



THE DENTAL HYGIENIST'S GUIDE TO Nutritional Care

5th
EDITION

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Judi Ratliff Davis

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The Dental Hygienist's Guide to Nutritional Care

5TH EDITION

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Criteria and Dietary Reference Intake Values: For Energy by Active Individuals by Life Stage Group^a

Life Stage Group	Criterion	ACTIVE PAL EER ^b (kcal/d)	
		Male	Female
0 through 6 mo	Energy expenditure plus energy deposition	570	520 (3 mo)
7 through 12 mo	Energy expenditure plus energy deposition	743	676 (9 mo)
1 through 2 y	Energy expenditure plus energy deposition	1,046	992 (24 mo)
3 through 8 y	Energy expenditure plus energy deposition	1,742	1,642 (6 y)
9 through 13 y	Energy expenditure plus energy deposition	2,279	2,071 (11 y)
14 through 18 y	Energy expenditure plus energy deposition	3,152	2,368 (16 y)
>18 y	Energy expenditure	3,067 ^c	2,403 ^c (19 y)
Pregnancy			
14 through 18 y	Adolescent female EER plus change in Total Energy Expenditure (TEE) plus pregnancy energy deposition		
1st trimester			2,368 (16 y)
2nd trimester			2,708 (16 y)
3rd trimester			2,820 (16 y)
19 through 50 y	Adult female EER plus change in TEE plus pregnancy energy deposition		
1st trimester			2,403 ^c (19 y)
2nd trimester			2,743 ^c (19 y)
3rd trimester			2,855 ^c (19 y)
Lactation			
14 through 18 y	Adolescent female EER plus milk energy output minus weight loss		
1st 6 mo			2,698 (16 y)
2nd 6 mo			2,768 (16 y)
19 through 50 y	Adult female EER plus milk energy output minus weight loss		
1st 6 mo			2,733 ^c (19 y)
2nd 6 mo			2,803 ^c (19 y)

^aFor healthy active Americans and Canadians. Based on the cited age, an active physical activity level, and the reference heights and weights cited in [Table 1.1](#). Individualized EERs can be determined by using the equations in [Chapter 5](#).

^bPAL = Physical Activity Level, EER = Estimated Energy Requirement. The intake that meets the average energy expenditure of individuals at the reference height, weight, and

age (see Table 1.1).

^cSubtract 10 kcal/d for males and 7 kcal/d for females for each year of age above 19 years.

Reproduced with permission from Energy Calculations for Active Individuals by Life Stage Group. In *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate*, National Academy of Sciences. Washington, DC: National Academies Press, 2005.

Dietary Reference Intakes (DRIs): Dietary Allowances and Adequate Intakes, Total Water, and Macronutrients (Food and Nutrition Board, National Academy of Medicine)

Life Stage Group	Total Water (L/d)	PROTEIN		CARBOHYDRATE FIBER		FAT		n-6 POLYUNSATURATED FATTY ACIDS (α-linoleic acid)			
		RDA/AI g/day ^a	AMDR ^b	RDA/AI g/day	AMDR ^b	RDA/AI g/day	AMDR ^b	RDA/AI g/day	AMDR ^b		
Infants											
0–6 mo	0.7*	9.1	ND ^c	60	ND	ND	ND	31		4.4*	ND
7–12 mo	0.8*	11.0	ND	95	ND	ND	ND	30		4.6*	ND
Children											
1–3 y	1.3*	13	5–20	130	45–65	19*	ND	ND	30–40	7*	5–10
4–8 y	1.7*	19	10–30	130	45–65	25*	ND	ND	25–35	10*	5–10
Males											
9–13 y	2.4*	34	10–30	130	45–65	31*	ND	ND	25–35	12*	5–10
14–18 y	3.3*	52	10–30	130	45–65	38*	ND	ND	25–35	16*	5–10
19–30 y	3.7*	56	10–35	130	45–65	38*	ND	ND	20–35	17*	5–10
31–50 y	3.7*	56	10–35	130	45–65	38*	ND	ND	20–35	17*	5–10
51–70 y	3.7*	56	10–35	130	45–65	30*	ND	ND	20–35	14*	5–10
>70 y	3.7*	56	10–35	130	45–65	30*	ND	ND	20–35	14*	5–10
Females											
9–13 y	2.1*	34	10–30	130	45–65	26*	ND	ND	25–35	10*	5–10
14–18 y	2.3*	46	10–30	130	45–65	26*	ND	ND	25–35	11*	5–10
19–30 y	3.7*	46	10–35	130	45–65	25*	ND	ND	20–35	12*	5–10
31–50 y	3.7*	46	10–35	130	45–65	25*	ND	ND	20–35	12*	5–10
51–70 y	3.7*	46	10–35	130	45–65	21*	ND	ND	20–35	11*	5–10
>70 y	3.7*	46	10–35	130	45–65	21*	ND	ND	20–35	11*	5–10
Pregnant											
≤18 y	3.0*	71	10–35	175	45–65	28*	ND	ND	20–35	13*	5–10
19–30 y	3.0*	71	10–35	175	45–65	28*	ND	ND	20–35	13*	5–10
31–50 y	3.0*	71	10–35	175	45–65	28*	ND	ND	20–35	13*	5–10
Lactating											
≤18 y	3.8*	71	10–35	210	45–65	29*	ND	ND	20–35	13*	5–10

19–30 y	3.8*	71	10–35	210	45–65	29*	ND	ND	20–35	13*	5–10
31–50 y	3.8*	71	10–35	210	45–65	29*	ND	ND	20–35	13*	5–10

^aBased on 1.5 g/kg/day for infants, 1.1 g/kg/day for 1–3 y; 0.95 g/kg/day for 4–13 y, 0.85 g/kg/day for 14–18 y, 0.8 g/kg/day for adults, and 1.1 g/kg/day for pregnant (using prepregnancy weight) and lactating women.

^bAcceptable Macronutrient Distribution Range (AMDR) is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individual has consumed in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and insufficient intakes of essential nutrients.

^cND 5 Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

^dApproximately 10% of the total can come from longer-chain, *n*-3 fatty acids.

Dietary cholesterol, *trans* fatty acids, saturated fatty acids: As low as possible while consuming a nutritionally adequate diet.

Added sugars: Limit to no more than 25% of total energy.^e

Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington, DC: The National Academies Press, 2002.

Note: This table represents Recommended Dietary Allowances (RDAs) in **bold type** and *Adequate Intakes (AIs) in ordinary type. RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97%–98%) individuals in a group. For healthy breastfed infants, 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 prevents being able to specify with confidence the percentage of individuals covered by this intake.

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Vitamins (Food and Nutrition Board, National Academy of Medicine)

Life Stage Group	Vitamin A (µg/d) ^a	Vitamin C (mg/d)	Vitamin D (µg/d) ^{b,c}	Vitamin E (mg/d) ^d	Vitamin K (µg/d)	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin (mg/d) ^e	Vitamin B ₆ (mg/d)	Folate (µg/d) ^f	Vitamin B ₁₂ (µg/d)	Vitamin I (µg/d)
Infants												
0–6 mo	400*	40*	13	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	1
7–12 mo	500*	50*	15	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1
Children												
1–3 y	300	15	15	6	30*	0.5	0.5	6	0.5	150	0.9	2
4–8 y	400	25	15	7	55*	0.6	0.6	8	0.6	200	1.2	3
Males												
9–13 y	600	45	15	11	60*	0.9	0.9	12	1.0	300	1.8	4
14–18 y	900	75	15	15	75*	1.2	1.3	16	1.3	400	2.4	5

y													
19–30 y	900	90	15	15	120*	1.2	1.3	16	1.3	400	2.4	5	
31–50 y	900	90	15	15	120*	1.2	1.3	16	1.3	400	2.4	5	
51–70 y	900	90	15	15	120*	1.2	1.3	16	1.7	400	2.4 ^b	5	
>70 y	900	90	20	15	120*	1.2	1.3	16	1.7	400	2.4 ^b	5	
Females													
9–13 y	600	45	15	11	60*	0.9	0.9	12	1.0	300	1.8	4	
14–18 y	700	65	15	15	75*	1.0	1.0	14	1.2	400 ⁱ	2.4	5	
19–30 y	700	75	15	15	90*	1.1	1.1	14	1.3	400 ⁱ	2.4	5	
31–50 y	700	75	15	15	90*	1.1	1.1	14	1.3	400 ⁱ	2.4	5	
51–70 y	700	75	15	15	90*	1.1	1.1	14	1.5	400	2.4 ^b	5	
>70 y	700	75	20	15	90*	1.1	1.1	14	1.5	400	2.4 ^b	5	
Pregnancy													
14–18 y	750	80	15	15	75*	1.4	1.4	18	1.9	600 ^j	2.6	6	
19–30 y	770	85	15	15	90*	1.4	1.4	18	1.9	600 ^j	2.6	6	
31–50 y	770	85	15	15	90*	1.4	1.4	18	1.9	600 ^j	2.6	6	
Lactation													
14–18 y	1,200	115	15	19	75*	1.4	1.6	17	2.0	500	2.8	7	
19–30 y	1,300	120	15	19	90*	1.4	1.6	17	2.0	500	2.8	7	
31–50 y	1,300	120	15	19	90*	1.4	1.6	17	2.0	500	2.8	7	

^aAs retinol activity equivalents (RAEs). 1 RAE = 1 µg retinol, 12 µg β-carotene, 24 µg β-carotene, or 24 µg β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is twofold greater than retinol equivalents (RE), whereas the RAE for preformed vitamin A is the same as RE.

^bAs cholecalciferol. 1 µg cholecalciferol = 40 IU vitamin D.

^cUnder the assumption of minimal sunlight.

^dAs 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*-, *RSR*-, *RRS*-, and *RSS*-α-tocopherol) that occur 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.

^eAs niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan; 0–6 months = preformed niacin (not NE).

^fAs 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.

^gAlthough 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 can be met by endogenous synthesis at some of these stages.

^hBecause 10% to 30% of older people may malabsorb food-bound B₁₂, it is advisable for those older than 50 years to meet their RDA mainly by consuming foods fortified with B₁₂ or a supplement containing B₁₂.

ⁱIn 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 or fortified foods in addition to intake of food folate from a varied diet.

^jIt 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 after the end of the periconceptional period—the critical time for formation of the neural tube.

NOTE: This table (taken from the DRI reports; see www.nap.edu) presents Recommended Dietary Allowances (RDAs) in **bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97%–98%) healthy individuals in a group. It is calculated from an Estimated Average Requirement (EAR). If sufficient scientific evidence is not available to establish an EAR for calculating an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life-stage and gender groups is believed to cover the needs of all healthy individuals in the groups, 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, Pantothenic 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, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate* (2005); and *Dietary Reference Intakes for Calcium and Vitamin D* (2011). These reports may be accessed via www.nap.edu.

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Elements (Food and Nutrition Board, National Academy of Medicine)

Life-Stage Group	Calcium (mg/d)	Chromium (µg/d)	Copper (µg/d)	Fluoride (mg/d)	Iodine (µg/d)	Iron (mg/d)	Magnesium (mg/d)
Infants							
0–6 mo	200*	0.2*	200*	0.01*	110*	0.27*	30*
7–12 mo	260*	5.5*	220*	0.5*	130*	11	75*
Children							
1–3 y	700*	11*	340	0.7*	90	7	80
4–8 y	1000*	15*	440	1*	90	10	130
Males							
9–13 y	1,300*	25*	700	2*	120	8	240
14–18 y	1,300*	35*	890	3*	150	11	410
19–30 y	1,000*	35*	900	4*	150	8	400
31–50 y	1,000*	35*	900	4*	150	8	420
51–70 y	1,200*	30*	900	4*	150	8	420
>70 y	1,200*	30*	900	4*	150	8	420
Females							
9–13 y	1,300*	21*	700	2*	120	8	240
14–18 y	1,300*	24*	890	3*	150	15	360
19–30 y	1,000*	25*	900	3*	150	18	310
31–50 y	1,000*	25*	900	3*	150	18	320
51–70 y	1,200*	20*	900	3*	150	8	320
>70 y	1,200*	20*	900	3*	150	8	320
Pregnancy							
≤18 y	1,300*	29*	1,000	3*	220	27	400
19–30 y	1,000*	30*	1,000	3*	220	27	350
31–50 y	1,000*	30*	1,000	3*	220	27	360
Lactation							
≤18 y	1,300*	11*	1,300	3*	290	10	360
19–30 y	1,000*	15*	1,300	3*	290	9	310
31–50 y	1,000*	45*	1,300	3*	290	9	320

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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, Pantothenic 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, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate* (2005); and *Dietary Reference Intakes for Calcium and Vitamin D* (2011). These reports may be accessed via www.nap.edu.

