



ALTON L. THYGERSON
STEVEN M. THYGERSON

FIFTH EDITION

FIT TO BE **WELL**

ESSENTIAL CONCEPTS

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The purpose of this text is, first, to introduce you to the extraordinary world of physical fitness and, second, to change your life.

In a time of high-tech advances, we have lost sight of the fact that the greatest high-tech invention of all time is the human body. What happens to our bodies as we move through life is the result of our lifestyle.

As priceless as good health is, it is freely available to us if we live the right way. The child does not have to be taught to play, but the adult must learn how to exercise. As we age and our lives become busier, we lose that childhood instinct to run and jump, to skip, and to walk briskly. But it is movement in assorted styles and speeds on a regular basis that is critical in maintaining the high-tech machinery of our bodies.

The good news is that it is never too late to start exercising, eating properly, and managing stress, regardless of your age or physical condition. This text can help you make the lifestyle changes that will sustain your health and make your life a better one.

Attempting to reach the goal of good health and wellness through physical fitness can be compared with preparing to take a journey. If you were driving from Los Angeles to New York City, you would first obtain a road map to determine the best route to follow. The journey to good health and wellness is very similar, but most people are not familiar with or do not know where to obtain a road map leading to good health and wellness.

This text is your road map. It takes you from your current level of fitness to increased cardiorespiratory endurance, strength, and flexibility, and helps you maintain a healthy weight and learn to relax.

Fit to Be Well: Essential Concepts, Fifth Edition offers a simple, workable approach to a healthy lifestyle.

Notes to Students and Instructors

No other fitness text is like this one.

The content of this text is organized in a succinct, easy-to-navigate manner, with emphasis placed on important concepts and applications. The advantages of this approach include:

- Decreased reading time
- Faster access to information
- Improved learning
- Less expense
- High reader satisfaction
- Creative uses of information (e.g., uses “chunking” to put content into manageable units for better learning)
- Content that is concise and straightforward, with information that a person “needs” to know rather than content that is simply “nice” to know
- Evidence-based medical sources that provide the content and latest recommendations

Special Features

Special features to improve learning include:

What's the word boxes throughout the text contain target terms and offer simple, clear definitions for terms of interest.

The Inside Track feature provides quick and easy guides to important information.

Medical News You Can Use consists of concise summaries from a range of recent medical journals and reports. These features simplify the technical language to provide a rich source of information. They serve not only as interesting reading, but more importantly, support many of this text's key concepts.

Tipping Point gives helpful hints and tips that explain to students how to manage their own fitness and healthy lifestyle program.

The Reflect >>>> Reinforce >>>> Reinvigorate section at the end of each chapter provides additional materials that consider the chapter contents as a whole:

Knowledge Check provides multiple-choice questions at the end of each chapter, which test students' knowledge of the information covered in the text.

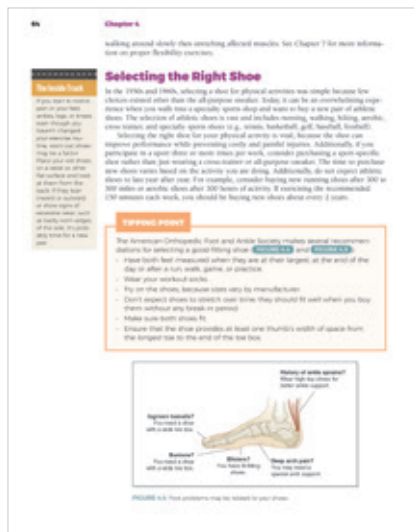
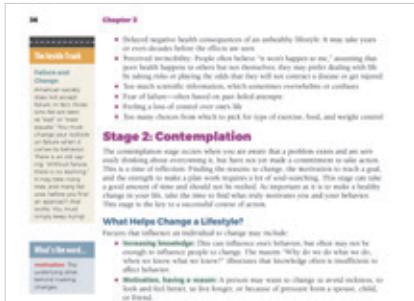
Modern Modifications sections in each chapter provide a list of simple suggestions related to that chapter's topic. Each of these suggestions is specifically intended to be easily absorbed into students' daily routines. The strategies are realistic and take into consideration "real-life" obstacles.

