Nutrition Assessment

Clinical and Research Applications

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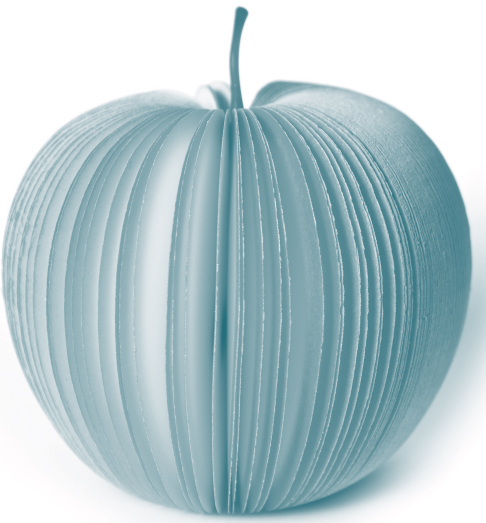

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To Pedro, Peter, and Samantha Munoz:

You three are my "North, my South, my East, and West,
My working week and my Sunday rest;
My noon, my midnight, my talk, my song;
My everything!"
(Based on a poem by W.H. Auden)

–Nancy Munoz

To my family—with all my love.

–Melissa Bernstein

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Brief Contents

Foreword xi
Preface xii
The Pedagogy xiv
About the Authors xvii
Acknowledgments xviii
Contributors xix
Reviewers xxii

SECTION 1 **Introduction** 1

Chapter 1 Nutritional Assessment 3
Chapter 2 Health Research Methods 37
Chapter 3 Standards for Desirable Nutrient Intake 81

SECTION 2 **Methods of Evaluation: Dietary Methods** 133

Chapter 4 Measuring Nutrient Intake 135
Chapter 5 National Food and Nutrition Surveys 165
Chapter 6 Computerized Food and Nutrition Analysis Systems 187

SECTION 3 **Method of Evaluation: Anthropometric Methods** 221

Chapter 7 Anthropometry 223

SECTION 4 **Method of Evaluation: Biochemical Assessment** 263

Chapter 8 Biomarkers in Nutritional Assessment 265

SECTION 5 **Method of Evaluation: Clinical Assessment** **313**

Chapter 9 Clinical Assessment of Nutritional Status 315

Chapter 10 Nutritional Assessment in Health Promotion, Disease Prevention, and Treatment 375

SECTION 6 **Application: Nutrition Coaching and International Nutrition** **403**

Chapter 11 Counseling and Health Coaching Theory and Approaches 405

Chapter 12 International Nutrition Assessment and Research 435

Appendix A **489**

Appendix B **491**

Appendix C **495**

Glossary **497**

Index **509**

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Contents

Foreword xi
Preface xii
The Pedagogy xiv
About the Authors xvii
Acknowledgments xviii
Contributors xix
Reviewers xxii

SECTION 1 **Introduction** 1

Chapter 1 Nutritional Assessment 3
Introduction 3
Nutrition and Health 4
Nutritional Screening and Nutritional Assessment Tools 7
Standard Methods of Evaluating Nutritional Status 9
The Nutrition Care Process 11
Emerging Opportunities for Nutritional Assessment and Evaluation 16
Chapter Summary 29
Learning Portfolio 30

Chapter 2 Health Research Methods 37
Introduction 37
The Research Process 38
Research Considerations 43
Study Approaches 55
Analyzing, Interpreting, and Communicating Research 68
Why Publish? 70
Chapter Summary 72
Learning Portfolio 73

Chapter 3 Standards for Desirable Nutrient Intake 81
Introduction 82
Historical Perspective for Dietary Standards and Recommendations 82
Dietary Reference Intake 90
Tolerable Upper Intake Level 95
Energy Requirements 95
Macronutrient Recommendations 100
Nutrient Density and Nutritional Rating 105
Diet Quality Indicators 109
Dietary Guidelines for Americans 2015 112
Food Labeling and Nutrition 118
Food Guides (MyPlate Food Exchange) 121
Chapter Summary 125
Learning Portfolio 126

