JUDITH E. BROWN

NUTRITION NOW

7e

Dietary Reference Intakes (DRI)

The Dietary Reference Intakes (DRI) include two sets of nutrient intake goals for individuals—the Recommended Dietary Allowance (RDA) and Adequate Intake (AI). The RDA reflects the average daily amount of a nutrient considered adequate to meet the needs of most healthy people. If there is insufficient evidence to determine an RDA, an AI is set. In addition, the Estimated Energy Requirement (EER) represents the average dietary energy intake considered adequate to maintain energy balance in healthy people.

The DRI also include the Tolerable Upper Intake Level (UL) that represents the estimated maximum daily amount of a nutrient that appears safe for most healthy people to consume on a regular basis. Turn the page for a listing of the UL for selected vitamins and minerals. Note that the absence of a UL for a nutrient does not indicate that it is safe to consume in high doses, but only that research is too limited to set a UL. Chapter 1 describes these DRI values in detail.

Estimated Energy Requirements (EER), Recommended Dietary Allowances (RDA), and Adequate Intakes (AI) for Water, Energy, and the Energy Nutrients

Age (yr)	Reference BMI (kg/m^2)	Reference Height cm (in)	Reference Weight kg (lb)	Water[a] AI (L/day)	Energy EER[b] (kcal/day)	Carbohydrate RDA (g/day)	Total Fiber AI (g/day)	Total Fat AI (g/day)	Linoleic Acid AI (g/day)	Linolenic Acid[c] AI (g/day)	Protein RDA (g/day)[d]	Protein RDA (g/kg/day)
Males												
0–0.5	—	62 (24)	6 (13)	0.7[e]	570	60	—	31	4.4	0.5	9.1	1.52
0.5–1	—	71 (28)	9 (20)	0.8[f]	743	95	—	30	4.6	0.5	11	1.20
1–3[g]	—	86 (34)	12 (27)	1.3	1046	130	19	—	7	0.7	13	1.05
4–8[g]	15.3	115 (45)	20 (44)	1.7	1742	130	25	—	10	0.9	19	0.95
9–13	17.2	144 (57)	36 (79)	2.4	2279	130	31	—	12	1.2	34	0.95
14–18	20.5	174 (68)	61 (134)	3.3	3152	130	38	—	16	1.6	52	0.85
19–30	22.5	177 (70)	70 (154)	3.7	3067[h]	130	38	—	17	1.6	56	0.80
31–50	22.5[i]	177 (70)[i]	70 (154)[i]	3.7	3067[h]	130	38	—	17	1.6	56	0.80
>50	22.5[i]	177 (70)[i]	70 (154)[i]	3.7	3067[h]	130	30	—	14	1.6	56	0.80
Females												
0–0.5	—	62 (24)	6 (13)	0.7[e]	520	60	—	31	4.4	0.5	9.1	1.52
0.5–1	—	71 (28)	9 (20)	0.8[f]	676	95	—	30	4.6	0.5	11	1.20
1–3[g]	—	86 (34)	12 (27)	1.3	992	130	19	—	7	0.7	13	1.05
4–8[g]	15.3	115 (45)	20 (44)	1.7	1642	130	25	—	10	0.9	19	0.95
9–13	17.4	144 (57)	37 (81)	2.1	2071	130	26	—	10	1.0	34	0.95
14–18	20.4	163 (64)	54 (119)	2.3	2368	130	26	—	11	1.1	46	0.85
19–30	21.5	163 (64)	57 (126)	2.7	2403[j]	130	25	—	12	1.1	46	0.80
31–50	21.5[i]	163 (64)[i]	57 (126)[i]	2.7	2403[j]	130	25	—	12	1.1	46	0.80
>50	21.5[i]	163 (64)[i]	57 (126)[i]	2.7	2403[j]	130	21	—	11	1.1	46	0.80
Pregnancy												
1st trimester				3.0	+0	175	28	—	13	1.4	46	0.80
2nd trimester				3.0	+340	175	28	—	13	1.4	71	1.10
3rd trimester				3.0	+452	175	28	—	13	1.4	71	1.10
Lactation												
1st 6 months				3.8	+330	210	29	—	13	1.3	71	1.30
2nd 6 months				3.8	+400	210	29	—	13	1.3	71	1.30

NOTE: For all nutrients, values for infants are AI. Dashes indicate that values have not been determined.