Critical Thinking sections give students a chance to apply what they learned in each chapter. Questions and scenarios about the work that they will do and the goals they want to

achieve will bring about some critical thoughts. This will help students assimilate what they learn and apply it to their daily lives.

Going Above and Beyond provides a perfect opportunity for students to take their research one step further. Complete bibliographies and websites are included so that students can learn more about topics of interest to them.

Time Outs explore topics of interest to students such as energy production, fad diets, and ethnic diets.



New to the *Fifth Edition*

Key changes for the *Fifth Edition* include the following:

- Updates reflect *Healthy People 2020*'s new physical activity objectives.
- Latest research showing additional health benefits of regular physical activity, including treating dementia and lowering the risk of heart disease and some cancers.
- Several new “Medical News Use Can Use” features describing the latest research on physical activity and nutrition.
- Additional criteria for selecting a physical activity and weight loss plan.
- Additional details on selecting appropriate shoes.
- New information on wearable fitness technology.
- Additional core exercises included to be part of any physical activity routine.
- Updated nutrition information meeting the new *2015–2020 Dietary Guidelines for Americans*.
- Information on the new Nutrition Facts food label redesign.
- Details for the USP label and the requirements for dietary supplements.
- Additional information on the importance of sleep.
- Updated care for exercise-related injuries.

Supplements

Lab Manual

A student lab manual is included at the end of the text at no additional cost to students! By adding self-assessments and related labs to each of the chapters, this text becomes an interactive guide to building and implementing a fitness program that will work with students' individual needs and schedules.

Instructor Resources

Qualified instructors can access comprehensive teaching resources, include the following:

- Slides in PowerPoint format, featuring more than 350 slides
- Test Bank, containing more than 400 questions
- Instructor's Manual, including chapter objectives, chapter outlines, answers to Knowledge Check questions, and teaching tools
- Image Bank, collecting photographs and illustrations that appear in the text

Student Resources

Students can access digital resources that help reinforce key concepts in the text, including an interactive eBook, an interactive glossary, weblinks, and flashcards.

Any book requires a great deal of effort, and not just on the part of the authors. This book is no exception to that rule.

We are fortunate to have a publisher who believed in this unique project and who encouraged us to write this textbook. We are very grateful to Sean Fabery, Product Manager, for pushing the project along the way, and Hannah Dziezanowski, Product Assistant, for helping to make it a better book. A strong appreciation goes to the Jones & Bartlett Learning production staff: Carolyn Pershouse, Production Manager; Merideth Tumas, Rights & Media Specialist; and Troy Liston, Media Development Editor.

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Introduction



OBJECTIVES

After reading this chapter, you should be able to:

- Describe the benefits of routine physical activity on life expectancy.
- Identify the actual causes of death in the United States.
- Identify and define the components of fitness and wellness.
- Describe national health and wellness goals.

“He who has health, has hope; and he who has hope, has everything.”

—Carlyle

How Long Can We Expect to Live?

Life expectancy in the United States in 2014 was the highest in recorded history, reaching 78.8 years (or about 78 years and 42 weeks). Since 2000, life expectancy has increased by 1.8% (or about 17 months) for the general population. Females continue to have the longer life expectancy (81.2 years), compared with males (76.4 years).

Life expectancies have risen dramatically in the past century. The average life span of anyone in an industrialized nation has increased since 1900 by over 30 years due to improvements in public health, vaccinations, and disease prevention. For example, fewer people have been affected by epidemics of infectious diseases that can be vaccinated against, such as smallpox. In 1940, the average 20-year-old female could expect to live an additional 45.7 years to the age of 65.7 years. Today, the average 20-year-old female can expect to live an additional 61.4 years to the age of 81.4 years (see **FIGURE 1.1**).

