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# nutrition

concepts & controversies

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FRANCES SIENKIEWICZ SIZER | ELLIE WHITNEY

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***Nutrition: Concepts & Controversies, 15e***  
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For our newest granddaughter,  
Karen Ann Sizer. Welcome,  
baby girl!

—Fran

## Eleanor Noss Whitney

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To Max, Zoey, Emily, Rebecca,  
Kalijah, and Duchess with love.

—Ellie

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# Preface

A billboard in Louisiana reads, “Come as you are. Leave different,” meaning that once you’ve seen, smelled, tasted, and listened to Louisiana, you’ll never be the same. This book extends the same invitation to its readers: come to nutrition science as you are, with all of the knowledge and enthusiasm you possess, with all of your unanswered questions and misconceptions, and with the habits and preferences that now dictate what you eat.

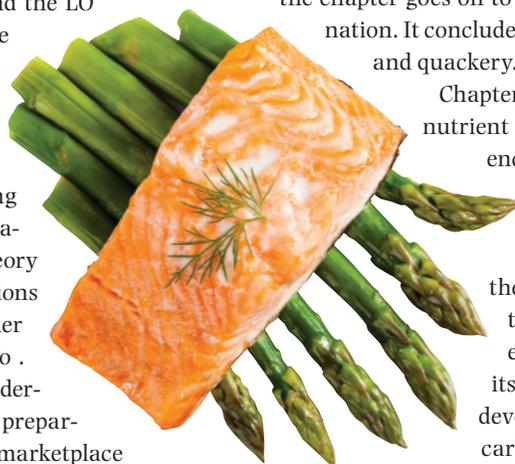
But leave different. Take with you from this study a more complete understanding of nutrition science. Take a greater ability to discern between nutrition truth and fiction, to ask sophisticated questions, and to find the answers. Finally, take with you a better sense of how to feed yourself in ways that not only please you and soothe your spirit but nourish your body as well.

For more than four decades, *Nutrition: Concepts and Controversies* has been a cornerstone of nutrition classes across North America, serving the needs of students and professors. In keeping with our tradition, in this, our 15th edition, we continue exploring the ever-changing frontier of nutrition science, confronting its mysteries through its scientific roots. We maintain our sense of personal connection with instructors and learners alike, writing for them in the clear, informal style that has become our trademark.

## Pedagogical Features

Throughout these chapters, features tickle the reader’s interest and inform. For both verbal and visual learners, our logical presentation and our lively figures keep interest high and understanding at a peak. The photos that adorn many of our pages add pleasure to reading.

Many tried-and-true features return in this edition: Each chapter begins with What Do You Think? questions to pique interest. What Did You Decide? at the chapter’s end asks readers to draw conclusions. A list of Learning Objectives (LO) offers a preview of the chapter’s major goals, and the LO reappear under section headings to make clear the main take-away messages. Do the Math margin features challenge readers to solve nutrition problems, with examples provided. Think Fitness reminders alert readers to links among nutrition, fitness, and health. Food Feature sections act as bridges between theory and practice; they are practical applications of the chapter concepts. The consumer sections, entitled A Consumer’s Guide To . . . , lead readers through an often bewildering marketplace with scientific clarity, preparing them to move ahead with sound marketplace



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decisions. Each Consumer’s Guide ends with review questions to improve recall of the main points.

By popular demand, we have retained our Snapshots of vitamins and minerals, which now reflect the 2015 Daily Values. These concentrated capsules of information depict food sources of vitamins and minerals, present DRI values, and offer the chief functions of each nutrient along with deficiency and toxicity symptoms.

New or major terms are defined in the margins of chapter pages or in nearby tables, and they also appear in the Glossary at the end of the book. Terms defined in margins are printed in **blue** boldface type; terms in tables are in **black**. Readers who wish to locate any term can quickly do so by consulting the Index, which lists the page numbers of definitions in boldface type. Each chapter closes with the indispensable Self Check that provides study questions, with answers in Appendix G to provide immediate feedback to the learner.

## Controversies

The Controversies of this book’s title invite you to explore beyond the safe boundaries of established nutrition knowledge. These optional readings, which appear at the end of each chapter, delve into current research themes and ongoing debates among nutrition scientists. These fast-changing topics capture interest and demonstrate how scientific investigations both build nutrition knowledge and challenge it.

## Chapter Contents

Chapter 1 begins the text with a personal challenge to students. It asks the question so many people ask of nutrition educators—“Why should people care about nutrition?” We answer with a lesson in the ways in which nutritious foods affect diseases and present a continuum of diseases from purely genetic in origin to those almost totally preventable by nutrition. After presenting some beginning facts about the genes, nutrients, bioactive food components, and nature of foods, the chapter goes on to present the *Healthy People* goals for the nation. It concludes with a discussion of scientific research and quackery.

Chapter 2 brings together the concepts of nutrient standards, such as the Dietary Reference Intakes, and diet planning using the Dietary Guidelines for Americans 2015–2020. Chapter 3 presents a thorough, but brief, introduction to the workings of the human body from the genes to the organs, with major emphasis on the digestive system and its microbiota. Chapters 4 through 6 are devoted to the energy-yielding nutrients: carbohydrates, lipids, and protein. Controversy 4 has renewed its focus on theories and

fables surrounding the health effects of added sugars in the diet. Controversy 5 considers the scientific underpinnings of lipid guidelines.

Chapters 7 and 8 present the vitamins, minerals, and water. Chapter 9 relates energy balance to body composition, obesity, and underweight and provides guidance on lifelong weight maintenance. Chapter 10 presents the relationships among physical activity, athletic performance, and nutrition, with some guidance about products marketed to athletes. Chapter 11 applies the essence of the first 10 chapters to chronic disease development and prevention.

Chapter 12 delivers urgently important concepts of food safety and ends with practical pointers for applying them in real-life situations. It also addresses the usefulness and safety of food additives, including artificial sweeteners and artificial fats. Chapters 13 and 14 emphasize the importance of nutrition through the life span, with issues surrounding childhood obesity in Controversy 13. Chapter 14 includes nutrition advice for feeding preschoolers, schoolchildren, teens, and the elderly.

Chapter 15 devotes attention to hunger and malnutrition, both in the United States and throughout the world. It also touches on the vast network of problems that threaten the future food supply, and explores potential paths to solutions.

## Our Message to You

Our purpose in writing this text, as always, is to enhance our readers' understanding of nutrition science. We also hope the information on this book's pages will reach beyond the classroom into our readers' lives. Take the information you find inside this book home with you. Use it in your life: nourish yourself, educate your loved ones, and nurture others to be healthy. Stay up with the news, too—for despite all the conflicting messages, inflated claims, and even quackery that abound in the marketplace, true nutrition knowledge progresses with a genuine scientific spirit, and important new truths are constantly unfolding.

## New to This Edition

Every section of each chapter of this text reflects the changes in nutrition science occurring since the last edition. The changes range from subtle shifts of emphasis to entirely new sections that demand our attention. Appendix F supplies current references; older references may be viewed in previous editions, available from the publisher.

### Inside Front Cover Pages

- The DRI tables, previously located on the inside front cover pages, have joined other standards at the back of the book, pages A through C.

### Chapter 1

- Updated leading causes of death figure.
- Updated midcourse review of HP2020.
- Defined term *macronutrients* and *micronutrients*.
- Defined term *meta-analysis*.

- Controversy definitions and descriptions follow Academy of Nutrition and Dietetics.
- Definition of Terms List (2017).
- Updated NDTR credentials.

### Chapter 2

- Updated U.S. diet compared with ideals figure.
- Defined term *nutritional equivalents*.
- Major revision to diet planning section and tables.
- Expanded and clarified Food Lists for Weight Management coverage.
- New food label comparison figure.
- Improved phytochemical tables.
- Moved Table C2–3 to instructors' materials.

### Chapter 3

- Reorganized chapter for greater focus on digestive tract and functions. Moved other body systems to instructors' materials.
- Revamped figure of pH values.
- Reorganized figure of small intestinal lining.
- Introduced and defined term *microbiome*.
- Reorganize table of foods and intestinal gas.
- Major reorganization, update, and streamlining of the alcohol Controversy.

### Chapter 4

- New explanation of energy nutrients percentages in relation to total calorie intake.
- New figure of percentages of energy nutrients.
- Moved figure of fiber composition to instructors' materials.
- New figure of strategies to increase fiber intake.
- Shortened glycemic index coverage.
- Major diabetes coverage moved to Chapter 11.
- New section on diabetes and hypoglycemia, explaining failure of blood glucose control.
- New section on sugar alcohols.
- New sugar alcohol table.
- Controversy is streamlined and updated.

### Chapter 5

- Defined term *shortening*.
- Defined term *inflammation*.
- Updated and improved coverage of EPA and DHA.
- Moved figure of fish oil supplement label to instructors' materials.
- New bar graph figure of lipids in grain foods.
- Updated Controversy.

### Chapter 6

- Added bone broth discussion to Consumer's Guide.
- Removed adult bone loss from protein excess.
- New figure comparing energy and protein in Greek-style yogurt and a commercial highprotein shake.
- Condensed and combined tables in Controversy section.
- New sample 2,000-calorie menu for a day of vegetarian meals.

## Chapter 7

- Fully updated each vitamin section.
- Converted photos to figures, as follows: Vitamin E in Oils; Vitamin K for newborns; Folate and neural tube defects.
- Moved table of Vitamin D in disease to instructors' materials.
- New Consumer's Guide on food processing and vitamins.
- New figure of the effect of folic acid fortification on neural tube defect prevalence in selected countries of the world.
- Updated Controversy section; addressed current supplement contamination concerns.
- New figure of how to read a food label.

## Chapter 8

- Reorganized, updated water section.
- Reorganized sodium sections.
- Replaced figure of sodium sources.
- New figure of sodium on a food label.
- Created new figures from photos as follows: Osmosis (egg-plant); goiter; iodized salt label; nonheme iron absorption; zinc deficiency.
- New figure of average daily sodium intakes in U.S. adults.
- New photo of calcium sources.
- Moved section on tracking calcium to instructors' materials.
- Updated Controversy.

## Chapter 9

- New obesity maps reflecting newer analytical methods.
- Defined clinical term *adiposity-based chronic disease*.
- Added sleep function of ghrelin.
- Refined section on microbiome and obesity.
- Addressed efficacy of artificial sweeteners.
- Added discussion of genetic alterations in obesity.
- New summary figure of factors in obesity development.
- Added sleeve gastrectomy to surgical options.
- New explanation of intermittent fasting.
- Defined term *exergaming*.
- Addressed cultural differences in dietary energy density.
- Updated terminology associated with female athlete triad.
- New table of harms from anorexia nervosa.

## Chapter 10

- Reorganized several major sections.
- Addressed energy availability and energy need concepts.
- Addressed gastrointestinal effects of ultraendurance events.
- New carbohydrate and protein recommendations from the Academy of Nutrition and Dietetics (AND).
- New figure of anemia in female athletes.
- New hydration schedule from AND.
- Applied guidelines for nutrient timing from the International Society of Sports Nutrition.
- New discussion of beetroot and dietary nitrite among ergogenic aids.

## Chapter 11

- Complete chapter reorganization to focus on nutrition and chronic diseases.
- Removed discussion of infectious disease.

- New table of chronic disease risk factors.
- New table of adult blood pressure standards.
- New major section on diabetes; new table of misconceptions about diabetes.
- Introduced term *precision medicine*.
- Addressed consumer privacy in genetic testing.

## Chapter 12

- Defined terms *pathogen*, *intoxication*, and *endemic*.
- Added term *toxin-mediated infections*.
- New section on the FDA Food Safety Modernization Act, with definition.
- Expanded coverage of package dating.
- Defined FDA's new Produce Safety Rule.
- Moved kitchen test table to new Food Feature.
- Restructured thermometer and safe temperature figures for clarity.
- New Food Feature: *Handling Real-Life Challenges to Food Safety*.
- New figure on selective breeding.
- Defined *gene editing* and CRISPR technology.
- Described and added new figure of genetically engineered salmon.
- Added consumer concerns about glyphosate to summary table.

## Chapter 13

- Deleted the infant mortality figure.
- Replaced the spina bifida figure.
- Added a new table of seafood advice for pregnant and lactating women.
- Replaced the sketched figure of facial characteristics of FAS with photo of FAS child.
- Reorganized table of supplements for breastfed infants.
- Added a discussion and definition of responsive feeding.
- Added hunger and satiety signals to the table of infant development.
- New table of parental strategies against childhood obesity.
- New adequate sleep section and table.

## Chapter 14

- Updated MyPlate figure.
- Updated and improved allergy section.
- Condensed and updated PMS coverage.
- New section on weight loss and overweight in aging.
- Restructured, updated vitamin D section.
- Addressed the Mediterranean Eating Pattern in Alzheimer's disease development.
- New figure of controllable factors associated with dementia in aging.
- New figure of caffeine sources.

## Chapter 15

- New figure of trends in prevalence of food insecurity.
- Updated hunger sections.
- Several new figures.

### Appendix Changes:

- Deleted the Table of Food Composition.
- Previous Appendix I, Chemical Structures, is now Appendix A.

## Ancillary Materials

Students and instructors alike will appreciate the innovative teaching and learning materials that accompany this text.

**MindTap:** A new approach to highly personalized online learning. Beyond an eBook, homework solution, digital supplement, or premium website, MindTap is a digital learning platform that works alongside your campus LMS to deliver course curriculum across the range of electronic devices in your life. MindTap is built on an “app” model allowing enhanced digital collaboration and delivery of engaging content across a spectrum of Cengage and non-Cengage resources.

**Instructor Companion Site:** Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via [www.cengage.com/login](http://www.cengage.com/login). Access and download PowerPoint presentations, images, instructors’ manual, videos, and more.

**Test Bank with Cognero:** Cengage Learning Testing Powered by Cognero is a flexible online system that allows you to:

- Author, edit, and manage test bank content from multiple Cengage Learning solutions.
- Create multiple test versions in an instant.
- Deliver tests from your LMS, your classroom, or wherever you want.

**Diet & Wellness Plus:** Diet & Wellness Plus helps you understand how nutrition relates to your personal health goals. Track your diet and activity, generate reports, and analyze the nutritional value of the food you eat. Diet & Wellness Plus includes over 75,000 foods as well as custom food and recipe features. The new Behavior Change Planner helps you identify risks in your life and guides you through the key steps to make positive changes. Diet & Wellness Plus is also available as an app that can be accessed from the app dock in MindTap.

**Global Nutrition Watch:** Bring currency to the classroom with Global Nutrition Watch from Cengage Learning. This user-friendly website provides convenient access to thousands of trusted sources, including academic journals, newspapers, videos, and podcasts, for you to use for research projects or classroom discussion. Global Nutrition Watch is updated daily to offer the most current news about topics related to nutrition.

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We are also grateful to the nutrition professionals who updated sections of this edition.