Dietary Reference Intakes (DRIs): Estimated Average Requirements (Food and Nutrition Board, National Academy of Medicine)

Life Stage-Group	Calcium (mg/d)	CHO (g/kg/d)	Protein (g/d)	Vitamin A (µg/d) ^a	Vitamin C (mg/d)	Vitamin D (µg/d)	Vitamin E (mg/d) ^b	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin (mg/d) ^c	Vitamin B ₆ (mg/d)
Infants											
0–6											

mo											
7-12 mo			1.0								
Children											
1-3 y	500	100	0.87	210	13	10	5	0.4	0.4	5	0.4
4-8 y	800	100	0.76	275	22	10	6	0.5	0.5	6	0.5
Males											
9-13 y	1,100	100	0.76	445	39	10	9	0.7	0.8	9	0.8
14-18 y	1,100	100	0.73	630	63	10	12	1.0	1.1	12	1.1
19-30 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.1
31-50 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.1
51-70 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.4
>70 y	1,000	100	0.66	625	75	10	12	1.0	1.1	12	1.4
Females											
9-13 y	1,100	100	0.76	420	39	10	9	0.7	0.8	9	0.8
14-18 y	1,100	100	0.71	485	56	10	12	0.9	0.9	11	1.0
19-30 y	800	100	0.66	500	60	10	12	0.9	0.9	11	1.1
31-50 y	800	100	0.66	500	60	10	12	0.9	0.9	11	1.1
51-70 y	1,000	100	0.66	500	60	10	12	0.9	0.9	11	1.3
>70 y	1,000	100	0.66	500	60	10	12	0.9	0.9	11	1.3
Pregnancy											
14-18 y	1,000	135	0.88	530	66	10	12	1.2	1.2	14	1.6
19-30 y	800	135	0.88	550	70	10	12	1.2	1.2	14	1.6
31-50 y	800	135	0.88	550	70	10	12	1.2	1.2	14	1.6
Lactation											
14-18 y	1,000	160	1.05	885	96	10	16	1.2	1.3	13	1.7
19-30 y	800	160	1.05	900	100	10	16	1.2	1.3	13	1.7
31-50 y	800	160	1.05	900	100	10	16	1.2	1.3	13	1.7

^aAs 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 two-fold greater than retinol equivalents (RE), whereas the RAE for preformed vitamin A is the same as RE.

^bAs 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*-, *RSR*-, *RRS*-, and *RSS*-α-tocopherol) that occur 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.

^cAs niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan.

^dAs 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.

Note: An Estimated Average Requirement (EAR) is the average daily nutrient intake level estimated to meet the requirements of the healthy individuals in a group. EARs have not been established for vitamin K, pantothenic acid, biotin, choline, chromium, fluoride, manganese, or other nutrients not yet evaluated via the DRI process.

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, Pantothenic 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, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (2002/2005); and *Dietary Reference Intakes for Calcium and Vitamin D* (2011). These reports may be accessed via www.nap.edu.

Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels, Vitamins (Food and Nutrition Board, National Academy of Medicine)

Life-Stage Group	Vitamin A (µg/d) ^a	Vitamin C (mg/d)	Vitamin D (µg/d)	Vitamin E (mg/d) ^{b,c}	Vitamin K	Thiamin	Riboflavin	Niacin (mg/d) ^c	Vitamin B ₆ (mg/d)	Folate (µg/d) ^c	Vitamin B ₁₂
Infants											
0–6 mo	600	ND ^e	25	ND	ND	ND	ND	ND	ND	ND	ND
7–12 mo	600	ND	38	ND	ND	ND	ND	ND	ND	ND	ND
Children											
1–3 y	600	400	63	200	ND	ND	ND	10	30	300	ND
4–8 y	900	650	75	300	ND	ND	ND	15	40	400	ND
Males											
9–13 y	1,700	1,200	100	600	ND	ND	ND	20	60	600	ND
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
51–70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
>70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
Females											
9–13 y	1,700	1,200	100	600	ND	ND	ND	20	60	600	ND
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
51–70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
>70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
Pregnancy											
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND

y											
Lactation											
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND

^aAs preformed vitamin A only.

^bAs α -tocopherol; applies to any form of supplemental α -tocopherol.

^cThe ULs for vitamin E, niacin, and folate apply to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

^d β -Carotene supplements are advised only to serve as a provitamin A source for individuals at risk of vitamin A deficiency.

^eND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

Note: A Tolerable Upper Intake Level (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. Unless otherwise specified, the UL represents total intake from food, water, and supplements. Due to a lack of suitable data, ULs could not be established for vitamin K, thiamin, riboflavin, vitamin B₁₂, pantothenic acid, biotin, and carotenoids. In the absence of a UL, extra caution may be warranted in consuming levels above recommended intakes. Members of the general population should be advised not to routinely exceed the UL. The UL is not meant to apply to individuals who are treated with the nutrient under medical supervision or to individuals with predisposing conditions that modify their sensitivity to the nutrient.

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, Pantothenic 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, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); and *Dietary Reference Intakes for Calcium and Vitamin D* (2011). These reports may be accessed via www.nap.edu.

Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels, Elements (Food and Nutrition Board, National Academy of Medicine)

Life-Stage Group	Arsenic ^a	Boron (mg/d)	Calcium (mg/d)	Chromium	Copper (μg/d)	Fluoride (mg/d)	Iodine (μg/d)	Iron (mg/d)	Magnesium (mg/d) ^b	Manganese (mg/d)	Molybdenum (μg)
Infants											
0–6 mo	ND ^e	ND	1,000	ND	ND	0.7	ND	40	ND	ND	NI
7–12 mo	ND	ND	1,500	ND	ND	0.9	ND	40	ND	ND	NI
Children											

1-3 y	ND	3	2,500	ND	1,000	1.3	200	40	65	2	300
4-8 y	ND	6	2,500	ND	3,000	2.2	300	40	110	3	600
Males											
9-13 y	ND	11	3,000	ND	5,000	10	600	40	350	6	1,100
14-18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700
19-30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
31-50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
51-70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000
>70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000
Females											
9-13 y	ND	11	3,000	ND	5,000	10	600	40	350	6	1,100
14-18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700
19-30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
31-50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
51-70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000
>70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000
Pregnancy											
14-18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700
19-30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
31-50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
Lactation											
14-18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700
19-30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000
31-50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000

^aAlthough the UL was not determined for arsenic, there is no justification for adding arsenic to food or supplements.

^bThe ULs for magnesium represent intake from a pharmacologic agent only and do not include intake from food and water.

^cAlthough silicon has not been shown to cause adverse effects in humans, there is no justification for adding silicon to supplements.

^dAlthough vanadium in food has not been shown to cause adverse effects in humans, there is no justification for adding vanadium to food and vanadium supplements should be used with caution. The UL is based on adverse effects in laboratory animals; this data could be used to set a UL for adults but not children and adolescents.

^eND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

Note: A Tolerable Upper Intake Level (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. Unless otherwise specified, the UL represents total intake from food, water, and

supplements. Due to a lack of suitable data, ULs could not be established for vitamin K, thiamin, riboflavin, vitamin B₁₂, pantothenic acid, biotin, and carotenoids. In the absence of a UL, extra caution may be warranted in consuming levels above recommended intakes. Members of the general population should be advised not to routinely exceed the UL. The UL is not meant to apply to individuals who are treated with the nutrient under medical supervision or to individuals with predisposing conditions that modify their sensitivity to the nutrient.

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, Pantothenic 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, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001); *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate* (2005); and *Dietary Reference Intakes for Calcium and Vitamin D* (2011). These reports may be accessed via www.nap.edu.

Body Mass Index Table

NORMAL	OVERWEIGHT											OBESE							EX			
	BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		36	37	38
Height (inches)	Body Weight (pounds)																					
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	199
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	206
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	213
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	220
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	227
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	234
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	241
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	249
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	256
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	263
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	271
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	279
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	287
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	295
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	303
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	320
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	329

SOURCE: Adapted from Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. Bethesda, MD: National Heart, Lung, and Blood Institute, 1998.



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**THE DENTAL HYGIENIST'S GUIDE TO NUTRITIONAL CARE,
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Dedication

This fifth edition is dedicated to all of the dental hygiene students, faculty, and practitioners throughout the world who read and apply information from this text. Your curiosity and desire to gain evidence-based and applicable information regarding the role of nutrition in oral health continues to guide the content.

Cyndee and Judi

and

To my husband, son, family, and dental hygiene and dietetic colleagues for their encouragement, support, visions, and humor.

Cyndee

and

To my friends and family, especially my five granddaughters: Riley, Avery, Ellie, Maggie, and Callie, and my newest addition, at last, a grandson, Falcon.

Judi



Preface

The *fifth* edition of this nutrition textbook for dental professionals!!! Why is nutrition information always changing? Concisely, nutrition is a relatively new science. It has long been recognized that certain food factors are important to health: in the early 1800s, all English ships carried lime juice, with a portion given to each sailor daily. However, isolation and discovery of the exact elements in foods and the role they play in maintaining health and preventing disease is more complicated. The B vitamins were only discovered as late as the twentieth century. Scientists continue to research the nutrient content of foods, the specific physiologic uses of vitamins and minerals, and the quantity resulting in beneficial or harmful effects. Advances in technology continue to guide us in the functions and interactions of nutrients. After discovering vitamins and determining which minerals and elements are essential to health, even more food components have been discovered, such as antioxidants and polyphenols, leading to shifting directions and policies. Expect further changes as research delves into the effects of the microbiome and nutrigenomics in maintaining optimal health and preventing chronic diseases. The science of nutrition is further complicated by such factors as personal food habits and nutrient interactions. You will realize in studying this subject that nutrition is a dynamic field relevant to both you and your patients.

The study of nutrition is a rewarding topic for dental hygiene students and practitioners, not only as it relates to patient education but also for how it can affect the dental hygienist's own health. *The Dental Hygienist's Guide to Nutritional Care* is designed to show both dental hygiene students and practicing dental professionals how to apply sound nutrition principles when assessing, diagnosing, planning, implementing, and evaluating the total care of patients, as well as to help them contribute to the nutritional well-being of patients. The Academy of Nutrition and Dietetics, American Dental Hygienists' Association, and American Dental Association each recognize nutrition as an integral component of oral health. The dental professional should be able to assess the oral cavity in relation to the patient's nutrition, dietary habits, and overall health status. A holistic approach to dietary management of a disease by all members of the health care team is especially appropriate to coordinate managed health care.

Since the subject of nutrition is a hot topic in today's world, the

consumer is challenged to comprehend and apply the overwhelming amount of nutritional information that can be confusing and conflicting. As the health source that patients may see most often, dental professionals should be able to knowledgeably and authoritatively discuss nutritional practices with their patients or provide appropriate referrals as needed.

New to This Edition

This expertly revised edition provides the most recent developments in the field and new and improved resources for instructors, including:

- The latest federal nutrition standards, including the *2020 Dietary Guidelines for Americans* and *MyPlate*
- Updated art program, featuring modern illustrations, more clinical photos, and food-source photos within micronutrient chapters
- Content on interdisciplinary practice and the Food Safety Modernization Act (FSMA), plus expanded coverage of older adults, vitamin D, and nutrigenomics
- Information on the role of biochemistry in dental hygiene and nutrition
- TEACH Lesson Plans, PowerPoints, Answer Keys, and Student Handouts provided for the instructor
- An expanded and improved Test Bank with cognitive leveling based on Bloom's Taxonomy and mapping to the National Board Dental Hygiene Examination (NBDHE) blueprint

Organization

Part I, Orientation to Basic Nutrition, deals with basic principles of nutrition. A basic understanding of fundamental nutrition facts enables the dental hygienist to make wise judgments about eating habits, educate patients about needed dietary changes, and evaluate the flood of new information available. Nutrient deficiencies and excesses are addressed in sections entitled *Hyper-States* and *Hypo-States*, terms that are more congruent with real-life occurrences. Chapters addressing vitamins and minerals are arranged to cover the specific nutrients involved in oral calcified structures or oral soft tissues. The chapter entitled *Concepts in Biochemistry* introduces a basic understanding of biochemistry, the foundation for understanding and applying principles of nutrition. This chapter serves as a valuable resource throughout the textbook.

Part II, Considerations of Clinical Nutrition, addresses problems specifically involved in the application of basic nutrition principles through the lifespan within ethnic groups and socioeconomically deprived individuals. Because of the ever-changing, diverse population in the United States, food pyramids or food guides from eight different cultural groups are provided within the chapters or on the back cover. This helps dental hygienists recognize that food choices different from their own eating patterns may be nutritionally healthy. By approaching any necessary modifications with sensitivity and respect, patients are more likely to make suggested changes. Alterations in nutritional requirements and eating patterns affected by various stages of life—specifically for females, infants and children, and older adults—are discussed.

Part III, Nutritional Aspects of Oral Health, looks at factors involved in oral problems and the nutritional treatment of these problems. In these chapters, *Dental Considerations* and *Nutritional Directions* boxes provide specific information to consider during an assessment and educational dialogue by the dental professional, including (1) *physical* status and *dietary* habits; (2) *interventions*, or factors that need to be considered when caring for the patient; and (3) *evaluations* concerning the patient's ability or motivation to make changes based on what has been learned during the appointment. A nutritional assessment is a basic procedure in dental management for the nutritional well-being of all patients. This involves performing a medical and dental assessment, evaluating dietary intake/history, and educating patients about healthful changes in food choices. Many conditions or their outcome are improved

by encouraging patients to eat a wide variety of foods and beverages in appropriate portion sizes or to make minor changes in food choices to improve their health.

