

Personal Nutrition

MARIE BOYLE | TENTH EDITION

Analyze Your Diet

Diet & Wellness Plus shows you how your current diet relates to recommended health goals. Use *Diet & Wellness Plus* to track your diet, generate reports, and analyze the nutritional value of the food you eat.

Assignment Objectives:

1. Gain experience in keeping a food record and utilizing a computer database
2. Collect and analyze food intake data and determine solutions for any dietary shortcomings identified

Instructions

Part I: Create a 3-Day Food Intake Record

1. Record all foods, snacks, and beverages that you consume on 3 consecutive days (include 2 weekdays and 1 weekend day). Do not include any vitamin, mineral, or protein supplements that you are taking so that you can accurately evaluate your dietary intake. Write down the information as soon as you finish eating.
2. Estimate amounts, as closely as possible, of each food item. Weigh or use household measuring cups and spoons to estimate amounts and, where needed, refer to food labels to determine ingredients. For casseroles, soups, or hot dishes, estimate the amount of each ingredient that you consumed.
3. Remember to list any salt added to foods; sugar added to cereal and beverages; milk or cream in coffee or tea; and any margarine, butter, oils, or gravies that you add to foods.

Tips: When recording your intake, be sure to include **everything** you eat, including serving sizes (cups, ounces, etc.). Also remember to include your snacks and beverages. Describe the type of food you have eaten, giving as many details as possible. For example, if you drank milk, indicate whether you had whole, skim, 2%, or 1% milk. Here is an example format for recording intake:

Time	Food	Amount (cups, oz, tsp, etc.)	Notes

Part II: Perform Computerized Diet Analysis

1. Sign in to *Diet & Wellness Plus* from www.cengagebrain.com and create a profile following the directions given in the program.
2. Click on the "Track Diet" tab and enter the foods you ate for each meal on each day.
3. Click on **Reports**, then select and print or save the following **Reports**:
 - a. **Intake Spreadsheets** (one for each day)
 - b. **Intake vs. Goals** (reporting your 3-day average intake compared to recommendations)

- c. **MyPlate Analysis**, which compares your intake with your recommendations
- d. **Energy Balance**
- e. **Fat Breakdown**
- f. **Macronutrient Ranges**
- g. **Daily Food Log**

Part III: Complete an Analysis of Your Diet Based on Your Reports

Using your analysis reports, respond to the questions in each section.

A. Energy (calories)

1. What was your energy (calorie) intake?
2. What is your DRI recommendation for energy (calorie) intake on your Intake vs. Goals report?
3. Is this a realistic caloric recommendation for you? Why or why not?

B. Carbohydrates

1. Did your carbohydrate intake meet the minimum of 130 grams per day?
2. How many grams of fiber did you consume? How does your intake compare to the DRI?
3. List two good sources of fiber in your diet. See each day's intake spreadsheet.
4. What changes could you make to improve your fiber intake?
5. Take a look at your daily food logs and list three foods that contain naturally occurring sugars (e.g., milk) and those that contain added sugars (e.g., soda).
6. What changes, if any, could you make in your sugar intake?

C. Fats

1. Fill in Table 1 using the data in your reports.

Type of Fat	Recommended Amount	% Recommended
Total fat (g)		
Saturated (g)		
Polyunsaturated (g)		
Monounsaturated (g)		
Trans (g)		

2. Which types of fat in your diet need to be decreased and/or increased and why?
3. If your overall intake of fat exceeded the recommended amount (20 to 35 percent of total calories), what changes could you make to improve your fat intake?

D. Protein

1. Calculate your DRI for protein. _____ grams per day.
2. How many grams of protein did you consume on average per day? _____ grams per day.
3. Does your protein intake need to be altered? If so, how?
4. How well did you balance your protein intake from animal sources vs. plant sources?

E. Vitamin and Mineral Intake

1. List ALL vitamins and minerals that were under 75% or were over 200% of your recommended intake, or above your Tolerable Upper Intake Level in Table 2.

TABLE 2	
Vitamins	
Under 75%	>200% or >UL
Minerals	
Under 75%	>200% or >UL

2. Why do you think that you did not achieve the recommended intakes for the vitamins or minerals listed above? What foods could you add to your diet to increase your intake of these vitamins and minerals?
3. For the nutrients listed above that are in excess (over 200%), what foods contributed to this excess? Can you adjust your diet to create a better balance of vitamins and minerals?

F. Your Overall Diet

1. Use the MyPlate Analysis report for your 3-day average to complete Table 3.

TABLE 3 MyPlate Analysis			
	Recommended Amount	My Intake	% Recommended Amount
Grains, ounce equivalents			
Vegetables, cup equivalents			
Fruits, cup equivalents			
Dairy, cup equivalents			
Protein foods, oz. equivalents			

2. How well does your MyPlate analysis reflect the five characteristics of a healthy diet (adequacy, balance, calorie control, moderation, and variety) discussed in your textbook? Briefly discuss **each** one as it applies to your diet.

G. Design a Healthy Diet

Take a look at your food records and analysis reports and think about the changes that you could make to address any concerns and improve your overall diet.

1. Using Table 4, evaluate your deficiencies and excesses. Add new rows if needed. You do not need to run any new printouts. Use your intake spreadsheets to help you.

TABLE 4 Diet Evaluation			
Nutrients under 75%	What will you change?	Nutrients over 200%	What will you change?
Ex: Calcium is 350 mg short	Add 8 oz. milk = 300 mg	Sodium 1000 mg over	Subtract 1 c. canned soup = 950 mg

2. In one or two paragraphs, summarize what changes you would make to your diet to improve it.

H. Assignment Completion.

Assemble the following items to complete this assignment:

1. LOGS and REPORTS:
 - Daily Food Logs (one for each day)
 - Intake Spreadsheets (one for each day)
 - Intake vs. Goals
 - MyPlate Analysis (3-day average)
2. DIET ANALYSIS QUESTIONS (SECTIONS A to G): Your responses to the questions in sections A through G.

Body Mass Index (BMI)

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Height	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 (<18.5)	Healthy Weight (18.5 – 24.9)						Overweight (25 – 29.9)						Obese (≥ 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. The area shaded in green represents healthy weight ranges.

Dietary Reference Intakes (DRI)

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 (cal/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	13.5	1.5
1–3 ^g	—	86 (34)	12 (27)	1.3	1046	130	19	—	7	0.7	13	1.1
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	0.8
31–50				3.7	3067 ^h	130	38	—	17	1.6	56	0.8
>50				3.7	3067 ^h	130	30	—	14	1.6	56	0.8
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	13.5	1.5
1–3 ^g	—	86 (34)	12 (27)	1.3	992	130	19	—	7	0.7	13	1.1
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 ⁱ	130	25	—	12	1.1	46	0.8
31–50				2.7	2403 ⁱ	130	25	—	12	1.1	46	0.8
>50				2.7	2403 ⁱ	130	21	—	11	1.1	46	0.8
Pregnancy												
1st trimester				3.0	+0	175	28	—	13	1.4	+25	1.1
2nd trimester				3.0	+340	175	28	—	13	1.4	+25	1.1
3rd trimester				3.0	+452	175	28	—	13	1.4	+25	1.1
Lactation												
1st 6 months				3.8	+330	210	29	—	13	1.3	+25	1.1
2nd 6 months				3.8	+400	210	29	—	13	1.3	+25	1.1

NOTE: For all nutrients, values for infants are AI. Dashes indicate that values have not been determined.
^aThe 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.
^bThe 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 2 (page 44), Chapter 10 (page 296), and www.ChooseMyPlate.gov provide tools to determine Estimated Energy Requirements.
^cThe linolenic acid referred to in this table and text is the omega-3 fatty acid known as alpha-linolenic acid.