- Linda DeBruyne, M.S., R.D.N. (Chapters 11 and 13). Linda received her master’s degree in nutrition from Florida State University and is a founding member of Nutrition and Health Associates. She also coauthors the college nutrition texts *Nutrition and Diet Therapy* and *Nutrition for Health and Health Care*.
- Shannon Dooies Gower-Winter, M.S., R.D.N./L.D.N. (Chapter 7). Shannon graduated from Florida State University with her master’s degree in nutrition. She has taught nutrition at Florida State University and lectured on topics related to childhood nutrition throughout the state. She has conducted research in the area of nutritional neuroscience, where her work focused on various roles of zinc in the brain. Her research has been presented at regional and national scientific conferences, and she has coauthored multiple articles in peer-reviewed journals.

Our special thanks to our publishing team—Miriam Myers, Lori Hazzard, and Carol Samet—for their superb work and dedication to excellence.

We would also like to thank **MPS North America LLC** for their work on the student and instructor ancillaries for the 15th edition, which includes the test bank, instructors’ manual, and PowerLecture.

## Reviewers of Recent Editions

As always, we are grateful for the instructors who took the time to comment on this revision. Your suggestions were invaluable in strengthening the book and suggesting new lines of thought. We hope you will continue to provide your comments and suggestions.

Samuel Adeyeye, *Georgia Southern University*  
Katherine Alaimo, *Michigan State University*  
Linda Armstrong, *Normandale Community College*  
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Taylor C. Wallace, *George Mason University*





# 1 Food Choices and Human Health

## Learning Objectives

After reading this chapter, you should be able to accomplish the following:

- LO 1.1** Describe the ways in which food choices impact a person's health.
- LO 1.2** List the seven major categories of nutrition and weight-related objectives included in the publication *Healthy People 2020*.
- LO 1.3** Name the six classes of nutrients.
- LO 1.4** Give examples of the challenges and solutions to choosing a health-promoting diet.
- LO 1.5** Describe the science of nutrition.
- LO 1.6** Describe the characteristics of the six stages of behavior change.
- LO 1.7** Explain how the concept of nutrient density can facilitate diet planning.
- LO 1.8** Evaluate the authenticity of any given nutrition information source.

## What do you think?

Can your diet make a real difference between getting **sick** or staying **healthy**?

Are **supplements** more powerful than food for ensuring good nutrition?

What makes your favorite foods your **favorites**?

Are **news and media nutrition reports** informative or confusing?



Jack Frog/Shutterstock.com

When you choose foods with nutrition in mind, you can enhance your own well-being.

**food** scientifically, materials, usually of plant or animal origin, that contain essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals, and that are ingested and assimilated by an organism to produce energy, stimulate growth, and maintain life; socially, a more limited number of such materials defined as acceptable by a culture.

**nutrition** the study of the nutrients in foods and in the body; sometimes also the study of human behaviors related to food.

**diet** the foods (including beverages) a person usually eats and drinks.

**nutrients** components of food that are indispensable to the body's functioning. They provide energy, serve as building material, help maintain or repair body parts, and support growth. The nutrients include water, carbohydrate, fat, protein, vitamins, and minerals.

**malnutrition** any condition caused by excess or deficient food energy or nutrient intake or by an imbalance of nutrients. Nutrient or energy deficiencies are forms of undernutrition; nutrient or energy excesses are forms of overnutrition.

If you care about your body, and if you have strong feelings about **food**, then you have much to gain from learning about **nutrition**—the science of how food nourishes the body. Nutrition is a fascinating, much-talked-about subject. Each day, newspapers, Internet websites, radio, and television present stories of new findings on nutrition and heart health or nutrition and cancer prevention, and at the same time, advertisements and commercials bombard us with multicolored pictures of tempting foods—pizza, burgers, cakes, and chips. If you are like most people, when you eat you sometimes wonder, “Is this food good for me?” or you berate yourself, “I probably shouldn’t be eating this.”

When you study nutrition, you learn which foods serve you best, and you can work out ways of choosing foods, planning meals, and designing your **diet** wisely. Knowing the facts can enhance your health and your enjoyment of eating while relieving your feelings of guilt or worry that you aren’t eating well.

This chapter addresses these “why,” “what,” and “how” questions about nutrition:

- Why care about nutrition? Why be concerned about the **nutrients** in your foods? Why not just take supplements?
- What are the nutrients in foods, and what roles do they play in the body? What are the differences between vitamins and minerals?
- What constitutes a nutritious diet? How can you choose foods wisely, for nutrition’s sake? What factors motivate your choices?
- How do we know what we know about nutrition? How does nutrition science work, and how can a person keep up with changing information?

Controversy 1 concludes the chapter by offering ways to distinguish between trustworthy sources of nutrition information and those that are less reliable.

## A Lifetime of Nourishment

**LO 1.1** Describe the ways in which food choices impact a person’s health.

If you live for 65 years or longer, you will have consumed more than 70,000 meals, and your remarkable body will have disposed of 50 tons of food. The foods you choose exert cumulative effects on your body.<sup>1\*</sup> As you age, you will see and feel those effects—if you know what to look for.

Your body renews its structures continuously. Each day, it builds a little muscle, bone, skin, and blood, replacing old tissues with new. It may also add a little fat if you consume excess food energy (calories) or subtract a little if you consume less than you require. Some of the food you eat today becomes part of “you” tomorrow.

The best food for you, then, is the kind that supports the growth and maintenance of strong muscles, sound bones, healthy skin, and sufficient blood to cleanse and nourish all parts of your body. This means you need food that provides not only the right amount of energy but also sufficient nutrients—that is, enough water, carbohydrates, fats, protein, vitamins, and minerals. If the foods you eat provide too little or too much of any nutrient today, your health may suffer just a little today. If the foods you eat provide too little or too much of one or more nutrients every day for years, then in later life you may suffer severe disease effects.

A well-chosen diet supplies enough energy and enough of each nutrient to prevent **malnutrition**. Malnutrition includes deficiencies, imbalances, and excesses of nutrients, alone or in combination, any of which can take a toll on health over time.

### KEY POINTS

- The nutrients in food support growth, maintenance, and repair of the body.
- Deficiencies, excesses, and imbalances of energy and nutrients bring on the diseases of malnutrition.

\*Reference notes are in Appendix F.

Table 1–1

### Leading Causes of Death in the United States

Chronic diseases cause the great majority of deaths among U.S. adults and account for more than 85 percent of U.S. health-care costs.

	Percentage of Total Deaths
1. <b>Heart disease</b>	23.5
2. <b>Cancers</b>	22.5
3. Chronic lung disease	5.7
4. <b>Strokes</b>	5.0
5. Accidents	5.0
6. Alzheimer's disease	3.3
7. <b>Diabetes mellitus</b>	2.9
8. Pneumonia and influenza	2.2
9. Kidney disease	1.8
10. Suicide	1.6

Note: The diseases highlighted in bold have relationships with diet.

Sources: National Center for Chronic Disease Prevention and Health Promotion, *Chronic disease prevention and health promotion*, [www.cdc.gov/chronicdisease](http://www.cdc.gov/chronicdisease), 2017, updated regularly; J. Q. Xu and coauthors, *Deaths: Final data for 2013*, National Vital Statistics Reports 64 (Hyattsville, MD: National Center for Health Statistics, 2016).

## The Diet–Health Connection

Your choice of diet profoundly affects your health, both today and in the future. Among the common lifestyle habits that profoundly affect development of these diseases, only two are more influential than food habits: smoking and using other forms of tobacco and drinking alcohol in excess. Of the leading causes of death listed in Table 1–1, four—heart disease, cancers, strokes, and diabetes—are directly related to nutrition, and another—accidents—is related to drinking alcohol.

Many older people suffer from debilitating conditions that could have been largely prevented had they applied the nutrition principles known today. The **chronic diseases**—heart disease, diabetes, some kinds of cancer, dental disease, and adult bone loss—all have a connection to poor diet. These diseases cannot be prevented by a good diet alone; they are to some extent determined by a person's genetic constitution, activities, and lifestyle. Within the range set by your genetic inheritance, however, the likelihood of developing these diseases is strongly influenced by your daily choices.

### KEY POINT

- Nutrition profoundly affects health.

## Genetics, Nutrition, and Individuality

Figure 1–1 demonstrates that genetics and nutrition affect different diseases to varying degrees. The **anemia** caused by sickle-cell disease, for example, is purely hereditary and thus appears at the left of Figure 1–1 as a genetic condition largely unrelated to nutrition. Nothing a person eats affects the person's chances of contracting this anemia, although nutrition therapy may help ease its course. At the other end of the spectrum, iron-deficiency anemia most often results from undernutrition. Diseases and conditions of poor health appear all along this continuum, from almost entirely genetically based

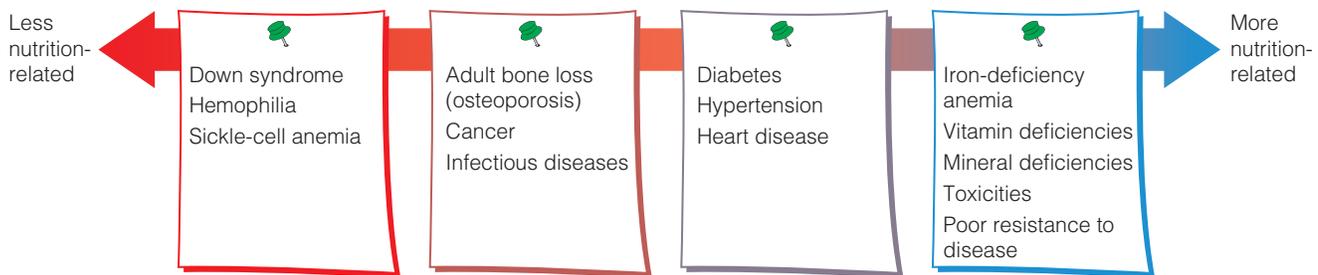
**chronic diseases** degenerative conditions or illnesses that progress slowly are long in duration, and lack an immediate cure. Chronic diseases limit functioning, productivity, and the quality and length of life. Examples include heart disease, cancer, and diabetes.

**anemia** a blood condition in which red blood cells, the body's oxygen carriers, are inadequate or impaired and so cannot meet the oxygen demands of the body.

Figure 1-1

## Nutrition and Disease

Not all diseases are equally influenced by diet. Some, such as sickle-cell anemia, are almost purely genetic. Some, such as diabetes, may be inherited (or the tendency to develop them may be inherited in the genes) but may be influenced by diet. Some, such as vitamin-deficiency diseases, are purely dietary.



**genome** (GEE-nome) the full complement of genetic information in the chromosomes of a cell. In human beings, the genome consists of about 35,000 genes and supporting materials. The study of genomes is *genomics*. Also defined in Controversy 11.

**genes** units of a cell's inheritance; sections of the larger genetic molecule DNA (deoxyribonucleic acid). Each gene directs the making of one or more of the body's proteins.

**DNA** an abbreviation for deoxyribonucleic (dee-OX-ee-RYE-bow-nu-CLAY-ick) acid, the thread-like molecule that encodes genetic information in its structure; DNA strands coil up densely to form the chromosomes (Chapter 3 provides more details).

to purely nutritional in origin; the more nutrition-related a disease or health condition is, the more successfully sound nutrition can prevent it.

Furthermore, some diseases, such as heart disease and cancer, are not one disease but many. Two people may both have heart disease but not the same form; one person's cancer may be nutrition-related, but another's may not be. Individual people differ genetically from each other in thousands of subtle ways, so no simple statement can be made about the extent to which diet can help any one person avoid such diseases or slow their progress.

The identification of the human **genome** establishes the entire sequence of the **genes** in human **DNA**. This work has, in essence, revealed the body's instructions for making all of the working parts of a human being. The human genome is 99.9 percent the same in all people; all of the normal variations such as differences in hair color, as well as variations that result in diseases such as sickle-cell anemia, lie in the 0.1 percent of the genome that varies. Nutrition scientists are working industriously to apply this

## THINK FITNESS

### Why Be Physically Active?

Why should people bother to be physically active? A person's daily food choices can powerfully affect health, but the combination of nutrition and physical activity is more powerful still. People who combine regular physical activity with a nutritious diet can expect to receive at least some of these benefits:

- Reduced risks of cardiovascular diseases, diabetes, certain cancers, hypertension, and other diseases.
- Increased endurance, strength, and flexibility.
- More cheerful outlook and less likelihood of depression.
- Improved mental functioning.
- Feeling of vigor.
- Feeling of belonging—the companionship of sports.
- Stronger self-image.
- Reduced body fat and increased lean tissue.
- A more youthful appearance, healthy skin, and improved muscle tone.
- Greater bone density and lessened risk of adult bone loss in later life.
- Increased independence in the elderly.
- Sound, beneficial sleep.
- Faster wound healing.
- Reduced menstrual symptoms.
- Improved resistance to infection.

If even half of these benefits were yours for the asking, wouldn't you step up to claim them? In truth, they are yours to claim, at the price of including physical activity in your day. Chapter 10 explores the topics of fitness and physical activity.

**start now!** Ready to make a change? Go to this book's website at [www.cengage.com](http://www.cengage.com), access MindTap, and open the Diet & Wellness Plus program. Track your physical activities—all of them—for three days. After you have recorded your activities, see how much time you spent exercising at a moderate to vigorous level. Should you increase the intensity level and amount of your activity?

new wealth of knowledge to benefit human health. Later chapters expand on the emerging story of nutrition and the genes.

### KEY POINTS

- Diet influences long-term health within the range set by genetic inheritance.
- Nutrition exerts little influence on some diseases but strongly affects others.

## Other Lifestyle Choices

Besides food choices, other lifestyle choices affect people's health. Tobacco use and alcohol and other substance abuse can destroy health. Physical activity, sleep, emotional stress, and other environmental factors can also modify the severity of some diseases. Physical activity is so closely linked with nutrition in supporting health that most chapters of this book offer a feature called Think Fitness, such as the previous one.

### KEY POINT

- Life choices, such as being physically active or using tobacco or alcohol, can improve or damage health.

# The Nation's Nutrition Objectives

**LO 1.2** List the seven major categories of nutrition and weight-related objectives included in the publication *Healthy People 2020*.

The U.S. Department of Health and Human Services has set specific 10-year objectives to guide national health promotion efforts.<sup>2</sup> The vision of its *Healthy People 2020* is a society in which all people live long, healthy lives. Table 1–2 (p. 6) provides a quick scan of the nutrition and weight-related objectives set for this decade. The inclusion of nutrition and food-safety objectives shows that public health officials consider these areas to be top national priorities.

In 2015, the nation's health report was mixed: more adults reported spending the recommended amount of leisure time in physical activity; at the same time, most people's diets still lacked vegetables, and obesity rates were creeping higher.<sup>3</sup> To fully meet the *Healthy People* nutrition goals, our nation must change its eating habits.

The next section shifts focus to the nutrients at the core of nutrition science. As your course of study progresses, the individual nutrients will become like old friends, revealing more and more about themselves as you move through the chapters.

### KEY POINT

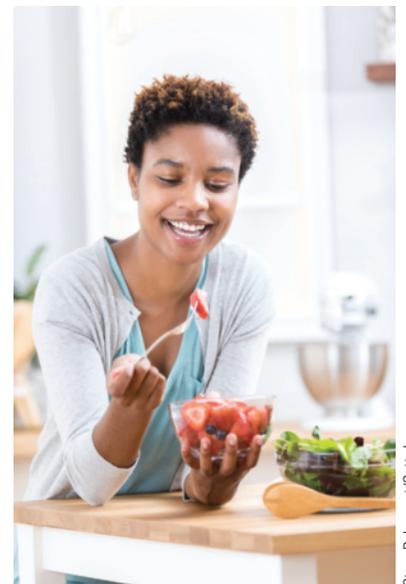
- Each decade, the U.S. Department of Health and Human Services sets health and nutrition objectives for the nation.

