



Judith E. Brown

# Nutrition

through the Life Cycle



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**Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Vitamins**  
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Vit A (µg/d) <sup>a</sup>	Vit C (mg/d)	Vit D (µg/d) <sup>b,c</sup>	Vit E (mg/d) <sup>d</sup>	Vit K (µg/d)	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin (mg/d) <sup>e</sup>	Vit B <sub>6</sub> (mg/d)	Folate (µg/d) <sup>f</sup>	Vit B <sub>12</sub> (µg/d)	Pa A
<i>Infants</i>												
0–6 mo	400*	40*	5*	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	
7–12 mo	500*	50*	5*	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	
<i>Children</i>												
1–3 y	300	15	5*	6	30*	0.5	0.5	6	0.5	150	0.9	
4–8 y	400	25	5*	7	55*	0.6	0.6	8	0.6	200	1.2	
<i>Males</i>												
9–13 y	600	45	5*	11	60*	0.9	0.9	12	1.0	300	1.8	
14–18 y	900	75	5*	15	75*	1.2	1.3	16	1.3	400	2.4	
19–30y	900	90	5*	15	120*	1.2	1.3	16	1.3	400	2.4	
31–50y	900	90	5*	15	120*	1.2	1.3	16	1.3	400	2.4	
51–70y	900	90	10*	15	120*	1.2	1.3	16	1.7	400	2.4 <sup>i</sup>	
>70y	900	90	15*	15	120*	1.2	1.3	16	1.7	400	2.4 <sup>i</sup>	
<i>Females</i>												
9–13 y	600	45	5*	11	60*	0.9	0.9	12	1.0	300	1.8	
14–18y	700	65	5*	15	75*	1.0	1.0	14	1.2	400 <sup>j</sup>	2.4	
19–30y	700	75	5*	15	90*	1.1	1.1	14	1.3	400 <sup>j</sup>	2.4	
31–50y	700	75	5*	15	90*	1.1	1.1	14	1.3	400 <sup>j</sup>	2.4	
51–70y	700	75	10*	15	90*	1.1	1.1	14	1.5	400	2.4 <sup>b</sup>	
>70y	700	75	15*	15	90*	1.1	1.1	14	1.5	400	2.4 <sup>b</sup>	
<i>Pregnancy</i>												
14–18y	750	80	5*	15	75*	1.4	1.4	18	1.9	600 <sup>j</sup>	2.6	
19–30y	770	85	5*	15	90*	1.4	1.4	18	1.9	600 <sup>j</sup>	2.6	
31–50y	770	85	5*	15	90*	1.4	1.4	18	1.9	600 <sup>j</sup>	2.6	
<i>Lactation</i>												
14–18 y	1200	115	5*	19	75*	1.4	1.6	17	2.0	500	2.8	
19–30y	1300	120	5*	19	90*	1.4	1.6	17	2.0	500	2.8	
31–50y	1300	120	5*	19	90*	1.4	1.6	17	2.0	500	2.8	

NOTE: This table (taken from the DRI reports, see [www.nap.edu](http://www.nap.edu)) presents Recommended Dietary Allowances (RDAs) in **bold type** and Adequate Intakes (AIs) in ordinary type followed by a superscripted letter. Both can be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy breastfed infants, the AI is the mean intake of the infants. For other life stage groups, the AI is based on the mean intake of the group. The AI for a group is believed to cover needs of all individuals in the group, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals that are covered. \*Based on the mean intake of the group. <sup>a</sup>As retinol activity equivalents (RAEs). 1 RAE = 1 µg retinol, 12 µg β-carotene, 24 µg α-carotene, or 24 µg β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is twice that of preformed vitamin A. <sup>b</sup>As cholecalciferol. 1 µg cholecalciferol = 40 IU vitamin D. <sup>c</sup>In the absence of adequate exposure to sunlight. <sup>d</sup>As α-tocopherol. α-Tocopherol includes RRR-α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the 2R-stereoisomeric forms of α-tocopherol (RRR-, RRR-, and RRR-α-tocopherol), also found in fortified foods and supplements. It does not include the 2S-stereoisomeric forms of α-tocopherol (SRR-, SSR-, SRS-, and SSS-α-tocopherol), also found in fortified foods and supplements. <sup>e</sup>As niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan; 0–6 months = preformed niacin (not NE). <sup>f</sup>As dietary folate equivalents (DFE). 1 DFE = 1 µg food folate = 0.6 µg of folic acid from fortified food or as a supplement consumed with food = 0.5 µg of a supplement taken on an empty stomach. <sup>g</sup>Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement varies with age. <sup>h</sup>Because 10 to 30 percent of older people may malabsorb food-bound B<sub>12</sub>, it is advisable for those older than 50 years to meet their RDA mainly by consuming foods fortified with B<sub>12</sub>. <sup>i</sup>In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 µg from supplements and 400 µg from food folate from a varied diet. <sup>j</sup>It is assumed that women will continue consuming 400 µg from supplements or fortified food until their pregnancy is confirmed and they enter prenatal care, which ordinarily occurs during the first trimester of pregnancy—the critical time for formation of the neural tube.