^dThe values listed are based on reference body weights.
^eAssumed to be from human milk.
^fAssumed to be from human milk and complementary foods and beverages. This includes approximately 0.6 L (~3 cups) as total fluid including formula and drinking water.
^gFor energy, the age groups for young children are 1–2 years and 3–8 years.
^hFor males, subtract 10 calories per day for each year of age above 19.
ⁱFor females, subtract 7 calories 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, by the National Academy of Sciences.

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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 (μg/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	10	4	2.0
0.5–1	0.3	0.4	4	6	1.8	0.3	80	0.5	150	50	500	10	5	2.5
Children														
1–3	0.5	0.5	6	8	2	0.5	150	0.9	200	15	300	15	6	30
4–8	0.6	0.6	8	12	3	0.6	200	1.2	250	25	400	15	7	55
Males														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	15	11	60
14–18	1.2	1.3	16	25	5	1.3	400	2.4	550	75	900	15	15	75
19–30	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	15	15	120
31–50	1.2	1.3	16	30	5	1.3	400	2.4	550	90	900	15	15	120
51–70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	15	15	120
>70	1.2	1.3	16	30	5	1.7	400	2.4	550	90	900	20	15	120
Females														
9–13	0.9	0.9	12	20	4	1.0	300	1.8	375	45	600	15	11	60
14–18	1.0	1.0	14	25	5	1.2	400	2.4	400	65	700	15	15	75
19–30	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	15	15	90
31–50	1.1	1.1	14	30	5	1.3	400	2.4	425	75	700	15	15	90
51–70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	15	15	90
>70	1.1	1.1	14	30	5	1.5	400	2.4	425	75	700	20	15	90
Pregnancy														
≤18	1.4	1.4	18	30	6	1.9	600	2.6	450	80	750	15	15	75
19–30	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	15	15	90
31–50	1.4	1.4	18	30	6	1.9	600	2.6	450	85	770	15	15	90
Lactation														
≤18	1.4	1.6	17	35	7	2.0	500	2.8	550	115	1200	15	19	75
19–30	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	15	19	90
31–50	1.4	1.6	17	35	7	2.0	500	2.8	550	120	1300	15	19	90

NOTE: For all nutrients, values for infants are AI.

^aNiacin recommendations are expressed as niacin equivalents (NE), except for recommendations for infants younger than 6 months, which are expressed as preformed niacin.

^bFolate recommendations are expressed as dietary folate equivalents (DFE).

^cVitamin A recommendations are expressed as retinol activity equivalents (RAE).

^dVitamin D recommendations are expressed as cholecalciferol and assumes minimal sun exposure.

^eVitamin 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

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 (µg/day) ^b	Vitamin D (µg/day)	Vitamin E (mg/day) ^c
Infants								
0–0.5	—	—	—	—	—	600	25	—
0.5–1	—	—	—	—	—	600	38	—
Children								
1–3	10	30	300	1000	400	600	63	200
4–8	15	40	400	1000	650	900	75	300
Adolescents								
9–13	20	60	600	2000	1200	1700	100	600
14–18	30	80	800	3000	1800	2800	100	800
Adults								
19–70	35	100	1000	3500	2000	3000	100	1000
>70	35	100	1000	3500	2000	3000	100	1000
Pregnancy								
≤18	30	80	800	3000	1800	2800	100	800
19–50	35	100	1000	3500	2000	3000	100	1000
Lactation								
≤18	30	80	800	3000	1800	2800	100	800
19–50	35	100	1000	3500	2000	3000	100	1000

^aThe UL for niacin and folate apply to synthetic forms obtained from supplements, fortified foods, or a combination of the two.
^bThe UL for vitamin A applies to the preformed vitamin only.

^cThe 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

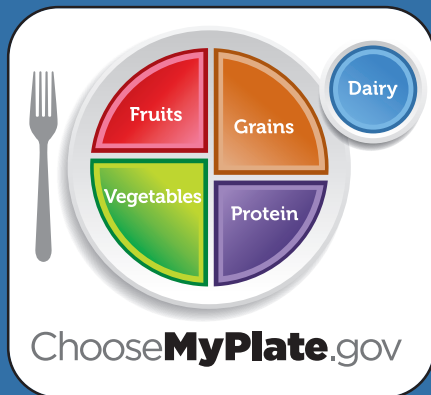
Age (yr)	Sodium (mg/day)	Chloride (mg/day)	Calcium (mg/day)	Phosphorus (mg/day)	Magnesium (mg/day) ^a	Iron (mg/day)	Zinc (mg/day)	Iodine (µg/day)	Selenium (µg/day)	Copper (µg/day)	Manganese (mg/day)	Fluoride (mg/day)	Molybdenum (µg/day)	Boron (mg/day)	Nickel (mg/day)
Infants															
0–0.5	— ^e	— ^e	1000	—	—	40	4	—	45	—	—	0.7	—	—	—
0.5–1	— ^e	— ^e	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
Adolescents															
9–13	2200	3400	3000	4000	350	40	23	600	280	5000	6	10	1100	11	0.6
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
51–70	2300	3600	2000	4000	350	45	40	1100	400	10,000	11	10	2000	20	1.0
>70	2300	3600	2000	3000	350	45	40	1100	400	10,000	11	10	2000	20	1.0
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

^aThe UL for magnesium applies to synthetic forms obtained from supplements or drugs only.
^eSource of intake should be from human milk (or formula) and food only.

NOTE: A UL 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.

SOURCE: Adapted with permission from the *Dietary Reference Intakes* series, National Academies Press. Copyright 1997, 1998, 2000, 2001, 2002, 2005 by the National Academy of Sciences. Courtesy of the National Academies Press, Washington, D.C.

What's on your plate?



Before you eat, think about what and how much food goes on your plate or in your cup or bowl. Over the day, include foods from all food groups: vegetables, fruits, whole grains, low-fat dairy products, and lean protein foods.

- Make half your plate fruits and vegetables.
- Make at least half your grains whole.
- Switch to skim or 1% milk.
- Vary your protein food choices.

Cut back on sodium and empty calories from solid fats and added sugars.

- Look out for salt (sodium) in foods you buy. Compare sodium in foods and choose those with a lower number.
- Drink water instead of sugary drinks. Eat sugary desserts less often.
- Make foods that are high in solid fats—such as cakes, cookies, ice cream, pizza, cheese, sausages, and hot dogs—occasional choices, not everyday foods.
- Limit empty calories to less than 270 per day, based on 2,000-calorie diet.

Be physically active your way. Pick activities you like and do each for at least 10 minutes at a time. Every bit adds up, and health benefits increase as you spend more time being active.

