing, dizziness and fainting, probably due to some form of allergic reaction. DHA is restricted to external application, so if you choose to use DHA spray or lotion, be sure to protect your mouth, eyes, and nose from it.

**TANNING PILLS**

Some companies market pills that contain the color additive canthaxanthin. When large amounts of canthaxanthin are ingested, the substance can turn the skin a range of colors, from orange to brown. However, there are no tanning pills approved by the FDA, and canthaxanthin is approved for use only as a color additive in foods and oral medications, and only in small amounts. Tanning pills have been associated with health problems, including an eye disorder called canthaxanthin retinopathy, which is the formation of yellow deposits on the eye’s retina. According to the American Academy of Dermatology, canthaxanthin has also been reported to cause liver injury and a severe itching condition called urticaria.

**Risk Factors and Prevention** Anyone who overexposes himself or herself without adequate protection is at risk for skin cancer. The risk is greatest for people who fit the following categories:

- Have fair skin; blonde, red, or light brown hair; blue, green, or gray eyes
- Always burn before tanning or burn easily and peel readily
- Don’t tan easily but spend lots of time outdoors
- Have previously been treated for skin cancer or have a family history of skin cancer
- Use no or low-SPF sunscreens

Detection, Symptoms, and Treatment Many people do not know what to look for when examining themselves for skin cancer. Figure 12.9 shows examples of the three most prevalent types. Basal and squamous cell carcinomas can be a recurrent annoyance, showing up most commonly on the
face, ears, neck, arms, hands, and legs as warty bumps, colored spots, or scaly patches. Bleeding, itchiness, pain, or oozing are other symptoms of carcinomas. Surgery may be necessary to remove them, but they are seldom life-threatening.

In striking contrast is the insidious melanoma, an invasive killer that quickly spreads to regional organs and throughout the body, accounting for over 75 percent of all skin cancer deaths. Risks increase dramatically among whites after age 20.62 Often, melanoma starts as a normal-looking mole but quickly develops abnormal characteristics. A simple **ABCD rule** outlines the warning signs of melanoma:

- **Asymmetry.** One half of the mole does not match the other half.
- **Border irregularity.** The edges are uneven, notched, or scalloped.
- **Color.** Pigmentation is not uniform. Melanomas may vary in color from tan to deeper brown, reddish black, black, or deep bluish black.
- **Diameter.** The diameter is greater than 6 millimeters (about the size of a pea).

If you notice any of these symptoms, consult a physician promptly.

Treatment of skin cancer depends on its seriousness. Surgery is performed in 90 percent of all cases. Radiation therapy, *electrodesiccation* (tissue destruction by heat), and *cryosurgery* (tissue destruction by freezing) are also common forms of treatment. For melanoma, treatment may involve surgical removal of the regional lymph nodes, radiation, or chemotherapy.

### Prostate Cancer

Cancer of the prostate is the most common cancer in American men today, with the exception of skin cancer, and the second leading cause of cancer death in men, after lung cancer. In 2007, about 218,890 new cases of prostate cancer were diagnosed in the United States. About 1 man in 3 will be diagnosed with prostate cancer during his lifetime, but only 1 man in 33 will die of it.63

**Symptoms** The prostate is a muscular, walnut-sized gland that surrounds part of the urethra, the tube that...
transports urine and sperm out of the body. As part of the male reproductive system, its primary function is to produce seminal fluid. Most symptoms of prostate cancer mimic signs of infection or an enlarged prostate. These may include weak or interrupted urine flow; difficulty starting or stopping urination; feeling the urge to urinate frequently; pain upon urination; blood in the urine; or pain in the low back, pelvis, or thighs. Many men have no symptoms in the early stages.

Prostate cancer may begin with a condition called prostatic intraepithelial neoplasia (PIN). In this condition, there are changes in the microscopic appearance of prostate gland cells, ranging from a bit different than normal to abnormal. PIN may appear in men in their twenties, and by the time men reach age 50, nearly 50 percent of men have these changes.