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**Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Elements**  
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Calcium (mg/d)	Chromium (µg/d)	Copper (µg/d)	Fluoride (mg/d)	Iodine (µg/d)	Iron (mg/d)	Magnesium (mg/d)	Manganese (mg/d)	Molybdenum (µg/d)	Phosphorus (mg/d)	Selenium (µg/d)	Zinc (mg/d)
<i>Infants</i>												
0–6 mo	210*	0.2*	200*	0.01*	110*	0.27*	30*	0.003*	2*	100*	15*	20*
7–12 mo	270*	5.5*	220*	0.5*	130*	11	75*	0.6*	3*	275*	20*	20*
<i>Children</i>												
1–3 y	500*	11*	340	0.7*	90	7	80	1.2*	17	460	20	20
4–8 y	800*	15*	440	1*	90	10	130	1.5*	22	500	30	30
<i>Males</i>												
9–13 y	1300*	25*	700	2*	120	8	240	1.9*	34	1250	40	40
14–18 y	1300*	35*	890	3*	150	11	410	2.2*	43	1250	55	55
19–30 y	1000*	35*	900	4*	150	8	400	2.3*	45	700	55	55
31–50 y	1000*	35*	900	4*	150	8	420	2.3*	45	700	55	55
51–70 y	1200*	30*	900	4*	150	8	420	2.3*	45	700	55	55
>70 y	1200*	30*	900	4*	150	8	420	2.3*	45	700	55	55
<i>Females</i>												
9–13 y	1300*	21*	700	2*	120	8	240	1.6*	34	1250	40	40
14–18 y	1300*	24*	890	3*	150	15	360	1.6*	43	1250	55	55
19–30 y	1000*	25*	900	3*	150	18	310	1.8*	45	700	55	55
31–50 y	1000*	25*	900	3*	150	18	320	1.8*	45	700	55	55
51–70 y	1200*	20*	900	3*	150	8	320	1.8*	45	700	55	55
>70 y	1200*	20*	900	3*	150	8	320	1.8*	45	700	55	55
<i>Pregnancy</i>												
14–18 y	1300*	29*	1000	3*	220	27	400	2.0*	50	1250	60	60
19–30 y	1000*	30*	1000	3*	220	27	350	2.0*	50	700	60	60
31–50 y	1000*	30*	1000	3*	220	27	360	2.0*	50	700	60	60
<i>Lactation</i>												
14–18 y	1300*	44*	1300	3*	290	10	360	2.6*	50	1250	70	70
19–30 y	1000*	45*	1300	3*	290	9	310	2.6*	50	700	70	70
31–50 y	1000*	45*	1300	3*	290	9	320	2.6*	50	700	70	70

NOTE: This table presents Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (\*). RDAs and AIs may vary by life stage and sex. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy breastfed infants, the AI is the mean intake. The AI for other life stage groups is based on the needs of all individuals in the group, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride* (1997); *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantoic Acid, Biotin, and Choline* (1998); *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids* (2000); *Dietary Reference Intakes for Vitamin A, Vitamin K, Vitamin E, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); and *Dietary Reference Intake for Water, Potassium, Sodium, Chloride, and Sulfate* (2004). These reports are available at <http://www.nap.edu>.