VEGETABLES	FRUITS	GRAINS	DAIRY	PROTEIN FOODS
<p>Eat more red, orange, and dark-green veggies like tomatoes, sweet potatoes, and broccoli in main dishes.</p> <p>Add beans or peas to salads (kidney or chickpeas), soups (split peas or lentils), and side dishes (pinto or baked beans), or serve as a main dish.</p> <p>Fresh, frozen, and canned vegetables all count. Choose “reduced sodium” or “no-salt-added” canned veggies.</p>	<p>Use fruits as snacks, salads, and desserts. At breakfast top your cereal with bananas or strawberries; add blueberries to pancakes.</p> <p>Buy fruits that are dried, frozen, and canned (in water or 100% juice), as well as fresh fruits.</p> <p>Select 100% fruit juice when choosing juices.</p>	<p>Substitute whole-grain choices for refined-grain breads, bagels, rolls, breakfast cereals, crackers, rice, and pasta.</p> <p>Check the ingredients list on product labels for the words “whole” or “whole grain” before the grain ingredient name.</p> <p>Choose products that name a whole grain first on the ingredients list.</p>	<p>Choose skim (fat-free) or 1% (low-fat) milk. They have the same amount of calcium and other essential nutrients as whole milk, but less fat and calories.</p> <p>Top fruit salads and baked potatoes with low-fat yogurt.</p> <p>If you are lactose intolerant, try lactose-free milk or fortified soymilk (soy beverage).</p>	<p>Eat a variety of foods from the protein food group each week, such as seafood, beans and peas, and nuts as well as lean meats, poultry, and eggs.</p> <p>Twice a week, make seafood the protein on your plate.</p> <p>Choose lean meats and ground beef that are at least 90% lean.</p> <p>Trim or drain fat from meat and remove skin from poultry to cut fat and calories.</p>

For a 2,000-calorie daily food plan, you need the amounts below from each food group. To find amounts personalized for you, go to ChooseMyPlate.gov.

Eat 2½ cups every day	Eat 2 cups every day	Eat 6 ounces every day	Get 3 cups every day	Eat 5½ ounces every day
<p>What counts as a cup? 1 cup of raw or cooked vegetables or vegetable juice; 2 cups of leafy salad greens</p>	<p>What counts as a cup? 1 cup of raw or cooked fruit or 100% fruit juice; ½ cup dried fruit</p>	<p>What counts as an ounce? 1 slice of bread; ½ cup of cooked rice, cereal, or pasta; 1 ounce of ready-to-eat cereal</p>	<p>What counts as a cup? 1 cup of milk, yogurt, or fortified soymilk; 1½ ounces natural or 2 ounces processed cheese</p>	<p>What counts as an ounce? 1 ounce of lean meat, poultry, or fish; 1 egg; 1 tbsp peanut butter; ½ ounce nuts or seeds; ¼ cup beans or peas</p>

TENTH EDITION

PERSONAL NUTRITION

Marie A. Boyle

COLLEGE OF SAINT ELIZABETH



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In memory of Jesse, Dylan, Kate, McCauley,
and Elvis—my twinkling stars in the night
sky—and to all those who surround
themselves with lives even more fleeting
than their own. And to Maggie, Rex,
and Tess—may there always be time for
footprints in the sand.

—MARIE A. BOYLE

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MARIE A. BOYLE, PhD, RD, received her BA in psychology from the University of Southern Maine and her MS and PhD in nutrition from Florida State University in Tallahassee, Florida. She is author of the community nutrition textbook *Community Nutrition in Action: An Entrepreneurial Approach*. She is Professor of Nutrition at the College of Saint Elizabeth in Morristown, New Jersey. Her other professional activities include serving as an author and reviewer for the Academy of Nutrition and Dietetics. She coauthored the current Position Paper of the Academy of Nutrition and Dietetics on *Nutrition Security in Developing Nations: Sustainable Food, Water, and Health*, and serves as editor-in-chief of the *Journal of Hunger and Environmental Nutrition* by Taylor & Francis Publishers. She is a member of the Academy of Nutrition and Dietetics, the American Public Health Association, and the Society for Nutrition Education and Behavior.

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Preface

This 10th edition of *Personal Nutrition* reflects the same vision we had in writing the first edition of this book some 30 years ago—that is, to apply basic nutrition concepts to personal, everyday life. The text is designed to support the many one- to four-credit introductory nutrition courses available to students today from a variety of majors, and offers all readers the opportunity to develop practical skills in making decisions regarding their personal nutrition and health. Our challenge has been to teach facts about nutrition, to nurture critical thinking skills, and to motivate readers to apply what they learn in daily life.

Chapter Content

Chapter 1 introduces the basic nutrients the body needs and provides a personal invitation to eat well for optimum health. It assists readers in becoming sophisticated consumers of new information about nutrition, and explores the factors that affect food choices, including the media, advertising, and cultural factors. Chapter 2 describes in detail the MyPlate food guide and related nutrition tools, and the 2015–2020 *Dietary Guidelines for Americans* needed to create healthy eating patterns. It provides the newly revised food label for understanding the nutrition information, terminology, and health claims found on labels. Chapter 2 also includes a section on various international and ethnic cuisines that highlights the multicultural heritage of our country. Chapter 3 provides a colorfully illustrated introduction to the workings of the human body, with an emphasis on the body's digestion and absorption of nutrients from foods. Chapters 4 through 8 present the nutrients and show how they all work together to nourish the body. Chapters 7 and 8 take a functional approach in presenting the roles of vitamins and minerals and spotlights the emerging importance of the antioxidant nutrients and phytochemicals; both chapters include colorful food photos depicting excellent food sources for individual vitamins and minerals. Chapter 9 discusses the impact of the beverages we drink on our nutritional health. In-depth coverage of alcohol in Chapter 9 provides students with important information on alcohol's relationship to nutrition and health, helping them make informed and responsible decisions. Chapter 10 discusses weight management issues and compares major weight-loss programs. Chapter 11 addresses the relationships between nutrition and personal fitness. Chapter 12 describes the special nutrition needs and concerns that arise during the various stages of the life cycle from conception through the older adult years. Chapter 13 addresses consumer concerns about the safety of our food supply, provides a glimpse at some of the problems and advantages of current food technologies, illustrates the global benefits derived when consumers choose locally grown, seasonal foods as much as possible, and presents a brief overview of hunger and food insecurity—both at home and abroad.

Features

The *Savvy Diner* features throughout the text motivate readers to make good health a priority and provide suggestions for making the best food and lifestyle choices for healthy living and disease prevention. This feature includes practical tips for today's students that offer health benefits for a lifetime. Topics include “Whole Grains for Health,” “Nourish the Heart,” “Never Say ‘Diet,’” “An Eating Pattern for Longevity,” and “Color Your Plate for Health.” The *Savvy Diner* features provide practical suggestions for healthy eating and reinforce the recommendations made in the *Dietary Guidelines for Americans*. These features include tips for consuming heart-healthy diets, eating more beans, preserving vitamins in foods, seasoning foods without excess sodium, dining out defensively, sports nutrition basics for athletes, and practicing home food safety.

The *Nutrition Action* features are magazine-style essays that keep you abreast of current topics important to nutrition-conscious consumers. The *Nutrition Action* features address topics such as fast food, smart snacking, food allergies, dietary supplements and medicinal herbs, diet and blood pressure, and aging well with physical activity. The *Nutrition Action* sections reflect the latest issues in the field. For example, “Carbohydrates—Friend or Foe?” helps consumers choose healthful carbohydrates while making sense of the carbohydrate debate; “Diet Confusion: Weighing the Evidence” helps readers make sense of the current weight-loss scene; and “Eat Fresh Eat Local” includes the earth-friendly benefits of eating fresh and locally grown organic foods.

The *Ask Yourself* sections at the beginning of each chapter contain a set of true or false questions designed to provide readers with a preview of the chapter's contents. Answers to the questions are also provided.