# The Human Body and Its Food

**LO 1.3** Name the six classes of nutrients.

As your body moves and works each day, it must use **energy**. The energy that fuels the body's work comes indirectly from the sun by way of plants. Plants capture and store the sun's energy in their tissues as they grow. When you eat plant-derived foods such as fruit, grains, or vegetables, you obtain and use the solar energy they have stored. Plant-eating animals obtain their energy in the same way, so when you eat animal tissues, you are eating compounds containing energy that came originally from the sun.

The body requires six kinds of nutrients—families of molecules indispensable to its functioning—and foods deliver these. Table 1–3 (p. 6) lists the six classes of nutrients. Four of these six are **organic**; that is, the nutrients contain the element carbon derived from living things.



Steve Debenport/Getty Images

*The aim of Healthy People 2020 is to help people live long, healthy lives.*

**energy** the capacity to do work. The energy in food is chemical energy; it can be converted to mechanical, electrical, thermal, or other forms of energy in the body. Food energy is measured in calories, defined on page 8.

**organic** carbon containing. Four of the six classes of nutrients are organic: carbohydrate, fat, protein, and vitamins. Organic compounds include only those made by living things and do not include compounds such as carbon dioxide, diamonds, and a few carbon salts.

**Table 1–2**

**Healthy People 2020, Selected Nutrition and Body Weight Objectives**

Many other Objectives for the Nation are available at [www.healthypeople.gov](http://www.healthypeople.gov).

**1. Chronic Diseases**

- Reduce the proportion of adults with osteoporosis.
- Reduce the death rates from cancer, diabetes, heart disease, and stroke.
- Reduce the annual number of new cases of diabetes.

**2. Food Safety**

- Reduce outbreaks of certain infections transmitted through food.
- Reduce severe allergic reactions to food among adults with diagnosed food allergy.

**3. Maternal, Infant, and Child Health**

- Reduce the number of low-birthweight infants and preterm births.
- Increase the proportion of infants who are breastfed.
- Reduce the occurrence of fetal alcohol syndrome (FAS).
- Reduce iron deficiency among children, adolescents, women of childbearing age, and pregnant women.
- Reduce blood lead levels in lead-exposed children.
- Increase the number of schools offering breakfast.

**4. Food and Nutrient Consumption**

- Increase vegetables, fruit, and whole grains in the diets of those aged 2 years and older, and reduce solid fats and added sugars.

**5. Eating Disorders**

- Reduce the proportion of adolescents who engage in disordered eating behaviors in an attempt to control their weight.

**6. Physical Activity and Weight Control**

- Increase the proportion of children, adolescents, and adults who are at a healthy weight.
- Reduce the proportions of children, adolescents, and adults who are obese.
- Reduce the proportion of people who engage in no leisure-time physical activity.
- Increase the proportion of schools that require daily physical education for all students.

**7. Food Security**

- Eliminate very low food security among children in U.S. households.

Source: [www.healthypeople.gov](http://www.healthypeople.gov).

**Table 1–3**

**Elements in the Six Classes of Nutrients**

The nutrients that contain carbon are organic.

	Carbon	Oxygen	Hydrogen	Nitrogen	Minerals
Carbohydrate	✓	✓	✓		
Fat	✓	✓	✓		
Protein	✓	✓	✓	✓	<sup>b</sup>
Vitamins	✓	✓	✓	✓ <sup>a</sup>	<sup>b</sup>
Minerals					✓
Water		✓	✓		✓

<sup>a</sup>All of the B vitamins contain nitrogen; amine means nitrogen.

<sup>b</sup>Protein and some vitamins contain the mineral sulfur; vitamin B<sub>12</sub> contains the mineral cobalt.

## Meet the Nutrients

The human body and foods are made of the same materials, arranged in different ways (see Figure 1–2). When considering quantities of foods and nutrients, scientists often measure them in **grams** or fractions of grams, units of weight.

**The Energy-Yielding Nutrients** Of the four organic nutrients, three are **energy-yielding nutrients**, meaning that the body can use the energy they contain. These are carbohydrate, fat, and protein, often referred to as the **macronutrients**, and they contribute to the calories you consume. Among them, protein stands out for doing double duty: it can yield energy, but it also provides materials that form structures and working parts of body tissues. (Alcohol yields energy, too—see Table 1–4 comments.)

**Vitamins and Minerals** The fourth and fifth classes of nutrients are the vitamins and the minerals, sometimes referred to as **micronutrients** because they are present in tiny amounts in living tissues. These provide no energy to the body. A few minerals serve as parts of body structures (calcium and phosphorus, for example, are major constituents of bone), but all vitamins and minerals act as regulators. As regulators, the vitamins and minerals assist in all body processes: digesting food; moving muscles; disposing of wastes; growing new tissues; healing wounds; obtaining energy from carbohydrate, fat, and protein; and participating in every other process necessary to maintain life. Later chapters are devoted to these six classes of nutrients.

**Water** Although last on the list, water is foremost in quantity among the six classes of nutrients in the body. The body constantly loses water, mainly through sweat, breath, and urine, and that water must constantly be replaced. Without sufficient water, the body’s cells cannot function.

**The Concept of Essential Nutrients** When you eat food, then, you are providing your body with energy and nutrients. Furthermore, some of the nutrients are **essential nutrients**, meaning that if you do not ingest them, you will develop deficiencies; the body cannot make these nutrients for itself. Essential nutrients are found in all six classes of nutrients. Water is an essential nutrient; so is a form of carbohydrate; so are some lipids, some parts of protein, all of the vitamins, and the minerals important in human nutrition.

Figure 1–2

### Components of Food and the Human Body

Foods and the human body are made of the same materials.

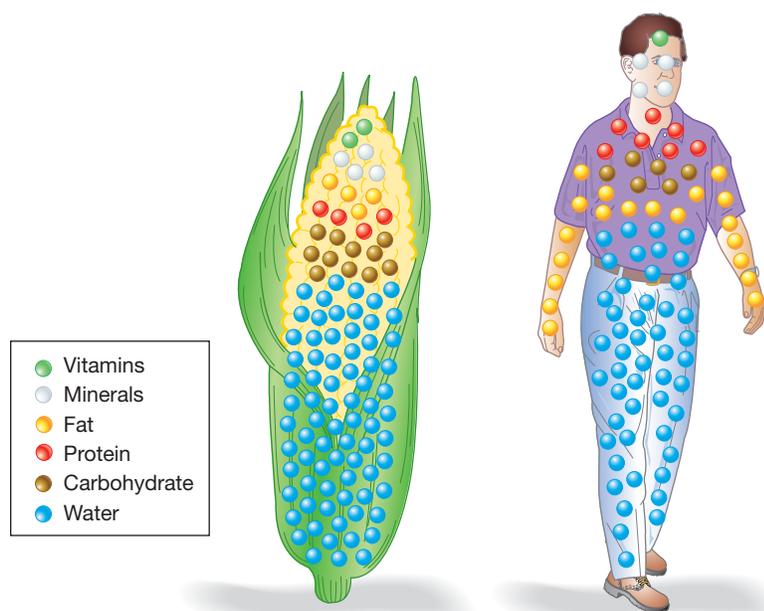


Table 1–4

### Energy-Yielding Nutrients

The energy a person consumes in a day’s meals comes from these three energy-yielding nutrients; alcohol, if consumed, also contributes energy at a rate of about 7 calories per gram (see note).

Energy Nutrient	Energy
Carbohydrate	4 cal/g
Fat (lipid)	9 cal/g
Protein	4 cal/g

*Note: Alcohol is not classed as a nutrient because it interferes with growth, maintenance, and repair of body tissues.*

**grams (g)** metric units of weight. About 28 grams equal an ounce. A *milligram* is one-thousandth of a gram. A *microgram* is one-millionth of a gram.

**energy-yielding nutrients** the nutrients the body can use for energy: carbohydrate, fat (also called *lipids*), and protein. These also may supply building blocks for body structures.

**macronutrients** another name for the energy-yielding nutrients: carbohydrate, fat, and protein.

**micronutrients** nutrients required in very small amounts: the vitamins and minerals.

**essential nutrients** the nutrients the body cannot make for itself (or cannot make fast enough) from other raw materials; nutrients that must be obtained from food to prevent deficiencies.

You may wonder why **fiber**, famous for its beneficial health effects, is not listed among the essential nutrients. The reason is that most fiber passes through the body unabsorbed, and omitting it from the diet does not reliably cause a specific deficiency disease. Even so, in research, health benefits often follow eating a fiber-rich diet (Chapter 4 has details).<sup>4</sup>

**Calorie Values** Food scientists measure food energy in kilocalories, units of heat. This book uses the common word **calories** to mean the same thing. It behooves the person who wishes to control food energy intake and body fatness to learn the calorie values of the energy nutrients, listed in Table 1–4. The most energy-rich of the nutrients is fat, which contains 9 calories in each gram. Carbohydrate and protein each contain only 4 calories in a gram. Weight, measure, and other conversion factors needed for the study of nutrition appear in Appendix C at the back of the book.

Scientists have worked out ways to measure the energy and nutrient contents of foods. They have also calculated the amounts of energy and nutrients various types of people need—by gender, age, life stage, and activity. Thus, after studying human nutrient requirements (in Chapter 2), you will be able to state with some accuracy just what your own body needs—this much water, that much carbohydrate, so much vitamin C, and so forth. So why not simply take pills or **dietary supplements** in place of food? Because, as it turns out, food offers more than just the six basic nutrients.

#### KEY POINTS

- The energy-yielding nutrients are carbohydrates, fats (lipids), and protein.
- The regulator nutrients are vitamins and minerals.
- Foremost among the nutrients in food is water.
- Essential nutrients in the diet prevent deficiencies.
- Food energy is measured in calories; nutrient quantities are often measured in grams.

## Can I Live on Just Supplements?

Nutrition science can state what nutrients human beings need to survive—at least for a time. Scientists are becoming skilled at making **elemental diets**—life-saving liquid diets of precise chemical composition for hospital patients and others who cannot eat ordinary food. These formulas, administered for days or weeks, support not only continued life but also recovery from nutrient deficiencies, infections, and wounds. Formulas can also stave off weight loss in the elderly or anyone in whom eating is impaired.<sup>5</sup>

Formula diets are essential to help sick people to survive, but they do not enable people to thrive over long periods. Even in hospitals, elemental diet formulas do not support optimal growth and health and may even lead to medical complications. Although serious problems are rare and can be detected and corrected, they show that the composition of these diets is not yet perfect for all people in all settings.

Lately, marketers have taken these liquid supplement formulas out of the medical setting and have advertised them heavily to healthy people of all ages as “meal replacers” or “insurance” against malnutrition. The truth is that real food is superior to such supplements. Most healthy people who eat a nutritious diet need no dietary supplements at all.

**Food Is Best** Even if a person’s basic nutrient needs are perfectly understood and met, concoctions of nutrients still lack something that foods provide. Hospitalized clients who are fed nutrient mixtures through a vein often improve dramatically when they can finally eat food. Something in real food is important to health—but what is it? What does food offer that cannot be provided through a needle or a tube? Science has some partial explanations, some physical and some psychological.

In the digestive tract, the stomach and intestine are dynamic, living organs, changing constantly in response to the foods they receive—even to just the sight, aroma, and taste of food. When a person is fed through a vein, the digestive organs, like unused muscles, weaken and grow smaller. Medical wisdom now dictates that a person should be fed through a vein for as short a time as possible and that real food taken by mouth

**fiber** a collective term for various indigestible plant materials, many of which bear links with human health. See also Chapter 4.

**calories** units of energy. In nutrition science, the unit used to measure the energy in foods is a kilocalorie (also called *kcalorie* or *Calorie*): it is the amount of heat energy necessary to raise the temperature of a kilogram (a liter) of water 1 degree Celsius. This book follows the common practice of using the lowercase term *calorie* (abbreviated *cal*) to mean the same thing.

**dietary supplements** pills, liquids, or powders that contain purified nutrients or other ingredients (see Controversy 7).

**elemental diets** diets composed of purified ingredients of known chemical composition; intended to supply, to the greatest extent possible, all essential nutrients to people who cannot eat foods.

should be reintroduced as early as possible. The digestive organs also release hormones in response to food, and these send messages to the brain that bring the eater a feeling of satisfaction: “There, that was good. Now I’m full.” Eating offers both physical and emotional comfort.

**Complex Interactions** Foods are chemically complex. In addition to their nutrients, foods contain **phytochemicals**, compounds that confer color, taste, and other characteristics to foods. Some may be **bioactive** food components that interact with metabolic processes in the body and may affect disease risks. Even an ordinary baked potato contains hundreds of different compounds. Nutrients and other food components interact with each other in the body and operate best in harmony with one another. In view of all this, it is not surprising that food gives us more than just nutrients. If it were otherwise, *that* would be surprising.

#### KEY POINTS

- Nutritious food is superior to supplements for maintaining optimal health.
- Most healthy people who eat a nutritious diet do not need supplements at all.

## The Challenge of Choosing Foods

**LO 1.4** Give examples of the challenges and solutions to choosing a health-promoting diet.

Well-planned meals convey pleasure and are nutritious, too, fitting your tastes, personality, family and cultural traditions, lifestyle, and budget. Given the astounding numbers and varieties available, consumers can easily lose track of what individual foods contain and how to put them together into a health-promoting diet. A few definitions and basic guidelines can help.

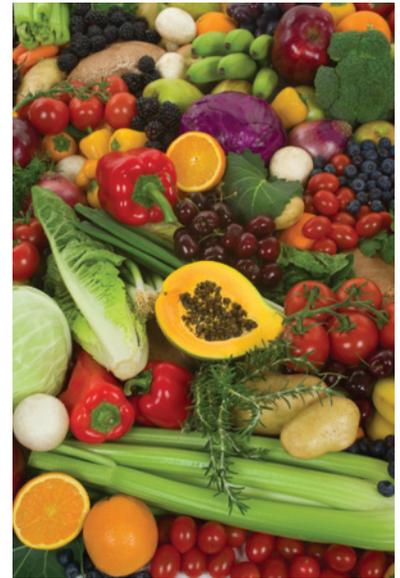
### The Abundance of Foods to Choose From

A list of the foods available 100 years ago would be relatively short. It would consist mostly of **whole foods**—foods that have been around for a long time, such as vegetables, fruit, meats, milk, and grains (Table 1–5 defines food types, p. 10; terms in tables are in black bold type, margin definitions are in blue). These foods have been called basic, unprocessed, natural, or farm foods. By any name, these foods form the basis of a nutritious diet. On a given day, however, well over 80 percent of our population consumes too few servings of fruit and vegetables each day.<sup>6</sup> And when people do choose to eat a vegetable, the one they most often choose is potatoes, usually prepared as French fries. Such choices, repeated over time, make development of chronic diseases more likely.

