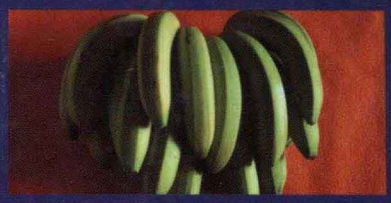
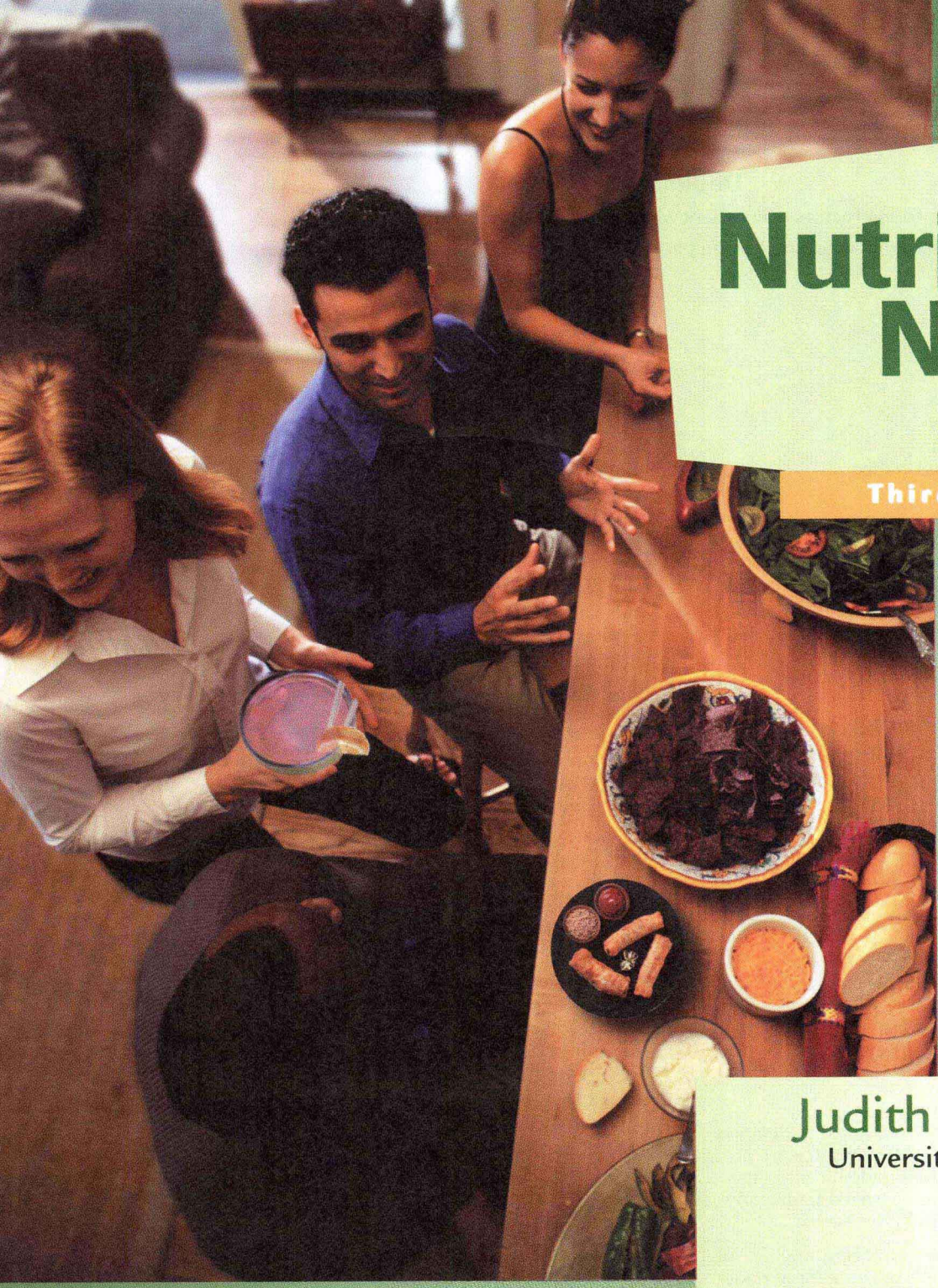


Third Edition

Judith E. Brown

Nutrition NOW



Nutrition Now

Third Edition

Judith E. Brown
University of Minnesota

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Dedication

To instructors everywhere who love to teach nutrition,
and to students who find learning about nutrition to be both enriching and fun.