Scorecards are hands-on features that allow readers to evaluate their own nutrition behaviors and knowledge in many areas. Some of the *Scorecards* assist readers in assessing their longevity, overall diet, fruit and vegetable consumption, weight status, physical activity habits, and food safety know-how.

The final special feature of each chapter is the *Spotlight*. Each addresses a common concern people have about nutrition. *Spotlight* topics include nutrition and the media, ethnic cuisines, alternative sweeteners, diet and heart disease, the benefits derived from vegetarian diets, nutrition and cancer prevention, osteoporosis, fetal alcohol syndrome, eating disorders, athletes and nutritional supplements, and child obesity. The Chapter 13 *Spotlight* covers the many factors that influence nutrition and food insecurity among the people of the world, and underscores that the practical suggestions offered throughout this book for attaining the ideals of personal nutrition are the very suggestions that best support the health of the whole earth as well. The *Spotlights* continue in their question-and-answer format to encourage readers to ask further questions about nutrition issues. We encourage you to ask us questions, too, in care of the publisher.

The appendixes have also been updated. Appendix A presents aids to calculations, including how to calculate the percentage of calories from fat in one's diet. Appendix A also provides a series of photos depicting the *Choose Your Foods: Food Lists for Diabetes and Weight Management*, and sample USDA Healthy Eating Patterns at various calorie levels that complement the *Dietary Guidelines for Americans*. Appendix B includes *Eating Well with Canada's Food Guide*, which interprets Canada's *Guidelines for Healthy Living*, including recommendations for physical activity.

A *Diet and Wellness Plus* assignment follows the appendixes. The glossary of terms that follows the appendixes provides a quick reference to the nutrition terminology defined in the margins of the text and can be used as a review tool.

Notable Changes in the 10th Edition

Nutrition is a subject that is forever changing. This edition incorporates the many recent changes that have taken place in the field of nutrition. Since the last edition was published, we have more robust research findings examining healthy eating patterns and the prevention of chronic diseases such as heart disease and certain types of cancer, as well as increasing consumer interest in environmentally friendly food choices. Additionally, we have been challenged by the increasing cultural, ethnic, and generational diversity of our society, recent advances in biotechnology, and the parallel trends toward supersized food portions and obesity. The *2015–2020 Dietary Guidelines for Americans* report describes healthy eating patterns, while emphasizing that all segments of our society—from home to school to work to communities—have a role to play in supporting healthy choices for all. Nevertheless, nutrition claims bombard us frequently in advertising and articles about nutrition and fitness on television, radio, and the Internet, and in newspapers and magazines. It is important that consumers have the knowledge to evaluate the nutrition issues and controversies. This 10th edition of *Personal Nutrition* provides a sieve through which to separate the valid nutrition information from the rest.

For all chapters and special chapter features:

- We have reviewed and updated content.
- Several new photos enhance student interest and reinforce the real-life applications of the material.
- The learning objectives have been augmented and refined to specify key student outcomes for each major section of each chapter.
- Some web links to sources of nutrition information on a variety of nutrition topics are included in the chapters; others are available to instructors through the companion website.
- *Diet & Wellness Plus* activities for each chapter have been revised and made available in MindTap. Visit www.cengagebrain.com to access MindTap, a complete digital course that includes access to *Diet & Wellness Plus* exercises and more.
- We've created several new figures and tables and updated others.
- **Chapter 1**
 - Included the latest trend information on consumer sources of nutrition information.
 - Updated the discussion regarding healthy lifestyle choices and disease prevention.
 - Revised the Nutrition Action feature to reflect the MyPlate and *Dietary Guidelines for Americans* messages.
 - Enhanced the discussion regarding nutrition misinformation and credible nutrition resources.
- **Chapter 2**
 - Created a new photo-illustrated graphic depicting nutrient density and the small shifts in food choices that can yield healthy eating patterns over time.
 - Created new graphic illustrating both a healthy eating pattern and the food and beverage components to be limited according to the *Dietary Guidelines for Americans*.

- Reorganized information on MyPlate; included table to provide summary information of dietary intake goals, key nutrients, and strategies for choosing nutrient-dense items from each food group.
- Revised the section on *Dietary Guidelines for Americans*, including new tables, figures, photos, and discussion to reflect the 2015–2020 edition; added new graphic demonstrating how the U.S. diet measures up to the recommended dietary guidelines.
- Included discussion and illustration of approved food label changes, including newly approved Daily Values; included labels showing nutrient claims, health claims, and structure/function claims.
- Added new tips for enjoying foods from many cultures.
- **Chapter 3**
 - Expanded discussion on prebiotics, probiotics, and intestinal microflora.
 - Added discussion regarding choking with a new graphic illustrating the prevention of choking.
- **Chapter 4**
 - Added a new figure that identifies common sources of added sugars and demonstrates how Americans exceed recommended limits for added sugars.
 - Enhanced the discussion of health benefits of various types of fiber; introduced a discussion of fermentable fiber.
 - Revised content on glycemic index of foods.
 - Strengthened the chapter discussion regarding diabetes.
 - Reorganized material in chapter *Spotlight* to include sweeteners approved for consumer use.
- **Chapter 5**
 - Reorganized major “Fat in the Diet” section; added new figure that identifies sources of saturated fat in the diet and demonstrates how Americans exceed recommended limits for saturated fats.
 - Strengthened discussion of omega-3 fats in the diet; updated recommendations for pregnant women regarding consumption of fish.
 - Revised recommendations and discussion for cholesterol according to the 2015–2020 *Dietary Guidelines for Americans*.
 - Added a new figure for a healthy Mediterranean eating pattern.
 - Added new information regarding lipoproteins and heart disease risk.
- **Chapter 6**
 - Updated food allergy feature and discussion of gluten intolerance and celiac disease.
 - Updated *Spotlight* including new tips for creating healthy vegetarian eating patterns reflecting the goals of the *Dietary Guidelines for Americans*.
 - Included new USDA Healthy Eating Patterns for Vegetarians, located in Appendix A.
- **Chapter 7**
 - Created summary tables for vitamin groups based on the functional roles they play in the body.
 - Included information on the vitamins of public health concern from the *Dietary Guidelines for Americans*.
 - Added a new text section regarding phytochemicals and functional foods with tips for optimizing intakes in the daily diet.

- Expanded *Nutrition Action* feature “Choosing a Vitamin-Mineral Supplement or Herbal Remedy”; developed new figures and discussion regarding dietary supplement use among U.S. adults; created new figure demonstrating structure/function labels used on supplements.
- Updated recommendations for reducing risk for cancer from major professional organizations; added discussion of prebiotics and probiotics.
- **Chapter 8**
 - Created summary tables for mineral groups based on the functional roles they play in the body.
 - Included information on the minerals of public health concern from the *Dietary Guidelines for Americans*.
 - Added a new figure that identifies major sources of sodium in the diet and demonstrates how Americans exceed recommended limits for sodium.
 - Updated *Nutrition Action* feature “Diet and Blood Pressure—Beyond Just the Salt Shaker”; enhanced DASH eating plan guidance with a new chart.
 - Revised *Spotlight* feature “Osteoporosis”; updated recommendations for prevention, and included tips for adding more calcium to the diet.
- **Chapter 9**
 - Enhanced discussion of fructose-versus glucose-based sports drinks and sports performance; updated discussion regarding energy drinks.
 - Modified content regarding fetal alcohol spectrum disorder.
- **Chapter 10**
 - Added new figure and maps regarding current prevalence of obesity.
 - Revised opening discussion and section on “What Is a Healthy Weight?”
 - Created new tables describing characteristics of successful dieters and the elements of behavior change.
 - Included new pharmaceutical options for weight loss.
 - Updated discussion and summary table comparing popular weight-loss diets.
 - Revised discussion of eating disorders, including summary table comparing the incidence and characteristics of various eating disorders.
- **Chapter 11**
 - Updated photos of people exercising; added new feature discussing the nutritional needs of active individuals versus competitive athletes.
 - Enhanced discussion of anaerobic versus aerobic metabolism, and expanded content regarding fuel use and duration/intensity of physical activity.
 - Included information about cardiorespiratory fitness and added new discussion and illustration regarding neuromotor exercise.
 - Updated recommendations regarding hydration and protein needs; added a new figure illustrating the color of urine in relation to hydration.
 - Added new table for carbohydrate recommendations for various levels of physical activity.
 - Added new Savvy Diner feature regarding sports nutrition for athletes, including MyPlates for athletes at various levels of training.
 - Added new graphic and discussion to introduce creation of SMART goals.
 - Revised Spotlight on supplements and athletes and added new table of ergogenic aids.