It is unlikely, however, that life expectancies will continue to rise as they have during the past century. The approximately 10 million cells in your body have a limited life span, meaning they can divide only a certain number of times before they begin to age and stop reproducing. This phenomenon, known as the Hayflick limit, is named after its discoverer, Dr. Leonard Hayflick. The human life-span limit is believed to be close to 125 years, although very few of us reach that age. Incidentally, Frenchwoman Jeanne Calment, who died in 1997 at the age of 122 years, 164 days, has the longest confirmed life span. Due to the complexity of the aging process, it is unlikely, if not impossible, for someone to break that record. The odds of reaching 125 years of age were calculated to be 1 in 10,000. Researchers think that 115 years is likely the maximum for the human life expectancy.

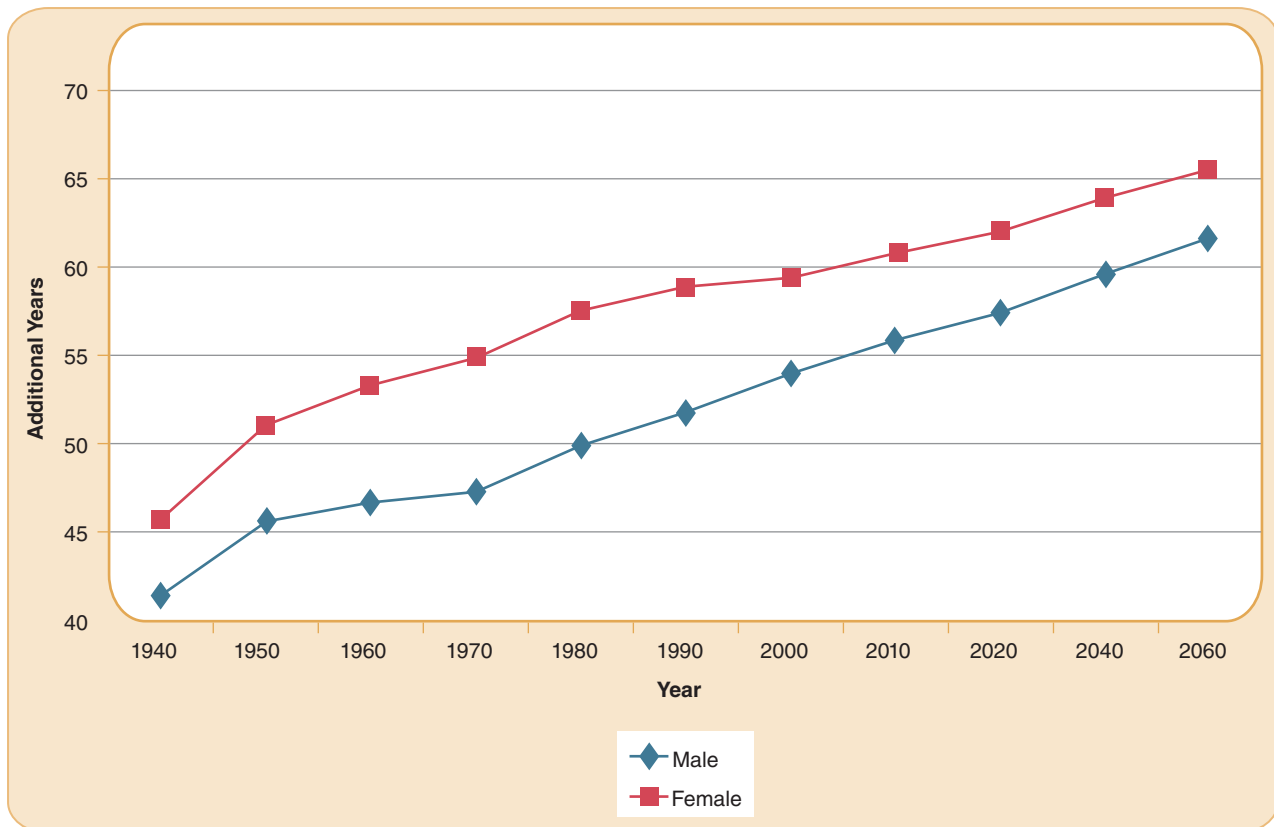


FIGURE 1.1 Life expectancy at age 20.