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**Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Macronutrients**  
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Total Water <sup>a</sup> (L/d)	Carbohydrate (g/d)	Total Fiber (g/d)	Fat (g/d)	Linoleic Acid (g/d)	α-Linoleic Acid (g/d)	Protein <sup>b</sup> (g/d)
<i>Infants</i>							
0–6 mo	0.7*	60*	ND	31*	4.4*	0.5*	9.1*
7–12 mo	0.8*	95*	ND	30*	4.6*	0.5*	11.0 <sup>c</sup>
<i>Children</i>							
1–3 y	1.3*	130	19*	ND	7*	0.7*	13
4–8 y	1.7*	130	25*	ND	10*	0.9*	19
<i>Males</i>							
9–13 y	2.4*	130	31*	ND	12*	1.2*	34
14–18 y	3.3*	130	38*	ND	16*	1.6*	52
19–30 y	3.7*	130	38*	ND	17*	1.6*	56
31–50 y	3.7*	130	38*	ND	17*	1.6*	56
51–70 y	3.7*	130	30*	ND	14*	1.6*	56
>70y	3.7*	130	30*	ND	14*	1.6*	56
<i>Females</i>							
9–13 y	2.1*	130	26*	ND	10*	1.0*	34
14–18 y	2.3*	130	26*	ND	11*	1.1*	46
19–30y	2.7*	130	25*	ND	12*	1.1*	46
31–50y	2.7*	130	25*	ND	12*	1.1*	46
51–70 y	2.7*	130	21*	ND	11*	1.1*	46
>70y	2.7*	130	21*	ND	11*	1.1*	46
<i>Pregnancy</i>							
14–18y	3.0*	175	28*	ND	13*	1.4*	71
19–30y	3.0*	175	28*	ND	13*	1.4*	71
31–50y	3.0*	175	28*	ND	13*	1.4*	71
<i>Lactation</i>							
14–18 y	3.8*	210	29*	ND	13*	1.3*	71
19–30y	3.8*	210	29*	ND	13*	1.3*	71
31–50y	3.8*	210	29*	ND	13*	1.3*	71

NOTE: This table presents Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (\*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy infants fed human milk, the AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all individuals in the group, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

<sup>a</sup> Total water includes all water contained in food, beverages, and drinking water.

<sup>b</sup> Based on 0.8 g/kg body weight for the reference body weight.

<sup>c</sup> Change from 13.5 in prepublication copy due to calculation error.

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**Dietary Reference Intakes (DRIs): Additional Macronutrient Recommendations**  
Food and Nutrition Board, Institute of Medicine, National Academies

Macronutrient	Recommendation
Dietary cholesterol	As low as possible while consuming a nutritionally adequate diet
Trans fatty acids	As low as possible while consuming a nutritionally adequate diet
Saturated fatty acids	As low as possible while consuming a nutritionally adequate diet
Added sugars	Limit to no more than 25% of total energy

SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (2002).

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# *Nutrition*

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*Through the Life Cycle*

FOURTH EDITION



# Nutrition

## Through the Life Cycle

FOURTH EDITION

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## Nutrition Time Line

1621

First Thanksgiving feast at Plymouth colony



H. Armstrong Roberts/  
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1702

First coffeehouse in America opens in Philadelphia



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1734

Scurvy recognized

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## Nutrition Time Line

1744

First record of ice cream in America at Maryland colony



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Images

1747

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



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1750

Ojibway and Sioux war over control of wild rice stands

1762

Sandwich invented by the Earl of Sandwich



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Images

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## Nutrition Time Line

1771

Potato heralded as famine food

1774

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

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1775

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

1816

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

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**Nutrition Time Line**

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**1833**

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

**1871**

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

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**1895**

First milk station providing children with uncontaminated milk opens in New York City

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**Nutrition Time Line**

1896

Atwater publishes  
*Proximate Composition of Food Materials*

1906

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



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1910

Pasteurized milk introduced



Jonelle Weaver/Photodisc/Getty Images

1912

Funk suggested scurvy, beriberi, and pellagra caused by deficiency of "vitamines" in the diet

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## Nutrition Time Line →

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**1913**

First vitamin discovered (vitamin A)