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The Dietary Reference Intakes (DRI) include two sets of values that serve as goals for nutrient intake—Recommended Dietary Allowances (RDA) and Adequate Intakes (AI). The RDA reflect 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. AI are more tentative than RDA, but both may be used as goals for nutrient intakes.

1997–2001 Recommended Dietary Allowances (RDA) and Adequate Intakes (AI)

	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 AI (µg/day)[d]	
Infants													
0–0.5	0.2	0.3	2	5	1.7	0.1	65	0.4	125	40	400	5	
0.5–1	0.3	0.4	4	6	1.8	0.3	80	0.5	150	50	500	5	
Children													
1–3	0.5	0.5	6	8	2	0.5	150	0.9	200	15	300	5	
4–8	0.6	0.6	8	12	3	0.6	200	1.2	250	25	400	5	
Males													
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	5	
14–18	1.2	1.3	16	25	5	1.3	400	2.4	550	75	900	5	
19–30	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	5	
31–50	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	5	
51–70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	10	
>70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	15	
Females													
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	5	
14–18	1.0	1.0	14	25	5	1.2	400	2.4	400	65	700	5	
19–30	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	5	
31–50	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	5	
51–70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	10	
>70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	15	
Pregnancy													
≤18	1.4	1.4	18	30	6	1.9	600	2.6	450	80	750	5	
19–30	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	5	
31–50	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	5	
Lactation													
≤18	1.4	1.6	17	35	7	2.0	500	2.8	550	115	1200	5	
19–30	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	5	
31–50	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	5	

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.

In addition to the values that serve as goals for nutrient intakes (presented in the table above), the Dietary Reference Intakes (DRI) include a set of values called Tolerable Upper Intake Levels (UL). The UL represent the maximum amount of a nutrient that appears safe for most healthy people to consume on a regular basis.

1997–2001 Tolerable Upper Intake Levels (UL)

	Vitamins								Minerals			
Age (yr)	Niacin (mg/day)[a]	Vitamin B_6 (mg/day)	Folate (µg/day)[a]	Choline (mg/day)	Vitamin C (mg/day)	Vitamin A (µg/day)[b]	Vitamin D (µg/day)	Vitamin E (mg/day)[c]	Calcium (mg/day)	Phosphorus (mg/day)	Magnesium (mg/day)[d]	Iron (mg/day)
Infants												
0–0.5	—	—	—	—	—	600	25	—	—	—	—	40
0.5–1	—	—	—	—	—	600	25	—	—	—	—	40
Children												
1–3	10	30	300	1000	400	600	50	200	2500	3000	65	40
4–8	15	40	400	1000	650	900	50	300	2500	3000	110	40
9–13	20	60	600	2000	1200	1700	50	600	2500	4000	350	40
Adolescents												
14–18	30	80	800	3000	1800	2800	50	800	2500	4000	350	45
Adults												
19–70	35	100	1000	3500	2000	3000	50	1000	2500	4000	350	45
>70	35	100	1000	3500	2000	3000	50	1000	2500	3000	350	45
Pregnancy												
≤18	30	80	800	3000	1800	2800	50	800	2500	3500	350	45
19–50	35	100	1000	3500	2000	3000	50	1000	2500	3500	350	45
Lactation												
≤18	30	80	800	3000	1800	2800	50	800	2500	4000	350	45
19–50	35	100	1000	3500	2000	3000	50	1000	2500	4000	350	45

[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.