Data from Social Security Trustees Report 2013, Office of the Chief Actuary, Social Security Administration.

Various reasons explain why more of us do not make it even to 100 years. Nearly all of us experience life-shortening diseases (e.g., heart disease, cancer). Whereas it may not be possible to change our cells' preprogramming, prevention or better treatment of these diseases allow us to come closer to our Hayflick limit. Some experts actually believe that life expectancy within the United States will fall dramatically—by at least 2 to 5 years—in the near future because of obesity. These experts believe that future generations will have shorter and less healthy lives than their parents for the first time in modern history unless changes are made (Olshansky 2005). In fact, the most recent data show that life expectancy has decreased for the first time since 1993.

In the United States, the average person lives into his or her seventies. Your chronological age is your actual age in years from your birth date. However, what really matters is your biological age, which is an estimate of your well-being and general health compared to that of others of your age. For example, people with health problems at age 50 are considered to be biologically older than a healthy and vigorous 70-year-old. The lesson here is for you to take control of your health sooner rather than later.

In the United States, women live about 5 years longer than men. For women, the most accurate predictor of their genetic effect is chronological age at menopause. The average age of menopause for American women is 52 years, but in general, the later her menopause occurs, the longer a woman will live. For those who have not reached that time in their lives, their mother's age at menopause will give an estimate of an expected menopause and an estimated genetic age. Research also suggests that knowing the age at which your parents died may provide an indication of your own risk of death and disease. The longer your mother and father lived, the longer you may live. Although the age of your parents may be predictive of how long you will live, many other factors play a role in the longevity parents and the health of their children.

Certain biomarkers of biological aging allow you estimate whether you are doing better or worse than your chronological age. These markers primarily come from blood testing at a physician's office, but you can test several of these on your own:

- Blood pressure
- Blood glucose and cholesterol levels
- Field test for cardiorespiratory fitness (e.g., walking test)
- Muscular strength
- Bone mineral density



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- Skin elasticity
- Cognitive abilities, including memory
- Blood markers for systemic inflammation

It is difficult to obtain a definite calculation of your biological age; however, if you can answer questions about different health factors, including cholesterol levels, blood pressure, exercise habits, and a few others, try one of several free online calculators:

- Life Expectancy Calculator, available at www.livingto100.com
- Real Age Test, available at www.age-test.com

MEDICAL NEWS YOU CAN USE

Healthy Living Really Does Postpone Death

Four health risk behaviors—lack of physical activity, poor nutrition, tobacco use, and excessive alcohol consumption—are responsible for much of the illness and death related to chronic diseases. Seven out of 10 deaths among Americans each year are from chronic diseases. Heart disease, cancer, and stroke account for more than 50% of all deaths each year.

A Centers for Disease Control and Prevention study finds that people can live longer if they practice one or more healthy lifestyle behaviors—not smoking, eating a healthy diet, getting regular physical activity, and limiting alcohol consumption. Not smoking provides the most protection from dying early from all causes.

People who engaged in all four healthy behaviors were 63% less likely to die early from cancer, 65% less likely to die early from cardiovascular disease, and 57% less likely to die early from other causes compared to people who did not engage in any of the healthy behaviors.

Data from Ford E.S., et al., Low-risk lifestyle behaviors and all-cause mortality. *American Journal of Public Health* 2011. 101(10): 1922-1929.

It is unknown how valid the tests are, but taking either or both of the online tests may point out some ways to change your lifestyle that can improve your health and wellness.

Most of us desire a long life; however, let us be mindful of the admonition given by the French essayist, Michel de Montaigne: “The usefulness of living lies not in duration but in what you make of it. Some have lived long and lived little.”

Compression of Morbidity

As people live longer, some fear that they will spend additional years suffering poor health, disability, or dementia. With increased life expectancy, might people simply increase the length of poor-quality life? In contrast, studies focusing on the concept known as *compression of morbidity* suggest that people can have both a longer life and a healthier old age. To do so, it is necessary to engage in healthy, preventive practices (see **LAB 1-1**).