The number and types of foods supplied by the food industry today is astounding, as Figure 1–3 (p. 10) illustrates. Tens of thousands of foods now line the market shelves—many are processed mixtures of the basic ones, and some are constructed entirely from highly processed ingredients.<sup>7</sup> Ironically, this abundance often makes it more difficult, rather than easier, to plan a nutritious diet.

The food-related terms defined in Table 1–5 reveal that all types of food—including **fast foods**, **processed foods**, and **ultra-processed foods**—offer various constituents to the eater, some more health-promoting than others.<sup>8</sup> You may also hear about **functional foods**, a marketing term coined to identify those foods containing substances, natural or added, that might lend protection against chronic diseases. The trouble with trying to single out the most health-promoting foods is that almost every naturally occurring food—even chocolate—is functional in some way with regard to human health.<sup>9</sup>

The extent to which foods support good health depends on the calories, nutrients, and phytochemicals they contain. In short, to select well among foods, you need to know more than their names; you need to know the foods’ inner qualities. Even more



Brian Chase/Shutterstock.com

*Some foods offer phytochemicals in addition to the six classes of nutrients.*

**phytochemicals** bioactive compounds in plant-derived foods (*phyto*, pronounced FYE-toe, means “plant”).

**bioactive** having chemical or physical properties that affect the functions of the body tissues. See Controversy 2.

Table 1–5

## Glossary of Food Types

- **enriched foods** and **fortified foods** foods to which nutrients have been added. If the starting material is a whole, basic food such as milk or whole grain, the result may be highly nutritious. If the starting material is a concentrated form of sugar or fat, the result is less nutritious.
- **fast foods** restaurant foods that are available within minutes after customers order them—traditionally, hamburgers, French fries, and milkshakes; more recently, salads and other vegetable dishes as well. These foods may or may not meet people’s nutrient needs, depending on the selections provided and on the energy allowances and nutrient needs of the eaters.
- **functional foods** whole or modified foods that contain bioactive food components believed to provide health benefits, such as reduced disease risks, beyond the benefits that their nutrients confer. However, all nutritious foods can support health in some ways; Controversy 2 provides details.
- **medical foods** foods specially manufactured for use by people with medical disorders and administered on the advice of a physician.
- **natural foods** a term that has no legal definition but is often used to imply wholesomeness.
- **organic foods** understood to mean foods grown without synthetic pesticides or fertilizers. In chemistry, however, all foods are made mostly of organic (carbon-containing) compounds.
- **processed foods** foods subjected to any process, such as milling, alteration of texture, addition of additives, cooking, or others. Depending on the starting material and the process, a processed food may or may not be nutritious.
- **staple foods** foods used frequently or daily—for example, rice (in East and Southeast Asia) or potatoes (in Ireland). Many of these foods are sufficiently nutritious to provide a foundation for a healthful diet.
- **ultra-processed foods** a term used to describe highly palatable food products of manufacturing made with industrial ingredients and additives, such as sugars, refined starches, fats, salt, and imitation flavors and colors, with little or no whole food added. Examples: sugary refined breakfast cereals, candies, cookies, fried chicken nuggets, potato “tots,” ready-to-heat meals, snack chips and cakes, and soft drinks.
- **whole foods** milk and milk products; meats and similar foods such as fish and poultry; vegetables, including dried beans and peas; fruit; and grains. These foods are generally considered to form the basis of a nutritious diet. Also called *basic foods*.

important, you need to know how to combine foods into nutritious diets. Foods are not nutritious by themselves; each is of value only insofar as it contributes to a nutritious diet. A key to wise diet planning is to make sure that the foods you eat daily, your **staple foods**, are especially nutritious.

### KEY POINT

- Foods that form the basis of a nutritious diet are whole foods, such as ordinary milk and milk products; meats, fish, and poultry; vegetables and dried peas and beans; fruit; and grains.

Figure 1–3

## Grocery Options Then and Now

All foods once looked like this ...



... but now many foods look like this.



## How, Exactly, Can I Recognize a Nutritious Diet?

A nutritious diet is really an **eating pattern**, a habitual way of choosing foods, with five characteristics. First is **adequacy**: the foods provide enough of each essential nutrient, fiber, and energy. Second is **balance**: the choices do not overemphasize one nutrient or food type at the expense of another. Third is **calorie control**: the foods provide the amount of energy you need to maintain appropriate weight—not more, not less. Fourth is **moderation**: the foods do not provide excess fat, salt, sugar, or other unwanted constituents. Fifth is **variety**: the foods chosen differ from one day to the next. In addition, to maintain a steady supply of nutrients, meals should occur with regular timing throughout the day. To recap, then, a nutritious diet is an eating pattern that follows the A, B, C, M, V principles: Adequacy, Balance, Calorie control, Moderation, and Variety.



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**Adequacy** Any nutrient could be used to demonstrate the importance of dietary adequacy. Iron provides a familiar example. It is an essential nutrient: you lose some every day, so you have to keep replacing it, and you can get it into your body only by eating foods that contain it.<sup>†</sup> If you eat too few iron-containing foods, you can develop iron-deficiency anemia. With anemia, you may feel weak, tired, cold, sad, and unenthusiastic; you may have frequent headaches; and you can do very little muscular work without disabling fatigue. Some foods are rich in iron; others are notoriously poor. If you add iron-rich foods to your diet, you soon feel more energetic. Meat, fish, poultry, and **legumes** are rich in iron, and an easy way to obtain the needed iron is to include these foods in your diet regularly.

**Balance** To appreciate the importance of dietary balance, consider a second essential nutrient, calcium. A diet lacking calcium causes poor bone development during the growing years and increases a person's susceptibility to disabling bone loss in adult life. Most foods that are rich in iron are poor in calcium. Calcium's richest food sources are milk and milk products, which happen to be extraordinarily poor iron sources. Clearly, to obtain enough of both iron and calcium, people have to balance their food choices among the types of foods that provide both nutrients. Balancing the whole diet to provide enough of every one of the 40-odd nutrients the body needs for health requires considerable juggling, however. As you will see in Chapter 2, food group plans ease this task by clustering rich sources of nutrients into food groups that will help you to achieve both dietary adequacy and balance within an eating pattern that meets your needs.

**Calorie Control** Energy intakes should not exceed or fall short of energy needs. Named *calorie control*, this characteristic ensures that energy intakes from food balance energy expenditures required for body functions and physical activity. Eating such a diet helps control body fat content and weight. The many strategies that promote this goal appear in Chapter 9.

**Moderation** Intakes of certain food constituents such as saturated fats, added sugars, and salt should be limited for health's sake. Some people take this to mean that they must never indulge in a delicious beefsteak or hot-fudge sundae, but they are misinformed: moderation, not total abstinence, is the key.<sup>10</sup> A steady diet of steak and ice cream might be harmful, but once a week as part of an otherwise healthful eating pattern, these foods may have little impact; as once-a-month treats, these foods would have practically no effect at all. Moderation also means that limits are necessary, even for desirable food constituents. For example, a certain amount of fiber in foods contributes to the health of the digestive system, but too much fiber leads to nutrient losses.

**eating pattern** the combination of foods and beverages that constitute an individual's complete dietary intake over time; a person's usual diet.

**adequacy** the dietary characteristic of providing all of the essential nutrients, fiber, and energy in amounts sufficient to maintain health and body weight.

**balance** the dietary characteristic of providing foods of a number of types in proportion to each other, such that foods rich in some nutrients do not crowd out the diet foods that are rich in other nutrients.

**calorie control** the dietary characteristic of controlling energy intake; a feature of a sound diet plan.

**moderation** the dietary characteristic of providing constituents within set limits, not to excess.

**variety** the dietary characteristic of providing a wide selection of foods—the opposite of monotony.

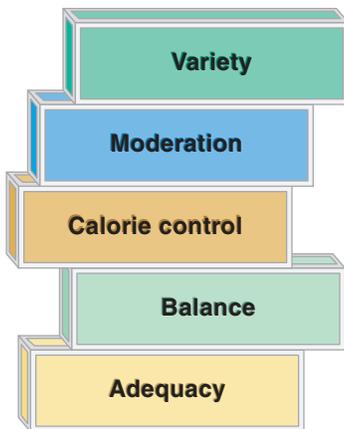
**legumes** (leg-GOOMS, LEG-yooms) beans, peas, and lentils, valued as inexpensive food sources of protein, vitamins, minerals, and fiber that contribute little fat to the diet. Also defined in Chapter 6.

<sup>†</sup>A person can also take supplements of iron, but as later discussions demonstrate, eating iron-rich foods is preferable.

Figure 1–4

### Components of a Nutritious Diet

All of these factors help to build a nutritious diet:



**Variety** As for variety, nutrition scientists agree that people should not eat the same foods, even highly nutritious ones, day after day, for a number of reasons. First, a varied diet is more likely to be adequate in nutrients. Second, some less-well-known nutrients and phytochemicals could be important to health, and some foods may be better sources of these than others. Third, a monotonous diet may deliver large amounts of toxins or contaminants. Such undesirable compounds in one food are diluted by all the other foods eaten with it and are diluted still further if the food is not eaten again for several days. Finally, variety adds interest—trying new foods can be a source of pleasure.

Variety applies to nutritious foods consumed within the context of all of the other dietary principles just discussed. Relying solely on the principle of variety to dictate food choices could easily result in a low-nutrient, high-calorie eating pattern with a variety of nutrient-poor snack foods and sweets. If you establish the habit of using all of the principles just described, you will find that choosing a healthful diet becomes as automatic as brushing your teeth or falling asleep. Establishing the A, B, C, M, V habit (summed up in Figure 1–4) may take some effort, but the payoff in terms of improved health is overwhelming. Table 1–6 takes an honest look at some common excuses for *not* eating well.

#### KEY POINT

- A well-planned diet is adequate, balanced, moderate in energy, and moderate in unwanted constituents and offers a variety of nutritious foods.

## Why People Choose Foods

Eating is an intentional act. Each day, people choose from the available foods, prepare the foods, and decide where to eat, which customs to follow, and with whom to dine. Many factors influence food-related choices.

**Cultural and Social Meanings Attached to Food** Like wearing traditional clothing or speaking a native language, enjoying traditional **cuisines** and **foodways** can be a celebration of your own or a friend’s heritage. Sharing **ethnic foods** can be symbolic: people offering foods are expressing a willingness to share cherished values with others. People accepting those foods are symbolically accepting not only the person doing the offering but also the person’s culture. Developing **cultural competence** is particularly important for professionals who help others to achieve a nutritious diet.<sup>11</sup>

Cultural traditions regarding food are not inflexible; they keep evolving as people move about, learn about new foods, and teach each other. Today, some people are ceasing to be **omnivorous** and are becoming **vegetarians**. Vegetarians often choose this lifestyle because they honor the lives of animals or because they have discovered the health and other advantages associated with eating patterns rich in beans,

Table 1–6

### What’s Today’s Excuse for Not Eating Well?

If you find yourself saying, “I know I should eat well, but I’m too busy” (or too fond of fast food, or have too little money, or a dozen other excuses), take note:

- *No time to cook.* Everyone is busy. Convenience packages of fresh or frozen vegetables, jars of pasta sauce, and prepared meats and salads make nutritious meals in little time.
- *Not a high priority.* Priorities change drastically and instantly when illness strikes—better to spend a little effort now nourishing your body’s defenses than to spend enormous resources later fighting illnesses.
- *Crave fast food and sweets.* Occasional fast-food meals and sweets in moderation are acceptable in a nutritious diet.
- *Too little money.* Eating right may cost a little more than eating poorly, but the cost of coping with a chronic illness is unimaginably high.
- *Take vitamins instead.* Vitamin pills or even advertised “nutritional drinks” cannot make up for consistently poor food choices.

Sources: D. P. Reidlinger, T. A. Sanders, and L. M. Goff, *How expensive is a cardioprotective diet? Analysis from the CRESSIDA study*, *Public Health Nutrition* (2017), epub ahead of print, doi: 10.1017/S1368980016003529; M. M. Abdullah, J. P. Jones, and P. J. Jones, *Economic benefits of the Mediterranean-style diet consumption in Canada and the United States*, *Food and Nutrition Research* (2015), epub, doi: 10.3402/fnr.v59.27541; M. Rao and coauthors, *Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis*, *BMJ Open* 3 (2013): e004277.

whole grains, fruit, nuts, and vegetables. Controversy 6 explores the strengths and weaknesses of both vegetarians' and meat eaters' diets.

**Factors that Drive Food Choices** Taste prevails as the number-one factor driving people's food choices, with price following closely behind.<sup>12</sup> Consumers also value convenience so highly that they are willing to spend almost half of their food budgets on meals prepared outside the home. Fewer people are learning the skills needed to prepare nutritious meals at home.<sup>13</sup> Instead, they frequently eat out, bring home ready-to-eat meals, or have food delivered. When they do cook, they want to prepare meals in 15 to 20 minutes, using only a few ingredients. Such convenience incurs a cost in terms of nutrition, however: eating away from home reduces intakes of fruit, vegetables, milk, and whole grains. It also increases intakes of calories, saturated fat, sodium, and added sugars. Convenience doesn't have to mean that nutrition flies out the window, however. This chapter's Food Feature (p. 20) explores the trade-offs of time, money, and nutrition that many busy people face today.

Many other factors—psychological, physical, social, and philosophical—also influence people's food choices. College students, for instance, often choose to eat at restaurants to socialize, to get out, to save time, or to date; they are not always conscious of their bodies' needs for nutritious food. A list of other factors follows:

- *Advertising.* The media have persuaded you to consume these foods.
- *Availability.* They are present in the environment and accessible to you.
- *Cost.* They are within your financial means.<sup>14</sup>
- *Emotional comfort.* They can make you feel better for a while.
- *Habit.* They are familiar; you always eat them.
- *Nutrition and health benefits.* You think they are good for you.
- *Personal preference and genetic inheritance.* You like the way these foods taste.
- *Positive or negative associations.* *Positive:* They are eaten by people you admire, or they indicate status, or they remind you of fun. *Negative:* They were forced on you, or you became ill while eating them.
- *Region of the country.* They are foods favored in your area.
- *Social norms.* Your companions are eating them, or they are offered and you feel you cannot refuse them.<sup>15</sup>
- *Values or beliefs.* They fit your religious tradition, square with your political views, or honor the environmental ethic.
- *Weight.* You think they will help control body weight.

One other factor affects food choices:

- *Nutrition and health benefits.* You think they are good for you.<sup>16</sup>

The next section addresses one of the “how” questions posed earlier in this chapter: How do we know what we know about nutrition?

### KEY POINTS

- Cultural traditions and social values often revolve around foodways.
- Many factors other than nutrition drive food choices.

## The Science of Nutrition

**LO 1.5** Describe the science of nutrition.

Understanding nutrition depends upon a firm base of scientific knowledge. This section describes the nature of such knowledge.



Sharing traditional food is a way of sharing culture.

**cuisines** styles of cooking.

**foodways** the sum of a culture's habits, customs, beliefs, and preferences concerning food.

**ethnic foods** foods associated with particular cultural subgroups within a population.

**cultural competence** having an awareness and acceptance of one's own and others' cultures and abilities, leading to effective interactions with all kinds of people.