SECTION 2 **Methods of Evaluation: Dietary Methods** 133

Chapter 4 Measuring Nutrient Intake 135
Introduction 135
Relationship Between Diet and Health 136
Methods for Measuring Usual Dietary Intake 136
Methods Designed to Measure Food and Nutrient Intake 140
Challenges in Food and Nutrient Intake Measurement Methods 149
Chapter Summary 154
Learning Portfolio 155

Chapter 5 National Food and Nutrition Surveys 165
Introduction 166

Food-Consumption Surveys: Background ... 167
Creation of the National Health and Nutrition Examination Survey ... 169
Creation of a National Nutrition-Monitoring System ... 171
Monitoring versus Surveillance ... 172
Dietary Assessment Methods ... 175
Defining the Elements of a Healthy Diet ... 177
How Well Do Americans Eat? The Healthy Eating Index ... 179
Chapter Summary ... 181
Learning Portfolio ... 182

Chapter 6 Computerized Food and Nutrition Analysis Systems ... 187

Introduction ... 187
Dietary-Intake Assessment Methods ... 188
Innovative Technologies in Nutrition Assessment ... 194
Selecting a Computerized Diet-Analysis System for the Research Nutritionist ... 198
Computer-Based Diet-Assessment Applications ... 201
Internet-Based Diet-Analysis Applications ... 206
Chapter Summary ... 212
Learning Portfolio ... 214

SECTION 3 Method of Evaluation: Anthropometric Methods 221

Chapter 7 Anthropometry ... 223

Introduction ... 223
Anthropometric Indicators and Cutoffs ... 224
Plotting and Interpreting Measurements In Children ... 226
Additional Anthropometrics ... 232
Body Composition ... 243
Chapter Summary ... 253
Learning Portfolio ... 255

SECTION 4 Method of Evaluation: Biochemical Assessment 263

Chapter 8 Biomarkers in Nutritional Assessment ... 265

Introduction ... 265
Use of Biochemical Measures ... 266
Protein Levels ... 266
Assessing Mineral Levels ... 270
Assessing Vitamin Levels ... 280
Blood Chemistry Studies ... 294
Chapter Summary ... 302
Learning Portfolio ... 303

SECTION 5 Method of Evaluation: Clinical Assessment 313

Chapter 9 Clinical Assessment of Nutritional Status ... 315

Introduction ... 316
Nutritional Assessment ... 316
Client History ... 324
Food- and Nutrition-Related History ... 325
Nutrition-Focused Physical Examination ... 329
Malnutrition ... 333
Estimating Energy Requirements ... 339
Estimating Protein Requirements ... 341
Estimating Fluid Requirements ... 342
Nutritional Assessment and Management of Eating Disorders ... 343
Nutritional Assessment and Management of the HIV Patient ... 347
Mini Nutritional Assessment ... 352
Malnutrition Universal Screening Tool (MUST) ... 355

Subjective Global Assessment 357
Chapter Summary 360
Learning Portfolio 364

CHAPTER 10 Nutritional Assessment in Health Promotion, Disease Prevention, and Treatment ... 375

Introduction 376
Cardiovascular Disease 376
Obesity 384
Diabetes 387
Nutrition Interventions in the Treatment of Chronic Diseases 390
Chapter Summary 397
Learning Portfolio 398

SECTION 6 Application: Nutrition Coaching and International Nutrition 403

CHAPTER 11 Counseling and Health Coaching Theory and Approaches 405

Introduction 405
Basic Communication and Interviewing Skills for the Nutrition Researcher 406
Nutrition Counseling Skills for Providing Medical Nutrition Therapy 412
Counseling Theories and Techniques 419
Motivational Interviewing 422
Successful Implementation of Lifestyle Changes 425
Chapter Summary 426
Learning Portfolio 428

CHAPTER 12 International Nutrition Assessment and Research 435

Introduction 436
What is on the Global Nutrition Agenda? 437
Who is Supporting the Global Nutrition Agenda? 443
How is an International Nutrition-Research Problem Defined? 456
What is Different About the International Nutrition-Research Process? 463
What Solutions have been Developed to Address International Nutrition Problems? 471
Chapter Summary 476
Learning Portfolio 479

Appendix A 489
Appendix B 491
Appendix C 495
Glossary 497
Index 509

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Foreword

Nutrition is a topic of growing interest for individuals, health science students and professionals, researchers, healthcare think tanks, international health organizations, and government agencies. It is the basis of well-being from before birth to the end of life. Over the course of a life span, good nutrition equips the body to grow and develop to its full potential. Good nutrition serves as the foundation for effective learning at school and as preparation for a productive adulthood. It is essential for a robust immune system to ward off infections and diseases throughout the life cycle. Good nutrition builds and maintains the body on bedrock, while poor nutrition builds and attempts to maintain the body on shifting sands.