[a]The water AI includes drinking water, water in beverages, and water in foods; in general, drinking water and other beverages contribute about 70 to 80 percent, and foods, the remainder. Conversion factors: 1 L = 33.8 fluid oz; 1 L = 1.06 qt; 1 cup = 8 fluid oz.

[b]The Estimated Energy Requirement (EER) represents the average dietary energy intake that will maintain energy balance in a healthy person of a given gender, age, weight, height, and physical activity level. The values listed are based on an "active" person at the reference height and weight and at the midpoint ages for each group until age 19. Chapter 8 and Appendix F provide equations and tables to determine estimated energy requirements.

[c]The linolenic acid referred to in this table and text is the omega-3 fatty acid known as alpha-linolenic acid.

[d]The values listed are based on reference body weights.

[e]Assumed to be from human milk.

[f]Assumed to be from human milk and complementary foods and beverages. This includes approximately 0.6 L (~2½ cups) as total fluid including formula, juices, and drinking water.

[g]For energy, the age groups for young children are 1–2 years and 3–8 years.

[h]For males, subtract 10 kcalories per day for each year of age above 19.

[i]Because weight need not change as adults age if activity is maintained, reference weights for adults 19 through 30 years are applied to all adult age groups.

[j]For females, subtract 7 kcalories per day for each year of age above 19.

SOURCE: Adapted from the *Dietary Reference Intakes series*, National Academies Press. Copyright 1997, 1998, 2000, 2001, 2002, 2004, 2005, 2011 by the National Academies of Sciences.

Recommended Dietary Allowances (RDA) and Adequate Intakes (AI) for Vitamins

Age (yr)	Thiamin RDA (mg/day)	Riboflavin RDA (mg/day)	Niacin RDA (mg/day)[a]	Biotin AI (µg/day)	Pantothenic acid AI (mg/day)	Vitamin B_6 RDA (mg/day)	Folate RDA (µg/day)[b]	Vitamin B_{12} RDA (µg/day)	Choline AI (mg/day)	Vitamin C RDA (mg/day)	Vitamin A RDA (µg/day)[c]	Vitamin D RDA (IU/day)[d]	Vitamin E RDA (mg/day)[e]	Vitamin K AI (µg/day)
Infants														
0–0.5	0.2	0.3	2	5	1.7	0.1	65	0.4	125	40	400	400 (10 µg)	4	2.0
0.5–1	0.3	0.4	4	6	1.8	0.3	80	0.5	150	50	500	400 (10 µg)	5	2.5
Children														
1–3	0.5	0.5	6	8	2	0.5	150	0.9	200	15	300	600 (15 µg)	6	30
4–8	0.6	0.6	8	12	3	0.6	200	1.2	250	25	400	600 (15 µg)	7	55
Males														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	600 (15 µg)	11	60
14–18	1.2	1.3	16	25	5	1.3	400	2.4	550	75	900	600 (15 µg)	15	75
19–30	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	600 (15 µg)	15	120
31–50	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	600 (15 µg)	15	120
51–70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	600 (15 µg)	15	120
>70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	800 (20 µg)	15	120
Females														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	600 (15 µg)	11	60
14–18	1.0	1.0	14	25	5	1.2	400	2.4	400	65	700	600 (15 µg)	15	75
19–30	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	600 (15 µg)	15	90
31–50	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	600 (15 µg)	15	90
51–70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	600 (15 µg)	15	90
>70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	800 (20 µg)	15	90
Pregnancy														
≤18	1.4	1.4	18	30	6	1.9	600	2.6	450	80	750	600 (15 µg)	15	75
19–30	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	600 (15 µg)	15	90
31–50	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	600 (15 µg)	15	90
Lactation														
≤18	1.4	1.6	17	35	7	2.0	500	2.8	550	115	1200	600 (15 µg)	19	75
19–30	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	600 (15 µg)	19	90
31–50	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	600 (15 µg)	19	90

NOTE: For all nutrients, values for infants are AI. The glossary on the inside back cover defines units of nutrient measure.