- **Chapter 12**
 - Revised risk factor criteria and discussion of gestational diabetes.
 - Added new American Academy of Pediatrics recommendations regarding use of juice during infancy and childhood.
 - Included new information and graphic regarding sugar-sweetened beverage consumption by children and teens.
 - Updated *Spotlight* feature—“Addressing Weight Problems in Children and Adolescents.”
 - Updated discussion regarding the aging of the population.
 - Revised recommendations for reducing the risk of chronic diseases; added new graphics showing prevalence of chronic health conditions as well as functional limitations among older adults.
 - Created new Savvy Diner feature illustrating the concepts included in the new MyPlate for Older Adults graphic.
 - Created new photo-illustrated figure highlighting the many elements of successful aging.
- **Chapter 13**
 - Updated discussions of problem foods needing special handling for food safety.
 - Expanded *The Savvy Diner* feature on local foods and sustainable food system approaches; added tips for reducing one’s ecological footprint.
 - Updated statistics, diagrams, and discussions in chapter *Spotlight* on global food insecurity issues.

We welcome you to the fascinating subject of nutrition. We hope that the book speaks to you personally and that you find it practical for your everyday use. We hope, too, that by reading it, you may enhance your own personal nutrition and health.

Student and Instructor Resources

In addition to the text, an array of teaching and learning resources are available for both instructors and students.

Instructor Companion Site Everything instructors need in one place! This collection of book-specific lecture and class tools is available online via www.cengage.com/login. Access and download PowerPoint presentations, images, an instructor’s manual, chapter references, videos, and more.

Cengage Learning Testing Powered by Cognero This flexible online system allows instructors to author, edit, and manage test bank content from multiple Cengage Learning solutions; create multiple test versions in an instant; and deliver tests from an LMS, a classroom, or wherever the instructor wants.

MindTap Nutrition MindTap is well beyond an eBook, a homework solution or digital supplement, a resource center website, a course delivery platform or a Learning Management System. MindTap is a personal learning experience that combines all your digital assets—readings, multimedia, activities, and assessments—into a singular learning path to improve student outcomes. The learning plan for each chapter features activities that incorporate *Diet and Wellness Plus*, the market-leading diet analysis software, to help students directly relate nutritional concepts to their own lives.

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

Global Nutrition Watch Global Nutrition Watch is a student-friendly website that provides one-stop access to the most current information about nutrition for classroom discussion and research projects. Global Nutrition Watch provides thousands of trusted nutrition sources, is updated daily, and is searchable by topic or key word, making it easy to find the most current news related to nutrition.

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PERSONAL NUTRITION



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Ask Yourself . . .

Which of the following statements about nutrition are true, and which are false? For each false statement, what is true?

1. The way people choose to live and eat can affect their health and quality of life as they age.
2. Healthy diets cost more than relatively unhealthy diets.
3. Most people obtain information about nutrition from health professionals.
4. The more current a dietary claim, the more you can trust its accuracy and reliability.

Answers found on page 4.

Chapter Objectives

- 1.1** List the six classes of nutrients.
- 1.2** Identify lifestyle factors that impact risk for chronic disease.
- 1.3** List several national nutrition-related objectives aimed at improving the nation's health.
- 1.4** Describe lifestyle practices associated with longevity and health.
- 1.5** Identify different factors that influence personal food choices.
- 1.6** Identify tips for stocking a healthy food pantry.
- 1.7** List strategies for choosing healthy meals when dining away from home.
- 1.8** Distinguish between reliable science-based nutrition information and nutrition/health fraud.

The Basics of Understanding Nutrition

CHAPTER

1

Stroll down the aisle of any supermarket, and you'll see all manner of foods touted with such claims as "low-fat," "low-carb," "low-calorie," and "fat-free." Flip through the pages of just about any magazine, and you're likely to find advice on how to lose weight. Walk into any gym, and you'll probably hear members discussing the merits of one performance-enhancing food or another. All this boils down to the fact that nutrition has become part and parcel of the American lifestyle.

It wasn't always that way, however. The field of nutrition is a relative newcomer on the scientific block. Although Hippocrates recognized diet as a component of health back in 400 B.C., only in the past hundred years or so have researchers begun to understand that carbohydrates, fats, and proteins are needed for normal growth. The discovery of the first vitamin occurred in the early 1900s. It wasn't until 1928, when an organization called the American Institute of Nutrition was formed, that nutrition was officially recognized as a distinct field of study.^{1*} It took several more decades before nutrition achieved its current status as one of the most talked-about scientific disciplines.

Today we spend billions of dollars each year investigating the many aspects of **nutrition**, a science that encompasses the study not only of vitamins, minerals, and other nutrients, but also of such diverse subjects as the effects of alcohol, caffeine, and pesticides. In addition, nutrition scientists continually expand our understanding of the impact food has on our bodies by examining research in chemistry, physics, biology, biochemistry, genetics, immunology, and other nutrition-related fields. A number of other disciplines also make valuable contributions to the study of nutrition. These related fields include psychology, anthropology, epidemiology, geography, agriculture, ethics, economics, sociology, and philosophy.

Tell me what you eat,
and I will tell you what you are.

— Jean Anthelme Brillat-Savarin (1755–1826,
French Politician and Gourmet; Author of *Physiology of Taste*)

nutrition the study of foods, their nutrients and other chemical components, their actions and interactions in the body, and their influence on health and disease.

*Reference notes for each chapter are in MindTap and in the Instructor Companion Site.



The scientific discipline of nutrition investigates how the foods you eat and your lifestyle habits affect your health over a lifetime.

Even though science has shown us that, to some extent, we really are what we eat, many consumers have become more confused than ever about how to translate the steady stream of new findings about nutrition into a lifestyle of healthy eating. Reportedly, people of all ages make food-purchasing decisions based on claims regarding nutrition and health.² Each additional nugget of nutrition news that comes along raises new concerns: Is caffeine bad for me? Should I take vitamin supplements? Do diet pills work? Can a sports drink improve my performance? Do pesticides really pose a hazard?