A variety of features throughout the text help to enhance the learning experience:

- **Student Learning Outcomes:** A list of outcomes accompanies each chapter to provide a guide to the important information to acquire from the chapter.
- **Key Terms:** Definitions of unfamiliar terms for each chapter in **bold** and **blue** letters within the text; also compiled in the **Glossary** for easy reference.
- **Test Your NQ** (nutrition quotient): True-false pretests to stimulate interest in the reading assignment; answers conveniently located in the back of the book.
- **Dental Considerations:** Practical information affecting the patient's care or nutritional status.
- **Nutritional Directions:** Information to teach the patient to improve oral health and overall health status; stimulating discussions with the patient using the educational information for improvement of oral health, food choices, and/or overall health status.
- **Health Applications:** Current “hot topics” in nutrition, including the ways to obtain an adequate balance of nutrients by a vegetarian; understanding the difficulty in diagnosing persons with gluten sensitivity or intolerance, and adhering to a gluten-free diet; causes and treatment of obesity; and appropriate use of vitamin and mineral supplements.
- **Case Application:** Potential patient situations describing a clinical situation and providing the five-step care plan to help “pull it all together.”
- **Student Readiness:** Questions at the end of each chapter for students to determine their comprehension of the subject.
- **Case Studies:** Practical case studies for students to test their ability to make sound judgments when faced with real-life patient scenarios.

About Evolve

The Evolve website offers a variety of additional learning tools that greatly enhance the text for both students and instructors.

For the Student

Evolve Student Resources offers the following:

- **Practice Quizzes.** Each chapter contains approximately 400 National Board Dental Hygiene Examination-style questions with instant-feedback answers, rationales, and page number references for remediation.
- **Illustrated Case Studies.** Written scenarios with accompanying photographs, and follow-up questions present situations observed frequently. These case studies serve as an excellent review source for the National Board Dental Hygiene Examination.
- **Nutritrac Nutrition Analysis Version 5.0:** An online tool allows users to analyze specifics of food intake and energy expenditure, manage weight loss and gain goals, and analyze nutrition and weight status.
- **Food Pyramids and Guides from Around the World.** Food pyramids and guides from a variety of countries are provided, including Mexico, Puerto Rico, the Philippines, Korea, China, Canada, Great Britain, Germany, Australia, Portugal, and Sweden. Also included are the Native American Food Pyramid, Mediterranean Diet Pyramid, DASH Eating Plan, Healthy Vegetarian Eating Patterns, My Vegan Plate, and MyPlate for Older Adults (©Tufts University).
- **Food Diary and Food Analysis Forms.** Printable versions of forms needed to complete the Personal Assessment Project as well as printable versions for Carbohydrate Intake Analysis and Menu Planning Record.
- **MNA Mini Nutritional Assessment.** A validated nutrition screening tool that can be used to assess for malnutrition in patients 65 years and older.

For the Instructor

Evolve Instructor Resources offers the following:

- **Testbank.** An extensive test bank makes the creation of quizzes and exams easier.
- **TEACH Instructor Resources.**

- **Lesson Plans** organize chapter content into 50-minute class times and map to educational standards and chapter learning objectives.
- **PowerPoints** provide lecture presentations with talking points for discussion, all mapped to chapter learning objectives.
- **Student Handouts** are PDFs of the lecture presentations for easy posting and sharing with students.
- **Image Collection.** An image collection with the illustrations from the textbook is provided for ease of incorporating a photo or drawing into a lecture or quiz.
- **Personal Assessment Project.** A classroom learning activity is provided for students to objectively assess their own personal dietary patterns, practice the process of recording and analyzing food intake for its nutritive and cariogenic value, and use nutritional and dental knowledge to contribute to better general and oral health for self and patients.

Note From the Authors

With a better understanding of the importance of food choices, the members of a multidisciplinary health care team can complement each other's work and provide optimal care for the patient. Even though specific amounts of nutrients are mentioned, the intent of this text is not for prescriptive use. Instead, its purpose is to provide dental hygiene students and practicing dental professionals with a relative idea of the amounts of various nutrients needed so that viable food sources can be recommended.

Dr. Cynthia Stegeman

Judi Ratliff Davis



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Because of the diversity of subjects presented in a general nutrition textbook, a compilation of the work of many people, whether direct or indirect, is necessary to present current and evidence-based information that is relevant to dental professionals. Whether the aid was in the area of a research study or verbal or written communications, each person's help and support is truly appreciated.

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PART I

Orientation to Basic Nutrition

OUTLINE

- 1 Overview of Healthy Eating Habits
- 2 Concepts in Biochemistry
- 3 The Alimentary Canal Digestion and Absorption
- 4 Carbohydrate The Efficient Fuel
- 5 Protein The Cellular Foundation
- 6 Lipids The Condensed Energy
- 7 Use of the Energy Nutrients Metabolism and Balance
- 8 Vitamins Required for Calcified Structures
- 9 Minerals Essential for Calcified Structures
- 10 Nutrients Present in Calcified Structures
- 11 Vitamins Required for Oral Soft Tissues and Salivary Glands
- 12 Fluids and Minerals Required for Oral Soft Tissues and Salivary Glands

1

Overview of Healthy Eating Habits

STUDENT LEARNING OUTCOMES

Upon completion of this chapter, the student will be able to achieve the following student learning outcomes:

1. Discuss why dental hygienists, registered dietitians, and nutritionists need to be competent in assessing and providing basic nutritional education to patients.
2. List and describe the general physiologic functions of the six nutrient classifications of foods. Also, describe factors that influence patients' food habits.
3. Discuss government concerns with nutrition, as well as the purpose and objectives of *Healthy People 2020*.
4. Discuss Dietary Reference Intakes (DRIs).
5. Describe the purpose of the *2015-2020 Dietary Guidelines for Americans*, and determine the number of food equivalents needed from each food group and subgroup based on the Healthy U.S.-Style Eating Pattern for various calorie levels.
6. Describe healthy eating patterns, and discuss the importance of vegetables, fruits, dairy, protein foods, and oils.
7. Discuss nutrients to limit, as well as other dietary components such as alcohol and caffeine.
8. Describe how physical activity and physical fitness are important factors for an individual's overall health, and how healthful choices should be supported by all systems.
9. Assess the dietary intake of a patient using the *MyPlate* system. Also, discuss other food guides and how they compare to the *MyPlate* system.
10. Master how to read a nutritional label.

KEY TERMS

Acceptable macronutrient distribution ranges (AMDRs)

Adequate Intake (AI)

Bariatric surgery
Body mass index (BMI)
Calorie (cal)
c-eq
Daily Value (DV)
Dietary Reference Intakes (DRIs)
Energy
Enrichment
Estimated Average Requirement (EAR)
Estimated Energy Requirement (EER)
Fortification
Ghrelin
Health claim
Healthy U.S.-Style Eating Pattern (U.S.-Pattern)
Hydrogenation
Hypertension
Kilocalorie (kcal)
Low nutrient density
Macronutrients
Micronutrients
Nutrient content claims
Nutrient-dense
Nutrients
Nutrition
Nutrition and Dietetic Technician, Registered (DTR)
Nutrition Facts label
Nutritionist
Obesity
Overweight
oz-eq
Physical activity
Physical fitness

Phytochemicals

Precursor

Qualified health claims

Recommended Dietary Allowances (RDAs)

Registered dietitian (RD)/registered dietitian nutritionist (RDN)

Satiety

Tolerable Upper Intake Level (UL)

Trans fatty acids

Unqualified health claims

Whole grains

• Test Your NQ

1. T/F Milk is a perfect food for everyone.
2. T/F According to the *Dietary Guidelines for Americans*, consumption of all sugars should be reduced.
3. T/F Water is the most important nutrient.
4. T/F Dietary Reference Intakes (DRIs) are required daily intakes essential for all patients to be healthy.
5. T/F Good nutrition is possible regardless of a patient's cultural habits.
6. T/F Based on *MyPlate*, two to four servings daily are needed from the fruit and vegetable group.
7. T/F The *Dietary Guidelines for Americans* were written for healthy people to help reduce their risk of developing chronic diseases.
8. T/F Sugar is the leading cause of chronic health problems.
9. T/F The goal of the *MyPlate Food Guidance System* is to convey the importance of variety, moderation, and proportion.
10. T/F The only nutrients that provide energy are carbohydrates, fats,

and vitamins.

The dental hygiene profession continues to grow and rapidly move into the forefront of health care. To function as valuable members of today's health care team, the dental hygienist must be knowledgeable in various aspects of health care. Because of the lifelong, synergistic, bidirectional relationship between oral health and nutritional status, dental hygienists and registered dietitians and nutritionists need to be competent in assessing and providing basic education to patients and provide referrals to each other to effect comprehensive patient care.

All registered dietitians and some nutritionists are considered experts in the field of food and nutrition, but their training prepares them for slightly different specialties. A **nutritionist** may have a 4-year degree in foods and nutrition and usually works in a public health setting assisting people in the community, such as pregnant women or older individuals, with diet-related health issues. In many states, a nutritionist is legally defined and is licensed or certified. Nutritionists work in local or state health departments and in the extension service of a land-grant university. A **registered dietitian (RD)** or **registered dietitian nutritionist (RDN)** has completed a minimum of a bachelor's degree in foods and nutrition with training in normal and clinical nutrition, food science, food service management, research, and medical nutrition therapy. The credential RDN is granted by the Commission on Dietetic Registration for the Academy of Nutrition and Dietetics for those who have passed a national registration examination and who maintain updated knowledge of the field through continuing education. RDNs working in hospitals, long-term care facilities, health care providers' offices, and pharmaceutical companies may be more involved with medical nutrition therapy or specialized diets. RDNs may also work in settings dealing principally with basic nutrition, such as in schools, community and research settings, wellness and fitness centers, public health and community programs, educational institutions, and health and wellness preventive programs. The addition of the term *nutritionist* helps identify the type of work performed. Actually, all registered dietitians are nutritionists, but not all nutritionists are registered dietitians.

A **Nutrition and Dietetic Technician, Registered (NDTR)** has completed a 2-year degree program in a dietetic technician program or has a 4-year degree from an approved program (approved by the Accreditation Council for Education in Nutrition and Dietetics). An NDTR, like the RDN, must pass a national registration examination and receive continuing education. The DTR normally works under the

supervision of an RDN in such practice areas as hospitals, clinics, and nursing homes, but they may also work independently to provide general nutrition education to healthy populations.

Dental professionals typically see patients on a more regular basis than other health care professionals; this allows observation of many physical signs, particularly oral signs, of a nutrient deficiency or medical condition that affects nutritional status before it is diagnosed.

Recognition of abnormal conditions and early referral to an appropriate health care professional can lead to positive health outcomes for patients. Assessment of dietary information obtained from a patient can also uncover habits detrimental to oral health readily addressed in the dental office. Additionally, compromised oral health may affect food choices. For example, patients with missing dentition or ill-fitting dentures may avoid foods that are hard to chew and reduce the quality and variety of their diets.

Finally, dental hygienists can follow up on goals established by patients to evaluate their understanding and compliance. Overall, the dental hygienist is committed to prevention of oral disease as well as the promotion of health and wellness. All health care professionals must work together to enhance patient care. This textbook provides the dental professional with the nutrition information that can realistically be applied to and practiced with patients in the dental setting.

Basic Nutrition

Nutrition is the process by which living things use food to obtain nutrients for energy, growth and development, and maintenance. **Energy** is the ability or power to do work. **Nutrients** are biochemical substances that can be supplied only in adequate amounts from an outside source, normally from food. One aspect of nutrition is the integration of physiologic and biochemical reactions within the body: (a) digesting food to make nutrients available, (b) absorbing and delivering nutrients to the cells where they are used, and (c) eliminating waste products.

Nutrition is a relatively new science and still an evolving discipline. People want science to be definitive; they become confused and concerned when scientific research challenges what they assume to be factual. In nutrition, something that is considered to be true today may be disrupted by future research refuting established beliefs. In many cases, the media exacerbate this situation by reporting new research and recommendations as soon as they are released. These findings may not necessarily be reproduced in further research. Often, it is difficult to separate a medical certainty from what is merely solid scientific conjecture. The pace of research has quickened; this text is based on current, well-established, and evidence-based nutrition advice. Everyone in the health care field must continue to stay abreast of ongoing research to knowledgeably respond to questions from patients.

Americans are interested in food and health issues and are concerned about their diet, their physical activity, and substances in foods they eat, but most Americans find it easier to do their own taxes than to choose an adequate balanced diet. This may be related to the fact that nutrition information is ever changing.

Psychological and social factors that enter into frequent decisions concerning food choices are also important aspects of nutrition. Freedom of choice and variety in consumption are important components of an individual's personal and social life. Tastes, budget, environment, and cultural attitudes influence food choices. Systemic and environmental effects of nutrients, which are determined by these food choices, affect dental health.

Physiologic Functions of Nutrients

Physiologically, foods eaten are used for energy, tissue building, maintenance and replacement, and obtaining or producing numerous regulatory substances. Nutrients obtained from foods are the following: (1) water, (2) proteins, (3) carbohydrates, (4) fats, (5) minerals, and (6) vitamins. Other naturally occurring substances in various foods, such as **phytochemicals** (plant chemicals) also promote health.