[a]Niacin recommendations are expressed as niacin equivalents (NE), except for recommendations for infants younger than 6 months, which are expressed as preformed niacin.

[b]Folate recommendations are expressed as dietary folate equivalents (DFE).

[c]Vitamin A recommendations are expressed as retinol activity equivalents (RAE).

[d]Vitamin D recommendations are expressed as cholecalciferol and assume an absence of adequate exposure to sunlight.

[e]Vitamin E recommendations are expressed as α-tocopherol.

Recommended Dietary Allowances (RDA) and Adequate Intakes (AI) for Minerals

Age (yr)	Sodium AI (mg/day)	Chloride AI (mg/day)	Potassium AI (mg/day)	Calcium RDA (mg/day)	Phosphorus RDA (mg/day)	Magnesium RDA (mg/day)	Iron RDA (mg/day)	Zinc RDA (mg/day)	Iodine RDA (µg/day)	Selenium RDA (µg/day)	Copper RDA (µg/day)	Manganese AI (mg/day)	Fluoride AI (mg/day)	Chromium AI (µg/day)	Molybdenum RDA (µg/day)
Infants															
0–0.5	120	180	400	200	100	30	0.27	2	110	15	200	0.003	0.01	0.2	2
0.5–1	370	570	700	260	275	75	11	3	130	20	220	0.6	0.5	5.5	3
Children															
1–3	1000	1500	3000	700	460	80	7	3	90	20	340	1.2	0.7	11	17
4–8	1200	1900	3800	1000	500	130	10	5	90	30	440	1.5	1.0	15	22
Males															
9–13	1500	2300	4500	1300	1250	240	8	8	120	40	700	1.9	2	25	34
14–18	1500	2300	4700	1300	1250	410	11	11	150	55	890	2.2	3	35	43
19–30	1500	2300	4700	1000	700	400	8	11	150	55	900	2.3	4	35	45
31–50	1500	2300	4700	1000	700	420	8	11	150	55	900	2.3	4	35	45
51–70	1300	2000	4700	1000	700	420	8	11	150	55	900	2.3	4	30	45
>70	1200	1800	4700	1200	700	420	8	11	150	55	900	2.3	4	30	45
Females															
9–13	1500	2300	4500	1300	1250	240	8	8	120	40	700	1.6	2	21	34
14–18	1500	2300	4700	1300	1250	360	15	9	150	55	890	1.6	3	24	43
19–30	1500	2300	4700	1000	700	310	18	8	150	55	900	1.8	3	25	45
31–50	1500	2300	4700	1000	700	320	18	8	150	55	900	1.8	3	25	45
51–70	1300	2000	4700	1200	700	320	8	8	150	55	900	1.8	3	20	45
>70	1200	1800	4700	1200	700	320	8	8	150	55	900	1.8	3	20	45
Pregnancy															
≤18	1500	2300	4700	1300	1250	400	27	12	220	60	1000	2.0	3	29	50
19–30	1500	2300	4700	1000	700	350	27	11	220	60	1000	2.0	3	30	50
31–50	1500	2300	4700	1000	700	360	27	11	220	60	1000	2.0	3	30	50
Lactation															
≤18	1500	2300	5100	1300	1250	360	10	13	290	70	1300	2.6	3	44	50
19–30	1500	2300	5100	1000	700	310	9	12	290	70	1300	2.6	3	45	50
31–50	1500	2300	5100	1000	700	320	9	12	290	70	1300	2.6	3	45	50

NOTE: For all nutrients, values for infants are AI. The glossary on the inside back cover defines units of nutrient measure.