**Risk Factors** Factors that appear to increase the risk of prostate cancer include the following:64

- **Age.** Chances of developing prostate cancer increase dramatically with age. More than 70 percent of cancers are diagnosed in men over age 65.
- **Race.** African American men are 61 percent more likely to develop prostate cancer than white men and are much more likely to be diagnosed at an advanced stage. Prostate cancer is less common among Asian men and occurs at about the same rates among Hispanic men as it does among white men.
- **Nationality.** Prostate cancer is most common in North America and northwestern Europe and less common in Asia, Africa, Central America, and South America.
- **Family history.** Having a father or brother with prostate cancer more than doubles a man’s risk of getting prostate cancer (interestingly, the risk is higher for men with an affected brother than it is for those with an affected father).
- **Diet.** Men in countries where the typical diet is high in fat have higher risks of prostate cancer than men in countries with lower-fat diets. Men who consume high levels of calcium also may be at greater risk, although studies have yet to confirm this.
- **Physical inactivity and overweight/obesity.** Regular physical activity and maintaining a healthy weight may help reduce the risk of prostate cancer.
- **Vasectomy.** Although there is concern among some groups that having a vasectomy, particularly before age 35, increases the risk of prostate cancer, most recent studies have not found this to be true.

**Prevention and Treatment** Eating more fruits and vegetables, particularly those containing lycopene, a pigment found in tomatoes and other red fruits, may lower the risk of prostate cancer. Some studies suggest that taking 50 milligrams (400 international units, or IU) of vitamin E and adequate amounts of selenium in your diet may reduce risk, whereas consuming high levels of vitamin A may increase risk. The best advice is to follow the dietary recommendations discussed in Chapter 9 and maintain a healthy weight.

Another important strategy is to get diagnostic tests on the schedule recommended by the American Cancer Society and the National Cancer Institute. Most health organizations do not recommend routine testing for men under age 40. Every man over age 40 should have an annual digital rectal prostate examination. The American Cancer Society recommends that men age 50 and over have an annual prostate-specific antigen (PSA) test.

Fortunately, 83 percent of all prostate cancers are detected while they are still in the local or regional stages, and they tend to progress slowly. Over the past 20 years, the survival rate for all stages combined has increased from 67 percent to 96 percent, largely because of earlier diagnosis and improved treatment.

**Ovarian Cancer**

Ovarian cancer is the fifth leading cause of cancer death for women, diagnosed in almost 22,430 women in 2007 and killing 15,280.65 Ovarian cancer causes more deaths than any other cancer of the reproductive system because its insidious, often silent, course means women tend not to discover it until the cancer is at an advanced stage. Overall, 1-year survival rates are 76 percent, and 5-year survival rates are 45 percent.

The most common symptom of ovarian cancer is enlargement of the abdomen. Women over 40 may experience persistent digestive disturbances, as well. Other symptoms include fatigue, pain during intercourse, unexplained weight loss, unexplained changes in bowel or bladder habits, and incontinence. However, many women have no early symptoms at all.

Risk factors for ovarian cancer include a family history of ovarian, breast, or colon cancer; never having been pregnant; taking fertility drugs; and genetic predisposition. The younger a woman is when she is diagnosed with ovarian cancer, the better her chances of survival. New diagnostic tests, including a blood test for the tumor marker, CA-125, can significantly improve chances of early diagnosis.66

Research shows that using birth control pills, adhering to a low-fat diet, having multiple children, and breast-feeding can all reduce risk of ovarian cancer. General prevention strategies such as focusing on diet, exercise, sleep, stress management, and weight control are good ideas to lower your risk for this and any of the diseases discussed in this chapter. To protect yourself, thorough annual pelvic examinations are important. Pap tests, although useful in detecting cervical cancer, do not reveal ovarian cancer. Women over age 40 should have a cancer-related checkup every year.