Some manufacturers and media outlets feed the confusion by offering health-conscious consumers unreliable products and misleading dietary advice, often making unsubstantiated claims for a number of nutritional products, including supplements touted as fat melters, muscle builders, and energy boosters. Unfortunately, misinformation runs rampant in the marketplace. Americans spend billions of dollars annually on medical and nutritional **health fraud** and **quackery**.³ Consider, for example, that college athletes alone may spend hundreds of dollars a month on nutritional supplements, even though most of the products pitched to serious exercisers are useless and, in some cases, potentially harmful. At the same time, the sale of weight-loss foods, products, and services—not all of them sound—has become a \$60 billion industry.⁴

To be sure, the widespread interest in nutrition has generated some positive changes in the marketplace. Whereas the sale of fresh fruit, low-fat yogurt, and salads in fast-food chains was virtually unheard of at one time, those eateries couldn't survive in the current nutrition-conscious environment without offering such healthy fare. (See the Nutrition Action feature later in this chapter for tips on eating healthfully at fast-food outlets.) By the same token, food manufacturers and grocers have responded to consumer concerns about health, wellness, and sustainability by providing shoppers with an unprecedented number of organic and locally sourced products and precooked fresh, retail meals at the supermarket.⁵

With the amount of nutrition information and the number of food alternatives always on the rise, choosing a healthy diet can seem like a daunting task. Fortunately, you don't need a degree in nutrition to put the principles of the science to use in your own life. A basic understanding of nutrition can go a long way in helping you protect your health (and your wallet). This book lays the foundation you need to take nutrition science out of the laboratory and move it into your kitchen, both today and tomorrow. The first steps are understanding the nature of the nutrients themselves and exploring the current thrust of the field of nutrition.

health fraud conscious deceit practiced for profit, such as the promotion of a false or an unproven product or therapy.

quackery health fraud; a quack is a person who practices health fraud (quack = to boast loudly).

ASK YOURSELF ANSWERS: **1.** True. **2.** False. People can save money when they switch from a typical high-fat diet to the whole-grain, produce-rich diet recommended by health experts. **3.** False. Most Americans look first to television for nutrition information, then to magazines, and then to the Internet. **4.** False. If a nutrition claim is too new, it may not have been adequately tested. Findings must be confirmed many times over by experiments and evaluated in light of other knowledge before they can be translated into recommendations for the public.

1.1 The Nutrients in Foods

Almost any food you eat is mostly water, and some foods are as high as 99 percent water. The bulk of the solid materials consists of carbohydrates, fats, and proteins. If you could remove these materials, you would be left with a tiny residue of minerals, vitamins, and other compounds. Water, carbohydrates, fats, proteins, vitamins, and some of the minerals found in foods represent the six classes of **nutrients** (see Table 1-1). The other compounds may include food additives, pigments, phytochemicals, and other substances.

A complete chemical analysis of your body would show that it is made of materials similar to those in most foods, in roughly the same proportions. For example, if you weigh 150 pounds (and if that is a desirable weight for you), your body contains about 90 pounds of water and about 30 pounds of fat. The other 30 pounds consist mostly of proteins, carbohydrates, and the major minerals of your bones—calcium and phosphorus. Vitamins, other minerals, and incidental extras constitute only a fraction of a pound.

Scientists use the term **essential nutrient** to describe the nutrients that the body must obtain from food. About 40 nutrients are known to be *essential*; that is, they are compounds that the body cannot make for itself but are indispensable to life processes. How can you be sure you're getting all of the nutrients you need? The rest of this chapter, along with the diet-planning tools presented in Chapter 2, will help you design a diet that supports good health.

The Energy-Yielding Nutrients Upon being broken down in the body, or digested, three of the nutrients—carbohydrates, proteins, and fats—yield the **energy** that the body uses to fuel its various activities. In contrast, vitamins, minerals, and water, once broken down in the body, do not yield energy but perform other tasks, such as maintenance and repair. Each gram of carbohydrate and protein consumed supplies your body with 4 calories, and each gram of fat provides 9 calories (see Figure 1-1). Only one other substance that people consume supplies calories, and that is alcohol, which provides 7 calories per gram. Alcohol is not considered a nutrient, however, because it does not help maintain or repair body tissues the way nutrients do.

The body uses energy from carbohydrates, fats, and proteins to do work or generate heat. This energy is measured in **calories**—familiar to almost everyone as markers of how “fattening” foods are. If your body doesn't use (release) the energy you obtained from a food soon after you've eaten it, it stores that energy, usually as body fat, for later use. If a person eats excess amounts of proteins, fats, or carbohydrates fairly regularly, the stored fat builds up over time and leads to obesity. Too much of any food, whether lean meat (a protein-rich food), potatoes (a high-carbohydrate food), or butter (a fatty food), can contribute excess calories that result in making someone overweight.

Vitamins, Minerals, and Water Unlike carbohydrates, fats, and proteins, **vitamins** and **minerals** do not supply energy or calories. Instead, they regulate the release of energy and other aspects of **metabolism**. As Table 1-2 shows, there are 13 vitamins, each with its special role to play. Vitamins are divided into two classes: water-soluble (the B vitamins and vitamin C) and fat-soluble (vitamins A, D, E, and K). This distinction has many implications for the kinds of foods that provide the different vitamins and how the body uses them, as you will see in Chapter 7.

The minerals also perform important functions. Some, such as calcium, make up the structure of bones and teeth. Others, including sodium, float about in the body's fluids, where they help regulate crucial bodily functions, such as heartbeat and muscle contractions.

TABLE 1-1 The Six Classes of Nutrients

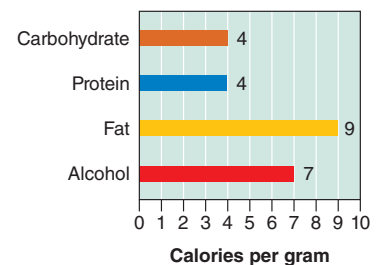
- carbohydrates
- fats
- proteins
- vitamins
- minerals
- water

The energy-yielding nutrients:

- carbohydrates
- fats
- proteins

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FIGURE 1-1 Caloric Values of Carbohydrates, Proteins, Fats, and Alcohol



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nutrients Substances obtained from food and used in the body to promote growth, maintenance, and repair. The nutrients include carbohydrates, fats, proteins, vitamins, minerals, and water.

essential nutrient A nutrient that must be obtained from food because the body cannot make it for itself.

energy The capacity to do work, such as moving or heating something.

calorie The unit used to measure energy.

vitamins Organic, or carbon-containing, essential nutrients that are vital to life but needed only in relatively minute amounts (*vita* = life; *amine* = containing nitrogen).

minerals Inorganic compounds, some of which are essential nutrients.

metabolism Collective term for all of the chemical and physical reactions occurring in living cells, including the reactions by which the body obtains and uses energy from foods.

TABLE 1-2

The Vitamins and Minerals

The Vitamins		The Minerals	
The Water-Soluble Vitamins:	The Fat-Soluble Vitamins:	The Major Minerals:	The Trace Minerals:
B vitamins	Vitamin A	Calcium	Chromium
Thiamin	Vitamin D	Potassium	Manganese
Riboflavin	Vitamin E	Chloride	Copper
Niacin	Vitamin K	Sodium	Molybdenum
Vitamin B ₆		Magnesium	Fluoride
Folate		Sulfur	Selenium
Vitamin B ₁₂		Phosphorus	Iodine
Biotin			Zinc
Pantothenic acid			Iron
Vitamin C			

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NOTE: A number of trace minerals are currently under study to determine possible dietary requirements for humans. These include arsenic, boron, cadmium, cobalt, lead, lithium, nickel, silicon, tin, and vanadium.