**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 was released. It was titled "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

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## Nutrition Time Line

### 1921

First fortified food produced: Iodized salt. It was needed to prevent widespread iodine deficiency goiter in many parts of the United States

Leonard Lessiny/PhotoLibrary



### 1928

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

### 1929

Essential fatty acids identified

PhotoDisc



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## **Nutrition Time Line**

### **1930s**

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



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### **1937**

Pellagra found to be due to a deficiency of niacin

### **1941**

First refined grain-enrichment standards developed



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**Nutrition Time Line****1941**

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

AP Photo

**1946**

National School Lunch Act passed

David Buffington/  
Photodisc/Getty Images**1947**

Vitamin B<sub>12</sub> identified

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**Nutrition Time Line****1953**

Double helix structure of DNA discovered

**1965**

Food Stamp Act passed, Food Stamp program established

**1966**

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

**1968**

First national nutrition survey in United States launched (the Ten State Nutrition Survey)

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**Nutrition Time Line****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

**1977**

Dietary Goals for the United States issued

**1978**

First Health Objectives for the Nation released

**1989**

First national scientific consensus report on diet and chronic disease published

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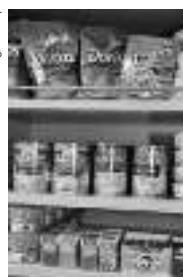
1997

RDAs expanded to Dietary Reference Intakes (DRIs)

1998

Folic acid fortification of refined grain products begins

Jeff Greenberg/Alamy



2003

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

2009

Global epidemics of obesity and diabetes threaten gains in life expectancy

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# Preface

It is our privilege to offer you the fourth edition of *Nutrition Through the Life Cycle*. This text was initially developed, and has been revised, to address the needs of instructors teaching, and students taking, a two- to four-credit course in life-cycle nutrition. It is written at a level that assumes students have had an introductory nutrition course. Overall, the text is intended to give instructors a tool they can productively use to enhance their teaching efforts, and to give students an engaging and rewarding educational experience they will carry with them throughout their lives and careers.

The authors of *Nutrition Through the Life Cycle* represent a group of experts who are actively engaged in clinical practice, teaching, and research related to nutrition during specific phases of the life cycle. All of us remain totally dedicated to the goals established for the text at its conception: to make the text comprehensive, logically organized, science-based, realistic, and relevant to the needs of instructors and students.

Chapter 1 summarizes key elements of introductory nutrition and gives students who need it a chance to update or renew their knowledge. Coverage of the life-cycle phases begins with preconceptional nutrition and continues with each major phase of the life cycle through adulthood and the special needs of the elderly. Each of these 19 chapters was developed based on a common organizational framework that includes key nutrition concepts, prevalence statistics, physiological principles, nutritional needs and recommendations, model programs, case studies, and recommended practices.

To meet the knowledge needs of students with the variety of career goals represented in many life-cycle nutrition courses, we include two chapters for each life-cycle phase. The first chapter for each life-cycle phase covers normal nutrition topics, and the second covers nutrition-related conditions and interventions. Every chapter focuses on scientifically based information and employs up-to-date resources and references. Each chapter ends with:

- A list of key points
- Review questions (excluding chapter 1; answers are located at the end of the book)
- A directory of internet and other resources for reliable information on topics presented in the chapter

## New to the Fourth Edition

Advances in knowledge about nutrition and health through the life cycle are expanding at a remarkably high rate.

New research is taking our understanding of the roles played by nutrients, nutrient–gene interactions, body fat, physical activity, and dietary supplements to new levels. The continued escalation rates of overweight, obesity, and type 2 diabetes are having broad effects on the incidence of disease throughout the life cycle. New knowledge about nutrition and health through the life cycle requires that we understand the effects of nutrients and body fat on hormonal activity, nutrient triggers to gene expression, and the roles of nutrients in the development and correction of chronic inflammation, oxidative stress, and endothelial dysfunction. Recommendations for dietary and nutrient supplement intake and for physical activity in health and disease are changing due to these understandings.