Improving the nutrition status of individuals is one of the most cost-effective investments for improving health outcomes and reducing healthcare costs, yet research on measuring the contributions of nutrition in terms of the aforementioned outcomes and costs is limited. Quantifying the population's needs for nutrition will require high-quality, evidence-based research and a data revolution in order to fill the gaps and prioritize the most effective actions to improve outcomes and reduce costs. It will require researchers to focus on two broad concepts. First, they will need to quantify what really counts as a measure of current and improving nutrition status, recognizing that some outcomes are readily visible and others are not clearly apparent. Second, they will need to identify what we are counting as metrics of improved nutrition status that lack sufficient sensitivity to measure changes.

As health sciences students, you have the opportunity to participate in health- and nutrition-related research to quantify the nutrition needs of populations and to develop measurement tools to demonstrate the valuable role that nutrition plays. As emerging leaders in the health sciences, you have the additional responsibility to communicate the role of nutrition as measured by high-quality research, with the findings of this research used to identify priority areas, set target goals, and establish actions for change.

Some nutrition programs will be more successful than others in improving healthcare outcomes and/or reducing healthcare costs. The less effective program outcomes give the trained professional an opportunity to use critical thinking skills to examine the root cause of disappointing outcomes and to develop stronger, more robust nutrition programs. It is through accurate assessment and evidence-based research that we can develop validated tools to differentiate definitive versus tentative relationships between nutrition and healthcare outcomes.

As a national or international nutrition advocate, you can use your academic training to shape not only your career but also the future health status of individuals living in the developed and developing world. Using *Nutrition Assessment: Clinical and Research Applications* as your guide, commit to developing and supporting the research-based innovations that are needed to meet the joint challenges of improving the lives of current and future generations.

Mary Litchford, PhD, RDN, LDN
President, CASE Software & Books

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Preface

Welcome to *Nutrition Assessment: Clinical and Research Applications*!

Almost half of all Americans have one or more preventable chronic diseases. Many chronic illnesses such as cardiovascular disease, hypertension, type 2 diabetes, some cancers, and poor bone health are related to poor eating habits and low levels of physical activity. In the United States, more than two-thirds of adults and approximately one-third of children and youth are overweight or obese, which is itself an underlying risk factor for chronic poor health. Nutrition scientists conduct research to elucidate how preventing and treating malnutrition, and considering both under- and over-nutrition, can promote better health outcomes for patients, clients, and communities.

This text is written for students in nutrition and health sciences programs and those involved in nutrition-related exploration. It is especially designed to meet the needs of nutrition researchers and students enrolled in masters and PhD courses in Nutrition and Dietetics, Public Health, Interprofessional Studies, and Population Health Science and Wellness programs. As such, it covers topics applicable and relevant to nutrition and health practitioners and those with advanced degrees, with a broad background in public health and advanced training in public health nutrition research. Complex topics are broken down into major key components to promote student understanding and build their practical knowledge base.

The Goal of this Text

Evaluating the nutrition status of different segments of the population helps in measuring the prevalence of nutritional disorders and also in planning counteractive strategies. Our goal in writing this text was to provide nutrition and public health researchers and students with the knowledge and skills to identify nutrition problems and to develop research questions and study hypotheses. This text provides insights into planning community, clinical, and individual applications of nutrition prevention and treatments, as well as provides fundamentals for critically evaluating published scientific research. We have written this text with the presumption that an understanding of government programs and a familiarity with the demographic profile of the U.S. population are necessary in order to appreciate nutrition in public health today.

The focus of this text is to help students select and use appropriate anthropometric, biochemical, clinical, dietary, functional, and socioeconomic assessment techniques to identify and prioritize the nutritional problems and needs of populations and communities. The contributors outline intervention strategies to guide students through the process of improving nutritional problems in target populations while also using critical thinking skills in evaluating the available literature.