FIGURE 1.2 shows two time lines for life-ending morbidity and longevity. The first line graph shows that today disability begins to be detectable around age 55 in the average individual, and death occurs on average around 76 years of age. Most disability occurs between these points, and the seriousness of the disability increases with time. The second line graph shows that a healthier lifestyle can not only extend your life, but if you become terminally ill, your life (and illness) will be shorter.

You want to minimize the number of years spent suffering and maximize the total number of years living. Ideally, we want a long, healthy life, with a rapid decline leading to death.

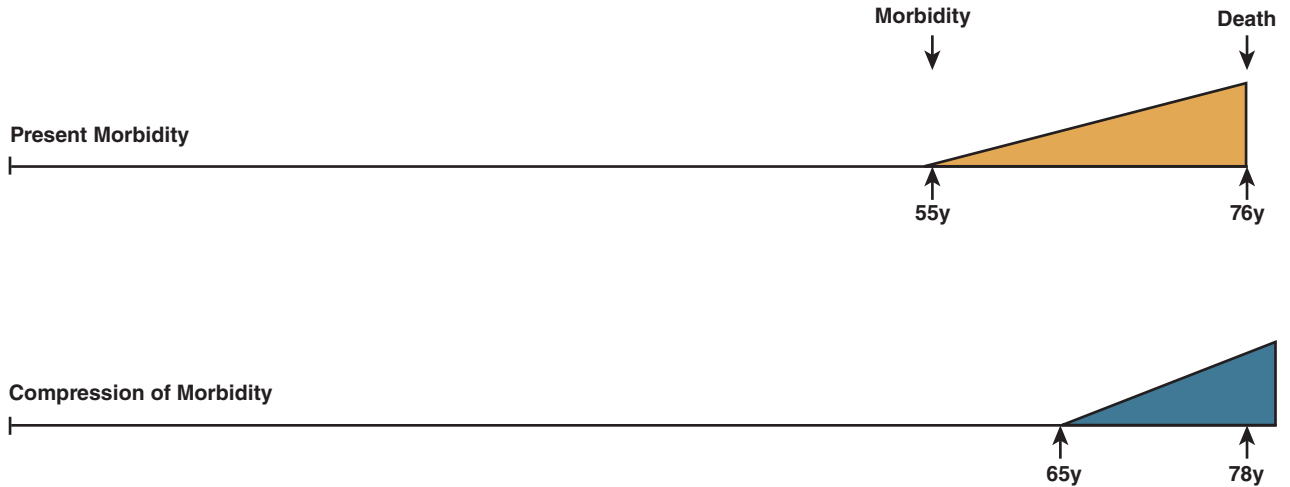


FIGURE 1.2 Compression of morbidity and effects of good health habits: Death and serious medical problems occur earlier in life and medical problems have a longer period in those not practicing a healthy lifestyle. Serious medical problems occur much later in life and have a shorter period in those practicing a healthy lifestyle.

Modified from Fries J.F., Measuring and Monitoring Success in Compressing Morbidity. *Annals of Internal Medicine* 2003; 139: 455-459.

Through a healthy lifestyle you can live longer. Although undesirable medical events will still occur near the end of your life, events leading to death will be delayed between 7 and 13 years, and time between that event and when death occurs is shortened.

You are the most important person taking care of your health. The key to taking responsibility for yourself is learning what works for you and then implementing what you have learned into your daily life. Some people view fitness-related goals as impossible dreams. The truth, however, is that everyone is capable of obtaining a healthy lifestyle. Keep in mind that every change you make is significant, no matter how big or small.

What Are the Leading Causes of Death?

There are more than 100,000 diseases. However, nearly 60% of the U.S. population dies from just three causes: heart disease, cancer, and stroke. The top 10 causes account for almost 80% of all deaths. Not one of the diseases below the top 10 accounts for even 1% of deaths. Therefore, to live a long and healthy life, as suggested by the data, we should focus primarily on preventing the top 10 diseases and not the 100,000 others.