[d] The UL for magnesium applies to synthetic forms obtained from supplements or drugs only.

1997–2001 Recommended Dietary Allowances (RDA) and Adequate Intakes (AI)

Vitamins			Minerals												
Vitamin E RDA (mg/day)[e]	Vitamin K AI (µg/day)	Calcium AI (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)		
4	2.0	210	100	30	0.27	2	110	15	200	0.003	0.01	0.2	2		
5	2.5	270	275	75	11	3	130	20	220	0.6	0.5	5.5	3		
6	30	500	460	80	7	3	90	20	340	1.2	0.7	11	17		
7	55	800	500	130	10	5	90	30	440	1.5	1.0	15	22		
11	60	1300	1250	240	8	8	120	40	700	1.9	2	25	34		
15	75	1300	1250	410	11	11	150	55	890	2.2	3	35	43		
15	120	1000	700	400	8	11	150	55	900	2.3	4	35	45		
15	120	1000	700	420	8	11	150	55	900	2.3	4	35	45		
15	120	1200	700	420	8	11	150	55	900	2.3	4	30	45		
15	120	1200	700	420	8	11	150	55	900	2.3	4	30	45		
11	60	1300	1250	240	8	8	120	40	700	1.6	2	21	34		
→ 15	75	1300	1250	360	15	9	150	55	890	1.6	3	24	43		
15	90	1000	700	310	18	8	150	55	900	1.8	3	25	45		
15	90	1000	700	320	18	8	150	55	900	1.8	3	25	45		
15	90	1200	700	320	8	8	150	55	900	1.8	3	20	45		
15	90	1200	700	320	8	8	150	55	900	1.8	3	20	45		
15	75	1300	1250	400	27	13	220	60	1000	2.0	3	29	50		
15	90	1000	700	350	27	11	220	60	1000	2.0	3	30	50		
15	90	1000	700	360	27	11	220	60	1000	2.0	3	30	50		
19	75	1300	1250	360	10	14	290	70	1300	2.6	3	44	50		
19	90	1000	700	310	9	12	290	70	1300	2.6	3	45	50		
19	90	1000	700	320	9	12	290	70	1300	2.6	3	45	50		

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

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1997–2001 Tolerable Upper Intake Levels (UL)

Minerals									
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)	
4	—	45	—	—	0.7	—	—	—	—	
5	—	60	—	—	0.9	—	—	—	—	
7	200	90	1000	2	1.3	300	3	0.2	—	
12	300	150	3000	3	2.2	600	6	0.3	—	
23	600	280	5000	6	10	1100	11	0.6	—	
34	900	400	8000	9	10	1700	17	1.0	—	
40	1100	400	10,000	11	10	2000	20	1.0	1.8	
40	1100	400	10,000	11	10	2000	20	1.0	1.8	
34	900	400	8000	9	10	1700	17	1.0	—	
40	1100	400	10,000	11	10	2000	20	1.0	—	
34	900	400	8000	9	10	1700	17	1.0	—	
40	1100	400	10,000	11	10	2000	20	1.0	—	

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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Judith E. Brown is a professor of nutrition and public health at the University of Minnesota. She received her Ph.D. in human nutrition from Florida State University and her M.P.H. in public health nutrition from the University of Michigan. She has received competitively funded research grants from the National Institutes of Health, the Centers for Disease Control and Prevention, and the Maternal and Child Health Bureau and has over 80 publications in the scientific literature including the *New England Journal of Medicine*, the *Journal of the American Medical Association*, and the *Journal of the American Dietetic Association*. A recipient of the Agnes Higgins Award in Maternal Nutrition from the March of Dimes, Dr. Brown teaches Human Nutrition and Health and Maternal and Infant Nutrition at the University of Minnesota. A registered dietitian, Brown is the successful author of *Everywoman's Guide to Nutrition* and *Nutrition for Pregnancy*.