**Cervical and Endometrial (Uterine) Cancer**

Most uterine cancers develop in the body of the uterus, usually in the endometrium (lining). The rest develop in the cervix, located at the base of the uterus. In 2007, an estimated 11,150 new cases of cervical cancer and 39,080
cases of endometrial cancer were diagnosed in the United States. The overall incidence of cervical and uterine cancer has been declining steadily over the past decade. This decline may be due to more regular screenings of younger women using the Pap test, a procedure in which cells taken from the cervical region are examined for abnormal cellular activity. Although Pap tests are very effective for detecting early-stage cervical cancer, they are less effective for detecting cancers of the uterine lining.

Risk factors for cervical cancer include early age at first intercourse, multiple sex partners, cigarette smoking, and certain sexually transmitted infections, including human papillomavirus (the cause of genital warts) and herpesvirus. For endometrial cancer, risk factors include age, endometrial hyperplasia, being overweight, diabetes, high blood pressure, a history of other cancers, race (white women are at higher risk), treatment with tamoxifen for breast cancer, and estrogen replacement therapy. Other factors also related to estrogen include having few or no children and entering menopause late in life.

Early warning signs of uterine cancer include bleeding outside the normal menstrual period or after menopause or persistent unusual vaginal discharge. These symptoms should be checked by a physician immediately.

Testicular Cancer

Testicular cancer is one of the most common types of solid tumors found in young adult men, affecting nearly 7,920 young men in 2007. Those between the ages of 15 and 35 are at greatest risk. There has been a steady increase in testicular cancer frequency over the past several years in this age group. Although the cause of testicular cancer is unknown, several risk factors have been identified. Men with undescended testicles appear to be at greatest risk, and some studies indicate a genetic influence.

In general, testicular tumors first appear as an enlargement of the testis or thickening in testicular tissue. Because this enlargement is often painless, it is extremely important that all young men practice regular testicular self-examination (Figure 12.10).

One of the most remarkable testicular cancer stories is the survival of champion cyclist Lance Armstrong. Struck by an invasive form of testicular cancer that had spread to several parts of his body, including his brain, Armstrong and his indomitable spirit set a wonderful example of hope. Through a combination of superior medical care, exercise, and dietary and lifestyle changes, as well as a spiritual journey, Lance recovered from his cancer and went on to win the Tour de France seven consecutive times.

How to Examine Your Testicles

The best time to perform a testicular self-examination is after a warm shower or bath, when the testicles descend and the scrotal skin is relaxed.

1. Use a mirror to examine the scrotum for any visible swelling.
2. Using both hands, place the index and middle fingers of each hand on the underside of the testicle and the thumbs on top. Gently roll the testicle between the thumbs and fingers.
3. Identify the epididymis, the structure behind the testicle that carries sperm, so that you don’t confuse it for a lump.

![Testicular Self-Examination](image)

Pap test A procedure in which cells taken from the cervical region are examined for abnormal cellular activity.

Pancreatic Cancer

The incidence of pancreatic cancer has increased substantially during the last 25 years to 37,170 cases in 2007. It is now the fourth leading cause of cancer deaths for both men and women. Chronic inflammation of the pancreas (pancreatitis), obesity, physical inactivity, diabetes, cirrhosis, and a high-fat diet may contribute to its development. Smokers have double the risk of nonsmokers. Only 5 percent of patients live more than 5 years after diagnosis, usually
because the disease is well advanced by the time there are
any symptoms and it is diagnosed.

Leukemia

Leukemia is a cancer of the blood-forming tissues that leads
to proliferation of millions of immature white blood cells.
These abnormal cells crowd out normal white blood cells
(which fight infection), platelets (which control hemorrhag-
ing), and red blood cells (which carry oxygen to body cells).
As a result, symptoms such as fatigue, paleness, weight loss,
easy bruising, repeated infections, nosebleeds, and other
forms of hemorrhaging occur.