The Organization of this Text

This text is divided into six sections. The first section serves as an introduction, which provides historical perspective, as well as an overview of scientific and nutritional research. The next four sections address the different components of nutritional assessment: dietary, anthropometric, biochemical, and clinical. The final section concludes with an exploration of public health topics such as population wellness, coaching, nutrition interventions, and international research. Each chapter is enhanced with an array of learning feature.

Features and Benefits

Nutrition Assessment: Clinical and Research Applications incorporates robust pedagogical features. These are deployed consistently across chapters, ensuring a uniform learning experience for the student and the reader.

Each chapter begins with a brief *Chapter Outline* and a series of *Learning Objectives*; together, these define expectations for each chapter. In that same vein,

each section within each chapter begins with a *Preview* statement, which is, in turn, mirrored by a summarizing *Recap* statement at the end of the section.

Within the chapters, there are three recurring boxed features:

- *Viewpoint* is written from the perspective of a nutrition professional and highlights how the chapter content impacts his or her work. This feature is designed to be conversational and is meant to spur a discussion around the topic as it appears in practice.
- *Highlight* presents interesting topics pulled from current research in the nutritional sciences.
- A *Case Study* appears toward the end of each chapter and illustrates how topics discussed in the text can be applied in practice.

Each chapter concludes with a *Learning Portfolio*, which contains the following:

- Key Terms
- Study Questions
- Discussion Questions
- Activities
- Online Resources

The Complete Learning Package

Nutrition Assessment: Clinical and Research Applications provides instructors with a full suite of resources, including:

- Test Bank, containing more than 500 questions
- Slides in PowerPoint format, featuring more than 300 slides
- Image Bank, collecting photographs and illustrations that appear in the text
- Instructor's Manual, including a number of educational tools:
  - Chapter Outlines
  - Answers to in-text Study Questions
  - Answers to in-text Case Studies

Nancy Munoz *Melissa Bernstein*

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The Pedagogy

Nutrition Assessment: Clinical and Research Applications incorporates an array of pedagogical features in order to facilitate active engagement.

CHAPTER 1

Nutritional Assessment

Nancy Munoz, DCN, MHA, RDN, FAND
Mary Dean Coleman-Kelly, PhD, MS, RDN

CHAPTER OUTLINE

- Introduction
- Nutrition and Health
- Nutritional Screening and Nutritional Assessment Tools
- Standard Methods of Evaluating Nutritional Status
- The Nutrition Care Process
- Emerging Opportunities for Nutritional Assessment and Evaluation
- Chapter Summary

LEARNING OBJECTIVES

After completing this chapter, the reader should be able to:

1. Describe the historic evolution of nutrient deficiency diseases, the role of nutrition with chronic disease, and the screening and diagnosis of malnutrition in the clinical setting.
2. Differentiate between screening and assessment for nutritional risk.
3. Understand the different methods of collecting nutrition assessment data.
4. Recognize the different components of the nutrition care process.
5. Examine the role of nutrition assessment in the prevention and treatment of chronic disease.

Introduction

Nutritional imbalances are a severe public-health problem that has been associated with a significant increase in the risk of mortality and morbidity. An individual's nutritional status is influenced by factors such as consuming food in sufficient amounts, selecting the right foods to promote adequate nutrient intake, and the individual's eating pattern. A sedentary lifestyle and a poor-quality eating pattern have been identified as risk factors for the development of chronic diseases such as hypertension, cardiovascular disease, diabetes mellitus (DM), stroke, and cancer. Adverse outcomes such as disability, poor quality of life, and high rates of low-birthweight babies occur as a result of poor eating patterns and malnutrition in both developed and underdeveloped countries. Identifying the impact of poor eating patterns on chronic diseases and assessing the nutritional status of individuals, families, and communities are important tasks in promoting population health.[1,2]

In the United States, approximately 50% of the adult population suffers from one or more avoidable

3

The **Chapter Outline** at the beginning of each chapter gives students a preview of topics that will be covered.

Learning Objectives focus students on the key concepts of each chapter and the material that they will learn.