Preface

We are pleased to present to instructors and students the third edition of *Nutrition Now.* Thoroughly updated, this text remains dedicated to complementing the instructional efforts of faculty who teach a one- to four-credit course on introductory nutrition to nonmajors. In line with the previous editions, *Nutrition Now* retains its scientific, student-focused, and practical approach to nutrition. It continues to be directed at the goals of increasing student understanding of basic nutrition concepts and developing skills for making healthful decisions about personal nutrition now and in the future. For many students, the course supported by *Nutrition Now* represents a happy balance between meeting an educational requirement and learning useful information about a subject of particular interest.

Readers of this preface will discover that the third edition covers new topics of growing importance to nutrition, and that the text's unique didactic features have been strengthened. There are now 33 "stand-alone" units in *Nutrition Now.* As before, subsets of units that match instructors' and students' interests and needs can be ordered and presented in class in any desired arrangement. Eleven of the units cover core nutrition topics, including nutrition concepts, nutrition and health relationships, the nutrients, healthy diets, and digestion. Other units address topics that touch students' lives regularly and that relate to students' professional interests. Topics covered in these 22 units include body weight, weight control, eating disorders, heart disease, cancer, herbal and other dietary supplements, sports nutrition, life cycle nutrition, food safety, and global nutrition. Exciting discoveries related to genes, genetic variation, and nutrition and health relationships receive first-time coverage in the nutrient-gene interactions unit.

In the third edition of *Nutrition Now,* you will find:

- **Expanded coverage** of herbal supplements (Unit 24), diabetes (Unit 12), genetically modified foods (Unit 21), food safety (Unit 32), Canadian dietary guides (Unit 6), the fetal origins hypothesis (Units 19 and 28), and lactose maldigestion (Units 12 and 17), as well as an expanded glossary.
- **Dietary Reference Intake values** released through 2001.
- **2000 Dietary Guidelines for Americans.**
- **New Nutrition Up Close** activities and other student activities.
- **A table of measurement equivalents.**
- **Additional Health Action features.**

Pedagogical Features

Nutrition Now continues to incorporate a number of unique approaches to student learning:

- Each unit begins with a feature called ***Nutrition Scoreboard*** that presents a set of true-false questions designed to test students' knowledge of various topics addressed in the unit. Answers to the questions appear on the following page.
- A **summary of the key concepts** covered is presented on the second page of each unit.
- **Every major point in each unit is accompanied by an illustration** that helps to drive the point home.

- ***Health Action* boxes** provide examples and guidelines for making healthful decisions about nutrition, food handling, and more.
- ***Nutrition Up Close* boxes** provide opportunities for students to apply nutrition concepts in their daily lives.
- ***WWW Links*** provide URLS and descriptions of high-quality nutrition resources.
- **Margin definitions** and an **end-of-text glossary** help students master the material presented.
- **Every version of the text includes a resource-rich appendix.** Materials include a table of food composition, the food exchange systems for the United States and for Canada, a table of intentional food additives, supplemental information related to the basic structure and function of cells, and a glossary.

A number of high-quality, useful aids to instruction are available to faculty adopting *Nutrition Now:*

- An ***Instructor's Manual*** is replete with class outlines, student activities, test questions and answers, and transparency masters of the Nutrition Scoreboard for each unit.
- A set of 80 **full-color transparencies** of key illustrations in the text.
- **CNN Videos** available to qualified adopters. These news clips are a good way to introduce nutrition topics and ignite class discussion.
- **Nutrilink CD-ROM** presentation software supplement. This software contains illustrations from this and other introductory nutrition textbooks. Instructors can download images, photographs, and animations from Nutrilink into Power Point or other electronic presentation programs.
- **Diet Analysis** software and a **Nutrition Interactive CD-ROM** are available for students to supplement their learning. These are sold individually or may be bundled with the text for a reduced price.
- ***Nutrition Now* on CD-ROM** provides the full text with student quizzes, animations, and video clips to enhance learning.