Leukemia can be acute or chronic and can strike both
sexes and all age groups. An estimated 44,240 new cases
were diagnosed in the United States in 2007.70 Chronic
leukemia can develop over several months and have few
symptoms. The 5-year survival rate for patients with chronic
lymphocytic leukemia, one of the most common types, has
risen to 74 percent.

Facing Cancer

Based on current rates, about 83 million people—or one in
three of us now living—will eventually develop cancer.
Despite these gloomy predictions, recent advancements in
the diagnosis and treatment of many forms of cancer have reduced
some of the fear and mystery that once surrounded this disease.

Detecting Cancer

The earlier cancer is diagnosed, the better the prospect for
survival. Make a realistic assessment of your own risk fac-
tors, and avoid the ones that you can control. Do you have a
family history of cancer? If so, what types? Make sure you
know which symptoms to watch for, and follow the recom-
mendations for self-exams and medical checkups outlined in
Table 12.6. Avoid known carcinogens—such as tobacco—
and other environmental hazards. Eat a nutritious diet.
Heeding the suggestions for primary prevention can signifi-
cantly decrease your own risk for cancer.

Several high-tech tools to detect cancer have been
developed. In magnetic resonance imaging (MRI), a huge
electromagnet detects hidden tumors by mapping the
vibrations of the various atoms in the body on a computer
screen. The computed tomography scan (CT scan) uses
X rays to examine parts of the body. In both of these painless,
noninvasive procedures, cross-sectioned pictures can reveal
a tumor’s shape and location more accurately than can con-
ventional X-ray images. Prostatic ultrasound (a rectal probe
using ultrasonic waves to produce an image of the prostate)
is being investigated as a means to increase the early
detection of prostate cancer.

Figure 12.11 lists seven warning signals of cancer. If
you notice any of these signals, and they don’t appear to be
related to anything else, see a doctor immediately.

New Hope in Cancer Treatments

Although cancer treatments have changed dramatically over
the past 20 years, surgery, in which the tumor and surrounding

magnetic resonance imaging (MRI)  A device that uses
magnetic fields, radio waves, and computers to generate an
image of internal tissues of the body for diagnostic purposes
without the use of radiation.

computed tomography scan (CT scan)  A scan by a
machine that uses radiation to view internal organs not
normally visible on X-ray images.
### TABLE 12.6 Screening Guidelines for the Early Detection of Cancer in Asymptomatic People

<table>
<thead>
<tr>
<th>Site</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancer-related checkup</strong></td>
<td>For individuals undergoing periodic health examinations, a cancer related checkup should include health counseling and, depending on a person’s age, might include examination for cancers of the thyroid, oral cavity, skin, lymph nodes, testes, and ovaries, as well as for some nonmalignant diseases.</td>
</tr>
<tr>
<td><strong>Breast</strong></td>
<td>Women 40 and older should have an annual mammogram and an annual clinical breast exam (CBE) performed by a health care professional and should perform monthly breast self-examination (BSE). Ideally, the CBE should occur before the scheduled mammogram. Women aged 20–39 should have a clinical breast exam performed by a health care professional every 3 years. Women should know how their breasts normally feel and report any breast change promptly to their health care providers. Breast self-exam is an option for women starting in their twenties. Women at increased risk (e.g., with family history, genetic tendency, past breast cancer) should talk with their doctors about the benefits and limitations of starting mammography screening earlier, having additional tests (i.e., breast ultrasound and MRI), or having more frequent exams.</td>
</tr>
</tbody>
</table>
| **Colon and rectum** | Beginning at age 50, men and women should follow one of the examination schedules below:  
  - A fecal occult blood test (FOBT) every year, or a flexible sigmoidoscopy (FSIG) every 5 years, or both annual fecal occult blood test and flexible sigmoidoscopy every 5 years*  
  - A double contrast barium enema every 5 to 10 years  
  - A colonoscopy every 10 years  