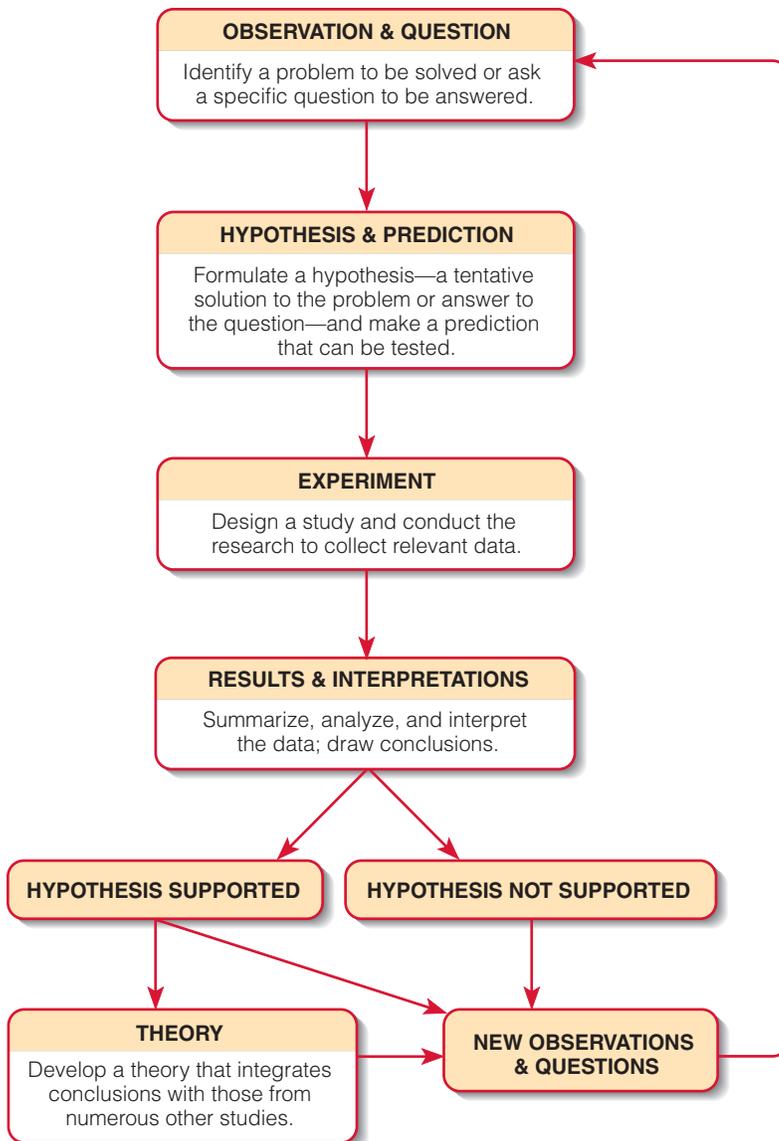
**omnivorous** people who eat foods of both plant and animal origin, including animal flesh.

**vegetarians** people who exclude from their diets animal flesh and possibly other animal products such as milk, cheese, and eggs.

Figure 1–5

## The Scientific Method

Research scientists follow the scientific method. Note that most research projects result in new questions, not final answers. Thus, research continues in a somewhat cyclical manner.



Unlike sciences such as astronomy and physics, nutrition is a relatively young science. Most nutrition research has been conducted since 1900. The first vitamin was identified in 1897, and the first protein structure was not fully described until the mid-1940s. Because nutrition science is an active, changing, growing body of knowledge, new findings often seem to contradict one another or are subject to conflicting interpretations. Bewildered consumers complain in frustration, “Those scientists don’t know anything. If they don’t know what’s true, how am I supposed to know?”

Yet experimenters have confirmed many nutrition facts with great certainty through repeated testing. To understand why apparent contradictions exist, we need to look first at what scientists do.

## The Scientific Approach

In truth, it is a scientist’s business not to know. Scientists obtain facts by systematically asking honest, objective questions—that’s their job. Following the scientific method (outlined in Figure 1–5), researchers attempt to answer scientific questions. They design and conduct various experiments to test for possible answers (see Figure 1–6, and Table 1–7 on p. 16). When they have ruled out some possibilities and found evidence for others, they submit their findings not to the news media but to boards of reviewers composed of other scientists who try to pick apart the findings and often call for further evidence before approving publication. Finally, the work is published in scientific journals where still more scientists can read it. Then the news reporters read it and write about it, and the public can read about it, too. In time, other scientists replicate the experiments and report their own findings, which either support or refute earlier conclusions.

### KEY POINTS

- Nutrition is a young and fast-growing science.
- Scientists ask questions and then design research experiments to test possible answers.
- Researchers follow the scientific method and apply it to various research study designs.

## Scientific Challenge

An important truth in science is that one experiment does not “prove” or “disprove” anything. When a finding has stood up to rigorous repeated testing in several kinds of experiments performed by several different researchers it is finally considered confirmed. Even then, strictly speaking, science consists not of facts that are set in stone but of *theories* that can always be challenged and revised. Some findings, though, such as the theory that the earth revolves about the sun, are so well supported by observations and experimental findings that they are generally accepted as facts. What we “know” in nutrition is confirmed in the same way—through years of replicating study findings. This slow path of repeated studies stands in sharp contrast to the media’s desire for today’s latest news.<sup>17</sup>

The type of study chosen for research depends upon what sort of information the researchers require. Studies of individuals (**case studies**) yield observations that may lead to possible avenues of research. A study of a man who ate gumdrops and became a famous dancer might suggest that an experiment be done to see if

gumdrops contain dance-enhancing power.

Studies of whole populations (**epidemiological studies**) provide another sort of information. Such a study can reveal a **correlation**. For example, an epidemiological study might find no worldwide correlation of gumdrop eating with fancy footwork

but, unexpectedly, might reveal a correlation with tooth decay.

Studies in which researchers actively intervene to alter people's eating habits (**intervention studies**) go a step further. In such a study, one set of subjects (the **experimental group**) receives a treatment, and another set (the **control group**) goes untreated or receives a **placebo** or sham treatment. If the study is a **blind experiment**, the subjects do not know who among the members receives the treatment and who receives the sham. If the two groups experience different effects, then the treatment's effect can be pinpointed. For example, an intervention study might show that withholding gumdrops, together with other candies and confections, reduced the incidence of tooth decay in an experimental population compared to that in a control population.

**Laboratory studies** can pinpoint the mechanisms by which nutrition acts. What is it about gumdrops that contributes to tooth decay: their size, shape, temperature, color, ingredients? Feeding various forms of gumdrops to rats might yield the information that sugar, in a gummy carrier, promotes tooth decay. In the laboratory, using animals or plants or cells, scientists can inoculate with diseases, induce deficiencies, and experiment with variations on treatments to obtain in-depth knowledge of the process under study. Intervention studies and laboratory experiments are among the most powerful tools in nutrition research because they show the effects of treatments.

### Case Study



Lester V. Bergman/Getty Images

*"This person eats too little of nutrient X and has illness Y."*

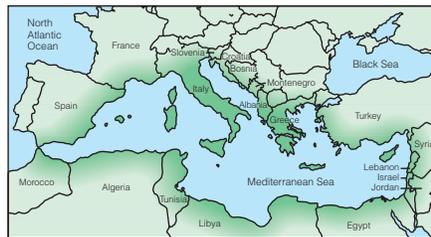
### Intervention Study



bokany/Shutterstock.com

*"Let's add foods containing nutrient X to some people's food supply and compare their rates of illness Y with the rates of others who don't receive the nutrient."*

### Epidemiological Study



*"This country's food supply contains more nutrient X, and these people suffer less illness Y."*

### Laboratory Study



Leslie Newman & Andrew Flowers/Science Source

*"Now let's see if a nutrient X deficiency causes illness Y by inducing a deficiency in these rats."*

To repeat: the only source of valid nutrition information is slow, painstaking, well-designed, unbiased, repeatable scientific research. We believe a nutrition fact to be true because it has been supported, time and again, in experiments designed to rule out all other possibilities.<sup>18</sup> For example, we know that eyesight depends partly on vitamin A because:

- In case studies, individuals with blindness report having consumed a steady diet devoid of vitamin A; and
- In epidemiological studies, populations with diets lacking in vitamin A are observed to suffer high rates of blindness; and
- In intervention studies (**controlled clinical trials**), vitamin A–rich foods provided to groups of people with vitamin A deficiency reduce their blindness rates dramatically; and

## Research Design Terms

- **blind experiment** an experiment in which the subjects do not know whether they are members of the experimental group or the control group. In a *double-blind experiment*, neither the subjects nor the researchers know to which group the members belong until the end of the experiment.
- **case study** a study of a single individual. When in clinical settings, researchers can observe treatments and their apparent effects. To prove that a treatment has produced an effect requires simultaneous observation of an untreated similar subject (a *case control*).
- **control group** a group of individuals who are similar in all possible respects to the group being treated in an experiment but who receive a sham treatment instead of the real one. Also called *control subjects*.
- **controlled clinical trial** an experiment in which one group of subjects (the **experimental group**) receives a treatment and a comparable group (the **control group**) receives an imitation treatment and outcomes for the two are compared. Ideally, neither subjects nor researchers know who receives the treatment and who gets the placebo (a double-blind study).
- **meta-analysis** a computer-driven statistical summary of evidence gathered from multiple previous studies.
- **correlation** the simultaneous change of two factors, such as the increase of weight with increasing height (a *direct* or *positive* correlation) or the decrease of cancer incidence with increasing fiber intake (an *inverse* or *negative* correlation). A correlation between two factors suggests that one may cause the other but does not rule out the possibility that both may be caused by chance or by a third factor.
- **epidemiological studies** studies of populations; often used in nutrition to search for correlations between dietary habits and disease incidence; a first step in seeking nutrition-related causes of diseases.
- **experimental group** the people or animals participating in an experiment who receive the treatment under investigation. Also called *experimental subjects*.
- **intervention studies** studies of populations in which observation is accompanied by experimental manipulation of some population members—for example, a study in which half of the subjects (the *experimental subjects*) follow diet advice to reduce fat intakes, while the other half (the *control subjects*) do not, and both groups' heart health is monitored.
- **laboratory studies** studies that are performed under tightly controlled conditions and are designed to pinpoint causes and effects. Such studies often use animals as subjects.
- **placebo** a sham treatment often used in scientific studies; an inert, harmless medication. The *placebo effect* is the healing effect that the act of treatment, rather than the treatment itself, often has.

- In laboratory studies, animals deprived of vitamin A and only that vitamin begin to go blind; when it is restored soon enough in the diet, their eyesight returns; and
- Further laboratory studies elucidate the molecular mechanisms for vitamin A activity in eye tissues; and
- Replication of these studies yields the same results.
- Later, a **meta-analysis** of previous studies also detects the effect.

Now we can say with certainty, “Eyesight depends upon sufficient vitamin A.”

#### KEY POINTS

- Single studies must be replicated before their findings can be considered valid.
- A theory is strengthened when results from follow-up studies with a variety of research designs support it.

## Can I Trust the Media for Nutrition Information?

The news media are hungry for new findings, and reporters often latch onto hypotheses from scientific laboratories before they have been fully tested. Also, a reporter who lacks a strong understanding of science may misunderstand or misreport complex scientific principles.<sup>19</sup> To tell the truth, sometimes scientists get excited about their findings, too, and leak them to the press before they have been through a rigorous review by the scientists' peers. As a result, the public is often exposed to late-breaking nutrition news stories before the findings are fully confirmed. Then, when a hypothesis being tested fails to hold up to a later challenge, consumers feel betrayed by what is simply the normal course of science at work.

Real scientists are trend watchers. They evaluate the methods used in each study, assess each study in light of the evidence gleaned from other studies, and modify little by little their picture of what may be true. As evidence accumulates, the scientists become more and more confident about their ability to make recommendations that apply to people's health and lives.

Sometimes media sensationalism overrates the importance of even true, replicated findings. For example, the media eagerly report that oat products lower blood cholesterol, a lipid indicative of heart disease risk. Although the reports are true, they often fail to mention that eating a nutritious diet that is low in certain fats is still the major step toward lowering blood cholesterol. They also may skip over important questions: How much oatmeal must a person eat to produce the desired effect? Do little oat bran pills or powders meet the need? Do oat bran cookies? If so, how many cookies? For oatmeal, it takes a bowl and a half daily to affect blood lipids. A few pills or cookies do not provide nearly so much bran and certainly cannot undo damage from an ill-chosen diet.

Today, the cholesterol-lowering effect of oats is well established. The whole process of discovery, challenge, and vindication took almost 10 years of research. Some other lines of research have taken much longer. In science, a single finding almost never makes a crucial difference to our knowledge, but like each individual frame in a movie, it contributes a little to the big picture. Many such frames are needed to tell the whole story. The Consumer's Guide section (p. 19) offers some tips for evaluating news stories about nutrition.

#### KEY POINT

- News media often sensationalize single-study findings and so may not be trustworthy sources.

## National Nutrition Research

As you study nutrition, you are likely to hear of findings based on ongoing nationwide nutrition and health research projects. A national food and nutrient intake survey, called *What We Eat in America*, reveals what we know about the population's food and supplement intakes. It is conducted as part of a larger research effort, the **National Health and Nutrition Examination Surveys (NHANES)**, which also conducts physical examinations and measurements and laboratory tests.<sup>20</sup> Boiled down to its essence, NHANES involves:

- Asking people what they have eaten and
- Recording measures of their health status.

Past NHANES results have provided important data for developing growth charts for children, guiding food fortification efforts, developing national guidelines for reducing chronic diseases, and many other beneficial programs. Some agencies involved with these efforts are listed in Table 1–8.

#### KEY POINT

- National nutrition research projects, such as NHANES, provide data on U.S. food consumption and nutrient status.

## Changing Behaviors

**LO 1.6** Describe the characteristics of the six stages of behavior change.

Nutrition knowledge is of little value if it only helps people to make A's on tests. The value comes when people use it to improve their diets. To act on knowledge, people must change their behaviors, and although this may sound simple enough, behavior change often takes substantial effort.

Table 1–8

### Nutrition Research and Policy Agencies

These agencies are actively engaged in nutrition policy development, research, and monitoring:

- Centers for Disease Control and Prevention (CDC)
- U.S. Department of Agriculture (USDA)
- U.S. Department of Health and Human Services (DHHS)
- U.S. Food and Drug Administration (FDA)

**National Health and Nutrition Examination Surveys (NHANES)** a program of studies designed to assess the health and nutritional status of adults and children in the United States by way of interviews and physical examinations.



UpperCut Images/Alamy Stock Photo

Many people need to change their daily routines to include physical activity.

## The Process of Change

Psychologists often describe the six stages of behavior change, offered in Table 1–9. Knowing where you stand in relation to these stages may help you move along the path toward achieving your goals. When offering diet help to others, keep in mind that their stages of change can influence their reaction to your message.

## Taking Stock and Setting Goals

Once aware of a problem, you can plan to make a change. Some problems, such as *never* consuming a vegetable, are easy to spot. More subtle dietary problems, such as failing to meet your need for calcium, may be hidden but can exert serious repercussions on health. Tracking food intakes over several days’ time and then comparing intakes to standards (see Chapter 2) can reveal all sorts of interesting tidbits about strengths and weaknesses of your eating pattern.