Recap Nutrition has played an integral role in maintaining optimal health and quality of life for individuals in the United States and elsewhere in the world. A paradox exists in the United States where healthcare professionals need to have the knowledge and skills to address the health-related problems associated with over nutrition (obesity and chronic diseases) and undernutrition (frailty and wasting diseases). Nutritional assessment is the first step to implementing a nutrition care plan that assists individuals in successfully implementing dietary and lifestyle changes to improve their quality of life, lower their risks for disease, and help prevent or overcome malnutrition.

Nutritional Screening and Nutritional Assessment Tools

Preview Nutritional screening tools are designed to quickly evaluate nutritional risk in individuals. Nutritional assessment tools identify malnutrition in individuals.

Nutritional Screening Tools

The Academy of Nutrition and Dietetics (the Academy) recommends the use of nutrition screening to identify individuals who are at nutritional risk. This ensures that those patients who are at risk, are given high priority for a thorough nutritional evaluation by an RDN. **Nutrition screening** is defined as "the process of identifying patients, clients, or groups who may have a nutrition diagnosis and benefit from nutritional assessment and intervention by a registered dietitian."[14] Nutritional screening tools should be quick, easy-to-use tools that can be completed by any member of a healthcare team with minimal nutrition expertise (e.g., diet technicians, nurses, and physician assistants). Furthermore, screening tools should be validated to ensure that they accurately identify nutritional risks for the population and setting for which they are intended. Screening forms have use in both community and clinical settings. In community settings, for example, forms can be used to identify risk for chronic diseases such as diabetes, heart disease, and high blood pressure in adults. These are typically used at community events such as health fairs and workplace wellness fairs. When the results identify individuals at risk for a chronic disease, they are often referred to their primary care physicians for extensive evaluation to determine whether a chronic disease is present. They may also be referred to an RDN who will offer recommendations for making dietary and lifestyle changes to the individual that, depending on the diagnosis, will either ward off the onset of the disease or will help the individual manage the newly diagnosed disease. Screening forms are also offered to the elderly living in the community setting or assisted living to identify risks for malnutrition, osteoporosis, and other chronic diseases. The criteria on the screening form varies by facility; key criteria that are commonly included are shown in **TABLE 1.2**.

TABLE 1.2 Nutrition screening key criteria

Height and weight
History of weight gain or loss (intentional or unintentional)
Changes in appetite
Lifestyle habits (tobacco use, physical activity, alcohol consumption)
Digestive disorders (constipation, diarrhea, nausea, vomiting)
Laboratory measures (blood, urine, or both)
Family history, previous medical history, or both

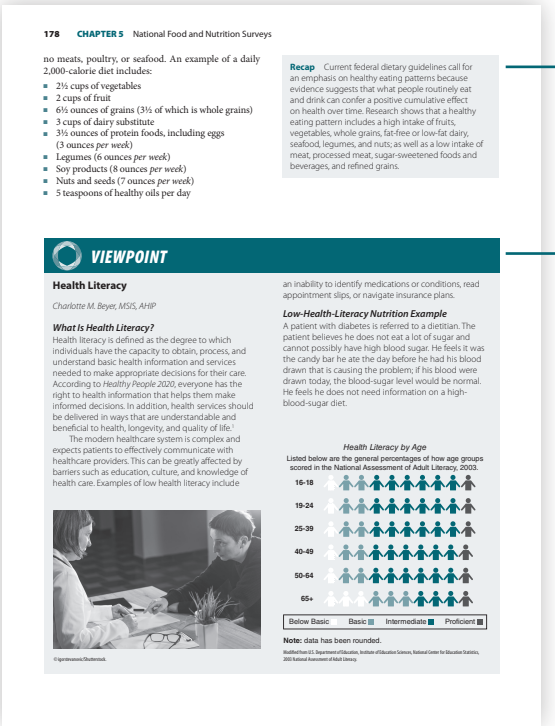
Modified from Field LB, Hand RK. Differentiating malnutrition screening and assessment: a nutrition care process perspective. *J Acad Nutr Diet.* 2015;15:824-828.