| **Prostate**       | The American Cancer Society recommends that both the prostate-specific antigen (PSA) blood test and the digital rectal examination be offered annually, beginning at age 50, to men who have a life expectancy of at least 10 more years. Men at high risk (African American men and men with a strong family history of one or more first-degree relatives diagnosed with prostate cancer at an early age) should begin testing at age 45. Information should be provided to patients about what is known and what is uncertain about the benefits and limitations of early detection and treatment of prostate cancer so that they can make an informed decision. |
| **Uterus**         |  
  - **Cervix:** Screening should begin approximately 3 years after a woman begins having vaginal intercourse but no later than 21 years of age. Screening should be done every year with Pap tests or every 2 years using liquid-based tests. At or after age 30, women who have had three normal tests in a row may get screened every 2–3 years, unless they have certain risk factors, such as HIV infection or a weak immune system. Screening after total hysterectomy (with removal of the cervix) is not necessary unless the surgery was done as a treatment for cervical cancer.  
  - **Endometrium:** The American Cancer Society recommends that all women be informed about the risks and symptoms of endometrial cancer and be strongly encouraged to report any unexpected bleeding or spotting to their physicians. Annual screening for endometrial cancer with endometrial biopsy beginning at age 35 should be offered to women with or at risk for hereditary nonpolyposis colon cancer (HNPC). |

*Combined testing is preferred over either annual FOBT or FSIG every 5 years alone. People who are at moderate or high risk for colorectal cancer should talk with a doctor about a different testing schedule.  

Source: From Cancer Facts and Figures 2007. Copyright © 2007, American Cancer Society. Used with permission from American Cancer Society, Atlanta, GA.

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Tissue are removed, is still common. Today, treatments such as radiotherapy (the use of radiation) or chemotherapy (the use of drugs) to kill cancerous cells are also used.

Radiation works by destroying malignant cells or stopping cell growth. It is most effective in treating localized cancer masses. When cancer has spread throughout the body, it is necessary to use some form of chemotherapy. Whether used alone or in combination, radiation and chemotherapy have side effects, including extreme nausea, nutritional deficiencies, hair loss, and general fatigue. In the process of killing malignant cells, some healthy cells are also destroyed. Long-term damage to the cardiovascular system and other body systems can be significant. Ongoing research promises to result in new drugs and treatments that are less toxic to normal cells.

Today, some researchers are targeting cancer as a genetic disease that is brought on by some form of mutation, either inherited or acquired. Promising treatments focus on stopping the cycle of these mutant cells, targeting toxins through monoclonal antibodies, and rousing the immune system to be more effective. Other areas of research include immunotherapy, which enhances the body’s own disease-fighting mechanisms, cancer-fighting vaccines to combat abnormal cells, gene therapy to increase the patient’s immune response, and various substances that block cancer-causing events along the cancer pathway. Another promising avenue of potential treatment is stem cell research, although controversy around the use of stem cells continues to slow research.
Cancer Survivors: Life after Cancer

Heightened public awareness and an improved prognosis have made the cancer experience less threatening and isolating than it once was. In fact, assistance for the cancer patient is more readily available than ever before. Cancer support groups, cancer information workshops, and low-cost medical consultation are just a few of the forms of assistance now offered in many communities. Groups have successfully lobbied the U.S. Congress to increase government funding for cancer research over the past decade. Increasing efforts in cancer research, improvements in diagnostic equipment, and advances in treatment provide hope for the future.

Chapter Review

1. The function of the aorta is to
   a. return the blood from the lungs.
   b. pump the blood to the arteries in the rest of the body.
   c. pump blood to the lungs.
   d. return blood back to the heart.

2. Severe chest pain occurring as a result of reduced oxygen flow to the heart is called
   a. angina pectoris.
   b. arrhythmias.
   c. myocardial infarction.
   d. congestive heart failure.

3. Arteriosclerosis is more commonly referred to as
   a. hardening of the arteries.
   b. heart attack.
   c. high blood pressure.
   d. plaque.