Of these nutrients, only proteins, carbohydrates, and fats provide energy. Alcohol also provides calories but limited or no nutrients. The potential energy value of foods within the body is expressed in terms of the kilocalorie, more frequently referred to as the **calorie**. A **kilocalorie (kcal)** is a measure of heat equivalent to 1000 calories.

Nutrients work together and interact in complex metabolic reactions. Proteins, carbohydrates, and fats provide energy the body needs for metabolic processes. However, the body cannot use energy from these caloric-containing components of food without adequate amounts of vitamins and minerals. Vitamins and minerals, along with protein and water, are essential for the body to build and maintain body tissues and to regulate essential body processes.

Basic Concepts of Nutrition

Foods differ in the amount of nutrients they furnish. Any individual food can be compatible with good nutrition but should be evaluated in the context of the patient's physiologic needs, the food's nutrient content, and other food choices. The premise of nutritional care is that, in any cultural or environmental circumstance or for any personal taste or preference, good nutrition is possible. The total diet or overall pattern of food intake is the most important focus of healthful eating.

Increasing the variety of healthful foods consumed reduces the probability of developing isolated nutrient deficiencies, nutrient excesses, and toxicities resulting from nonnutritive components or contaminants in any particular food. A dietary change to eliminate or increase intake of one specific food component or nutrient usually alters the intake of other nutrients. For instance, because red meats are an excellent source of iron and zinc, decreasing cholesterol intake by limiting these meats can reduce dietary iron and zinc intake.

Essential nutrients are needed throughout life on a regular basis; only the amounts of nutrients require change. The patient's consumption of foods and beverages, stage of growth and development, sex, body size, weight, physical activity, and state of health influence nutrient requirements.

Some nutrients can be converted by the body to meet physiologic needs. Nonessential nutrients can be used by the body but either are not required or can be synthesized from dietary precursors. **Precursors** are substances from which an active substance is formed. An example is carotene, found in fruits and vegetables, which the liver can convert into an active form of vitamin A.

Water is the most important nutrient. After water, nutrients of highest priority are those providing energy, which must be obtained from foods or supplied from physiologic stores. The human body has adaptive mechanisms that allow toleration of modest ranges in nutrient intakes. For instance, the metabolic rate usually decreases as a result of decreased caloric intake.

● Dental Considerations

- Because nutrients work interdependently, a lack or excess of one can interfere with or prevent use of another. Asking the patient to record

food and beverage intake for the past 24 to 72 hours allows assessment of nutrient intake.

- Evaluation of the patient's intake of food and beverages can help determine whether intake is adequate or excessive.
- Abnormalities in the oral cavity can affect systemic health and nutrition. Additionally, nutritional conditions or their treatments can affect the oral cavity or the feasibility of delivering dental care.

+ Nutritional Directions

- No single food contains all the essential nutrients in amounts needed for optimal health.
- Nutritional intake can either improve or adversely affect health.

Government Nutrition Concerns

Before 1977, nutritional efforts focused on ensuring that the food supply provided adequate nutrients to prevent deficiency diseases. The U.S. government recognized health and nutritional problems related to food choices in 1977 with the *United States Dietary Goals*, which addressed excessive consumption of some nutrients. In 1988, the Surgeon General issued a report confirming that 5 of the 10 leading causes of death (cardiovascular disease [CVD], certain types of cancer, stroke, diabetes mellitus, and atherosclerosis) were associated with dietary intake. These reports provided comprehensive science-based objectives to improve the health of the U.S. population and to establish national objectives for promoting health and preventing disease.

Healthy People Nutrition Objectives

Healthy People 2000: National Health Promotion and Disease Prevention Objectives, initially introduced in 1990 by the U.S. Department of Health and Human Services (USDHHS), established objectives and goals to measure progress in specific areas. The objectives for *Healthy People* focus on (a) increasing the quality and years of healthy life, (b) eliminating health disparities among racial and ethnic groups, (c) creating social and physical environments that promote good health for everyone, and (d) promoting quality of life and healthful development and behaviors of all age groups. Based on progress toward these objectives by 2010, many of the 10-year national objectives were continued if they had not been met and/or goals were adjusted, and new goals were set for 2020. New topics continue to be added as needed.

Healthy People 2020 (Healthy People) identifies emerging public health priorities and aligns them with health promotion strategies driven by the best evidence available. *Healthy People 2020* is organized into 42 topic areas with about 600 measurable objectives to be accomplished by 2020. It targets 22 objectives related to nutrition, physical activity, and weight, and 17 objectives related to oral health.¹

A midcourse progress report on these objectives indicates that there was little or no detectable change for the prevalence of obesity among adults or children and adolescents or in mean daily intake of vegetables, but goals were met for adults meeting physical activity and muscle-strengthening objectives. The number of children, adolescents, and adults who had an annual dental visit declined. Two oral health objectives showing significant improvement are to increase the

percentage of the U.S. population served by community water systems that are optimally fluoridated and the proportion of children who have received dental sealants.² Little to no progress has been accomplished in the area of reducing health disparities for minority and low-income groups. Many other objectives showed small improvements.

Other relevant objectives are referenced throughout this text. The *Healthy People* website (<https://www.healthypeople.gov/>) is updated frequently, providing consumers and health care providers the opportunity to monitor progress.

Nutrient Recommendations: Dietary Reference Intakes

Recommendations for the amounts of required nutrients have undergone significant changes over the years, and the revised sets of nutrient-based reference values are collectively called the **Dietary Reference Intakes (DRIs)**; see pp. iii–vi). In 1993, the Food and Nutrition Board of the Institute of Medicine (IOM, now the National Academy of Medicine) undertook this major project, which was completed in 2004. The DRIs, published by the National Academy of Medicine, are established by an expert group of scientists and RDNs from the United States and Canada. These groups of experts base their recommendations on the most current scientific knowledge from different types of studies involving nutrients for healthy populations.

Previous **Recommended Dietary Allowances (RDAs)** focused on amounts of nutrients necessary to prevent deficiency diseases. The current DRIs also attempt to (a) estimate amounts of required nutrients to improve long-term health and well-being by reducing risk of chronic diseases affected by nutrition, for example, heart disease, diabetes, osteoporosis, and cancer; and (b) establish maximum safe levels of tolerance. The four categories of nutrient-based reference values are relevant for various stages of life. The DRIs were intended for planning and assessing diets of healthy Americans and Canadians. The DRIs are inappropriate for malnourished individuals or patients whose requirements are affected by a disease state. Because of emerging evidence involving potential roles of nutrients or other food substances in ameliorating chronic diseases, the National Academies appointed a committee to make recommendations for establishing DRIs for specific nutrients that could ameliorate the risk of chronic diseases. In 2017, *Guiding Principles for Developing Dietary Reference Intakes Based on Chronic Disease* ad hoc committee established guiding principles to support future DRI committees in making decisions about recommending chronic disease DRIs.

Estimated Average Requirement

The **Estimated Average Requirement (EAR)** is the amount of a nutrient that is estimated to meet the needs of half of the healthy individuals in a specific age and gender group. This set of values is useful in assessing nutrient adequacy or planning intakes of population groups, not individuals.

Recommended Dietary Allowance

The new RDA is generally higher than the EAR and provides a sufficient amount of a nutrient to meet the requirements of nearly all healthy individuals (97%–98%). These recommendations provide a generous margin of safety and are intended as a goal for achieving adequate intakes. No health benefits are established for consuming intakes greater than the RDA.

Adequate Intakes

If sufficient scientific evidence was unavailable to determine an EAR or RDA, an **Adequate Intake (AI)** was established based on scientific judgments. An AI, which is derived from mean nutrient intakes by groups of healthy people, is the average amount of a nutrient that seems to maintain a defined nutritional state. An AI is expected to exceed average requirements of virtually all members of a life stage/gender group but is more tentative than an RDA. AI values were established for various life stages for several nutrients, including fluoride, because of uncertainties about the scientific data to determine EAR and RDA values that would reduce the risk of chronic disease.

Tolerable Upper Intake Level

A **Tolerable Upper Intake Level (UL)** is the maximum daily level of nutrient intake that probably would not cause adverse health effects or toxic effects for most individuals in the general population. The potential risk of adverse effects increases as intake exceeds the UL. The term Tolerable Intake was selected to avoid implying that these higher levels would result in beneficial effects. These values are especially helpful because of increased consumption of nutrients in the form of dietary supplements or from enrichment and fortification. This recommendation pertains to habitual daily use and is based on combined intake of food, water, dietary supplements, and fortified foods, with a few exceptions: the UL for magnesium applies only to intake from nonfood sources; ULs for vitamin E, niacin, and folate apply only to fortified foods or supplement sources; and UL for vitamin A applies only to intake of preformed retinol, regardless of the source.

Acceptable Macronutrient Distribution Ranges

Acceptable Macronutrient Distribution Ranges (AMDRs) were

established for the macronutrients, fat, carbohydrate, protein, and two polyunsaturated fatty acids, to ensure sufficient intakes of essential nutrients (carbohydrate, protein and fat), while potentially reducing risk of chronic disease. **Macronutrients** are energy-providing nutrients needed in larger amounts than **micronutrients**, for example, vitamins and minerals. The AMDR is a range of intakes for food components that provide calories; these are expressed as a percentage of total energy intake because the intake of each depends on intake of the others or of total energy requirement of the individual. Increasing or decreasing one energy source while consuming a set amount of calories affects intake of the other sources of energy. For instance, if an individual who routinely consumes 2000 cal reduces fat intake, either protein or carbohydrate intake would need to increase to provide 2000 cal. Consuming amounts outside of the ranges increases risk of insufficient intake of essential nutrients. Recommended ranges for carbohydrates, fats, and proteins allow more flexibility in eating patterns for healthy individuals and as well as accommodating individual preferences.

Estimated Energy Requirement

The **Estimated Energy Requirement (EER)** is defined as dietary energy intake that is predicted to maintain energy balance in healthy, normal-weight individuals of a defined age, gender, weight, height, and physical activity level consistent with good health. The EER is similar to the EAR, and no RDA was established because consuming more calories than are needed would result in weight gain. Because energy requirement depends on activity level, four different activity levels are provided.

Summary of Dietary Reference Intakes

Because nutrient requirements are influenced by age and sexual development, the DRIs are listed for 16 groups, separating gender groups after 10 years of age. Separate levels are established for three categories of pregnant and lactating women. Also, two age groups for the older American population are available.

These guidelines apply to average daily intakes. Meeting the recommendations for every nutrient on a daily basis is very difficult and unnecessary. These nutrient goals are intended to be met by consuming a variety of foods whenever possible.

• Dental Considerations

- Use of DRIs as an assessment guide is for healthy patients only.
- An individual's exact requirement for a specific nutrient is not known for certain.
- The ULs may be used to warn patients that excessive intake of nutrients from nutritional supplements could lead to adverse effects if taken on a regular basis.
- Generally, specific foods or food groups, rather than nutrients, should be discussed with patients.
- If an individual's food consumption is below the RDA for a nutrient over several days, more food choices containing that particular nutrient should be encouraged.

+ Nutritional Directions

- The DRIs are general guidelines for good health rather than specific requirements.
- Choosing a wide variety of foods will probably result in meeting established nutrient requirements.

Food Guidance System for Americans

Identification of nutrients and knowledge of their physiologic functions are significant developments. However, consumers eat and think in terms of food, not nutrients. Nutrient requirements and information must be interpreted into the “food” language that consumers understand. In 2015, the USDHHS and the U.S. Department of Agriculture (USDA) released the *Dietary Guidelines for Americans 2015–2020 (Dietary Guidelines)*, the eighth edition of the guidelines. These *Dietary Guidelines* are based on scientific knowledge to meet nutrient requirements, promote health, support active lives through physical activity, and reduce risks of chronic disease. The *Dietary Guidelines* are the foundation for *MyPlate* (www.ChooseMyPlate.gov), released in 2011 to help consumers become healthier by making wise food choices.

Another helpful tool is the food label that helps consumers determine what kind and how much food to eat. Nutrition labeling, required for most packaged foods, provides information on certain nutrients. The **Nutrition Facts label** enumerates nutrient content of food for the serving size specified and discloses the number of servings in the package. Knowing how to interpret labels enables consumers to accurately apply *Dietary Guideline* messages that correspond to the nutrients and other information on the label.

2015–2020 Dietary Guidelines for Americans

The objective of the five key guidelines is to help consumers make healthful choices from each of the food groups that, with an awareness of caloric intake, will result in an overall healthful eating pattern (Fig. 1.1). An eating pattern represents all the foods and beverages consumed over time or a customary way of eating. Ideally, it meets nutritional needs without exceeding limitations with regard to saturated fats, added sugars, sodium, and total calories. The long-range goal of the *Dietary Guidelines* is to prevent, or at least decrease, the rate of chronic disease and mortality. Interestingly, a recent study attributed dietary factors as a substantial cause of mortality from heart disease, stroke, and type 2 diabetes. Intakes of high sodium, low nuts/seeds, highly processed meats, low seafood omega-3 fats, low fruits, and high sugar-sweetened beverages were related to diet-related deaths.³ All these nutrients/foods are addressed in the *Dietary Guidelines*.