In the clinical and long-term care setting, screening forms are designed to identify risks of malnutrition (undernutrition), determine the need for more-in-depth nutritional assessment, and ultimately offer an early detection of malnutrition so that nutrition support is provided in a timely manner. In the United States, an estimated 30% to 50% of adult hospital patients are malnourished. Few patients, however receive the formal diagnosis of malnutrition at discharge, and only an estimated 3.2% of discharged patients are diagnosed with malnutrition.[15] It has been well documented that patients who enter the hospital malnourished and are not given nutrition support have increased morbidity and mortality, decreased function and quality of life, and increased length of hospital stays.[16,17] This leads to increased healthcare costs expenses that can cost hospitals millions of dollars.[18]

It is critical for clinical, long-term care, and community facilities to use validated screening tools to identify patients for malnutrition risk or use

Each section begins with a **Preview** statement, giving the reader a sense of what content to expect.

Key Terms are in boldface type the first time they are mentioned, with definitions appearing in the end-of-text Glossary.



178 CHAPTER 5 National Food and Nutrition Surveys

no meats, poultry, or seafood. An example of a daily 2,000-calorie diet includes:

- 2½ cups of vegetables
- 2 cups of fruit
- 6½ ounces of grains (3½ of which is whole grains)
- 3 cups of dairy substitute
- 3½ ounces of protein foods, including eggs (3 ounces *per week*)
- Legumes (6 ounces *per week*)
- Soy products (8 ounces *per week*)
- Nuts and seeds (7 ounces *per week*)
- 5 teaspoons of healthy oils per day

Recap Current federal dietary guidelines call for an emphasis on healthy eating patterns because evidence suggests that what people routinely eat and drink can confer a positive cumulative effect on health over time. Research shows that a healthy eating pattern includes a high intake of fruits, vegetables, whole grains, fat-free or low-fat dairy, seafood, legumes, and nuts; as well as a low intake of meat, processed meat, sugar-sweetened foods and beverages, and refined grains.

VIEWPOINT

Health Literacy

Charlotte M. Beyer, MSIS, AHIP

What Is Health Literacy?

Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate decisions for their care. According to *Healthy People 2020*, everyone has the right to health information that helps them make informed decisions. In addition, health services should be delivered in ways that are understandable and beneficial to health, longevity, and quality of life.[1]

The modern healthcare system is complex and expects patients to effectively communicate with healthcare providers. This can be greatly affected by barriers such as education, culture, and knowledge of health care. Examples of low health literacy include an inability to identify medications or conditions, read appointment slips, or navigate insurance plans.

Low-Health-Literacy Nutrition Example

A patient with diabetes is referred to a dietitian. The patient believes he does not eat a lot of sugar and cannot possibly have high blood sugar. He feels it was the candy bar he ate the day before he had his blood drawn that is causing the problem; if his blood were drawn today, the blood-sugar level would be normal. He feels he does not need information on a high-blood-sugar diet.

Health Literacy by Age

Listed below are the general percentages of how age groups scored in the National Assessment of Adult Literacy, 2003.

Note: data has been rounded.

Modified from U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2003 National Assessment of Adult Literacy.

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Each **Viewpoint** feature is written by a nutrition professional and notes how the chapter content impacts his or her work.

28 CHAPTER 1 Nutritional Assessment

HIGHLIGHT

Understanding Types of Research

References

1. Aslam S, Georgiev H, Mehta K, Kumar A. Matching research design to clinical research questions. *Indian J Sex Transm Dis.* 2012;33:49–53.
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Highlight presents topics of interest from current research literature.

Chapter Summary 29

biomarkers have shown good validity with the use of several criteria. The strengths unique to each method make it appropriate for use in particular applications.

The gold standard for determining nutrient information is the multiple-week diet record. With this tool, individuals document all items they consume over a period of several weeks. The method is different from other data-collection processes because an individual does not have to depend on his or her memory. The high contributor burden as well as the cost of maintaining diet records has reduced their use in large-scale epidemiologic studies. The capacity of these records to convey thorough diet data makes them valuable in validation studies for other dietary assessment techniques. Another drawback of diet records is that the procedure of logging data can alter an individual's diet, thus rendering the data nonrepresentative of actual and usual intake. On the other hand, projected intakes from diet records have shown high correlation with results from multiple 24-hour recalls.[43] In recurrent 24-hour recalls, a participant details all foods eaten in the preceding 24 hours or calendar day to a skilled interviewer in person or over the phone. This technique has been commonly used in dietary-intervention trials. It is also used in national surveys to discover trends in nutritional intake.[40]