4. A stroke results
   a. when a heart stops beating.
   b. when cardiopulmonary resuscitation has failed to revive the stopped heart.
   c. when blood to the brain has been blocked off.
   d. when the blood pressure rises too high.
5. The “bad” type of cholesterol found in the bloodstream is known as
   a. high-density lipoprotein.
   b. low-density lipoprotein.
   c. total cholesterol.
   d. triglyceride.

6. Diabetes mellitus interferes with the body’s ability to
   a. metabolize sugars.
   b. produce adrenaline.
   c. respond to saturated fats in the diet.
   d. all of the above.

7. The greatest number of cancer deaths for both men and women is caused by
   a. colorectal cancer.
   b. pancreatic cancer.
   c. lung cancer.
   d. stomach cancer.

8. The more serious, life-threatening type of skin cancer is
   a. basal cell.
   b. squamous cell.
   c. melanoma.
   d. lymphoma.

9. Suspected cancer-causing genes are called
   a. epigenes.
   b. oncogenes.
   c. primogenes.
   d. metastogenes.

10. The fecal occult blood test is the most basic screening test used for
    a. lung cancer.
    b. prostate cancer.
    c. cervical cancer.
    d. colorectal cancer.

Answers to these questions can be found on page A-1.

Questions for Discussion and Reflection

1. Trace the path of a drop of blood from the time it enters the vena cava until it reaches your little finger. Be sure to include the types of blood vessels involved.

2. List the different types of CVD. Compare and contrast their symptoms, risk factors, prevention, and treatment.

3. Discuss the role that exercise, stress management, dietary changes, medical checkups, sodium reduction, and other factors can play in reducing risk for CVD. What role may chronic infections play in CVD risk?

4. Describe some of the diagnostic and treatment alternatives for CVD. If you had a heart attack today, which treatment would you prefer? Explain why.

5. Describe the risk factors for diabetes and its symptoms and treatment. What is the difference between type 1 diabetes and type 2 diabetes?

6. List the likely causes of cancer. Do any of them put you at greater risk? What can you do to reduce your risk? What risk factors do you share with family members? With friends?

7. What are the symptoms of lung, breast, prostate, and testicular cancer? What can you do to reduce your risk of developing these cancers or increase your chances of surviving them?

8. Why are breast and testicular self-exams important for women and men? What could be the consequences of failing to do these exams regularly?

9. Discuss the seven warning signals of cancer. How soon should you seek treatment for any of the warning signs?

Accessing Your Health on the Internet

The following websites explore further topics and issues related to personal health. For links to the websites below, visit the Companion Website for Health: The Basics, Eighth Edition at www.aw-bc.com/donatelle.

1. American Heart Association. Home page for the leading private organization dedicated to heart health. This site provides information, statistics, and resources regarding cardiovascular care, including an opportunity to test your own risk for CVD. www.americanheart.org


4. American Cancer Society. Resources from the leading private organization dedicated to cancer prevention. This site provides information, statistics, and resources regarding cancer. www.cancer.org

Further Reading


Contains up-to-date information on treatments, medicines, reconstructive surgery, and complementary and alternative options. Also includes information for caregivers, family, and friends.


e-themes from The New York Times

For up-to-date articles about current health issues, visit www.aw-bc.com/donatelle, select Health: The Basics, Eighth Edition, Chapter 12, and click on “e-themes.”

References


6. American Heart Association, “Homocysteine, Folic Acid, and Cardiovascular Disease.”


10. Ibid.
11. Ibid.
12. Ibid.
13. Ibid.
14. Ibid.
15. Ibid.
16. Ibid.
17. Ibid.
20. Ibid.
27. Ibid.
28. Ibid.
32. Ibid.
33. Ibid.
34. Ibid.
40. Ibid.
41. Ibid.
42. Ibid.
43. Ibid.
44. Ibid.
45. Ibid.
54. Ibid.
57. Ibid.
61. Ibid.
62. Ibid.
63. Ibid.
64. Ibid.
65. Ibid.
66. Ibid.
67. Ibid.