FIGURE 1.1 2015–2020 Dietary Guidelines for Americans. (From the U.S. Department of Agriculture and U.S. Department of Health and Human Services: *2015-2020 Dietary Guidelines for Americans*. 8th ed. Washington, DC; U.S. Government Printing Office: December 2015. [https://health.gov/dietaryguidelines/2015/.](https://health.gov/dietaryguidelines/2015/))

The *Dietary Guidelines* reference the **Healthy U.S.-Style Eating Pattern (U.S.-Pattern)** that indicates the number of food equivalents from each food group and subgroups for 12 caloric levels to be consumed each week for an adequate healthful diet (Table 1.1). Foods providing similar kinds of nutrients are grouped together and, as a rule, foods in one group cannot replace those in another (Table 1.2). This U.S.-Pattern can be adapted easily using various types and proportions of foods that Americans typically consume; however, to provide all the essential nutrients, foods need to be nutrient dense and in appropriate amounts to prevent exceeding calorie limits and other limiting dietary components.

Nutrient-dense foods provide substantial amounts of vitamins and minerals but relatively few calories. When many **low nutrient-density** foods or beverages (containing high fat, sugar, or alcohol) are chosen, obtaining adequate amounts of essential nutrients without gaining weight is unachievable. The consumption of excessive calories from fats, added sugars, and refined grains reduces intake of nutrient-dense foods and beverages without exceeding caloric requirements.

TABLE 1.1

Healthy U.S.-Style Eating Pattern: Recommended Amounts of Food From Each Food Group at 12 Calorie Levels

Calorie Level of Pattern ^a	1000	1200	1800	2000	2400	3000
Food Group	Daily Amount^b of Food From Each Group (vegetable and protein foods subgroup amounts are per week)					
Vegetables	1 c-eq	1½ c-eq	2½ c-eq	2½ c-eq	3 c-eq	4 c-eq
Dark-green vegetables (c-eq/wk)	½	1	1½	1½	2	2½
Red and orange vegetables (c-eq/wk)	2½	3	5½	5½	6	7½
Legumes (beans and peas; c-eq/wk)	½	½	1½	1½	2	3
Starchy vegetables (c-eq/wk)	2	3½	5	5	6	8
Other vegetables (c-eq/wk)	1½	2½	4	4	5	7
Fruits	1 c-eq	1 c-eq	1½ c-eq	2 c-eq	2 c-eq	2½ c-eq
Grains	3 oz-eq	4 oz-eq	6 oz-eq	6 oz-eq	8 oz-eq	10 oz-eq
Whole grains ^c (oz-eq/day)	1½	2	3	3	4	5
Refined grains (oz-eq/day)	1½	2	3	3	4	5
Dairy	2 c-eq	2½ c-eq	3 c-eq	3 c-eq	3 c-eq	3 c-eq
Protein Foods	2 oz-eq	3 oz-eq	5 oz-eq	5½ oz-eq	6½ oz-eq	7 oz-eq
Seafood (oz-eq/wk)	3	4	8	8	10	10
Meats, poultry, eggs (oz-eq/wk)	10	14	23	26	31	33
Nuts, seeds, soy products (oz-eq/wk)	2	2	4	5	5	6
Oils	15 g	17g	24 g	27 g	31 g	44 g
Limit on calories for other uses, calories (% of calories)^d	150 (15%)	100 (8%)	170 (9%)	270 (14%)	350 (15%)	470 (16%)

^aFood intake patterns at 1000, 1200, and 1400 calories are designed to meet the nutritional needs of 2- to 8-year-old children. Patterns from 1600 to 3200 calories are designed to meet the nutritional needs of children 9 years and older and adults. If a child 4 to 8 years of age needs more calories and, therefore, is following a pattern at 1600 calories or more, that child's recommended amount from the dairy group should be 2.5 cups per day. Children 9 years and older and adults should not use the 1000-, 1200-, or 1400-calorie patterns.

^bFood group amounts shown in cup-equivalents (c-eq) or ounce-equivalents (oz-eq), as appropriate for each group, based on caloric and nutrient content.

^cAmounts of whole grains in the Patterns for children are less than the minimum of 3 oz-eq in all Patterns recommended for adults.

^dAll foods are assumed to be in nutrient-dense forms; lean or low-fat; and prepared without added fats, sugars, refined starches, or salt. If all food choices to meet food group recommendations are in nutrient-dense forms, a small number of calories remain within the overall calorie limit of the Pattern (i.e., limit on calories for other uses). The number of these calories depends on the overall calorie limit in the Pattern and the amounts of food from each food group required to meet nutritional goals. Calories from protein, carbohydrates, and total fats should be within the Acceptable Macronutrient Distribution Ranges (AMDRs).

From U.S. Department of Health and Human Services, U.S. Department of Agriculture: *2015–2020 Dietary Guidelines for Americans*. 8th ed. Washington, DC: 2015 (Dec), USDHHS/USDA. <https://health.gov/dietaryguidelines/2015/guidelines/appendix-3/>.

TABLE 1.2
Principal Nutrient Contributions of Each Food Group

Nutrients	Vegetable	Fruit	Meat	Milk	Grain
Protein			X	X	X
Vitamin A	X	X			
Vitamin D				X ^a	
Vitamin E	X				
Vitamin C	X	X			
Thiamin			X		X ^b
Riboflavin				X	X ^b
Niacin			X		X ^b
Vitamin B ₆			X	X	
Folate/folic acid	X	X			X ^b
Vitamin B ₁₂			X ^c	X ^c	
Calcium				X	
Phosphorus			X	X	X
Magnesium	X			X	X ^d
Iron			X		X ^b
Zinc			X	X	X
Fiber	X	X			X ^d

^aIf fortified

^bIf enriched

^cOnly animal products

^dWhole grains

Portion control is very important to stay within the desired caloric level. Portion size is different than serving size. The amounts from each food group and subgroup change as needed among the different caloric levels to meet nutrient and *Dietary Guidelines* standards and comply with calories and overconsumed dietary components. Fig. 1.2 is a simple tool from the USDHHS that provides relationships consumers can relate to for estimating portion sizes. Within the U.S.-Pattern, serving or portion

sizes are depicted as c-eq or oz-eq. Vegetables, fruits, and dairy food groups are represented with **c-eq**, which is the amount of a food or beverage considered equal to 1 cup or one portion. A serving size of many popular foods or beverages differs due to (1) concentration (e.g., raisins or tomato paste), (2) fresh produce that does not compress into a cup (e.g., salad greens), or (3) foods that are measured in a different form (e.g., meat and cheese). A serving portion of food from the grain or protein groups is equivalent to one ounce (**oz-eq**). If a food is concentrated or contains minimal amounts of water (e.g., nuts, peanut butter, jerky, cooked beans, rice or pasta), its portion size may be less than a measured ounce (by weight). If it contains a large amount of water (e.g., tofu, cooked beans, cooked rice or pasta), it may be more than a measured ounce (weight).

Serving Size Card:

Cut out and fold on the dotted line. Laminate for longtime use.

















1 Serving Looks Like . . .	1 Serving Looks Like . . .
Grain Products 1 cup of cereal flakes = fist  1 pancake = compact disc  ½ cup of cooked rice, pasta, or potato = ½ baseball  1 slice of bread = cassette tape  1 piece of cornbread = bar of soap 	Vegetables and Fruit 1 cup of salad greens = baseball  1 baked potato = fist  1 med. fruit = baseball  ½ cup of fresh fruit = ½ baseball  ¼ cup of raisins = large egg 
Dairy and Cheese 1½ oz. cheese = 4 stacked dice or 2 cheese slices  ½ cup of ice cream = ½ baseball 	Meat and Alternatives 3 oz. meat, fish, and poultry = deck of cards  3 oz. grilled/baked fish = checkbook  2 Tbsp. peanut butter = ping pong ball 
Fats 1 tsp. margarine or spreads = 1 dice 	

FIGURE 1.2 Serving size card. This tool can be used when estimating appropriate serving sizes when choosing/serving foods. (From U.S. Department of Health and Human Services, National Heart, Lung and Blood Institute, Obesity Education Initiative. Serving sizes and portions: and servings: what's the difference? Portion distortion.

<https://www.nhlbi.nih.gov/health/educational/wecan/downloads/servingcard7.pdf>.)

The U.S.-Patterns meet the RDA for almost all nutrients. Vitamins D and E and potassium are marginal in the U.S.-Patterns for many or all age–sex groups. Intake below the RDA or AI for these nutrients is not considered to be of public health concern.

Other meal patterns endorsed in the 2015–2020 *Dietary Guidelines* include the Dietary Approaches to Stop Hypertension (DASH) diet (see [Chapter 12](#)), Mediterranean-Style Eating Pattern (see Evolve website), and Healthy Vegetarian Eating Pattern (see [Chapter 5](#) and Evolve website).

Key Recommendations for Healthy Eating Patterns

A healthful eating pattern includes vegetables, fruits, dairy, protein foods, and oils, as summarized in the Key Recommendations ([Box 1.1](#)).

Box 1.1

2015–2020 Dietary Guidelines for Americans Executive Summary: Key Recommendations

Consume a healthful eating pattern that accounts for all foods and beverages within an appropriate calorie level.

A Healthy Eating Pattern Includes:*

- A variety of vegetables from all of the subgroups—dark green, red and orange, legumes (beans and peas), starchy, and other
- Fruits, especially whole fruits
- Grains, at least half of which are whole grains
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
- A variety of protein foods, including seafood; lean meats and poultry; eggs; legumes (beans and peas); and nuts, seeds, and soy products
- Oils

A Healthy Eating Pattern Limits:

- Saturated fats and *trans* fats, added sugars, and sodium

Key recommendations that are quantitative are provided for several components of the diet that should be limited. These components are of particular public health concern in the United States, and the specified limits can help individuals achieve healthy eating patterns within calorie limits:

- Consume less than 10% of calories per day from added sugars^a
- Consume less than 10% of calories per day from saturated fats^b
- Consume less than 2300 milligrams (mg) per day of sodium^c
- If alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and up to two drinks per day for men—

and only by adults of legal drinking age.^d

*Definitions for each food group and subgroups are provided in subsequent sections of this chapter.

^aThe recommendation to limit intake of calories from added sugars is a target based on evidence that demonstrates the need to limit added sugars to meet food group and nutrient needs within calorie limits.

^bThe recommendation to limit intake of calories from saturated fats is a target based on evidence that replacing saturated fats with unsaturated fats is associated with reduced risk of cardiovascular disease.

^cThe recommendation to limit intake of sodium is the UL for individuals ages 14 years and older set by the National Academy of Medicine (formerly the Institute of Medicine).

^dThe amount of alcohol and calories in beverages varies and should be accounted for within the limits of healthy eating patterns. There are many circumstances in which individuals should not drink, such as during pregnancy.

From U.S. Department of Health and Human Services, U.S. Department of Agriculture, *2015–2020 Dietary Guidelines for Americans*, 8th ed. Washington, DC: USDHHS/USDA, 2015.
<https://health.gov/dietaryguidelines/2015/guidelines/executive-summary/#key-recs>.

Calorie Balance

Individuals should consume a healthy eating pattern that includes all foods and beverages within an appropriate caloric level to achieve and/or maintain a healthy body weight. The basic element for healthful eating patterns is managing caloric balance, an average equilibrium between calories consumed (food and beverages) and calories expended (metabolic processes and physical activity). For a person to maintain a set weight, energy consumed from foods and beverages must equal calories expended in normal physiologic functions and physical activity. The average intake for Americans age 20 years and over in 2011 to 2012 was 2191 cal per day (1837 cal/day for women and 2567 cal/day for men).⁴ Because weight loss is a challenge requiring changes in many behaviors and patterns, avoiding excess pounds is ideal. Even small decreases in caloric intake can help prevent weight gain. A reduction in daily intake of 100 calories to prevent gradual weight gain is much easier than reducing daily intake by 500 calories to lose weight. In general, the best choice for weight loss involves a change in lifestyle, both in diet and physical activity. By frequently monitoring body weight, consumers can determine whether their eating patterns are providing an appropriate amount of

calories and thereby adjust food intake and/or activity level. All Americans are encouraged to achieve and/or maintain a healthy body weight:

- Children and adolescents are encouraged to maintain calorie balance to support normal growth and development without promoting excess weight gain.
- Women are encouraged to achieve and maintain a healthy weight, and women who are pregnant are encouraged to gain weight within gestational weight gain guidelines (see [Chapter 13](#)).
- Adults who are overweight or obese should change both eating habits and physical activity to prevent additional weight gain and/or promote weight loss.
- Older adults (65 years and older) who are overweight or obese are encouraged to prevent additional weight gain. Intentional weight loss is beneficial for patients who have chronic conditions such as CVD or diabetes.