Nutritional Epidemiology in Illness Cause and Effect

One of the main reproaches stacked against nutritional epidemiology is that it depends heavily on observational data. This research method is believed to be secondary to experimental data in defining causation. When evidence from randomized controlled trials is not available, nutritional epidemiologists characteristically rely on prospective cohort studies, the strongest observational study design in terms of diminishing bias and deducing causality.[44]

Recap The incidence of obesity is associated with increased risks for morbidity associated with the presence of hypertension, dyslipidemia, diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems, and some cancers. Obesity has also been linked to increased risk of mortality. Nutritional epidemiology is a moderately new field of medical research that looks at the association between nutrition and health.

Chapter Summary

Consuming healthy foods and living an active lifestyle are basic ways to promote health and well-being. Getting adequate nutrition is particularly important during periods of rapid growth and development. Following an unhealthy eating pattern during pregnancy, infancy, childhood, and adolescence can contribute to underdeveloped physical and mental abilities that have lifelong consequences. Prolonged nutrition deficiency, whether from excessive or inadequate intake, will promote or exacerbate a range of ailments and affect an individual's quality and length of life.

The use of nutrition screening allows for the identification of individuals who are at nutritional risk so that a full nutrition assessment can be completed. The Academy defines a nutrition assessment as "identifying and evaluating data needed to make decisions about a nutrition-related problem/diagnosis."[21] Nutrition-assessment techniques can be classified as one of four types: anthropometric, biochemical, clinical, or dietary.

The increased understanding of the role of nutrition in promoting health and well-being has made the evaluation of individuals, families, and communities key to monitoring public health.

CASE STUDY

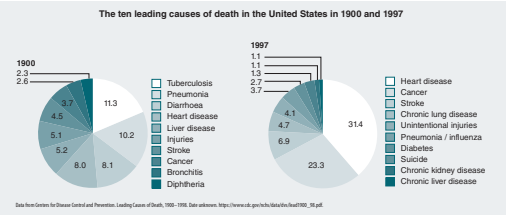
In the 21st century, the incidence of chronic disease has displaced the previous prevalence of nutrient deficiency as the primary area of public-health concern as population conditions. Leading causes of death have shifted from infectious diseases to chronic conditions. Approximately one-half of all American adults—117 million individuals—have one or more preventable chronic diseases, many of which are related to poor-quality eating patterns and physical inactivity.

Dr. Jones is a researcher who was just awarded a grant by the National Institute of Health (NIH) to measure the prevalence of diabetes in a selected sector of Camden, New Jersey.

Questions:

1. As you go through the information in this chapter, determine which nutrition assessment methods you would incorporate in your procedure.
2. What drives your assessment-method selection?

At least one **Case Study** appears toward the end of each chapter and illustrates how topics discussed in the text might appear in practice.



Learning Portfolio

Key Terms

Anthropometry
Body mass index (BMI)
Bureau of Labor Statistics Consumer expenditure survey data
Epidemiology
Food and Agriculture Organization of the United Nations (FAO)
Healthy People 2020 (HP 2020)
Interprofessional
Nutrition assessment
Nutrition Care Process (NCP)
Nutrition Care Process Terminology (NCPT)
Nutrition Care Process and Model (NCPM)
Nutrition diagnosis
Nutrition-focused physical exam (NFPE)
Nutrition intervention
Nutrition screening
PES statement
Scurvy
Subjective global assessment (SGA)
Tumors

Study Questions

1. The key difference between a nutrition-screening form and a nutrition-assessment form is:
   a. Screening forms provide a diagnosis for malnutrition
   b. Screening forms determine risk for malnutrition
   c. Screening forms diagnose chronic disease
   d. Screening forms determine risk for weight gain
2. The Academy of Nutrition and Dietetics recommends using the _____ screening form to assess risk for malnutrition in the adults in the clinical setting.
   a. MUST
   b. SNAQ
   c. Mini SNAQ
   d. Mini MUST

Each chapter concludes with a **Learning Portfolio**, which is an array of student-centered resources and activities.