Refer to **FIGURE 1.3**, 10 Leading Causes of Death. Note that the far-right column lists the leading causes of death for all ages.

What Are the Actual Causes of Death?

What actually kills us? Many people and even health professionals have come up with the answer of heart disease, followed by cancer and stroke—the top three leading causes of death.

Epidemiologists, however, thought that it did not help, when someone died of a heart attack, to conclude merely that the cause was disease of the heart. They wanted to know what caused the disease of the heart in the first place, and likewise, what caused the cancer or the stroke. They determined that more than half of the instances of these diseases were attributable to a handful of largely preventable behaviors: smoking, poor diet, physical inactivity, and alcohol consumption. Our lifestyle, not our genes, largely determines if and when we suffer from one or more of the top causes of death. See **TABLE 1.1**.

| 10 Leading Causes of Death by Age Group, United States - 2015 | | | | | | | | | | | |
|---|-----------------------------------|---------------------------------------|---------------------------------------|--|--|--------------------------------|--------------------------------|---|--|---|---|
| Rank | <1 | 1–4 | 5–9 | 10–14 | 15–24 | 25–34 | 35–44 | 45–54 | 55–64 | 65+ | Total |
| 1 | Congenital Anomalies 4,825 | Unintentional Injury 1,235 | Unintentional Injury 755 | Unintentional Injury 763 | Unintentional Injury 12,514 | Unintentional Injury 19,795 | Unintentional Injury 17,818 | Malignant Neoplasms 43,054 | Malignant Neoplasms 116,122 | Heart Disease 507,138 | Heart Disease 633,842 |
| 2 | Short Gestation 4,084 | Congenital Anomalies 435 | Malignant Neoplasms 437 | Malignant Neoplasms 428 | Suicide 5,491 | Suicide 6,947 | Malignant Neoplasms 10,909 | Heart Disease 34,248 | Heart Disease 76,872 | Malignant Neoplasms 419,389 | Malignant Neoplasms 595,930 |
| 3 | SIDS 1,568 | Homicide 369 | Congenital Anomalies 181 | Suicide 409 | Homicide 4,733 | Homicide 4,863 | Heart Disease 10,387 | Unintentional Injury 21,499 | Unintentional Injury 19,488 | Chronic Low. Respiratory Disease 131,804 | Chronic Low. Respiratory Disease 155,041 |
| 4 | Maternal Pregnancy Comp. 1,522 | Malignant Neoplasms 354 | Homicide 140 | Homicide 158 | Malignant Neoplasms 1,469 | Malignant Neoplasms 3,704 | Suicide 6,936 | Liver Disease 8,874 | Chronic Low. Respiratory Disease 17,457 | Cerebrovascular 120,156 | Unintentional Injury 146,571 |
| 5 | Unintentional Injury 1,291 | Heart Disease 147 | Heart Disease 85 | Congenital Anomalies 156 | Heart Disease 997 | Heart Disease 3,522 | Homicide 2,895 | Suicide 8,751 | Diabetes Mellitus 14,166 | Alzheimer's Disease 109,495 | Cerebrovascular 140,323 |
| 6 | Placenta Cord Membranes 910 | Influenza & Pneumonia 88 | Chronic Low Respiratory Disease 80 | Heart Disease 125 | Congenital Anomalies 386 | Liver Disease 844 | Liver Disease 2,861 | Diabetes Mellitus 6,212 | Liver Disease 13,278 | Diabetes Mellitus 56,142 | Alzheimer's Disease 110,561 |
| 7 | Bacterial Sepsis 599 | Septicemia 54 | Influenza & Pneumonia 44 | Chronic Low Respiratory Disease 93 | Chronic Low Respiratory Disease 202 | Diabetes Mellitus 798 | Diabetes Mellitus 1,986 | Cerebrovascular 5,307 | Cerebrovascular 12,116 | Unintentional Injury 51,395 | Diabetes Mellitus 79,535 |
| 8 | Respiratory Distress 462 | Perinatal Period 50 | Cerebrovascular 42 | Cerebrovascular 42 | Diabetes Mellitus 196 | Cerebrovascular 567 | Cerebrovascular 1,788 | Chronic Low. Respiratory Disease 4,345 | Suicide 7,739 | Influenza & Pneumonia 48,774 | Influenza & Pneumonia 57,062 |
| 9 | Circulatory System Disease 428 | Cerebrovascular 42 | Benign Neoplasms 39 | Influenza & Pneumonia 39 | Influenza & Pneumonia 184 | HIV 529 | HIV 1,055 | Septicemia 2,542 | Septicemia 5,774 | Nephritis 41,258 | Nephritis 49,959 |
| 10 | Neonatal Hemorrhage 406 | Chronic Low Respiratory Disease 40 | Septicemia 31 | Two Tied: Benign Neo./Septicemia 33 | Cerebrovascular 166 | Congenital Anomalies 443 | Septicemia 829 | Nephritis 2,452 | Nephritis 5,452 | Septicemia 30,817 | Suicide 44,193 |