Tolerable Upper Intake Levels (UL) for Vitamins

Age (yr)	Niacin (mg/day)[a]	Vitamin B_6 (mg/day)	Folate (µg/day)[a]	Choline (mg/day)	Vitamin C (mg/day)	Vitamin A (IU/day)[b]	Vitamin D (IU/day)	Vitamin E (mg/day)[c]
Infants								
0–0.5	—	—	—	—	—	600	1000 (25 µg)	—
0.5–1	—	—	—	—	—	600	1500 (38 µg)	—
Children								
1–3	10	30	300	1000	400	600	2500 (63 µg)	200
4–8	15	40	400	1000	650	900	3000 (75 µg)	300
9–13	20	60	600	2000	1200	1700	4000 (100 µg)	600
Adolescents								
14–18	30	80	800	3000	1800	2800	4000 (100 µg)	800
Adults								
19–70	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
>70	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
Pregnancy								
≤18	30	80	800	3000	1800	2800	4000 (100 µg)	800
19–50	35	100	1000	3500	2000	3000	4000 (100 µg)	1000
Lactation								
≤18	30	80	800	3000	1800	2800	4000 (100 µg)	800
19–50	35	100	1000	3500	2000	3000	4000 (100 µg)	1000

[a]The UL for niacin and folate apply to synthetic forms obtained from supplements, fortified foods, or a combination of the two.
[b]The UL for vitamin A applies to the preformed vitamin only.
[c]The UL for vitamin E applies to any form of supplemental α-tocopherol, fortified foods, or a combination of the two.

Tolerable Upper Intake Levels (UL) for Minerals

Age (yr)	Sodium (mg/day)	Chloride (mg/day)	Calcium (mg/day)	Phosphorus (mg/day)	Magnesium (mg/day)[d]	Iron (mg/day)	Zinc (mg/day)	Iodine (µg/day)	Selenium (µg/day)	Copper (µg/day)	Manganese (mg/day)	Fluoride (mg/day)	Molybdenum (µg/day)	Boron (mg/day)	Nickel (mg/day)	Vanadium (mg/day)
Infants																
0–0.5	—	—	1000	—	—	40	4	—	45	—	—	0.7	—	—	—	—
0.5–1	—	—	1500	—	—	40	5	—	60	—	—	0.9	—	—	—	—
Children																
1–3	1500	2300	2500	3000	65	40	7	200	90	1000	2	1.3	300	3	0.2	—
4–8	1900	2900	2500	3000	110	40	12	300	150	3000	3	2.2	600	6	0.3	—
9–13	2200	3400	3000	4000	350	40	23	600	280	5000	6	10	1100	11	0.6	—
Adolescents																
14–18	2300	3600	3000	4000	350	45	34	900	400	8000	9	10	1700	17	1.0	—
Adults																
19–50	2300	3600	2500	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
51–70	2300	3600	2000	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
>70	2300	3600	2000	3000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	1.8
Pregnancy																
≤18	2300	3600	3000	3500	350	45	34	900	400	8000	9	10	1700	17	1.0	—
19–50	2300	3600	2500	3500	350	45	40	1100	400	10,000	11	10	2000	20	1.0	—
Lactation																
≤18	2300	3600	3000	4000	350	45	34	900	400	8000	9	10	1700	17	1.0	—
19–50	2300	3600	2500	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0	—

[d]The UL for magnesium applies to synthetic forms obtained from supplements or drugs only.
NOTE: An upper Limit was not established for vitamins and minerals not listed and for those age groups listed with a dash (—) because of a lack of data, not because these nutrients are safe to consume at any level of intake. All nutrients can have adverse effects when intakes are excessive.

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SEVENTH EDITION

Nutrition Now

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Courtesy of the author

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Nutrition Now

Judith E. Brown
University of Minnesota

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Contents in Brief

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nutrition timeline

1621
First Thanksgiving feast at Plymouth colony

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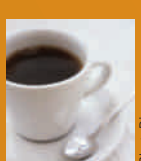
1702
First coffeehouse in America opens in Philadelphia