The Learning Portfolio collects a comprehensive list of **Key Terms** specific to the chapter.

Study Questions provide multiple-choice and true/false questions, testing the reader's knowledge of information covered in the chapter. These can be used for self-assessment or as homework assignments; answers are included in the Instructor's Manual.

Discussion Questions provide prompts for greater engagement with the content.

Suggested **Activities** provide additional interactive avenues for grappling with the chapter content.

Online Resources direct students to additional materials relevant to the content.

30. The most reliable indicator of poor nutritional status is:
    a. Weight loss
    b. Low albumin concentrations
    c. Low dietary intake of nutrients
    d. Poor handgrip strength

Discussion Questions

1. How does the obesity rate affect the incidence of chronic disease in the United States?
2. Describe the shift from infectious disease to chronic disease that affects public health.
3. Nutrition screens allow individuals who are at risk of suboptimal nutritional status to be identified. List and describe the most commonly used screening tools. What are the benefits and drawbacks of each screening tool?

Activities

1. Develop a marketing campaign targeting a specific segment of the community you live or study in that introduces population-based intervention strategies to reduce obesity and impact overall health.
2. Type 2 diabetes is widespread in all obese groups and now even in preteen children. Develop an education tool to teach young children the health risks associated with diabetes.
3. Select a chronic condition that is prevalent in the American population. Work with three to four classmates to develop "the top 10 must know topics" by the average person in efforts to prevent or manage the disease. Develop a wiki page to communicate the information. Use videos and graphics on the page to deliver the message.

Online Resources

Food and Agriculture Organization (FAO) of the United Nations

The FAO develops methods and standards for food and agriculture statistics, provides technical assistance services, and disseminates data for global monitoring. It is the world's largest database of food and agriculture statistics:
http://www.fao.org/statistics/en/.

Bureau of Labor Statistics Consumer Expenditure Survey Data

This database provides information on the buying habits of American consumers, including data on their expenditures, income, and consumer unit (families and single consumers) characteristics:
http://www.bls.gov/cex/.

Anthropometric Measurement Videos

This website provides technical videos on how to conduct anthropometric measures:
https://wwwn.cdc.gov/nchs/nhanes/nhanes3/anthropometricvideos.aspx.

The State of Obesity: Adults in the United States

This website provides interactive maps on adult obesity in the United States:
http://stateofobesity.org/adult-obesity/.

Malnutrition Universal Screening Tool (MUST)

This website provides the background for the MUST tool, online calculator, and videos.
http://www.bapen.org.uk/screening-and-must/must.

Mini Nutritional Assessment Tool (MNA)

This website provides an overview of the MNA tool and videos and provides access to the required forms:
http://www.mna-elderly.com/.

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Nancy Munoz, DCN, MHA, RD, FAND holds a doctorate in clinical nutrition from Rutgers State University of New Jersey (previously known as the University of Medicine and Dentistry of New Jersey), a master's degree in healthcare administration from the University of Maryland, and a bachelor's degree in food and nutrition from Marymount College in Tarrytown, New York. She is a registered dietitian nutritionist and a member, as well as a Fellow, of the Academy of Nutrition and Dietetics.

While guiding the practice of registered dietitian nutritionists in the care of older adults has defined Dr. Munoz's career, she has also been caring for veterans who have served our nation as the Assistant Chief for Nutrition and Food Services at the VA Southern Nevada Healthcare System since 2015. She is involved in the development, communication, and implementation of effective and efficient clinical nutrition protocols to guide compliance to assessment and foodservice standards.

Since 2009, Dr. Munoz has been a lecturer at the University of Massachusetts, Amherst campus for the Masters in Public Health program. Teaching the Nutritional Assessment course for this institution helped inspire the development of this text, as Dr. Munoz wanted a resource with a fresh approach to teaching students the different methods that can be applied to addressing nutrition questions in diverse research situations.

Dr. Munoz has contributed to and authored numerous textbook chapters and peer-reviewed journal articles on the topics of nutrition for older adults, pressure injuries, and clinical nutrition. She coauthored *Nutrition for the Older Adult*, also published by Jones & Bartlett Learning.

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