Data Source: National Vital Statistics System, National Center for Health Statistics, CDC.

Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC using WISQARS™

FIGURE 1.3 Ten leading causes of death by age group. Note that the far-right column lists the leading causes of death for all ages.

Modified from *Ten Leading Causes of Death and Injury 2011*. Courtesy of the National Center for Injury Prevention and Control/CDC.

| TABLE 1.1 Actual Causes of Death in the United States | | |
|---|-----------------------------------|----------------------|
| Rank | Actual Cause | Percentage of Deaths |
| 1 | Tobacco use | 18.1 |
| 2 | Obesity (inactivity/poor diet) | 16.6 |
| 3 | Alcohol consumption | 3.5 |
| 4 | Microbial agents (flu, pneumonia) | 3.1 |
| 5 | Toxic agents | 2.3 |
| 6 | Motor vehicles | 1.8 |
| 7 | Firearms | 1.2 |
| 8 | Sexual behavior | 0.8 |
| 9 | Illicit drug use | 0.7 |
| 10 | Other | < 0.05 |

Data from Mokdad A. et al., Actual causes of death in the United States, 2000. *Journal of the American Medical Association* 2004; 291(10):1238-1245.

MEDICAL NEWS YOU CAN USE

Heart Disease Prevention May Save Billions of Dollars Annually in United States

Prevention is the key to slowing the soaring healthcare costs of heart disease in the United States. These costs reached \$450 billion in 2010. Prevention of heart disease by managing programs to reduce cholesterol, blood pressure, and tobacco use would be a wise long-term investment in the nation's health and economy. Additionally, researchers calculated that every \$1 spent on the construction of walking or biking paths would cut medical costs by \$3. Slashing daily salt intake by Americans would help reduce the rate of high blood pressure by 25%. That could potentially save \$26 billion in healthcare costs each year. The American Heart Association concluded by showing that the savings would not only be monetary but would also lengthen and improve the quality of life that people enjoy. These changes would also have an effect on generations to come.

Data from Weintraub W.S., et al., Value of primordial and primary prevention for cardiovascular disease. *Circulation* 2011; 124:967-990.

Although there are no surefire recipes for good health, the mixture of regular exercise and healthy eating comes close. Tobacco use and physical inactivity, combined with unhealthy diets, are running neck-and-neck at the top of the list of actual causes of death. Americans are sitting around and eating themselves to death.

With the benefits of regular exercise or physical activity capable of doing everyone a world of good, it is mind-boggling that only a minority of Americans get enough exercise or leisure-time physical activity. Studies that have followed the health of large groups of people for many years, as well as short-term studies, all point in the same direction: A

sedentary (inactive) lifestyle increases the chances of becoming overweight and developing a number of chronic diseases.

Exercise or physical activity helps many of the body's systems function better and keeps a host of diseases at bay.

A U.S. Surgeon General's report analyzed the 10 leading causes of death and suggested that up to half of U.S. deaths were attributable to unhealthy behavior or lifestyle; 20% to environmental factors; 20% to human biological/genetic factors; and 10% to inadequacies in health care (see **FIGURE 1.4**). This led to first national public health agenda establishing quantifiable goals for improving the health of all Americans.