PhotoDisc

1734
Scurvy recognized

1744
First record of ice cream in America at Maryland colony

PhotoDisc


Alistair Berg/Getty Images

Lind publishes "Treatise on Scurvy," citrus identified as cure


PhotoDisc

Ojibway and Sioux war over control of wild rice stands

Sandwich invented by the Earl of Sandwich


PhotoDisc

Potato heralded as famine food

Americans drink more coffee in protest over Britain's tea tax


© Digital Vision/Alamy

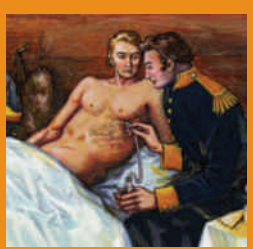
nutrition timeline

1775
Lavoisier ("the father of the science of nutrition") discovers the energy- producing property of food


Stefano Bianchetti/CORBIS

1816
Protein and amino acids identified, followed by carbohydrates and fats in the mid-1800s

1833
Beaumont's experiments on a wounded man's stomach greatly expand knowledge about digestion


© Bettmann/Corbis

1862
U.S. Department of Agriculture founded by authorization of President Lincoln

1871
Proteins, carbohydrates, and fats determined to be insufficient to support life; there are other "essential" components


© Scott Goodwin Photography

First milk station providing children with un-contaminated milk opens in New York City

Bettman/CORBIS

Atwater publishes Proximate Composition of Food Materials

Pure Food and Drug Act passed by President Theodore Roosevelt to protect consumers against contaminated foods


Bettmann/CORBIS

Pasteurized milk introduced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Funk suggests scurvy, beriberi, and pellagra caused by deficiency of "vitamines" in the diet

Elena Schweitzer/Shutterstock.com

nutrition timeline

1913
First vitamin discovered (vitamin A)

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1914
Goldberger identifies the cause of pellagra (niacin deficiency) in poor children to be a missing component of the diet rather than a germ as others believed

1916
First dietary guidance material produced for the public released; title is "Food for Young Children"

1917
First food groups published the Five Food Groups: Milk and Meat; Vegetables and Fruits; Cereals; Fats and Fat Foods; Sugars and Sugary Foods

1921
First fortified food produced: iodized salt, needed to prevent widespread iodine-deficiency goiter in many parts of the United States


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1928
American Society for Nutritional Sciences and the Journal of Nutrition founded

1929
Essential fatty acids identified


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1930s
Vitamin C identified in 1932, followed by pantothenic acid and riboflavin in 1933 and vitamin K in 1934

1937
Pellagra found to be due to a deficiency of niacin

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1938
Health Canada issues nutrient intake standards

1941
First refined grain enrichment standards developed

Creatas/Fotosearch

nutrition timeline

1941
First Recommended Dietary Allowances (RDAs) announced by President Franklin Roosevelt on radio

Franklin D. Roosevelt Presidential Library and Museum

1946
National School Lunch Act passed

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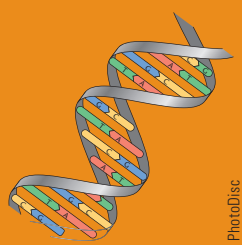
1947
Vitamin B_{12} identified

1953
Double helix structure of DNA discovered



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1956
Basic Four Food Groups released by the U.S. Department of Agriculture

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1965
Food Stamp Act passed, Food Stamp program established

1966
Child Nutrition Act adds school breakfast to the National School Lunch Program

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1968
First national nutrition survey in U.S. launched (The Ten State Nutrition Survey)

1970
First Canadian national nutrition survey launched (Nutrition Canada National Survey)

1972
Special Supplemental Food and Nutrition Program for Women, Infants, and Children (WIC) established

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nutrition timeline

1977
Dietary Goals for the U.S. issued

1978
First Health Objectives for the Nation released

1989
First national scientific consensus report on diet and chronic disease published

1992
The Food Guide pyramid is released by the USDA

USDA

1997
RDAs expanded to Dietary Reference Intakes (DRIs)

living the dream/Flickr/Getty Images

1998

Folic acid fortification of refined grain products begins

Richard Anderson

2003

Sequencing of DNA in the human genome completed; marks beginning of new era of research in nutrient–gene interactions

2009

Obesity and diabetes become global epidemics

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Jose Luis Pelaez Inc/Getty Images/Blend Images

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Preface

"Everything should be made as simple as possible. But not simpler."
—ALBERT EINSTEIN