Body weight can be evaluated in relation to a person's height using **body mass index (BMI)** to determine health risks that increase at higher levels of **overweight** (BMI 25.0–29.9) and **obesity** (BMI >30.0). BMI is a preferred method of defining healthy weight because it correlates more closely with actual body fat than height and weight tables. BMI can be determined by using the table on [page ix](#) and [Table 1.3](#) to classify body weight category (underweight, normal weight, overweight, or obese). A BMI of less than 25 is generally considered a healthy weight; chronic disease risk increases in most people who have a BMI above 25. BMI reflects overall fat distribution and can be calculated quickly and inexpensively. BMI is not appropriate for pregnant and nursing women, infants and children younger than age 2 years (see special table on the Evolve website for children 2 to 20 years old), or some athletes with a large percentage of muscle.

TABLE 1.3**Body Mass Index and Corresponding Body Weight Categories for Children and Adults**

Body Weight Category	Children and Adolescents (Ages 2–19 y; BMI-for-Age Percentile Range)	Adults (BMI)
Underweight	< 5th percentile	< 18.5 kg/m ²
Normal weight	5th percentile to < 85th percentile	18.5–24.9 kg/m ²
Overweight	85th to < 95th percentile	25.0–29.9 kg/m ²
Obese	≥ 95th percentile	≥ 30.0 kg/m ²

From U.S. Department of Health and Human Services, U.S. Department of Agriculture: *2015–2020 Dietary Guidelines for Americans*. 8th ed. 2015 (Dec), USDHHS/USDA. <https://health.gov/dietaryguidelines/2015/guidelines/>.

BMI reveals little about overall body composition. It is a starting point in assessing an individual's health status and risks that is noninvasive, inexpensive, and quick. Limitations of relying solely on a person's BMI include the following: (1) women tend to have more body fat; (2) BMI can underestimate body fat in an elderly person who has lost lean body mass; (3) ethnic background can impact bone mineral density; and (4) BMI overestimates body fat in individuals who have very high levels of lean body mass. Athletes usually have high BMIs because of their increased muscle mass, not excess fat. On the other hand, a frail or inactive person with a normal-range BMI may have excess body fat and not appear out of shape. Additional muscle tissue aids body functions, but excessive fat interferes with normal metabolism. A healthy weight depends on the amount and location of body fat and other health indicators, such as blood pressure, glucose, and cholesterol and triglyceride levels.

Major ethnic differences exist regarding BMI. For example, Asian Americans or persons from India are at risk of health problems at a lower BMI (18.5–23.9 is a better range) than whites; African Americans can have higher BMIs (28.0) than other populations without developing health problems. Older adults can tolerate slightly more body fat and tend to have a better survival rate with a BMI in the upper range of normal.⁵

All foods and some beverages contain varying amounts of calories based on their nutrient content. Macronutrients include carbohydrates and protein that contribute 4 cal/g; fats, 9 cal/g; and alcohol, which, although not a nutrient, contributes 7 cal/g when consumed. Most foods and beverages contain combinations of macronutrients in varying amounts. There is little evidence that any individual macronutrient has a

unique impact on body weight. Caloric intake is the key factor to controlling body weight, not by manipulating the proportions of fat, carbohydrates, and protein but by balancing overall calories with energy expenditure.

A patient's caloric requirements are based on size (height and weight), age, sex, and level of physical activity. Many Americans consume more calories than they need and spend large portions of their days engaged in sedentary behaviors that expend minimal calories. Consequently, many children and adults routinely consume more calories than they expend.

For weight maintenance, caloric requirements typically range from 1600 to 2400 calories daily for adult women and 2000 to 3000 calories for adult men, with variances depending on physical activity. The metabolic rate decreases with age, thus lowering caloric requirements for older adults.

Vegetables

Vegetables are primary sources of the required nutrients dietary fiber, vitamin A (carotenoids), vitamin C, folic acid, and potassium ([Table 1.4](#)). Most vegetables are naturally low in fat and are cholesterol free. Because of their high water and fiber content, most vegetables are relatively low in calories. Dark-green vegetables provide calcium, iron, magnesium, and riboflavin. Beans are unusual because they are in both the vegetable and protein groups. Beans contain protein, fiber, calcium, folic acid, and potassium. Choosing dark-green, red, and orange vegetables; legumes (beans and peas); starchy vegetables; and other vegetables several times a week is encouraged to provide the many nutrients contributed by different vegetables.

Table 1.4
Contributions of Selected Fruits and Vegetables

Fruit/Vegetable	Vitamin A ^{a,b}	Vitamin C ^{c,d}	Fiber ^{e,f}
Acorn squash	#	#	#
Apple with skin			#
Avocado		#	†
Banana		#	#
Bell pepper		†	
Bok choy	†	†	
Broccoli, cooked	†	†	#
Brussels sprouts		†	#
Cabbage		†	#
Cantaloupe	†	†	
Carrot	†	#	#
Cauliflower		†	
Collard greens	†	†	
Grapefruit	#	†	
Iceberg lettuce	#		
Kale	†	†	#
Kiwi		†	#
Kohlrabi		†	#
Mango	†	†	
Orange		†	
Papaya	†	†	
Pear			#
Prune, dried			†
Romaine lettuce	†		
Spinach	†	#	
Strawberry		†	
Sweet potato	†	†	#
Swiss chard	†	†	
Tomato	#	†	

^a# = Good source: 500–950 IU/100 g

^b† = Excellent source: ≥ 950 IU/100 g

^c# = Good source: 6–11.4 mg/100 g

^d† = Excellent source: ≥ 11.4 mg/100 g

^e# = Good source: 2.5–4.75 g/100 g

^f† = Excellent source: ≥ 4.75 g/100 g

Data from U.S. Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. *USDA National Nutrient Database for Standard Reference, Release 28*. Version current: September 2015, slightly revised May 2016. Accessed August 8, 2017. <https://www.ars.usda.gov/ba/bhnrc/ndl>

Despite an abundance of nutritious foods available in the United States, many individuals do not choose the variety of nutrient-dense foods that provide all their nutrient requirements and enable them to remain within their calorie needs.

Vegetable choices include all fresh, frozen, canned, and dried options,

cooked or raw, in addition to vegetable juices. Nutrient-dense vegetables are limited in the amount of salt, butter, or creamy sauces added. The U.S.-Pattern for a 2000-calorie diet includes $2\frac{1}{2}$ c-eq of vegetables daily. For each vegetable subgroup, weekly amounts are recommended to ensure variety and meet nutrient needs.

Fruits

All fruits or 100% fruit juices count as part of the fruit group. Fruits are naturally low in fat, sodium, and calories, and do not contain cholesterol. They are also important sources of potassium, dietary fiber, vitamin C, and folate (see [Table 1.4](#)). Fresh, frozen, canned, or dried fruits are recommended for their fiber content, but fruit juice should be minimized because it does not contain fiber and excess amounts can contribute extra calories.

Because of their high water content, fruits are more filling than juices, with fewer calories. Fruit juice can be part of a healthful diet, but only the proportion that is 100% fruit juice counts because these products usually contain added sugars. The percentage of juice in a beverage is indicated on the package label. Fruit juices containing added sugars are classified as sugar-sweetened beverages. The recommendation for children 6 months to 6 years old limits 100% fruit juice to 4 to 6 fluid ounces per day (infants under 6 months old should not be given any juice).

At least half of the recommended amount of fruit should be from whole fruits (fresh, canned, frozen, or dried). Fruits that contain a small amount of added sugar can be chosen as long as daily calories from added sugars does not exceed 10% and total caloric intake remains within limits. With canned fruits, those containing the least amount of added sugar should be selected. The recommended amount of fruits in the U.S.-Pattern for 2000 cal is 2 c-eq daily (see [Table 1.1](#) for amounts for different caloric levels).

Grains

Grains are principally carbohydrates or starchy foods and are essential for a healthful diet. The U.S.-Patterns include whole grains and refined grains, but products made with refined grains, especially those high in saturated fats, added sugars, and/or sodium, such as cookies, cakes, and some snack foods are limited. All whole-grain, refined and enriched, or fortified-grain products are included in these two groups, for example, barley, buckwheat, bulgur, corn, millet, rice, rye, oats, sorghum, wheat,

and wild rice.

At the 2000-cal level, the U.S.-Pattern indicates a total of 6 oz-eq per day. Most Americans are consuming more than the recommended amount of refined grains, but the Dietary Guidelines Advisory Committee estimates that 95% of Americans do not reach guideline amounts for whole grains.⁶

Whole grains are grains and grain products made from the entire grain seed, usually called the *kernel*, which consists of bran, germ, and endosperm. If the kernel has been cracked, crushed, or flaked, it must retain all components of the original grain kernel (bran, germ, and endosperm) to be called *whole grain*. Whole wheat, oatmeal, brown rice, whole rye, and quinoa are all whole grains. When selecting whole grains, the first or second ingredient listed on the ingredient panel should contain the words *whole grain*. One oz-eq of whole grains has 16 g of whole grains; a food that contains 8 g/oz-eq or more whole grains is at least half whole grains. Product labels usually indicate the grams of whole grain to help consumers identify food choices having a substantial amount of whole grains.

The difficulty in identifying whole grains is a major barrier. Labels such as “100% wheat,” “stone-ground,” and “multigrain” do not guarantee that the food contains whole grain. Multiple conflicting definitions exist for identifying whole-grain products, causing confusion for consumers. Color is a poor indicator of whole grains because molasses or caramel food coloring may be added. As a result of the *Dietary Guidelines*, food manufacturers have introduced more processed foods with higher whole-grain content.

Most whole grains are a good source of dietary fiber and are needed to meet the daily fiber recommendation. Whole grains differ from a nutritional perspective, with significant variations in levels and effects of the fiber. Whole-grain products contribute more fiber, magnesium, phosphorus, and zinc than do enriched products (Table 1.5). When whole grains are refined, vitamins, minerals, and dietary fiber are lost in the process.

TABLE 1.5**Comparison of Nutrient Values of Selected Whole-Grain and Enriched Breads (1 slice)**

Nutrients	Enriched White	Whole Wheat	Multigrain	Whole Grain	Rye
Protein (g)	3.0	3.98	3.47	4.0	2.72
Total dietary fiber (g)	0.6	1.9	1.9	3.0	1.9
Thiamin (mg)	0.20	0.126	0.73	0.740	0.139
Riboflavin (mg)	0.13	0.053	0.034	0.340	0.107
Niacin (mg)	1.89	1.420	1.051	1.20	1.218
Vitamin B ₆ (mg)	0.01	0.069	0.068	0.080	0.024
Total folate (mcg)	72	13	20	Unk	48
Iron (mg)	1.10	0.79	0.65	0.72	0.91
Zinc (mg)	0.21	0.57	0.44	0.60	0.36
Sodium (mg)	120	146	99	150	193
Calcium (mg)	4.0	52.0	27.0	20.0	23.0
Phosphorus (mg)	24.0	68.0	59.0	80.0	40.0
Magnesium (mg)	6.0	24.0	20.0	32.0	13.0

U.S. Department of Agriculture, Agricultural Research Service. 2016. *USDA Food and Nutrient Database for Dietary Studies 2011–2012*. Release 28.

<https://ndb.nal.usda.gov/ndb/>. Accessed March 20, 2017.

Most refined grains are enriched with some of the nutrients lost in the process, but dietary fiber and some vitamins and minerals are not routinely added back in the enrichment process. **Enrichment** is the process by which iron, thiamin, riboflavin, folic acid, and niacin removed during processing are restored to approximate their original levels. This process is controlled by the U.S. Food and Drug Administration (FDA), which establishes the quantity of nutrients permitted.

Fortification is the process by which nutrients not present in the natural product are added or increased in the original product. Most processed breakfast cereals are fortified to achieve nutrient levels higher than those naturally occurring in the grain. Whole grains are a poor source of folic acid; thus, rather than relying exclusively on whole grains, some cereal products fortified with folic acid should be selected. Products that are enriched with folic acid are especially important for women who are pregnant or capable of becoming pregnant. Serious birth defects may occur during early pregnancy if adequate amounts of folic acid are not consumed. Despite the fact that enriched grains have a positive role in providing some vitamins and minerals, excessive amounts can result in excess calories being consumed. The recommended amount of refined grains is less than 3 oz-eq servings daily; at least one-half of an individual's grain choices should be whole grains.

Dairy

Healthful eating patterns include fat-free and low-fat (1%) dairy, including milk, yogurt, cheese, and/or fortified soy beverages. Soy beverages fortified with calcium and vitamins A and D are similar to milk in nutrient composition and can replace traditional cow's milk. The U.S.-Pattern recommends 2 c-eq per day for children ages 2 to 3 years, $2\frac{1}{2}$ c-eq for children ages 4 to 8 years, and 3 c-eq per day for adolescents and adults. Children who establish the habit of drinking milk are more likely to drink milk as adults. Most age-sex groups (except children 1–3 years old) fall below the recommended amount.

Milk products provide calcium and potassium and may be a good source of vitamin D. Fortified milk products are important sources of vitamin D. However, many milk substitutes (cheese, yogurt, and ice cream) are not fortified with vitamin D (unless made with fortified milk). Whole milk and many cheeses are high in saturated fat and can have negative health implications. Low-fat or fat-free milk products providing little or no fat should be chosen most often to avoid consuming more calories than needed. These products contain similar amounts of nutrients as the higher-fat options. Fat-free milk and yogurt contain less saturated fat and sodium and more potassium and vitamins A and D than cheese; therefore, decreasing the proportion of cheese-to-milk consumption improves overall nutritional intake. If a consumer does not drink milk, efforts should be made to obtain adequate amounts of calcium, potassium, magnesium, and vitamins A and D from other food sources.