Behavior remains the dominant cause of premature death and disability. Today, chronic diseases—such as cardiovascular disease (primarily heart disease and stroke), cancer, and type 2 diabetes—are among the most prevalent, costly, and preventable of all health problems and account for 7 out of every 10 deaths in the United States. Chronic diseases are mostly preventable but can be difficult to change because the risk factors associated with developing chronic conditions are linked primarily to lifestyle behaviors.

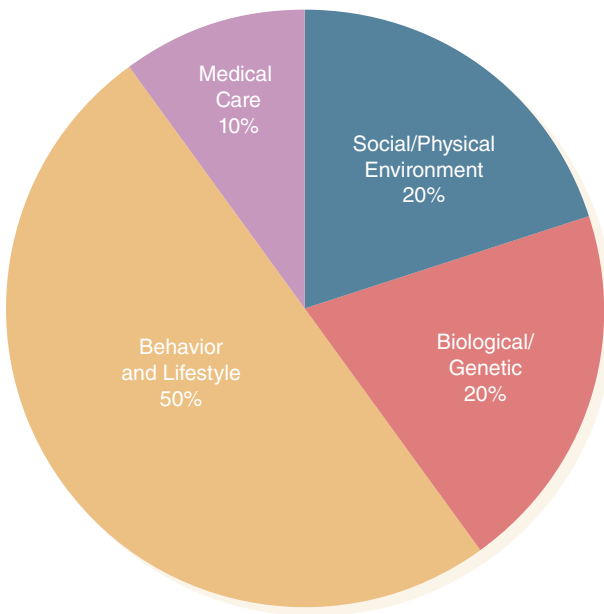


FIGURE 1.4 Factors that contribute to mortality.

Modified with permission of the Duval County Center of Health Statistics, Florida Department of Health. Data from *Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention, 1979*.

MEDICAL NEWS YOU CAN USE

Physical Inactivity Kills as Many as Smoking

Physical inactivity, defined as less than 150 minutes per week of moderate physical activity, is responsible for 5.3 million deaths globally each year. This exceeds the 5 million deaths globally attributed to smoking. Several large cohort studies throughout the world helped define the burden of physical inactivity. Researchers estimated that a 10 to 25% reduction in global rates of inactivity would prevent 533,000 to 1.3 million deaths, respectively.

Data from Lee IM, et al., Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet* 2012; DOI: 10.1016/20140-6736(12)61031-9.

What's the word...

fitness The body's response to physical effort.

wellness An active process of becoming aware of and making choices toward a more successful existence.

Definitions

To prepare properly for physical activity and exercise, let us start by examining two key words—"fit" and "well"—plus a few others from our everyday conversations.

Fitness, as defined by the U.S. Department of Health and Human Services (DHHS), is "the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies. Physical fitness includes a number of components consisting of cardiorespiratory endurance; skeletal muscle endurance, strength and power; flexibility; and body composition."

Those four components of fitness provide the basis of a balanced workout program. They are made up of structured activities aimed at increasing specific elements of fitness. Each is a health-related component of physical fitness. The DHHS defines these components of physical fitness as follows:

- **Cardiorespiratory fitness (endurance)** is the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity.
- **Muscle-strengthening activity (strength training, resistance training, or muscular strength and endurance exercises)** is physical activity, including exercise, that increases skeletal muscle strength, power, endurance, and mass.
- **Flexibility** is the range of motion possible at a joint. Flexibility is specific to each joint and depends on a number of variables, including but not limited to the tightness of specific ligaments and tendons. Flexibility exercises enhance the ability of a joint to move through its full range of motion.
- **Body composition** refers to body weight and the relative amounts of muscle, fat, bone, and other vital tissues of the body. Most often, body composition addresses only fat and lean body mass (or fat-free mass).

The second key word is "well." Fitness leads to being well.

Wellness, defined by the National Wellness Institute, is "an active process of becoming aware of and making choices toward a more successful existence." Some have described wellness as "the constant, conscious pursuit