Acknowledgments

Nutrition Now has been and continues to be the product of a group of creative, kind, and highly skilled people. From rough drafts to published copy, the atmosphere of shared enthusiasm made my part of the effort entirely fun. For making that possible, and for his inside-out knowledge of the ingredients of high-quality textbooks, I thank Pete Marshall, Publisher, Wadsworth Publishing. Special thanks go to the rest of the editorial team for their work on all facets of production. A pat on the back goes to Becky Tollerson, Marketing Manager, for her effort in marketing this book. The creative and talented mind behind the art work in *Nutrition Now* belongs to Ann Borman. (She is the reason I traveled to a little UPS box in a dark alley late at night to drop off chunks of the manuscript.) The text has been thoughtfully reviewed for author's mistakes by Patricia Lewis. Her terrific copy-editing job is much appreciated. Once again a miracle has happened. Batches of typed pages, taped-on notes, and ideas have been converted into a text to be proud of. My thanks to you all.

Textbooks don't get to see the light of day unless instructors know they are available and have a chance to hear about them and review them. I am fortunate to have representation of *Nutrition Now* placed in the highly capable hands of Wadsworth sales representatives and managers. I hope you enjoy reading this new edition.

The Instructor's Manual for *Nutrition Now* was developed by Judy Kaufman. Thank you for expanding the usefulness of the text.

The second edition of *Nutrition Now* received a thorough going-over by faculty who teach introductory nutrition. Their comments always make me sit up and pay attention. And you will note in the third edition that I did pay attention. To the reviewers, I send my thanks for your time and helpful comments.

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Daily Values for Food Labels

The Daily Values are standard values developed by the Food and Drug Administration (FDA) for use on food labels. Daily Values for protein, vitamins, and minerals reflect average allowances based on the RDA. Daily Values for nutrients and food components, such as fat and fiber, that do not have an established RDA but do have important relationships with health are based on recommended calculation factors as noted.

Proteins, Vitamins, and Minerals

Nutrient	Amount
Protein[a]	50 g
Thiamin	1.5 mg
Riboflavin	1.7 mg
Niacin	20 mg NE
Biotin	300 µg
Pantothenic acid	10 mg
Vitamin B_6	2 mg
Folate	400 µg
Vitamin B_{12}	6 µg
Vitamin C	60 mg
Vitamin A	5000 IU
Vitamin D	400 IU
Vitamin E	30 IU
Vitamin K	80 µg
Calcium	1000 mg
Iron	18 mg
Zinc	15 mg
Iodine	150 µg
Copper	2 mg
Chromium	120 µg
Selenium	70 µg
Molybdenum	75 µg
Manganese	2 mg
Chloride	3400 mg
Magnesium	400 mg
Phosphorus	1000 mg

[a]The Daily Values for protein vary for different groups of people: pregnant women, 60 g; nursing mothers, 65 g; infants under 1 year, 14 g; children 1 to 4 years, 16 g.

Nutrients and Food Components

Food Component	Amount	Calculation Factors
Fat	65 g	30% of kcalories
Saturated fat	20 g	10% of kcalories
Cholesterol	300 mg	Same regardless of kcalories
Carbohydrate (total)	300 g	60% of kcalories
Fiber	25 g	11.5 g per 1000 kcalories
Protein	50 g	10% of kcalories
Sodium	2400 mg	Same regardless of kcalories
Potassium	3500 mg	Same regardless of kcalories

Note: Daily Values were established for adults and children over 4 years old. The values for energy-yielding nutrients are based on 2000 kcalories a day.

GLOSSARY OF NUTRIENT MEASURES

kcal: kcalories; a unit by which energy is measured.

g: grams; a unit of weight equivalent to about 0.03 ounces.

mg: milligrams; one-thousandth of a gram.

µg: micrograms; one-millionth of a gram.

IU: international units; an old measure of vitamin activity determined by biological methods (as opposed to new measures that are determined by direct chemical analyses). Many fortified foods and supplements use IU on their labels.