Welcome to the new *Nutrition Now*. It is reborn in the seventh edition. Take a look. In this edition of *Nutrition Now* you will see a crisp design, instructive photos, tables, and illustrations—and uncluttered margins. You will find content that is rewritten and reorganized around learning objectives and additional interactive learning opportunities. After Unit 1, if you read the first section of a unit you will find that specific, key nutrition concepts that apply to the unit's content are listed. You will notice that ChooseMyPlate food guidance materials are featured in this edition, as well as the 2010 Dietary Guidelines for Americans. The recently released DRIs for vitamin D and calcium appear in this edition, as well as the 2020 Health Objectives for the Nation. Multiple-choice questions based on real-life case scenarios are added to the Review Question sections. Additional opportunities for interactive learning, and activities that focus on real-life situations that require decision-making skills, are expanded in this edition. Revised, interactive, and real-life-based problem-solving activities are added to the seventh edition's *Instructor's Activity Manual*.

The principles of the science of nutrition as presented in this text have not changed, but much else has. Knowledge gains in nutrition continue to advance, and the implications of the advances to human health and well-being are impressive. Growth in our understanding of the role of plant foods on health has changed dietary guidance. New information about dietary fats and health is changing recommendations for fat intake. Advances in knowledge about the health effects of nutrient-gene interactions are changing fundamental concepts about the origins and prevention of disease. The epidemics of obesity and type 2 diabetes are reaching into younger age groups, and much more public attention is being paid to the roles of the food environment, diet, and physical activity in their prevention and management. The seventh edition covers these and other emerging topics directly related to the state of the science of nutrition now. It attempts to introduce these topics to students in a straightforward and clear way that keeps coverage as simple as possible, but no simpler than that.

Nutrition Now continues to be oriented toward enhancing instructor's teaching experiences and helping students build a firm foundation of scientific knowledge about nutrition that will serve them well throughout their careers and life.

Pedagogical Features

Units now begin with learning objectives. Unit content and Review Questions at the end of units are organized by learning objectives.

Also new to this edition are the Activity Cards at the back of the book. Each card contains an activity and its worksheet. Activities can be assigned individually or as group or special projects. They are designed to involve students in interactive application of topics to new situations. Activities include taste testing to identify genetically determined sensitivity to bitterness, developing a dietary behavioral change plan, anthropometry lab, designing fraudulent nutrition products, a physical activity assessment, and an assessment of three days of dietary intake.

Features widely utilized in past editions are updated and expanded in this one:

- Nutrition Scoreboard, a feature that pre-tests student knowledge and understanding of specific nutrition-related topics, has new questions that correspond to updated content in the Units. Answers for the Nutrition Scoreboard are moved to the end of units.
- The Reality Check feature is now included in every unit after Unit 1.

- Take Action, a feature that encourages students to consider options for diet or physical activity improvements, is included in most Units.
- Health Action, a feature that directs student's attention to diet, physical activity, and health recommendations, is updated and revised throughout.
- Nutrition Up Close activities have been revised in a number of units to correspond to updated and revised nutrition content. Answers to the Nutrition Up Close activities are now included in Appendix G.
- Review Questions are now organized around learning objectives and include multiple choice questions based on real-life scenarios. Answers to the Review Questions now appear in Appendix G.
- The Glossary is expanded and includes 46 mainly new definitions that correspond to the revised content of the units.

Several unit titles have been changed to reflect updated content. The term *genetically modified foods* is deleted from the title of Unit 21 and its contents. Unit 24 now emphasizes dietary supplements while content on functional foods is abbreviated. Prebiotics and probiotics are still covered in this unit. Primary coverage of lactose intolerance is now located in the unit on carbohydrates.

Changes to the Seventh Edition

To keep the list of changes appearing in the seventh edition to a reasonable length, I have attempted to select and list the substantial changes.