The practice of dietetics and nutrition is changing due to the emerging emphasis on electronic medical records, evidence-based health care services, and standardization of care delivery. The American Dietetic Association is responding to these changes through the development of nutrition care process standards. These process standards are intended to provide a systematic approach to the delivery of nutrition care to patients and clients. Revised standards for nutrition assessment have also been developed by the American Dietetic Association.

You will see these emerging areas of direct relevance to nutrition and updated information about nutrition incorporated throughout the fourth edition of *Nutrition Through the Life Cycle*.

The fourth edition differs from the third in important ways. We have:

- Added 8–12 review questions at the end of Chapters 2–19.
- Expanded coverage of nutrition assessment in all chapters.
- Added nutrition biomarker values by life-cycle stage.
- Added content and case studies related to the nutrition care process (NCP).
- Expanded presentation of oxidative stress, free radicals, antioxidants, chronic inflammation, and their relationship to diet and disease states from infertility to aging.
- Expanded coverage of ethnic disparities in health status.
- Added photographs, tables, and figures to enhance instruction and student understanding of material presented.

- Increased emphasis on use of SI units; expanded list of SI unit conversion factors for nutrition biomarkers appear in Appendix C.
- Incorporated presentations of mechanisms underlying nutrition and disease relationships.

### Chapter-by-Chapter Changes

In addition to the enhancements just listed for every chapter, we have extensively revised and updated the text based on the most current research. The following is a list of some of those changes.

#### Chapter 1: Nutrition Basics

- Expanded coverage of the life-cycle concept as it relates to nutrition and lifelong health
- New illustration that shows the similarity among the chemical structures of monosaccharides
- Updated food-sources-of-nutrients tables to reflect food manufacturers' fortification changes and new analyses of nutrient content of foods
- Updated content on cholesterol, including plant cholesterol
- Updated content on fiber
- New content on choline
- Updated summary table on the vitamins
- Revised definition of *kwashiorkor* based on new evidence of its potential cause(s)
- Added section on increasing omega-3 fatty acid intake
- Updated table on top sources of antioxidant-rich foods
- Added content on low and high folic acid intake and cancer risk
- Updated content on nutrient–gene interactions during critical stages of growth and development and later health risks
- Revised content on glycemic index and health
- Expanded coverage of nutrition and autoimmune diseases, chronic inflammation, and oxidative stress
- Updated table on examples of diseases and disorders linked to diet
- Added content on shared dietary risk factors for chronic disease
- Expanded coverage on characteristics of healthy diets
- Modified content related to issues surrounding the “good food, bad food” concept
- Expanded content on nutrition assessment, including a new table of normal levels of various nutrition biomarkers that may be used as part of a biochemical assessment of nutritional status
- New information about mypyramid.gov features, the Mediterranean diet, and the DASH diet

#### Chapter 2: Preconception Nutrition

- Added background information and summary table related to the Nutrition Care Process
- Added case study that uses the Nutrition Care Process procedures

- Update on success (or the lack of it) in meeting Health Objectives for the year 2010 related to preconception men and women
- Updated content and table on factors related to altered fertility in women and men
- Revised content on body fat, obesity, and fertility
- Substantially modified sections on factors affecting male fertility to reflect new research findings related to nutrition exposures and sperm development and function
- Updated and expanded table on caffeine content of foods and beverages
- Updated content on oral contraceptives and nutrition status
- Added content on multivitamin supplements, folate intake, and fertility

#### Chapter 3: Preconception Nutrition: Conditions and Interventions

- Expanded presentation of ethnic and racial disparities in nutrition-related health disorders
- Added examples of mechanisms underlying nutrition and health relationships prior to and early in pregnancy
- Substantially expanded coverage on obesity and fertility, with new sections on bariatric surgery, nutrient needs, and fertility outcomes
- Updated table on biological bases of infertility in obese men and women
- Added coverage of the effects of obesity on chronic inflammation and insulin resistance on fertility-related disorders
- Reorganized, updated section on nutritional management of type 2 diabetes before pregnancy
- Updated section on nutrition recommendations for type 2 diabetes before pregnancy
- New section on pre-diabetes
- Updated sections on PKU and celiac disease, including a section on maternal PKU