Often neglected but equally vital, **water** is the medium in which all of the body's processes take place. Some 60 percent of your body's weight consists of water, which carries materials to and from cells and provides the warm, nutrient-rich bath in which cells thrive. Water also transports hormonal messages from place to place. When energy-yielding nutrients release energy, they break down into water and other simple compounds. Without water, you could live only a few days.

Each day your body loses water in the form of sweat and urine. Therefore, you must replace large amounts of it—on the order of 2 to 3 quarts a day. To be sure, you don't



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James R. T. Bossert/Shutterstock.com

Remember that 1 gram is a very small amount. For instance, 1 teaspoon of sugar weighs roughly 4 grams.

Calorie Value of Carbohydrates, Fats, and Proteins

If you know the number of grams of carbohydrates, fats, and proteins in a food, you can calculate the number of calories in it. Simply multiply the carbohydrate grams by 4, the fat grams by 9, and the protein grams by 4. Add the totals together to obtain the number of calories. For example, a deluxe fast-food hamburger contains about 45 grams of carbohydrate, 27 grams of protein, and 39 grams of fat:

45 grams of carbohydrate	× 4 calories	= 180 calories
39 grams of fat	× 9 calories	= 351 calories
27 grams of protein	× 4 calories	= 108 calories
Total:		639 calories

The percentage of your total energy intake from carbohydrates, fats, and proteins can then be determined by dividing the number of calories from each energy nutrient by the total calories and then multiplying your answer by 100 to get the percentage:

$$\text{calories from carbohydrates} = \frac{45 \times 4 \text{ cal/g}}{639} = 0.281 \times 100 = 28\%$$

$$\text{calories from fats} = \frac{39 \times 9 \text{ cal/g}}{639} = 0.548 \times 100 = 55\%$$

$$\text{calories from proteins} = \frac{27 \times 4 \text{ cal/g}}{639} = 0.168 \times 100 = 17\%$$

See Appendix A for help with figuring percentages and other calculations.

water Fluid that provides the medium for life processes.

need to *drink* that much water daily, because the foods and other beverages you consume do supply some of the water you need.

1.2 Nutrition and Health Promotion

In the past, scientists investigating the role that diet plays in health focused on the consequences of getting too little of one nutrient or another. Until the end of World War II, in fact, nutrition researchers concentrated on eliminating diseases caused by deficiency (lack or absence) of a particular vitamin or mineral.

These days, the focus is just the opposite. Deficiency diseases have been virtually eliminated in America because of our abundant food supply and the practice of fortifying food with essential nutrients (adding iodine to salt, for example). Nevertheless, diseases related to **malnutrition**, in the form of dietary excess and imbalance, run rampant. Many of the major killers, such as heart disease, some types of cancer, stroke, and diabetes, are influenced by a number of factors, including a person's genetic makeup, eating and physical activity habits, exposure to tobacco, and other lifestyle practices (see Table 1-3). Five of the leading causes of death—heart disease, cancer, stroke, diabetes, and hypertension—have been linked to diet (see Figure 1-2). Another three are associated with excessive alcohol consumption: accidents, suicide, and liver disease.⁶ **Overnutrition** contributes to other ills as well, including obesity and dental disease. Because obesity and a sedentary lifestyle are linked with chronic diseases, such as diabetes, heart disease, and certain cancers, it can be projected that increased rates of obesity will lead to increased deaths each year, not to mention hospitalizations, disabilities, time lost from jobs, and poor quality of life for many Americans.⁷

This is not to say that diet is the sole culprit causing these diseases. Figure 1-3 puts nutrition (a factor you can control) in perspective with respect to heredity (a factor you cannot control). It illustrates the point that some diseases are much more related

Factors	Percentage of Deaths
Tobacco	18
Poor diet/inactivity	15
Alcohol	4
Microbial agents	3
Toxic agents	2
Motor vehicles	2
Firearms	1
Sexual behavior	1
Illicit drugs	1

SOURCE: A. H. Mokdad and coauthors, Actual causes of death in the United States, 2000, *Journal of American Medical Association* 291 (2004): 1238–45, with corrections from *Journal of the American Medical Association* 293 (2005): 298.

malnutrition Any condition caused by an excess, deficiency, or imbalance of calories or nutrients.

overnutrition Calorie or nutrient overconsumption severe enough to cause disease or increased risk of disease; a form of malnutrition.

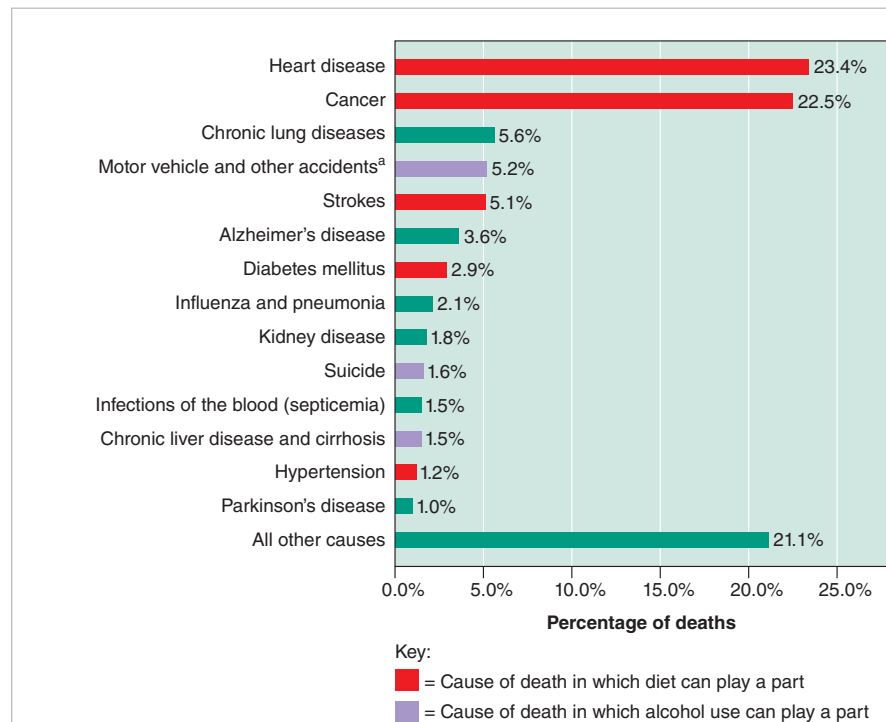


FIGURE 1-2

The Leading Causes of Death in the United States

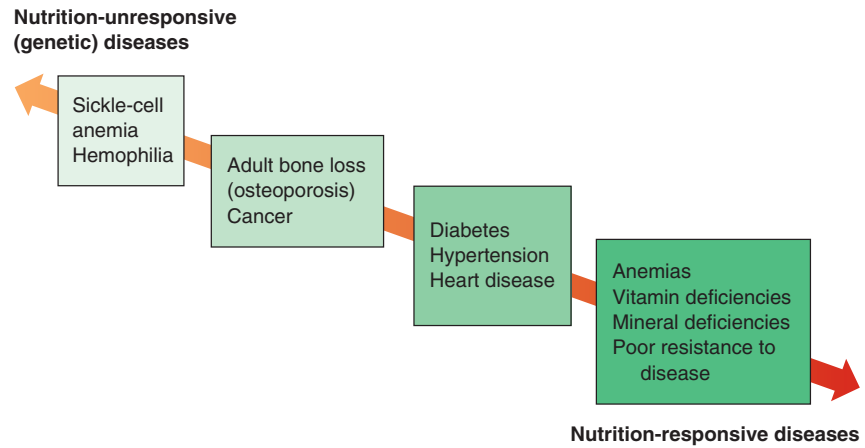
^aThe leading cause of death for people aged 15 to 24 is motor vehicle and other accidents, followed by suicide, homicide, cancer, and heart disease. About half of all accident fatalities are alcohol related.