- For vitamin A, 1 IU = 0.3 µg retinol, 3.6 µg β-carotene, or 7.2 µg other vitamin A carotenoids.
- For vitamin D, 1 IU = 0.025 µg cholecalciferol.
- For vitamin E, 1 IU = 0.67 natural α-tocopherol (other conversion factors are used for different forms of vitamin E).

mg NE: milligrams niacin equivalents; a measure of niacin activity.

- 1 NE = 1 mg niacin.
  = 60 mg tryptophan (an amino acid).

µg DFE: micrograms dietary folate equivalents; a measure of folate activity.

- 1 µg DFE = 1 µg food folate.
  = 0.6 µg fortified food or supplement folate.
  = 0.5 µg supplement folate taken on an empty stomach.

µg RAE: micrograms retinol activity equivalents; a measure of vitamin A activity.

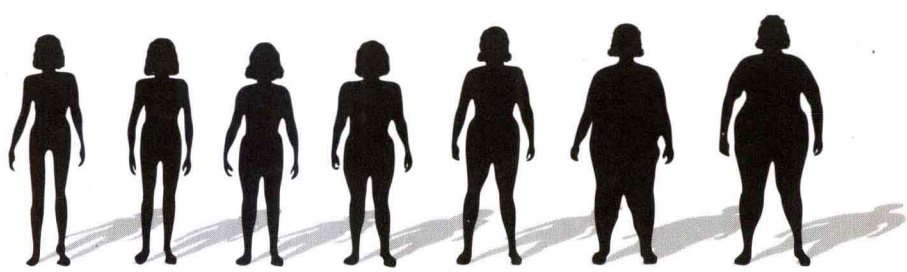
- 1 µg RE = 1 µg retinol.
  = 12 µg β-carotene.
  = 24 µg other vitamin A carotenoids.

Body Mass Index (BMI)

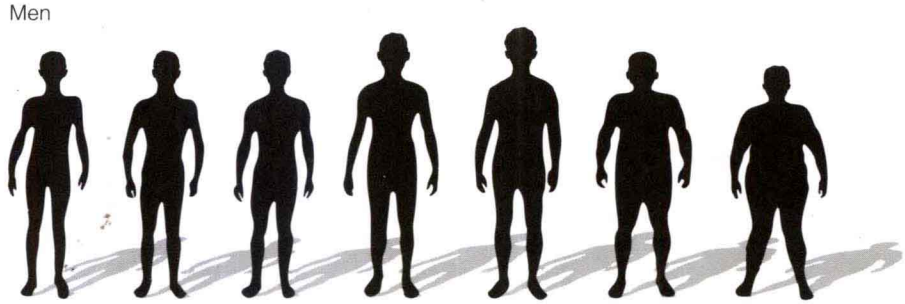
Height	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	Body Weight (pounds)																						
4′10″	86	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191
4′11″	89	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198
5′0″	92	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204
5′1″	95	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211
5′2″	98	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218
5′3″	102	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225
5′4″	105	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232
5′5″	108	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240
5′6″	112	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247
5′7″	115	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255
5′8″	118	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262
5′9″	122	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270
5′10″	126	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278
5′11″	129	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286
6′0″	132	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294
6′1″	136	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302
6′2″	141	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311
6′3″	144	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319
6′4″	148	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328
6′5″	151	160	168	176	185	193	202	210	218	227	235	244	252	261	269	277	286	294	303	311	319	328	336
6′6″	155	164	172	181	190	198	207	216	224	233	241	250	259	267	276	284	293	302	310	319	328	336	345
	Under-weight	**Healthy Weight**						**Overweight**					**Obese**										
	(<18.5)	(18.5–24.9)						(25–29.9)					(≥30)										

Find your height along the left-hand column and look across the row until you find the number that is closest to your weight. The number at the top of that column identifies your BMI. Chapter 8 describes how BMI correlates with disease risks and defines obesity, and Chapter 16 presents BMI for children and adolescents. The area shaded in green represents healthy weight ranges. The figure below presents silhouettes of various BMI.

Women



Men



SOURCE: Reprinted from material of the Dietitians of Canada.

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