The dairy group does not include high-fat products, such as butter and cream, because they are not high in calcium, riboflavin, and protein. Other milks—such as almond, rice, coconut, and hemp milks—may contain calcium but are not part of the dairy group because overall nutritional content is inferior to dairy milk and fortified soy milk.

The consumption of dairy products can help children and adolescents achieve peak bone mass and reduce the risk of low bone mass and osteoporosis. In terms of oral health, studies indicate that higher dairy product consumption is associated with decreased prevalence and severity of periodontal disease.⁷

Protein Foods

The U.S.-Patterns include a variety of nutrient-dense forms of protein foods, including legumes (beans and peas). The U.S.-Patterns divide

protein foods into subgroups, as follows, with recommended amounts of each to encourage nutritional balance and flexibility: seafood; meats, poultry, and eggs; and nuts, seeds, and soy products.

These foods are important sources of protein, B vitamins (niacin, thiamin, riboflavin, and B₆), vitamin E, iron, zinc, and magnesium. A variety of foods from this group is advisable because each food has distinct nutritional advantages (Table 1.6). By varying choices and including fish, nuts, beans, and seeds, the intake of healthful fats, such as monounsaturated fatty acids and polyunsaturated fatty acids, is increased.

TABLE 1.6

Outstanding Contributions of Various Protein Foods

Protein Food	Nutrient
Lean red meats	Iron
	B vitamins
	Zinc
Pork	Thiamin
	Zinc
Poultry	Potassium
	Niacin
Liver and egg yolks	Vitamin A
	Iron
	Zinc
Dry peas and beans, soybeans, and nuts	Magnesium
	Fiber
	Zinc

Red meats include all forms of beef, pork, lamb, veal, goat, and nonbird game (e.g., venison, bison, elk). Chicken, turkey, duck, geese, guineas, and game birds are classified as poultry. To decrease intake of saturated fats and calories, lean cuts of meat and skinless poultry should be chosen; seafood, nuts, and seeds should replace some of the meat and poultry. Fish, nuts, and seeds contain a healthful type of fat; thus, they should be chosen more often than meat or poultry.

Dry beans and peas, such as kidney beans, pinto beans, lima beans, black-eyed peas, and lentils, are included in this group, as well as in the vegetable group. Dried beans and peas do not contain significant quantities of fat and are excellent sources of plant protein and dietary fiber. They also contribute other nutrients found in meats, poultry, and fish. Whether they are counted as a vegetable or a meat, several cups a week are recommended.

Seafood includes all edible marine animals from saltwater and freshwater sources, including fish (e.g., salmon, tuna, trout, tilapia) and

shellfish (e.g., shrimp, crab, oysters). The adult recommendation for seafood is approximately 20% of total intake of protein foods. Moderate evidence shows that 8 oz-eq or more of seafood per week from a variety of seafood sources provides omega-3 fatty acids associated with prevention of CVD. Pregnant or breastfeeding women should avoid fish high in mercury—such as tilefish, shark, swordfish, and king mackerel—and should limit white tuna to 6 oz-eq per week.

The size portion for nuts or seeds is only $\frac{1}{2}$ ounce rather than 1 ounce because of the high calorie content of these foods; thus, small portions should replace other protein foods (meat or poultry). Nuts and seeds should be unsalted to control sodium intake.

Vegetarians can choose eggs, beans, nuts, nut butters, peas, and soy products to obtain adequate amounts of protein (see [Chapter 5](#)).

The U.S.-Pattern recommends 5 to 6 $\frac{1}{2}$ oz-eq of protein foods, with the specific recommendation of at least 8 oz-eq of seafood per week. Most individuals consume adequate amounts (or more) of protein foods, but leaner types of protein foods need to be chosen more often. Although consuming significantly higher amounts of protein may not be harmful, high-fat meats may be an undesirable source of calories, cholesterol, and/or saturated fatty acids. Protein supplements promoted to increase muscle mass may not contain nutrients important for health and should be used only after consulting a health care provider or an RDN.

Oils

Lipids (oils and fats) are not a food group, but these nutrients are important in a healthful diet. Individuals should be mindful of the type and total amount of fats chosen. Oils are distinctly different from fats because oils, liquids at room temperature, contain a higher percentage of monounsaturated and polyunsaturated fats. Commonly selected oils include canola, corn, olive, peanut, safflower, soybean, and sunflower oils; these are also present in nuts, seeds, seafood, olives, and avocados. Coconut oil, palm kernel, and palm oils are called *oils* because they are derived from tropical plants, but nutritionally they are considered solid fats because they are solid at room temperature due to their high percentages of saturated fatty acids.

The U.S.-Patterns contain some oils, measured in grams (g), but because they are a concentrated source of calories, amounts are limited to within calorie limits and the AMDR (20%–35% of calories) for total fat intake. Fats are classified by the type and percentage of fatty acids they contain. Polyunsaturated fatty acids, monounsaturated fatty acids,

saturated fatty acids, and *trans* fatty acids are prevalent in American foods. Polyunsaturated and monounsaturated fats are included in the U.S.-Patterns as long as the amounts are within caloric limitations, but saturated and *trans* fats are addressed in the subsequent discussion in the [Nutrients to Limit](#) section. A more detailed explanation of lipids is provided in [Chapters 2](#) and [6](#).

Highlights of Nutrient-Dense Foods

- Meet recommended intakes with energy needs by adopting balanced dietary habits using the U.S.-Patterns, *MyPlate*, Mediterranean-style pattern (see [Fig. 6.7](#)), DASH Eating Plan (see [Chapter 12](#)), or Healthy Vegetarian Eating Pattern (see [Table 5.5](#)) as a guide for food choices.
- Consume a sufficient amount of fiber-rich fruits and vegetables while staying within energy needs. Per day, 2 c-eq of fruit and 2 ½ c-eq of vegetables are recommended for a reference 2000-cal intake, with higher or lower amounts depending on the calorie level.
- Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange and red, legumes, starchy vegetables, and other vegetables) several times a week.
- Adding more fruits, vegetables, whole grains, and fat-free or low-fat dairy products may have beneficial health effects and provide good sources of nutrients commonly lacking in American diets.
- Consume 3 or more oz-eq per day of whole-grain products, with the rest of the recommended grains coming from enriched products. In general, at least half the grains should come from whole grains.
- Replace most refined-grain food choices with whole-grain foods that are nutrient dense (low in added sugars and fats) to keep total caloric intake within limits.
- Because fruit juices contain little or no fiber, whole fruits (fresh, frozen, canned, or dried) are preferable choices.
- Protein-containing foods are important, but most Americans consume adequate amounts; therefore, for most, an increase is not recommended.
- Keep total fat intake between 20% and 35% of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- When selecting and preparing meat, poultry, dry beans, and dairy products, choose lean, low-fat, or fat-free options to decrease intake of

saturated fats and calories.

Nutrients to Limit

Total Caloric Intake

The U.S.-Patterns indicate food group and nutrient recommendations for caloric needs, which can only be achieved by choosing foods in a nutrient-dense form (without added sugar and lean and/or very-low-fat dairy and protein foods). To remain within a specific caloric range, only a limited number of calories are available after eating the specified amounts of all the food groups, and this is based on choosing nutrient-dense foods. For example, the amount of additional calories for added sugars or additional fats is only 270 cal for a 2000-cal diet (see [Table 1.1](#)). These additional calories can be used for foods that are not nutrient dense (added sugars, additional refined starches, or fats) or to eat more than the recommended amount of nutrient-dense foods. Many foods in the American food supply provide excess calories without contributing wholesome nutrients or meeting food group recommendations and thus exceed the recommended caloric amount to maintain a healthy body weight.

Added Sugars

Naturally occurring sugars found in fruits and milk are not added sugars. Added sugars are listed in [Box 1.2](#). Consumption of foods containing added sugars increases the difficulty of obtaining adequate nutrients without weight gain.

Box 1.2

Sources of Other Sugars

Agave

Barley malt

Beet sugar

Brown sugar

Cane sugar/juice

Coconut palm sugar (or coconut sugar)

Confectioner's sugar

Corn sweetener

Date sugar

Dextrose

Evaporated cane juice

Fructose

Fruit juice concentrate

Fruit sugar

Glucose

High-fructose corn syrup

Honey

Invert sugar

Lactose

Maltose

Molasses

Palm sugar

Raw sugar

Refiner's syrup

Sucrose

Syrups (malt, corn, brown rice, malt, maple, refiner's sorghum)

Trehalose

Sugars, whether they are naturally present or added to the food, and grains supply physiologic energy in the form of glucose. The physiologic response of naturally occurring sugars is similar to the response from added sugars, but added sugars supply calories with few or no nutrients. Additionally, the frequency and duration of sugars and refined-grain consumption are important factors in caries risk by increasing exposure to cariogenic substrates.

The recommendation is to limit added sugars to less than 10% of calories per day. At lower caloric levels (below 2000 calories), the amount of calories remaining after meeting food group recommendations, even using nutrient-dense foods, is less than 10% per day of the total caloric goal. The limited amount of added sugars can be used to improve the palatability of nutrient-dense foods as long as calories from added sugars do not exceed 10% per day, total carbohydrate intake remains within the AMDR, and total calorie intake remains within limits.

High-intensity sugars (saccharin, aspartame, acesulfame potassium [Ace-K], and sucralose) can replace added sugars to reduce caloric intake, but their effectiveness in long-term weight management is uncertain. Moderate intake of these high-intensity sugars has been deemed safe for the general population.

Saturated Fats, *Trans* Fats, and Cholesterol

Usually, high fat intake (more than 35% of calories) is associated with a higher intake of saturated fat, *trans* fatty acid and cholesterol, and excess calories. These unnecessary lipid components of food may raise undesirable blood lipids. On the other hand, if fat intake is less than 20% of calories, inadequate intakes of vitamin E and essential fatty acids may lead to unfavorable changes in the good type of blood lipids and triglycerides.

Saturated fatty acids should provide less than 10% of calories and should be replaced with monounsaturated and polyunsaturated fatty acids while keeping total dietary fats within the age-appropriate AMDR. There is no dietary requirement of saturated fats for persons 2 years and older because the human body produces more than enough to meet physiologic and structural requirements. Solid fats usually contain a high percentage of saturated fatty acids. Saturated fats are consumed as food (high-fat meats and dairy products) or as ingredients in mixed dishes (e.g., burgers, pizza, hamburgers, tacos, shortening in a cake,

hydrogenated oils in fried foods). These fats, abundant in the American diet, contribute significantly to excess caloric intake and exceeding the 10% per day recommendation.

Trans fatty acid consumption should be as low as possible.

Commercially produced solid fats may contain a high percentage of *trans* fatty acids. Partially hydrogenated oils in margarines are synthetic sources of ***trans* fatty acids** produced by a process called **hydrogenation**. This process was implemented by food manufacturers to make products more resistant to spoilage and rancidity. In partial hydrogenation, some of the unsaturated fats are converted to saturated fatty acids, but some of the unsaturated fats are changed to the *trans* configuration associated with increased risk of CVD. These *trans* fatty acids are frequently found in partially hydrogenated oils (some margarines, snack foods, and prepared desserts). Due to heightened consumer awareness and federal regulations, the amount of artificial *trans* fats in processed foods has decreased significantly in recent years.

Naturally occurring *trans* fats produced by ruminant animals are present in small quantities in dairy products and meats. They do not have the same undesirable effects as commercially produced *trans* fats.

Cholesterol is a very important component in the body for physiologic and structural functions, but adequate amounts are naturally produced; making dietary cholesterol unnecessary. Individuals should eat as little dietary cholesterol as possible while consuming a healthy diet. As a general rule, foods high in fats, such as fatty meats and high-fat dairy products, are also high in cholesterol and saturated fats. Because the U.S.-Pattern limits saturated fats, dietary cholesterol is naturally low—100 to 300 mg of cholesterol. Dietary cholesterol is present only in animal foods such as egg yolk, high-fat dairy products, shellfish, meats, and poultry. Eggs and shellfish are high in dietary cholesterol but not in saturated fats.

Sodium

Sodium is an essential nutrient, but the body requires relatively small quantities available from naturally occurring sodium in foods. The natural sodium content of food only accounts for approximately 10% of total intake; discretionary sodium (i.e., salt added at the table or in cooking) provides another 5% to 10% of intake. Manufacturers and food establishments add more than 75% to prepared foods. Because most of the sodium consumed in American diets is from processed foods, the goal should concentrate primarily on reducing sodium added during

food processing and on changing food selections to more fresh foods and fewer processed items.

Most Americans consume an average of 3440 mg sodium daily; the recommended intake (per the *Dietary Guidelines*, UL from the National Academy of Medicine, and the American Heart Association) is less than 2300 mg per day for adults and children ages 14 years and older.