Once a weakness is identified, setting small, achievable goals to correct it becomes the next step to making improvements. The most successful goals are set for specific behaviors, not overall outcomes. For example, if losing 10 pounds is the desired outcome, goals should be set in terms of food intakes and physical activity to help achieve weight loss. After goals are set and changes are under way, a means of tracking progress increases the likelihood of success.

## Start Now

As you progress through this text, you may want to change some of your own habits. To help you, little reminders entitled “Start Now” close each chapter’s Think Fitness section with an invitation to visit this book’s website (p. 21). There, you can take inventory of your current behaviors, set goals, track progress, and practice new behaviors until they become as comfortable and familiar as the old ones were.

### KEY POINTS

- Behavior change follows a multistep pattern.
- Setting goals and monitoring progress facilitate behavior change.

**Table 1–9**

**The Stages of Behavior Change**

Stage	Characteristics	Actions
Precontemplation	Not considering a change; have no intention of changing; see no problems with current behavior.	Collect information about health effects of current behavior and potential benefits of change.
Contemplation	Admit that change may be needed; weigh pros and cons of changing and not changing.	Commit to making a change and set a date to start.
Preparation	Preparing to change a specific behavior, taking initial steps, and setting some goals.	Write an action plan, spelling out specific parts of the change. Set small-step goals; tell others about the plan.
Action	Committing time and energy to making a change; following a plan set for a specific behavior change.	Perform the new behavior. Manage emotional and physical reactions to the change.
Maintenance	Striving to integrate the new behavior into daily life and striving to make it permanent.	Persevere through lapses. Teach others and help them achieve their own goals. (This stage can last for years.)
Adoption/Moving On	The former behavior is gone, and the new behavior is routine.	After months or a year of maintenance without lapses, move on to other goals.

## A CONSUMER'S GUIDE TO . . .

# Reading Nutrition News

At a coffee shop, Nick, a health-conscious consumer, sets his cup down on the Lifestyle section of the newspaper. He glances at the headline—“Eating Fat OK for Heart Health!”—and jumps to a wrong conclusion: “Do you mean to say that I could have been eating burgers and butter all this time? I can't keep up! As soon as I change my diet, the scientists change their story.” Nick's frustration is understandable. Like many others, he feels betrayed when, after working for years to make diet changes for his health's sake, headlines seem to turn dietary advice upside down. He shouldn't blame science, however.

## Tricks and Traps

The trouble started when Nick was “hooked” by a catchy headline. Media headlines often seem to reverse current scientific thought because new “break-through” studies are exciting; they grab readers' attention and make them want to buy a newspaper, book, or magazine. (By the way, you can read the true story behind changing lipid intake guidelines in Controversy 5.) Even if Nick had read the entire newspaper article, he could have still been led astray by phrases like “Now we know” or “The truth is.” Journalists use such phrases to imply finality, the last word. In contrast, scientists use tentative language, such as “may” or “might,” because they know that the conclusions from one study will be challenged, refined, and even refuted by others that follow.

## Markers of Authentic Reporting

To approach nutrition news with a trained eye, look for these signs of a scientific approach:

- When an article describes a scientific study, that study should have been published in a peer-reviewed journal, such as the *American Journal of Clinical*

*Nutrition* (see Figure 1–7). An unpublished study may or may not be valid; readers have no way of knowing because the study lacks scrutiny by other experts (the authors' peers).

- The news item should describe the researchers' methods. In truth, few popular reports provide these details. For example, it matters whether the study participants numbered 8 or 80,000 or whether researchers personally observed participants' behaviors or relied on self-reports given over the telephone.
- The report should define the study subjects—were they single cells, animals, or human beings? If they were human beings, the more you have in common with them (age and gender, for example), the more applicable the findings may be for you.
- Valid reports also present new findings in the context of previous research. Some reporters in popular media regularly follow developments in a research area and thus acquire the background knowledge needed to report meaningfully. They strive for adequacy, balance, and completeness, and they cover such things as cost of a treatment, potential harms and benefits, strength of evidence, and who might stand to gain from potential sales relating to the finding.\*
- For a helpful *scientific* overview of current topics in nutrition, look for review articles written by experts. They regularly appear in scholarly journals such as *Nutrition Reviews*.

The most credible sources of scientific nutrition information are scientific journals. Controversy 1, which follows this chapter, addresses other sources of nutrition information and misinformation.

\*An organization that promotes valid health-care reporting is [HealthNewsReview.org](http://HealthNewsReview.org), available at [www.healthnewsreview.org/](http://www.healthnewsreview.org/).

Figure 1–7

### Peer-Reviewed Journals

For the whole story on a nutrition topic, read articles from peer-reviewed journals such as these. A review journal examines all available evidence on major topics. Other journals report details of the methods, results, and conclusions of single studies.



## Moving Ahead

Develop a critical eye, and let scientific principles guide you as you read nutrition news. When a headline touts a shocking new “answer” to a nutrition question, approach it with caution. It may indeed be a carefully researched report that respects the gradual nature of scientific discovery and refinement, but more often it is a sensational news flash intended to grab your attention.

## Review Questions<sup>†</sup>

1. To keep up with nutrition science, consumers should \_\_\_\_\_.
  - a. seek out the health and fitness sections of newspapers and magazines and read them with a trained eye
  - b. read studies published in peer-reviewed journals, such as the

(continued)

<sup>†</sup>Answers to Consumer's Guide review questions are in Appendix G.

*American Journal of Clinical Nutrition*

- c. look for review articles published in peer-reviewed journals, such as *Nutrition Reviews*
  - d. all of the above
2. To answer nutrition questions \_\_\_\_\_.
- a. rely on articles that include phrases such as “Now we know”

or “The answer is,” which appear to provide conclusive answers to nutrition questions

- b. look to science for answers, with the expectation that scientists will continually revise their understandings
- c. realize that problems in nutrition are probably too complex for consumers to understand
- d. a and c

3. Scholarly review journals such as *Nutrition Reviews* \_\_\_\_\_.

- a. are behind the times when it comes to nutrition news
- b. discuss all available research findings on a topic in nutrition
- c. are filled with medical jargon
- d. are intended for use by practitioners only, not students

## FOOD FEATURE

# Nutrient Density: How to Get Enough Nutrients without Too Many Calories

**LO 1.7** Explain how the concept of nutrient density can facilitate diet planning.

In the United States, only a tiny percentage of adults manage to choose an eating pattern that achieves both adequacy and calorie control. The foods that can help in doing so are foods richly endowed with nutrients relative to their energy contents; that is, they are foods with high **nutrient density**.<sup>21</sup> Figure 1–8 is a simple depiction of this concept. Consider calcium sources, for example. Ice cream and fat-free milk both supply calcium, but a cup of rich ice cream contributes more than 350 calories, whereas a cup of fat-free milk has only 85—and almost double the calcium. Most people cannot, for their health’s sake, afford to choose foods without regard to their energy contents. Those who do very often exceed calorie allowances while leaving nutrient needs unmet.

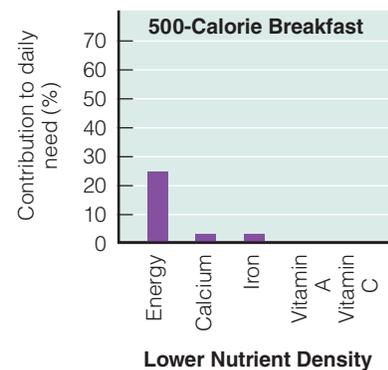
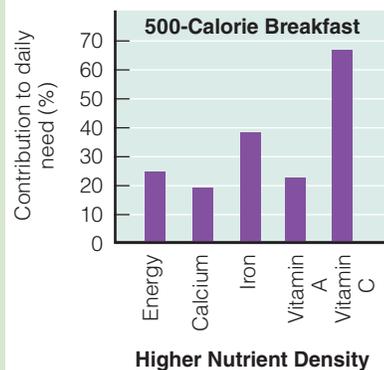
Among foods that often rank high in nutrient density are the vegetables, particularly the nonstarchy vegetables such as dark leafy greens (cooked and raw), red bell peppers, broccoli, carrots, mushrooms, and tomatoes.<sup>22</sup> These inexpensive foods take time to prepare, but time invested in this way pays off in

**nutrient density** a measure of nutrients provided per calorie of food. A *nutrient-dense food* provides needed nutrients with relatively few calories.

**Figure 1–8**

### A Way to Judge which Foods Are Most Nutritious

These two breakfasts provide about 500 calories each, but they differ greatly in the nutrients they provide per calorie. Note that the sausage in the larger breakfast is lower-calorie turkey sausage, not the high-calorie pork variety. Making small changes like this at each meal can add up to large calorie savings, making room in the diet for more servings of nutritious foods and even some treats.



© Matthew Farruggio

(continued)

nutritional health. Twenty minutes spent peeling and slicing vegetables for a salad is a better investment in nutrition than 20 minutes spent fixing a fancy, high-fat, high-sugar dessert. Besides, the dessert ingredients often cost more money and strain the calorie budget, too.

Time, however, is a concern to many people. Today's working families, college students, and active people of all ages may have little time to devote to food preparation. Busy cooks should seek out convenience foods that are nutrient-dense, such as bags of ready-to-serve salads, ready-to-cook fresh vegetables, refrigerated prepared low-fat meats and poultry, canned beans, and frozen vege-

tables. A tip for lower-cost convenience is to double the amount of whole vegetables for a recipe; wash, peel, and chop them; and then refrigerate or freeze the extra to use on another day. Dried fruit and dry-roasted nuts require only that they be kept on hand and make a tasty, nutritious topper for salads and other foods. To round out a meal, fat-free milk or yogurt is both nutritious and convenient. Other convenience selections, such as most potpies, many frozen pizzas, ramen noodles, and "pocket"-style pastry sandwiches, are less nutritious overall because they contain too few vegetables and too many calories, making them low in nutrient density. The Food Features of

later chapters offer many more tips for choosing convenient and nutritious foods.

All of this discussion leads to a principle that is central to achieving nutritional health: no particular foods must be included or excluded in the diet. Instead, your eating pattern—the way you combine foods into meals and the way you arrange meals to follow one another over days and weeks—determines how well you are nourishing yourself.<sup>23</sup> Nutrition is a science, not an art, but it can be used artfully to create a pleasing, nourishing diet. The rest of this book is dedicated to helping you make informed choices and combine them artfully to meet all the body's nutrition needs.

## What did you decide?



Can your diet make a real difference between getting **sick** or staying **healthy**?

Are **supplements** more powerful than food for ensuring good nutrition?

What makes your favorite foods your **favorites**?

Are **news and media nutrition reports** informative or confusing?

## What's online?



Visit [www.Cengage.com](http://www.Cengage.com) to access MindTap, a complete digital course that includes Diet & Wellness Plus, interactive quizzes, videos, and more.

# Self Check

- (LO 1.1) Both heart disease and cancer are due to genetic causes, and diet cannot influence whether they occur.  
T F
- (LO 1.1) Some conditions, such as \_\_\_\_\_, are almost entirely nutrition related.
  - cancer
  - Down syndrome
  - iron-deficiency anemia
  - sickle-cell anemia
- (LO 1.2) The nutrition objectives for the nation, as part of *Healthy People 2020*,
  - envision a society in which all people live long, healthy lives.
  - track and identify cancers as a major killer of people in the United States.
  - set U.S. nutrition- and weight-related goals, one decade at a time.
  - a and c.
- (LO 1.2) According to a national health report,
  - most people's diets lacked enough fruit, vegetables, and whole grains.
  - fewer adults reported being sufficiently physically active.
  - the number of overweight people was declining.
  - the nation had fully met the previous *Healthy People* objectives.
- (LO 1.3) Energy-yielding nutrients include all of the following except \_\_\_\_\_.
  - vitamins
  - carbohydrates
  - fat
  - protein
- (LO 1.3) Organic nutrients include all of the following except \_\_\_\_\_.
  - minerals
  - fat
  - carbohydrates
  - protein
- (LO 1.3) Both carbohydrates and protein have 4 calories per gram.  
T F
- (LO 1.4) One of the characteristics of a nutritious diet is that the diet provides no constituent in excess. This principle of diet planning is called \_\_\_\_\_.
  - adequacy
  - balance
  - moderation
  - variety
- (LO 1.4) Which of the following is an example of a processed food?
  - carrots
  - bread
  - nuts
  - watermelon
- (LO 1.4) People most often choose foods for the nutrients they provide.  
T F
- (LO 1.5) Studies of populations in which observation is accompanied by experimental manipulation of some population members are referred to as \_\_\_\_\_.
  - case studies
  - intervention studies
  - laboratory studies
  - epidemiological studies
- (LO 1.5) An important national food and nutrient intake survey, called *What We Eat in America*, is part of \_\_\_\_\_.
  - NHANES
  - FDA
  - USDA
  - none of the above
- (LO 1.6) Behavior change is a process that takes place in stages.  
T F
- (LO 1.6) A person who is setting goals in preparation for a behavior change is in a stage called *precontemplation*.  
T F
- (LO 1.7) A slice of peach pie supplies 357 calories with 48 units of vitamin A; one large peach provides 42 calories and 53 units of vitamin A. This is an example of \_\_\_\_\_.
  - calorie control
  - nutrient density
  - variety
  - essential nutrients
- (LO 1.7) A person who wishes to meet nutrient needs while not overconsuming calories is wise to master
  - the concept of nutrient density.
  - the concept of carbohydrate reduction.
  - the concept of nutrients per dollar.
  - French cooking.
- (LO 1.8) "Red flags" that can help to identify nutrition quackery include
  - enticingly quick and simple answers to complex problems.
  - efforts to cast suspicion on the regular food supply.
  - solid support and praise from users.
  - all of the above.
- (LO 1.8) In this nation, stringent controls make it difficult to obtain a bogus nutrition credential.  
T F

Answers to these Self Check questions are in Appendix G.

## Sorting Imposters from Real Nutrition Experts

**LO 1.8** Evaluate the authenticity of any given nutrition information source.

From the time of snake oil salesmen in horse-drawn wagons to today's Internet sales schemes, nutrition **quackery** has been a problem that often escapes government regulation and enforcement. To avoid being sitting ducks for quacks, consumers themselves must distinguish between authentic, useful nutrition products or services and a vast array of faulty advice and outright scams.

Each year, consumers spend a deluge of dollars on nutrition-related services and products from both legitimate and fraudulent businesses. Each year, nutrition and other health **fraud** diverts tens of *billions* of consumer dollars from legitimate health care.

### More than Money at Stake

When scam products are garden tools or stain removers, hoodwinked consumers may lose a few dollars and some pride. When the products are ineffective, untested, or even hazardous “dietary supplements” or “medical devices,” consumers stand to lose the very thing they are seeking: good health. When a sick person wastes time with

quack treatments, serious problems can advance while proper treatment is delayed. And ill-advised “dietary supplements” have inflicted dire outcomes, even liver failure, on previously well people who took them in hopes of *improving* their health.

### Information Sources

When questions about nutrition arise, most people consult the Internet, a popular book or magazine, or television for the answer.<sup>1\*</sup> Sometimes these sources provide sound, scientific, trustworthy information. More often, though, **infomercials**, **advertorials**, and **urban legends** (defined in Table C1–1) pretend to inform but in fact aim primarily to sell products by making fantastic promises of health or weight loss with minimal effort and at bargain prices.