Unit 1: Key Nutrition Concepts and Terms

- The latest DRI report, released in 2010 with updated calcium and vitamin D intake recommendations, is presented
- Dietary Reference Intakes (DRIs) section is rewritten and reorganized
- New student activities encourage students to use the DRI tables
- ChooseMyPlate.gov content replaces MyPyramid
- A number of the illustrations have been modified or updated

Unit 2: The Inside Story about Nutrition and Health

- Tables and figures are updated and revised
- Ethnic-group specific data added
- ChooseMyPlate content replaces MyPyramid materials
- Nutrition Up Close feature modified from MyPyramid to ChooseMyPlate

Unit 3: Ways of Knowing about Nutrition

- New illustrations replace many from the sixth edition
- The FDA's Food Safety Modernization Act of 2011 Information section added
- Reality Check scenario modified

Unit 4: Understanding Food and Nutrition Labels

- Replaced a number of Illustrations with updated ones
- Added content on new calorie labeling requirements for chain restaurants
- Added discussion of new food labeling standards proposals

Unit 5: Nutrition, Attitudes, and Behaviors

- Revised illustrations
- Updated content on trends in food consumption

Unit 6: Healthy Diets, Dietary Guidelines, ChooseMyPlate and More

- Updated illustrations and tables
- Replaced content on the 2005 Dietary Guidelines with information from the 2010 Dietary Guidelines
- Replaced content on MyPyramid with ChooseMyPlate materials
- Updated and condensed information on dietary guidelines from other countries
- Modified the Health Action feature to focus on the 2010 Dietary Guidelines

Unit 7: How the Body Uses Food: Digestion and Absorption

- Changed Nutrition Scoreboard questions and answers
- Expanded content on the development and practical meaning of individual food preferences
- Expanded content on absorption, including the absorption of alcohol
- Modified content of digestive processes tables
- Expanded content on the lymph and circulatory systems
- Added sections titled "Other functions of the gastrointestinal tract," "Functions of taste," and "Gut bacteria"
- Revised content or replaced tables
- Revised content on ulcers, heartburn, constipation, and irritable bowel syndrome
- Added a Reality Check
- Moved content on lactose intolerance to the unit on carbohydrates
- Modified the Nutrition Up Close activity

Unit 8: Calories! Food, Energy, and Energy Balance

- Added a section on basal metabolism
- Added photo of indirect calorimeter plus added brief discussion on indirect calorimetry

Unit 9: Obesity to Underweight: The Highs and Lows of Weight Status

- Modified presentation of culturally-defined ideal body size for women and men
- Updated definitions of overweight and obesity in children and adolescents and added new example of CDC's BMI charts for age and sex that provide an example of interpretation of growth chart results in practice
- Updated data on obesity and overweight incidence and maps
- Added content on "environmental triggers" and genetic susceptibility to obesity
- Replaced the Reality Check
- Added discussion of replacement terms for "obese" and "fat" and on some health care provider's bias against obese people

Unit 10: Weight Control: The Myths and Realities

- Updated or replaced illustrations and table content
- Reorganized presentation of content
- Revised section on diet pills
- Rewrote section on popular diets
- Modified content on dietary supplements and internet products for weight loss
- Updated content on effectiveness of organized weight-loss programs
- Added section on successful weight control methods and programs, including lifestyle programs
- Revised content on bariatric surgery
- Added a separate section on physical activity and weight control

Unit 11: Disordered Eating: Anorexia Nervosa, Bulimia, and Pica

- Reorganized section on female athlete triad
- Expanded content on prevention of eating disorders
- Updated information about Health at Every Size
- Modified and updated presentation on plumbism and proposed eating disorders

Unit 12: Useful Facts about Sugars, Starches, and Fiber

- Modified Nutrition Scoreboard questions and answers
- Updated content on health effects of high sugar intake and particular effects in Latinos.
- Moved content on lactose maldigestion and intolerance to this unit
- Revised content on types of fiber
- Modified the Reality Check

Unit 13: Diabetes Now

- Updated content on prediabetes
- Updated and expanded content on fatty liver disease
- Added content on hemoglobin A1c
- Updated presentation on glycemic index and glycemic load
- Revised table on the glycemic index of foods
- Added Australia's GI food label
- Added content on vitamin D and diabetes
- Added an illustration showing projected increases in rates of type 2 diabetes
- Revised content on hypoglycemia

Unit 14: Alcohol: The Positives and Negatives

- Expanded presentation on fatty liver disease and steatohepatitis
- Modified content on fetal alcohol spectrum disorder
- Increased information on alcohol absorption and metabolism