#### Chapter 4: Nutrition During Pregnancy

- Updated natality statistics
- Added content related to rates of preterm delivery and low birth weight by ethnic/racial background
- Added content related to effects of nutrition exposures during critical periods of growth and development on gene expression and future health; added definitions and discussion of “developmental plasticity” and “epigenetic” mechanisms
- Updated content on pre-pregnancy weight status, weight gain, and pregnancy outcomes
- Updated content on early pregnancy blood lipid levels, oxidative stress, and pregnancy outcomes
- Refined coverage of effects of diet on pregnancy outcomes

- Expanded coverage of the functions of protein, fat, and essential fatty acids during pregnancy
- Updated coverage on the effects of protein, fat, and essential fatty acids on the course and outcome of pregnancy
- New table on the EPA+DHA, vitamin A, and vitamin D
- Updated content related to folate and pregnancy; added content on choline and pregnancy course and outcome
- Updated content on vitamin D and the course and outcome of pregnancy
- New overview sections on the need for vitamins during pregnancy and the need for minerals during pregnancy
- Updated section on fluoride and enamel formation during pregnancy
- Updated content on iron and iodine and pregnancy; added section on bioactive food components
- New section on nutrition assessment during pregnancy that includes a nutrition-biomarker assessment component and a table of normal nutrition biomarker concentrations during pregnancy
- Updated section on dietary supplements (including vitamin and mineral supplements) and pregnancy; new table on the nutrient formulation of common prenatal multivitamin and mineral supplements

### **Chapter 5: Nutrition During Pregnancy: Conditions and Interventions**

- Increased coverage of mechanisms underlying nutrition and health disorders during pregnancy
- Reorganized to make obesity and pregnancy outcome the first condition presented, with new material including a table titled “Comparative prevalence of obesity prior to pregnancy and outcomes related to pre-pregnancy weight status”
- New sections: “Nutrition Recommendations and Interventions for Obesity During Pregnancy,” “Pregnancy after Bariatric Surgery,” and “Nutrition Care for Pregnant Women Post Bariatric Surgery”
- New coverage of dumping syndrome
- Fully updated table on “Dietary and other environmental exposures that increase or decrease chronic inflammation and oxidative stress”
- Updated content on carbohydrates, glycemic index, and diabetes during pregnancy
- New section titled “Vitamin and Mineral Supplementation and the Risk of Preeclampsia”
- Updated content on the nutritional management of diabetes (gestational, type 1, and type 2) during pregnancy
- New illustration of chorionicity in coverage on twin pregnancy

### **Chapter 6: Nutrition During Lactation**

- New table on nutrition assessment for breastfeeding women
- Updated information on breastfeeding rates
- New diagram of breast that reflects latest understanding of ductal structure
- New discussion of the risks of cruciferous vegetables
- New material on breastfeeding duration
- Coverage of effects of implant surgery on breastfeeding
- New discussion of infant colic and its nutritional management
- New discussion of the effect of the WIC program on breastfeeding prevalence and duration
- Added overview of the obstacles to breastfeeding
- New information on the preparation of the breast for lactation during pregnancy and common problems such as leaking prior to delivery
- Additional information on MyPyramid for Moms, specific to pregnancy and lactation

### **Chapter 7: Nutrition During Lactation: Conditions and Interventions**

- Updated discussion of common breastfeeding conditions
- Added section on flat or inverted nipples
- Added section on hyperlactation
- Updated information in engorgement section, including instructions on use of cabbage leaves
- Updated information in plugged-duct section, including instruction on use of lecithin
- Updated section on mastitis, modifying definition and treatment options
- Additional section on low milk supply
- Updated section on maternal medications, including discussion of OTC cold remedies, antihistamines, and decongestants
- Updated herbal remedies section
- Updated alcohol section, including AAP recommendations
- Updated smoking information with potential changes to mother’s milk and infant behaviors
- Updated THC/marijuana section, including discussion of new studies
- Near-term section retitled as “late preterm”
- Added/updated info in the human-milk preterm section, reflecting current studies on infection rates
- Updated HIV section with WHO policy
- Additional information on human-milk storage guidelines, including estimated volumes
- Updated statistics on milk banking in North America



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sample content of Nutrition Through the Life Cycle

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