SOURCE: Table C from p. 9 of Centers for Disease Control & Prevention, *National Vital Statistics Reports*, Vol 65, No. 5. June 30, 2016.

FIGURE 1-3

Nutrition and Disease

Not all diseases are equally influenced by diet. Some are purely hereditary, such as sickle-cell anemia. Some may be inherited (or the tendency to develop them may be inherited) but may be influenced by diet, such as some forms of diabetes. Some are purely dietary, such as the vitamin and mineral deficiency diseases. Good nutrition alone is certainly not enough to prevent many diseases, but it helps.



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to nutrition than others and that some are not responsive to nutrition at all. At one extreme are diseases that can be completely cured by supplying missing nutrients, and at the other extreme are certain genetic (inherited) diseases that are unaltered by nutrition. Most diseases fall in between, being influenced by inherited susceptibility but responsive to dietary manipulations that help counteract the disease process. Thus, diabetes may be managed by means of a special diet; cardiovascular disease may respond favorably to a heart-healthy diet.

A number of environmental, behavioral, social, and genetic factors work together to determine a person's likelihood of suffering from a **degenerative disease**. For example, diet notwithstanding, someone who smokes, doesn't exercise regularly, and has a parent who suffered a heart attack is more likely to end up with heart disease than a nonsmoker who works out regularly and does not have a close relative with heart disease. The way to alter disease risk is to concentrate on changing the daily habits that can be controlled. The results can be significant.

Researchers who monitored the habits and health of a group of some 7,000 Californians for nearly two decades were able to pinpoint seven common lifestyle elements associated with optimal quality of life and longevity: avoiding excess alcohol; not smoking; maintaining a healthy weight; exercising regularly; sleeping seven to eight hours a night; eating breakfast; and eating nutritious, regular meals. In fact, after 20 years, those who had adhered to these healthy habits were only half as likely to have died as those who had unhealthy habits. The group with healthy habits was also half as likely to have suffered the types of disabilities that interfere with day-to-day living. Granted, the researchers speculated that some of the habits—for example, sleeping seven to eight hours a night—are not necessarily as beneficial as, say, the habit of exercising regularly. Rather, regular eating and sleeping habits are most likely to be signs that people make the time and have enough control of their lives to take care of their health.⁸

Nutrition shares responsibility with other lifestyle factors for maintaining good health. By the time you are 65 years old, you will have eaten about 100,000 pounds of food. Each bite may or may not have brought with it the nutrients you needed. The impact of the food you have eaten, together with your lifestyle habits, accumulates over a lifetime, and people who have lived and eaten differently all their lives are in widely different states of health by the time they reach 65. Researchers repeatedly report that people who regularly consume a variety of plant foods, such as fruits, vegetables, legumes, nuts, and whole grains, have reduced risks of heart disease, stroke, diabetes, certain cancers, and other chronic diseases.⁹ The key to disease prevention and optimal

degenerative disease Chronic disease characterized by deterioration of body organs as a result of misuse and neglect. Poor eating habits, smoking, lack of exercise, and other lifestyle habits often contribute to degenerative diseases including heart disease, cancer, osteoporosis, and diabetes.

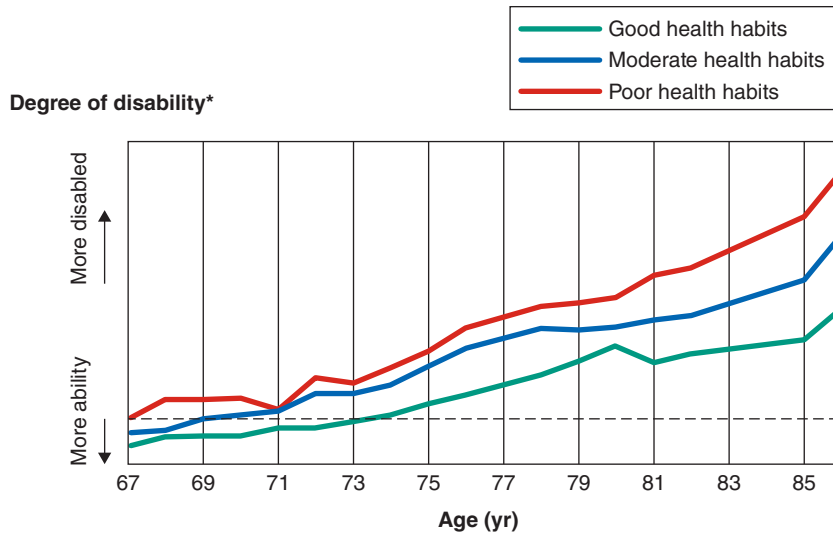
FIGURE 1-4

Healthy Aging

In a study of more than 1,700 people, those who smoked the least, maintained a healthy weight, and exercised regularly not only lived longer but also postponed disability. As shown here, people with the best health habits delayed the onset of even minimal disability to about age 73, compared with age 66 for those with the poorest health habits.

*The dashed line represents minimal disability, defined as having some difficulty performing the everyday tasks of daily living (such as bathing, dressing, eating, walking, toileting, and getting outside).

SOURCE: Based on Figure 2 from p. 4 of the following article: J. F. Fries, The theory and practice of active aging. *Current Gerontology and Geriatrics Research* 2012, no 3 (2012): 420637. doi:10.1155/2012/420637.



health is not in eating or avoiding a certain food, but rather in creating a lifestyle that includes time for preparing nutritious meals and enjoying regular physical activity.

A person who practices good health habits can expect to delay the onset of even minimal disability by several years, compared with a person who practices few or none of them (see Figure 1-4).¹⁰ If you believe in accepting the things you cannot control and controlling the things you can, you are in luck. Your nutritional health can be controlled, and because nutrition is involved in at least half of the preceding lifestyle recommendations, it clearly plays a key role in maintaining good health. This chapter’s Scorecard feature, “The Longevity Game,” further demonstrates this point.

Table 1-4 summarizes ways to improve health with sound nutrition practices. As you read Table 1-4, keep in mind that although everyone can benefit from eating a nutritious diet that complies with the guidelines, some people stand to gain more than others. Those who have high blood cholesterol levels, for instance, are already at risk for heart disease, thereby making it especially important for them to eat a health-promoting diet and maintain a healthy weight. By the same token, those who have close relatives with, say, diabetes, would do well to keep their weight down and pay particular attention to the other nutrition guidelines that help stave off that condition. (The chapters that follow explain the link between diet and chronic diseases in more detail and offer advice on how to follow each dietary recommendation.)

1.3 A National Agenda for Improving Nutrition and Health

Some people do things that are not good for their health. They overeat, smoke, refuse to wear a helmet when riding a bicycle, never wear seat belts when driving, fail to take their blood pressure medication—the list is endless. These behaviors reflect personal choices, habits, and customs that are influenced and modified by social forces. We call these *lifestyle behaviors*, and they can be changed if the individual is so motivated. **Health promotion** focuses on changing human behavior: getting people to eat healthy diets, be physically active, get regular rest, develop leisure-time hobbies for relaxation, strengthen social networks with family and friends, and achieve a balance among family, work, and play.¹¹

health promotion Helping people achieve their maximum potential for good health.