How can people learn to distinguish valid nutrition information from misinformation? Some quackery is easy to identify—like the claims of the salesman in Figure C1–1—whereas other types are more subtle. Between the extremes of accurate scientific data and intentional

\* Reference notes are in Appendix F

**Table C1–1**

### Quackery Terms

- **advertorials** lengthy advertisements in newspapers and magazines that read like feature articles but are written for the purpose of touting the virtues of products and may or may not be accurate.
- **anecdotal evidence** information based on interesting and entertaining, but not scientific, personal stories.
- **critical thinking** the mental activity of rationally and skillfully analyzing, synthesizing, and evaluating information.
- **fraud or quackery** the promotion, for financial gain, of devices, treatments, services, plans, or products (including diets and supplements) claimed to improve health, well-being, or appearance without proof of safety or effectiveness. (The word *quackery* comes from the term *quacksalver*, meaning a person who quacks loudly about a miracle product—a lotion or a salve.)
- **infomercials** feature-length television commercials that follow the format of regular programs but are intended to convince viewers to buy products and not to educate or entertain them.
- **urban legends** stories, usually false, that may travel rapidly throughout the world via the Internet, gaining the appearance of validity solely on the basis of repetition.



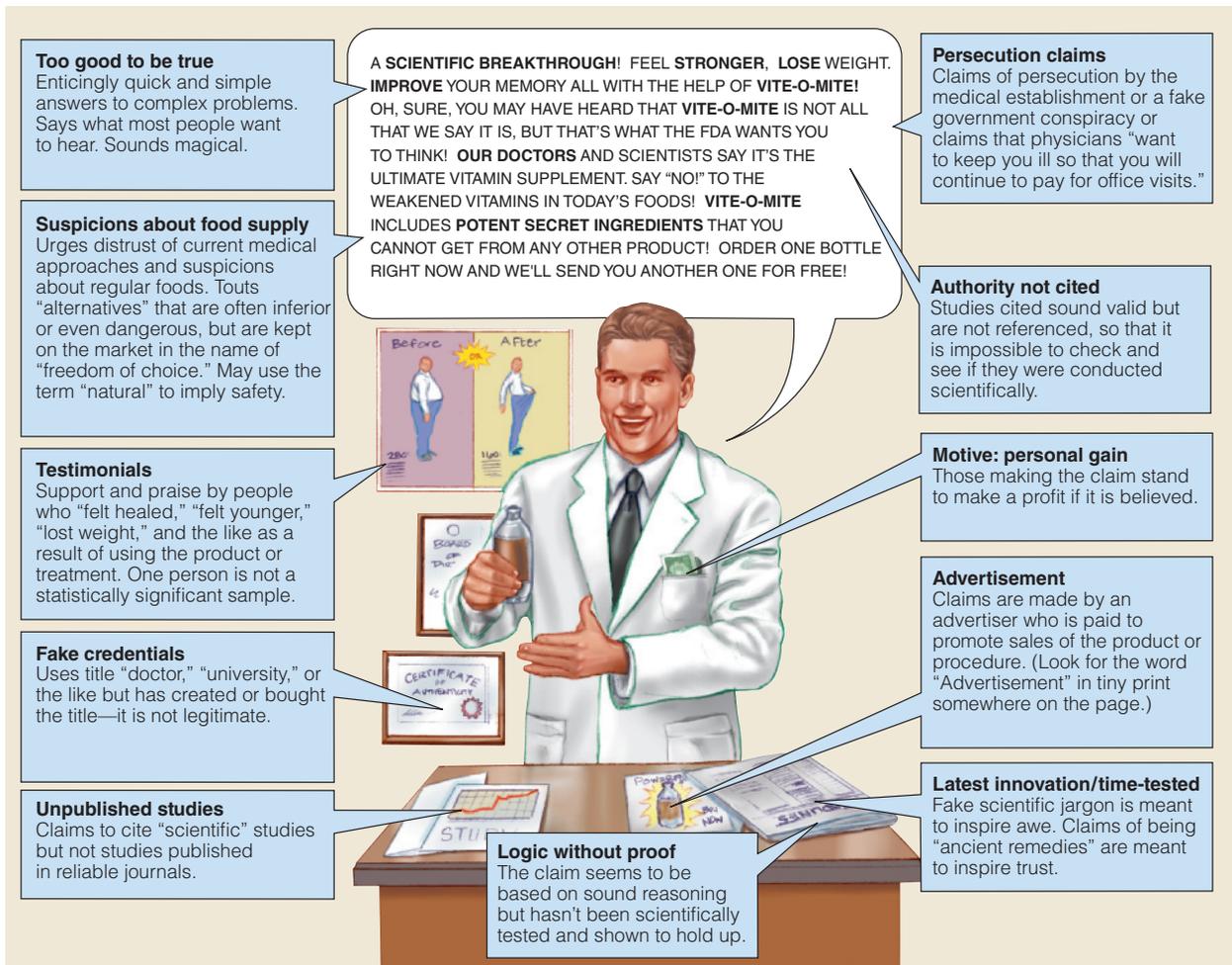
Who speaks on nutrition?

quackery lies an abundance of nutrition misinformation.<sup>†</sup> An instructor at a gym, a physician, a health-food store clerk, an author of books, or an advocate for a “cleansing diet” product or weight-loss gadget may sincerely believe that the recommended nutrition regimen is beneficial. But what qualifies these people to give nutrition advice? Would following

<sup>†</sup>Reliable information on quackery is available. Search for the National Council Against Health Fraud or the Food and Drug Administration on the Internet, or call (888) INFO-FDA.

Figure C1-1

Earmarks of Nutrition Quackery



their advice be helpful or harmful? To sift meaningful nutrition information from rubbish, you must learn to identify both.

Chapter 1 explained that valid nutrition information arises from scientific research and does not rely on **anecdotal evidence** or testimonials. Table C1-2 lists some sources of such authentic nutrition information.

Identifying nutrition misinformation requires more than simply gathering accurate information, though. It also requires you to develop skills in **critical thinking**. Critical thinking allows a person who has gathered information to:

- Understand how concepts are related.
- Evaluate the pros and cons of an argument.

- Detect inconsistencies and errors in thinking.
- Solve problems.
- Judge the relevance of new information.

This book’s Controversy sections are dedicated to helping you to develop your critical thinking skills.

### Nutrition on the Net

If you have a question, the World Wide Web on the Internet has an answer. The “Net” offers convenient access to reliable reports of scientific research published in refereed journals, but it also delivers an abundance of incomplete, misleading, or inaccurate informa-

tion. Simply put: anyone can publish anything on the Internet. For example, popular self-governed Internet “encyclopedia” websites allow anyone to post information or change others’ postings on all topics. Information on the sites may be correct, but it may not be—readers must evaluate it for themselves. Table C1-3 provides some clues to judging the reliability of nutrition information websites.

Personal Internet sites, known as “weblogs” or “blogs,” contain the authors’ personal opinions and are often not reviewed by experts before posting. In addition, e-mail messages often circulate hoaxes and scare stories. Be suspicious when:

**Table C1–2****Credible Sources of Nutrition Information**

Government agencies, volunteer associations, consumer groups, and professional organizations provide consumers with reliable health and nutrition information. Credible sources of nutrition information include:

- Nutrition and food science departments at a university or community college
- Local agencies such as the health department or County Cooperative Extension Service
- Government resources such as:
  - Centers for Disease Control and Prevention (CDC) [www.cdc.gov](http://www.cdc.gov)
  - Department of Agriculture (USDA) [www.usda.gov](http://www.usda.gov)
  - Department of Health and Human Services (DHHS) [www.hhs.gov](http://www.hhs.gov)
  - Dietary Guidelines for Americans [fnic.nal.usda.gov/dietary-guidance](http://fnic.nal.usda.gov/dietary-guidance)
  - Food and Drug Administration (FDA) [www.fda.gov](http://www.fda.gov)
  - Health Canada [www.hc-sc.gc.ca/index-eng.php](http://www.hc-sc.gc.ca/index-eng.php)
  - Healthy People [www.healthypeople.gov](http://www.healthypeople.gov)
  - Let's Move! [www.letsmove.gov](http://www.letsmove.gov)
  - MyPlate [www.choosemyplate.gov](http://www.choosemyplate.gov)
  - National Institutes of Health [www.nih.gov](http://www.nih.gov)
  - Physical Activity Guidelines for Americans [www.health.gov/paguidelines](http://www.health.gov/paguidelines)
- Volunteer health agencies such as:
  - American Cancer Society [www.cancer.org](http://www.cancer.org)
  - American Diabetes Association [www.diabetes.org](http://www.diabetes.org)
  - American Heart Association [www.heart.org/HEARTORG](http://www.heart.org/HEARTORG)
- Reputable consumer groups such as:
  - American Council on Science and Health [www.acsh.org](http://www.acsh.org)
  - International Food Information Council [www.foodinsight.org](http://www.foodinsight.org)
- Professional health organizations such as:
  - Academy of Nutrition and Dietetics [www.eatright.org](http://www.eatright.org)
  - American Medical Association [www.ama-assn.org](http://www.ama-assn.org)
  - Dietitians of Canada [www.dietitians.ca](http://www.dietitians.ca)
- Journals such as:
  - American Journal of Clinical Nutrition* [ajcn.nutrition.org](http://ajcn.nutrition.org)
  - Journal of the Academy of Nutrition and Dietetics* [www.andjnl.org](http://www.andjnl.org)
  - New England Journal of Medicine* [www.nejm.org](http://www.nejm.org)
  - Nutrition Reviews* [www.ilsj.org](http://www.ilsj.org)

- Someone other than the sender or some authority you know wrote the contents.
- A phrase like “Forward this to everyone you know” appears anywhere in the piece.
- The piece states, “This is not a hoax”; chances are it is.
- The information seems shocking or something that you’ve never heard from legitimate sources.
- The language is overly emphatic or sprinkled with capitalized words or exclamation marks.
- No references are offered or, if present, prove to be of questionable validity when examined.
- Websites such as [www.quackwatch.org](http://www.quackwatch.org) or [www.urbanlegends.com](http://www.urbanlegends.com) have debunked the message.

In contrast, one of the most trustworthy Internet sites for scientific

**Table C1–3****Is This Site Reliable?**

To judge whether an Internet site offers reliable nutrition information, answer the following questions.

- Who?** Who is responsible for the site? Is it staffed by qualified professionals? Look for the authors’ names and credentials. Have experts reviewed the content for accuracy?
- When?** When was the site last updated? Because nutrition is an ever-changing science, sites need to be dated and updated frequently.
- Where?** Where is the information coming from? The three letters following the dot in a Web address identify the site’s affiliation. Addresses ending in “gov” (government), “edu” (educational institute), and “org” (organization) generally provide reliable information; “com” (commercial) sites represent businesses and, depending on their qualifications and integrity, may or may not offer dependable information. Many reliable sites provide links to other sites to facilitate your quest for knowledge, but this provision alone does not guarantee a reputable intention. Be aware that any site can link to any other site without permission.
- Why?** Why is the site giving you this information? Is the site providing a public service or selling a product? Many commercial sites provide accurate information, but some do not. When money is the prime motivation, be aware that the information may be biased.
- What?** What is the message, and is it in line with other reliable sources? Information that contradicts common knowledge should be questioned.

investigation is the National Library of Medicine's PubMed website, which provides free access to over 10 million abstracts (short descriptions) of research papers published in scientific journals around the world.<sup>2</sup> Many abstracts provide links to full articles posted on other sites. The site is easy to use and offers instructions for beginners. Figure C1–2 introduces this resource.

## Who Are the True Nutrition Experts?

Most people turn to their physicians for dietary advice, but physicians vary in their knowledge of nutrition. Physicians have extensive training in human biochemistry and physiology, the bedrocks

of nutrition science, but typical medical schools in the United States do not require students to take a comprehensive nutrition course, such as the class taken by students reading this text.<sup>3</sup>

An exceptional physician has a specialty area in clinical nutrition and is highly qualified to advise on nutrition. Membership in the Academy of Nutrition and Dietetics or the Society for Clinical Nutrition, whose journals are cited many times throughout this text, can be a clue to a physician's nutrition knowledge.

Fortunately, a credential that indicates a qualified nutrition expert is easy to spot—you can confidently call on a **registered dietitian nutritionist (RDN)**. To become an RDN, a person must earn a bachelor's or master's of science degree from an **accredited**

college or university based on course work that typically includes biochemistry, chemistry, human anatomy and physiology, microbiology, and food and nutrition sciences, along with food service systems management, business, statistics, economics, computer science, sociology, and counseling or education courses. Then the person must complete an accredited and supervised practice program and, finally, pass a national examination administered by the Academy of Nutrition and Dietetics. Once credentialed, the expert must maintain **registration** by participating in required continuing education activities.

Additionally, some states require that **nutritionists** and **dietitians** obtain a **license to practice**. Meeting state-established criteria in addition to **registration** with the **Academy of Nutrition and Dietetics** certifies that an expert is the genuine article. Table C1–4 defines nutrition specialists along with other relevant terms.

RDNs are easy to find in most communities because they perform a multitude of duties in a variety of settings (see Table C1–5). They work in food service operations, pharmaceutical companies, sports nutrition programs, corporate wellness programs, the food industry, home health agencies, long-term care institutions, private practice, community and public health settings, cooperative extension offices,<sup>5</sup> research centers, universities, hospitals, health maintenance organizations (HMO), and other facilities. In hospitals, they may offer **medical nutrition therapy** as part of patient care, or they may specialize as **certified diabetes educators (CDE)** to help people with diabetes manage the disease. **Public health nutritionists** take leadership roles in government agencies as expert consultants and advocates or in direct service delivery. A **certified specialist in sports dietetics (CSSD)** counsels people who must perform physically for sports, emergency response, military defense, and the like.<sup>4</sup> The roles are so diverse that many pages would be required to cover them thoroughly.

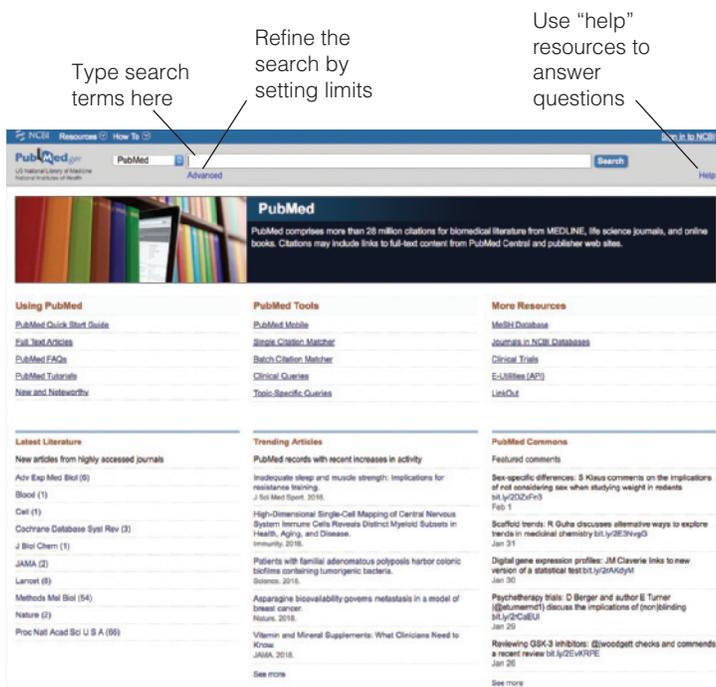
<sup>5</sup> Cooperative extension agencies are associated with land grant colleges and universities and may be found in the telephone book's government listings or on the Internet.