Unit 15: Proteins and Amino Acids

- Modified illustrations and tables
- Expanded coverage on the functions of protein
- Added illustration and presentation of the basic structure of an amino acid
- Added section on protein structural types (e.g. primary, secondary, tertiary, and quaternary structures of proteins)
- Added section on nitrogen balance, presentation on how to calculate it
- Updated content on amino acids supplements, protein powders, and muscle mass and strength
- Added section on protein deficiency
- Deleted content on tryptophan supplements

Unit 16: Vegetarian Diets

- Updated and expanded content on vegetarian diets and health
- Added table on fortified foods that provides key nutrients needed by some vegetarians

Unit 17: Food Allergies and Intolerances

- Modified titles on headers
- Added section on the prevalence of food allergies
- Added sections on food allergy prevention and food allergy treatment
- Increased presentation of celiac disease and gluten-free regulations and products
- Moved content on lactose intolerance to Unit 12

Unit 18: Fats and Cholesterol in Health

- Expanded coverage of functions of fats
- Added content on the structure of fats
- Updated the table on food sources of *trans* fat
- Updated content on fat intake and health

Unit 19: Nutrition and Heart Disease

- Updated and expanded discussion of saturated fat and cholesterol intake, genetic traits, and heart disease risk
- Updated content on dietary and lifestyle changes and plasma lipid levels
- Updated and expanded presentation of oxidation and inflammation and heart disease
- Updated content on sex differences in heart disease risk and heart attack symptoms
- Heavily modified the Health Action
- Revised the Reality Check
- Added a section on dietary interventions for the prevention and treatment of heart disease
- Added content on added sugars, fatty liver, insulin resistance, metabolic syndrome, and heart disease risk
- Extensively modified content of tables
- Changed the Nutrition Up Close activity

Unit 20: Vitamins and Your Health

- Updated and revised table on vitamin functions, deficiency, toxicity, and food sources
- Extensively updated and modified table on food sources of vitamins
- Expanded content on vitamin deficiency disease prevention
- Updated content on folate and neural tube defects
- Updated content on recommendations for vitamin D intake and vitamin D and health relationships
- Reorganized and updated content on the antioxidant vitamins

Unit 21: Phytochemicals

- Reorganized content on phytochemicals and health, and phytochemical functions
- Deleted or reorganized content on phytochemical work in groups, beta-carotene supplements, vegetable extracts, and the table on examples of phytochemicals, their food sources, and potential mechanisms of action in disease prevention
- Revised content of tables
- Added a section on caffeine
- Added a section on food sources of phytochemicals
- Revised the Reality Check
- Deleted content on genetically modified organisms
- Modified the Nutrition Up Close activity

Unit 22: Diet and Cancer

- Revised Nutrition Scoreboard questions and answers
- Revised and updated section on how cancer develops
- Expanded presentation on how DNA becomes damaged
- Extensively revised sections on diet and cancer prevention, including tables and illustrations
- Added section on obesity and cancer
- Modified the Nutrition Up Close activity

Unit 23: Good Things to Know about Minerals

- Updated content on calcium, and on calcium, vitamin D, and osteoporosis
- Updated and revised table on mineral functions, deficiency, toxicity, and food sources
- Extensively updated and modified table on food sources of minerals
- Deleted the Health Action and other redundant content on osteoporosis
- Updated content on prehypertension and hypertension
- Added a Reality Check
- Updated DASH eating plan guidance
- Added content on potassium and health
- Updated content of tables
- Modified the Take Action feature to focus on potassium intake
- Changed the Nutrition Up Close activity to focus on the sodium content of processed foods

Unit 24: Dietary Supplements

- Added content on herbs versus drugs and herbs with drugs
- Extensively modified content of tables and some illustrations, added new tables and deleted others
- Added a presentation on dietary supplement realities

Unit 25: Water Is an Essential Nutrient

- Changed Nutrition Scoreboard questions and answers
- Expanded content on functions of water
- Updated illustrations
- Addressed new threats to safe and sufficient water supplies worldwide

Unit 26: Nutrient-Gene Interactions in Health and Disease

- Extensively modified and updated section on nutrient-gene interactions
- Extensively modified and updated tables
- Added content on gene variants, nutrients, and disease risk; and on epigenetics