Figure C1–2

### PubMed (www.ncbi.nlm.nih.gov/pubmed): Internet Resource for Scientific Nutrition References

The U.S. National Library of Medicine's PubMed website offers tutorials to help teach beginners to use the search system effectively. Often, simply visiting the site, typing a query in the search box, and clicking *Search* will yield satisfactory results.

For example, to find research concerning calcium and bone health, typing in “calcium bone” nets almost 3,000 results. To refine the search, try setting limits on dates, types of articles, languages, and other criteria to obtain a more manageable number of abstracts to peruse.



Courtesy of National Center for Biotechnology Information

Table C1–4

### Terms Associated with Nutrition Advice

- **Academy of Nutrition and Dietetics (AND)** the professional organization of dietitians in the United States (formerly the American Dietetic Association). The Canadian equivalent is the Dietitians of Canada (DC), which operates similarly.
- **accredited** approved; in the case of medical centers or universities, certified by an agency recognized by the U.S. Department of Education.
- **certified diabetes educator (CDE)** a health-care professional who has completed an intensive professional training program and examination to earn a certificate attesting to the attainment of knowledge and skill in educating people with diabetes to help them manage their disease through medical and lifestyle means. Professional certifications in many other practice areas also exist.
- **certified specialist in sports dietetics (CSSD)** a Registered Dietitian Nutritionist with special credentials and expertise to deliver safe, effective, evidence-based nutrition assessments and guidance for health and performance to athletes and other physically active people.
- **nutrition and dietetics technician, registered (NDTR)** a dietetics professional who has completed an academic degree from an accredited college or university and an approved dietetic technician program. This professional has also passed a national examination and maintains registration through continuing professional education.
- **dietitian** a person trained in the science of nutrition and dietetics. See also *Registered Dietitian Nutritionist*.
- **diploma mill** an organization that awards meaningless degrees without requiring students to meet educational standards. Diploma mills are not the same as diploma forgers (providing fake diplomas and certificates bearing the names of real, respected institutions). Although visually indistinguishable from authentic diplomas, forgeries can be unveiled by checking directly with the institution.
- **Fellow of the Academy of Nutrition and Dietetics (FAND)** members of the academy who are recognized for their outstanding service and integrity in the dietetics profession.
- **license to practice** permission under state or federal law, granted on meeting specified criteria, to use a certain title (such as *dietitian*) and to offer certain services. Licensed dietitians may use the initials LD after their names.
- **medical nutrition therapy** nutrition services used in the treatment of injury, illness, or other conditions; includes assessment of nutrition status and dietary intake and corrective applications of diet, counseling, and other nutrition services.
- **nutritionist** someone who studies or advises others on nutrition, and who may or may not have an academic degree in the nutrition. In states with responsible legislation, the term applies only to people who have master of science (MS) or doctor of philosophy (PhD) degrees from properly accredited institutions.
- **public health nutritionist** a dietitian or other person with an advanced degree in nutrition who specializes in public health nutrition.
- **registered dietitian nutritionist (RDN)** food and nutrition experts who have earned at least a bachelor's degree from an accredited college or university with a program approved by the Academy of Nutrition and Dietetics. The dietitian must also serve in an approved internship or coordinated program, pass the registration examination, and maintain professional competency through continuing education. Many states also require licensing of practicing dietitians. Also called *registered dietitian (RD)*.
- **registration** listing with a professional organization that requires specific course work, experience, and passing of an examination.

In some facilities, a dietetic technician assists a registered dietitian nutritionist in administrative and clinical responsibilities. A dietetic technician has been educated in nutrition and trained to perform practical tasks in patient care, food service, and other areas of dietetics.<sup>5</sup> Upon passing a national examination,

the technician earns the title **nutrition and dietetics technician, registered (NDTR)**.

### Detecting Fake Credentials

In contrast to RDNs and other credentialed nutrition professionals, thousands of people possess fake nutrition degrees

and claim to be nutrition counselors, nutritionists, or “dietists.” These and other such titles may sound meaningful, but most of these people lack the established credentials of Academy of Nutrition and Dietetics–sanctioned dietitians. If you look closely, you can see signs that their expertise is fake.

### Educational Background

A fake nutrition expert may display a degree from a six-week course of study; such a degree is simply not the same as the extensive requirements for legitimate nutrition credentials. In some cases, schools posing as legitimate institutions are actually **diploma mills**—fraudulent businesses that sell certificates of competency to anyone who pays the fees, from under a thousand dollars for a bachelor's degree to several thousand for a doctorate. To obtain these “degrees,” a candidate need not read any books or pass any examinations, and the only written work is a signature on a check. Here are a few red flags to identify these scams:

- A degree is awarded in a very short time—sometimes just a few days.
- A degree can be based entirely on work or life experience.
- An institution provides only an e-mail address, with vague information on physical location.
- It provides sample styles of certificates and diplomas for choosing.
- It offers a choice of graduation dates to appear on a diploma.

Selling degrees is big business; networks of many bogus institutions are often owned by a single entity. In 2011, more than 2,600 such diploma and accreditation mills were identified, and 2,000 more were under investigation.

### Accreditation and Licensure

Lack of proper accreditation is the identifying sign of a fake educational institution. To guard educational quality, an accrediting agency recognized by the U.S. Department of Education certifies those schools that meet the criteria defining a complete and accurate schooling, but in the case of nutrition, quack accrediting agencies cloud the picture. Fake nutrition

Table C1–5

## Professional Responsibilities of Registered Dietitian Nutritionists

Registered Dietitian Nutritionists perform varied and important roles in the workforce. This table lists just a few responsibilities of just a few specialties.

Specialty	Sample Responsibilities
Education	<ul style="list-style-type: none"> <li>Write curricula to deliver to students nutrition knowledge that is appropriate for their goals and that meets criteria of accrediting agencies and professional groups.</li> <li>Teach and evaluate student progress; research, write, and publish.</li> </ul>
Food Service Management	<ul style="list-style-type: none"> <li>Plan and direct an institution's food service system, from kitchen to delivery.</li> <li>Plan and manage budgets; develop products; market services.</li> </ul>
Health and Wellness	<ul style="list-style-type: none"> <li>Design and implement research-based programs for individuals or populations to improve nutrition, health, and physical fitness.</li> </ul>
Hospital Health Care/Clinical Care	<ul style="list-style-type: none"> <li>Design and implement disease prevention services.</li> <li>Order therapeutic diets independently.</li> <li>Coordinate patient care with other health-care professionals.</li> <li>Assess client nutrient status and requirements.</li> <li>Provide client care and diet plan counseling.</li> </ul>
Laboratory Research	<ul style="list-style-type: none"> <li>Design, execute, and interpret food and nutrition research.</li> <li>Write and publish research articles in peer-reviewed journals and lay publications.</li> <li>Provide science-based guidance to nutrition practitioners.</li> <li>Write and manage grants.</li> </ul>
Public Health Nutrition	<ul style="list-style-type: none"> <li>Influence nutrition policy, regulations, and legislation.</li> <li>Plan, coordinate, administer, and evaluate food assistance programs.</li> <li>Consult with agencies; plan and manage budgets.</li> </ul>
Sports Team Nutrition	<ul style="list-style-type: none"> <li>Provide individual and group/team nutrition counseling and education to enhance the performance of competitive and recreational athletes, on-site and during travel.</li> <li>Perform assessments of body composition.</li> <li>Track and document performance and other outcomes.</li> <li>Manage budgets, dining facilities, and personnel.</li> </ul>

Sources: Academy Quality Management Committee, Academy of Nutrition and Dietetics: Revised 2017 Scope of Practice for the Registered Dietitian Nutritionist, *Journal of the Academy of Nutrition and Dietetics* 118 (2018): 141–165.

degrees are available from schools “accredited” by more than 30 phony accrediting agencies.\*\*

\*\* To find out whether an online school is accredited, write the Distance Education and Training Council, Accrediting Commission, 1601 Eighteenth Street, NW, Washington, D.C. 20009; call 202-234-5100; or visit their website ([www.detc.org](http://www.detc.org)).

To find out whether a school is properly accredited for a dietetics degree, visit the U.S. Department of Education's Database of Accredited Postsecondary Institutions and Programs at <https://ope.ed.gov/accreditation>. You can also write the Academy of Nutrition and Dietetics, Division of Education and Research, 120 South Riverside Plaza, Suite 2000, Chicago, Illinois 60606-6995; call 800-877-1600; or visit their website ([www.eatright.org](http://www.eatright.org)).

The American Council on Education publishes Accredited Institutions of Postsecondary Education Programs, a directory of accredited institutions, professionally accredited programs, and candidates for accreditation that is available at many libraries. For additional information, write the American Council on Education, One Dupont Circle NW, Suite 800, Washington, D.C. 20036; call 202-939-9382; or visit their website ([www.acenet.edu](http://www.acenet.edu)).

State laws do not necessarily help consumers distinguish experts from fakes; some states allow anyone to use the title *dietitian* or *nutritionist*. But other states have responded to the need by allowing only RDNs or people with certain graduate degrees and state licenses to call themselves dietitians. Licensing provides a way to identify people who have met minimum standards of education and experience.

### A Failed Attempt to Fail

To dramatize the ease with which anyone can obtain a fake nutrition degree, one writer paid \$82 to enroll in a nutrition diploma mill that billed itself as a correspondence school. She made every attempt to fail, intentionally giving

all wrong answers to the examination questions. Even so, she received a “nutritionist” certificate at the end of the course, together with a letter from the “school” officials explaining that they were sure she must have misread the test.

### Would You Trust a Nutritionist Who Eats Dog Food?

In a similar stunt, Mr. Eddie Diekman was named a “professional member” of an association of nutrition “experts” (see Figure C1–3). For his efforts, Eddie received a diploma suitable for framing and displaying. Eddie is a cocker spaniel. His owner, Connie B. Diekman, then president of the American Dietetic Association, paid Eddie's tuition to

Figure C1-3

### A “Professional Member” of a Fake Association

Eddie displays his professional credentials.



© Courtesy of eatright.org

prove that he could be awarded the title “nutritionist” merely by sending in his name.

### Staying Ahead of the Scammers

In summary, to stay one step ahead of the nutrition quacks, check a provider’s qualifications. First, look for the degrees and credentials listed after the person’s name (such as MD, RDN, MS, PhD, or LD). Then, find out what you can about

the reputations of institutions that are affiliated with the provider. If the person objects, or if your findings raise suspicions, look for someone better qualified to offer nutrition advice. Your health is your most precious asset, and protecting it is well worth the time and effort it takes to do so.

### Critical Thinking

1. Describe how you would respond to the following situation:

A friend has started taking ginseng, a supplement that claims to help with weight loss. You are thinking of trying ginseng, but you want to learn more about the herb and its effects before deciding. What research would you do, and what questions would you ask your friend to determine if ginseng is a legitimate weight loss product?

2. Recognizing a nutrition authority that you can consult for reliable nutrition information can be difficult because it is so easy to acquire questionable nutrition credentials. Read the education and experience of the “nutrition experts” described as follows and put them in order, beginning with the person with the strongest and most trustworthy nutrition expertise and ending with the person with the weakest and least trustworthy nutrition expertise:
  1. A nutrition and dietetics technician, registered (NDTR) working in a clinic
  2. A highly successful athlete/coach who has a small business as a nutrition counselor and sells a line of nutrition supplements
  3. An individual who has completed 30 hours of nutrition training through the American Association of Nutrition Counseling
  4. A Registered Dietitian Nutritionist (RDN) associated with a hospital



# 2 Nutrition Tools—Standards and Guidelines

## Learning Objectives

After completing this chapter, you should be able to accomplish the following:

- LO 2.1** State the significance of Dietary Reference Intakes (DRI) and Daily Values as nutrient standards.
- LO 2.2** Define the role of the Dietary Guidelines as part of the overall U.S. dietary guidance system.
- LO 2.3** Describe how the USDA Eating Patterns support the planning of a nutritious diet.
- LO 2.4** Given a specified number of calories, create a healthful diet plan using the USDA Eating Patterns.
- LO 2.5** Describe the information that appears on food labels.
- LO 2.6** Compare one day's nutrient-dense meals with meals not planned for nutrient density.
- LO 2.7** Summarize the potential health effects of phytochemicals from both food sources and supplements.

## What do you think?

How can you tell **how much of each nutrient** you need to consume daily?

Can we trust the **government's dietary recommendations**?

Are the health claims on food labels **accurate and reliable**?

Can certain "**superfoods**" boost your health with more than just nutrients?

Eating well is easy in theory—just choose foods that supply appropriate amounts of the essential nutrients, fiber, phytochemicals, and energy without excess intakes of fat, sugar, and salt, and be sure to get enough physical activity to help balance the foods you eat. In practice, eating well proves harder to do. Many people are overweight, or are undernourished, or suffer from nutrient excesses or deficiencies that impair their health—that is, they are malnourished. You may not think that this statement applies to you, but you may already have less than optimal nutrient intakes without knowing it. Accumulated over years, the effects of your habits can seriously impair the quality of your life.

Putting it positively, you can enjoy the best possible vim, vigor, and vitality throughout your life if you learn now to nourish yourself optimally. To learn how, you first need some general guidelines and the answers to several basic questions. How much of each nutrient and how many calories should you consume? Which types of foods supply which nutrients? How much of each type of food do you have to eat to get enough? And how can you eat all these foods without gaining excess weight? This chapter begins by identifying some ideals for nutrient and energy intakes and ends by showing how to achieve them.

## Nutrient Recommendations

**LO 2.1** State the significance of Dietary Reference Intakes (DRI) and Daily Values as nutrient standards.

Nutrient recommendations are sets of standards against which people's nutrient and energy intakes can be measured. Nutrition experts use the recommendations to assess intakes and to offer advice on amounts to consume. Individuals may use them to decide how much of a nutrient they need and how much is too much.

### Two Sets of Standards

Two sets of standards are important for students of nutrition: one for people's nutrient intakes and one for food labels. The first set are the **Dietary Reference Intakes (DRI)**. A committee of nutrition experts from the United States and Canada develops, publishes, and updates the DRI.\* The DRI committee has set recommended intakes and limits for all of the vitamins and minerals, as well as for carbohydrates, fiber, lipids, protein, water, and energy.

The other standards, the **Daily Values**, are familiar to anyone who has read a food label. Nutrient standards—the DRI and Daily Values—are used and referred to so often that they

**Dietary Reference Intakes (DRI)** a set of five lists of values for measuring the nutrient intakes of healthy people in the United States and Canada. The lists are Estimated Average Requirements (EAR), Recommended Dietary Allowances (RDA), Adequate Intakes (AI), Tolerable Upper Intake Levels (UL), and Acceptable Macronutrient Distribution Ranges (AMDR).

**Daily Values** nutrient standards used on food labels and on grocery store and restaurant signs.

\* This is a committee of the Food and Nutrition Board of the National Academy of Sciences' Institute of Medicine.