Decreasing sodium intake is advisable for all, but persons with high blood pressure may benefit by a further reduction to 1500 mg per day.

In general, high sodium intake is associated with **hypertension** (high blood pressure). Hypertension increases an individual's risk of CVD, stroke, congestive heart failure, and kidney disease. The DASH diet is recommended for people with hypertension (see [Chapter 12](#)). The *Dietary Guidelines* endorses this diet for all Americans to ensure adequate essential nutrients while reducing undesirable ones.

Caloric intake is associated with sodium intake; the more foods and beverages consumed, the more sodium is consumed. By reducing calorie intake, sodium intake is lowered somewhat. Additionally, sodium intake can be reduced by choosing fewer processed foods (e.g., pizza, burgers, sandwiches, tacos, soups). Manufacturers are endeavoring to reduce sodium content of processed foods.

Highlights of Nutrients to Limit

- Consume a variety of nutrient-dense foods and beverages within and among the basic food groups while limiting foods containing saturated and *trans* fats, cholesterol, added sugars, salt, and alcohol.
- Consume less than 2300 mg of sodium (approximately 1 tsp of salt) per day. Individuals ages 51 years and older; all African Americans; and people with hypertension, diabetes, or chronic kidney disease should further reduce intake to 1500 mg sodium per day.
- Processed meats and poultry are preserved by smoking, curing, salting, and/or the addition of chemical preservatives. Processed meats, such as hot dogs and luncheon meats, contain larger amounts of sodium and saturated fats. However, these products can be accommodated as long as sodium, saturated fats, and total calories are within limits of the U.S.-Pattern.
- To decrease intake of saturated fats, lean cuts of meat and skinless poultry should be chosen. Seafood, nuts, and seeds should replace some of the protein foods, as they are higher in monounsaturated and polyunsaturated fatty acids.

- Read nutrition labels and choose and prepare foods with less sodium.
- Choose fresh or frozen vegetables over canned versions.
- For 2000 cal per day intake, solid fats and added sugars should comprise less than 13% of the calories, or approximately 258 cal.
- Avoid processed foods containing synthetic sources of *trans* fats, such as partially hydrogenated oils.
- Limit consumption of refined grains to three servings daily, especially those containing solid fats, added sugars, and sodium.
- Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.

Other Dietary Components

Alcohol

Alcohol (also referred to as adult beverages) is not a component of the U.S.-Pattern but as a substance frequently chosen by Americans, contributes to overall caloric intake. There is no nutritional reason for a person to begin consuming alcohol, and many reasons exist for abstinence.

In the past two decades, both the number of people consuming adult beverages and the amount consumed have increased, representing approximately 17% of total caloric intake.⁸ Women who are pregnant or anticipate a pregnancy should not consume alcohol.

Alcohol consumption can have beneficial or harmful effects depending on the amount consumed, age, and other characteristics of the person consuming the alcohol and other circumstances. Because alcoholic beverages supply calories with few nutrients, adequate nutrient intake without weight gain is difficult with excessive alcohol consumption.

The U.S.-Pattern categorizes adult beverages as drink-equivalents. One alcoholic beverage contains 14 g (0.6 fl oz) of pure alcohol. One alcoholic drink-equivalent (oz-eq) is defined as 12 fluid oz of regular beer (5% alcohol), 5 fluid oz of wine (12% alcohol), or 1.5 fluid oz of 80 proof distilled spirits (40% alcohol). If alcohol is consumed, it should be in moderation—up to one drink per day for women and limited to two drinks per day for men, and only by adults of legal drinking age. Moderation is not intended as an average over several days, but rather as the amount consumed on any single day.

Caffeine

Caffeine is a desirable dietary component (not an essential nutrient) for many Americans; more than 90% consume caffeine-containing foods and/or beverages. Caffeine functions as a stimulant in the body.

Popular plant sources of naturally occurring caffeine are coffee beans, tea leaves, cocoa beans, and kola nuts, consumed as coffee, tea, and soda. Caffeine is also added to foods and beverages, such as caffeinated soft drinks and energy drinks. Caffeine added to foods and beverages must be included in the ingredient list on the food label.

The amount of caffeine in frequently consumed beverages varies widely (see [Box 12.1](#)). Average intake of caffeine ranges from 110 to 260 mg per day, although 400 mg per day is considered the highest safe amount.⁶ Women who are pregnant or capable of becoming pregnant, or breastfeeding, should follow the advice of their health care providers regarding caffeine consumption. Further discussion about the health effects of caffeine is provided in [Chapter 12](#).

Highlights of Other Dietary Components

- Moderate coffee consumption (3–5 8-oz cups/day or up to 400 mg/day of caffeine) can be incorporated into healthful eating patterns, but people who do not currently consume caffeine (in various forms) are not encouraged to begin.
- Adults of legal drinking age should consume alcoholic beverages in moderation—up to one drink daily for women and two drinks per day for men.
- Excessive drinking is an important health problem, not limited to college-age individuals.
- Alcoholic beverages should not be consumed by some individuals, including those who cannot limit their alcohol intake; women of childbearing age who may become pregnant; pregnant and lactating women; children and adolescents; or individuals taking prescription or over-the-counter medications that can interact with alcohol, those engaging in activities requiring attention, skill, or coordination (e.g., driving or operating machinery), and those with specific medical conditions (e.g., liver disease, hypertriglyceridemia, and pancreatitis).
- Caution is advised for individuals who choose to mix caffeine and alcohol together or consume them at the same time.

Physical Activity Guidelines

The principal focus of the *Dietary Guidelines* is to ensure that Americans choose foods that promote overall health and well-being. Part of the objective to improve and/or maintain health and prevent chronic disease includes maintaining a healthy weight. Excess weight can contribute to many health problems, including CVD, diabetes, and hypertension. Because of the prevalence of overweight and obesity, the *Dietary Guidelines* frequently mentions the other side of the balance—calorie expenditure, which is a significant factor in attaining a healthy weight.

Physical Activity

Regular physical activity and physical fitness are important factors for an individual's health, sense of well-being, and maintenance of a healthy body weight. **Physical activity** is defined as any body movement produced by skeletal muscles resulting in energy expenditure. Physical activity is not the same as physical fitness. **Physical fitness** is related to the ability to perform physical activity. People with high levels of physical fitness are at lower risk of developing chronic diseases, whereas a sedentary lifestyle increases the risk of weight gain and overweight, obesity, and the development of many chronic diseases. Active individuals have longer life expectancies. Furthermore, physical activity can help manage mild to moderate depression and anxiety.

Different intensities and types of exercise yield distinct benefits. Vigorous activity improves physical fitness more than moderate physical activity and burns more calories per unit of time. Resistance exercise increases muscular strength and endurance and maintains or increases muscle mass. Weight-bearing exercise increases peak bone mass during growth, maintains peak bone mass during adulthood, and reduces the rate of bone loss during aging. It also may reduce the risk of osteoporosis. Also, regular exercise can help prevent falls, common sources of injury, and disability in older adults.

Physical activity may be accomplished in short bouts (10-minute periods) of moderate-intensity activity performed three to six times during the course of a day; the cumulative total is the factor in improving health status and increasing caloric expenditure. The higher a person's physical activity level, the more calories can be consumed without gaining weight. This makes it easier to plan a daily food intake pattern providing recommended nutrient requirements without exceeding caloric requirements.

In addition to physical activity, a high-quality diet without excess

calories enhances the health of most Americans. This may include healthful, nutrient-dense foods and beverages that meet nutrient requirements within individual calorie needs. In general, individuals should become more mindful of what they eat and what they do. The *Dietary Guidelines* encourage adherence to the Physical Activity Guidelines for Americans (<https://www.health.gov/paguidelines>) to help promote health, reduce the risk of chronic disease, and achieve and maintain a healthy body weight.

Highlights of Physical Activity Guidelines

- To prevent gradual weight gain over time, make small decreases in calories from foods and beverages and increase physical activity.
- Engage in regular physical activity and reduce sedentary activities to promote health, psychological well-being, and a healthy body weight.
- For adults to reduce the risk of chronic disease: Engage in at least 30 minutes of moderate-intensity physical activity, beyond usual activity, on most days of the week.
- To help adults manage body weight and prevent gradual unhealthy body weight gain: Engage in approximately 60 minutes of moderate- to vigorous-intensity activity on most days of the week while not exceeding caloric intake requirements.
- For adults to sustain weight loss: Participate in at least 60 to 90 minutes of daily moderate-intensity physical activity while not exceeding caloric intake requirements. (Some people may need to consult a health care provider before participating in this level of activity.)
- For most adults, greater health benefits can be obtained by engaging in physical activity of more vigorous intensity or longer duration. Achieve physical fitness by including cardiovascular conditioning, stretching exercises for flexibility, and resistance exercises or calisthenics for muscle strength and endurance.

• Dental Considerations

- The *Dietary Guidelines* do not necessarily apply to individuals with conditions that interfere with normal nutrition and require a special diet or for children younger than 2 years of age.
- Nutrient-dense foods provide substantial amounts of vitamins and

minerals and relatively few calories. Suggestions for foods to recommend are noted in [Table 1.7](#).

TABLE 1.7

Frequency of Use of Foods for Implementing the *Dietary Guidelines*

Food Groups	Choose More Often	Choose Less Often	Major Contributions
Fats	Corn, cottonseed, olive, sesame, soybean, safflower, sunflower, peanut, canola oils Mayonnaise or salad dressing (made from olive oils) Avocado Olives	Butter, lard Margarine made from hydrogenated (<i>trans</i>) or saturated fats Coconut or palm oil Hydrogenated vegetable shortening Bacon Meat/fat drippings, gravy, sauces	Vitamin A, calories, essential fatty acids
Soups	Lightly salted soups with fat skimmed Cream-style soups (with low-fat milk)	Commercially prepared soups and mixes	Fluid, calories (may contain a variety of vitamins, minerals, and proteins, depending on type)
Sweets and desserts	Desserts that have been sweetened lightly or contain only moderate fat, such as puddings made from skim milk, angel food cake, fruit-based desserts	Desserts high in sugar or fats, candy, pastries, cakes, pies, whole-milk puddings, cookies	Calories (fats, carbohydrates)
Beverages	Water Unsweetened soft drinks Decaffeinated drinks	Sweetened beverages Caffeine-containing beverages Alcoholic beverages	Fluid, calories (unless sugar-free)
Milk and milk products	Low-fat or skim milk Low-fat cheese Low-fat yogurt	Whole-milk Whole-milk cheeses Whole-milk yogurt Ice cream	Calories, calcium, protein, phosphorus, vitamins A and D, riboflavin
Vegetables, including starchy vegetables	Fresh, frozen, or canned; potatoes—baked or boiled Include one dark-green or deep-orange vegetable daily	Deep-fried vegetables, chips Pickled vegetables Highly salted vegetables or juices	Calories, vitamins A and C, dietary fiber, potassium, zinc, cobalt, folic acid
Fruits	Unsweetened fruits or juices Include one citrus fruit/juice or one tomato juice daily	Sweetened fruits or juices Coconut	Calories, dietary fiber, vitamins A and C
Breads, starches, and cereals	Whole-grain breads or cereals Muffins, bagels, tortillas Enriched pasta, rice, grits, or noodles	Snack chips or crackers Sweetened cereals Pancakes, doughnuts, and biscuits	Calories, B-complex vitamins, magnesium, copper, iron, dietary fiber
Meats or substitutes	Lean meats, fish, shellfish, poultry without skin Low-fat cheese (e.g., cottage cheese and part skim mozzarella) Peanut butter Soybeans, tofu Dry beans and peas	Fried or fatty meats/fish Fried poultry or poultry with skin High-fat cheeses (e.g., cheddar and processed cheese) Nuts	Calories, protein, iron, zinc, copper, B-complex vitamins
Miscellaneous	Herbs, spices, flavorings	Salt and salt/spice combinations	Sodium

From Peckenpaugh NJ. *Nutrition Essentials and Diet Therapy*. 11th ed, Philadelphia, PA: W. B. Saunders: 2010.

- Fats provide energy and essential fatty acids and are important for absorption of fat-soluble vitamins A, D, E, and K, and carotenoids.
- Processed foods and oils provide approximately 80% of *trans* fats, with the remainder coming from natural sources or animal foods. *Trans* fats from natural sources are not considered detrimental.
- Provide the patient with a definition or example of moderation (e.g., 1 tsp salt per day or 5-oz glass of wine for a woman per day).
- Many patients understand the general concepts of healthful eating, but they lack specific knowledge or motivation to help implement the recommendations. Most questions or misunderstandings are related to servings and food group placement.
- Dental hygienists should be knowledgeable enough to provide foundational information about the food groups, whole grains, types of fats, and physical activity.
- Assess each patient's diet to determine nutrient adequacy or inadequacy. (For example, if a patient eliminates fruits and vegetables, vitamin A and C deficiencies may develop; if milk and other milk products are eliminated, calcium and vitamin D deficiencies may develop.)
- Ensure that patients are aware of the number and size of servings recommended from each food group daily to obtain adequate nutrients.
- Although consumers are aware that they need to make positive dietary and lifestyle changes, putting that advice into practice is challenging and confusing for many (Fig. 1.3).

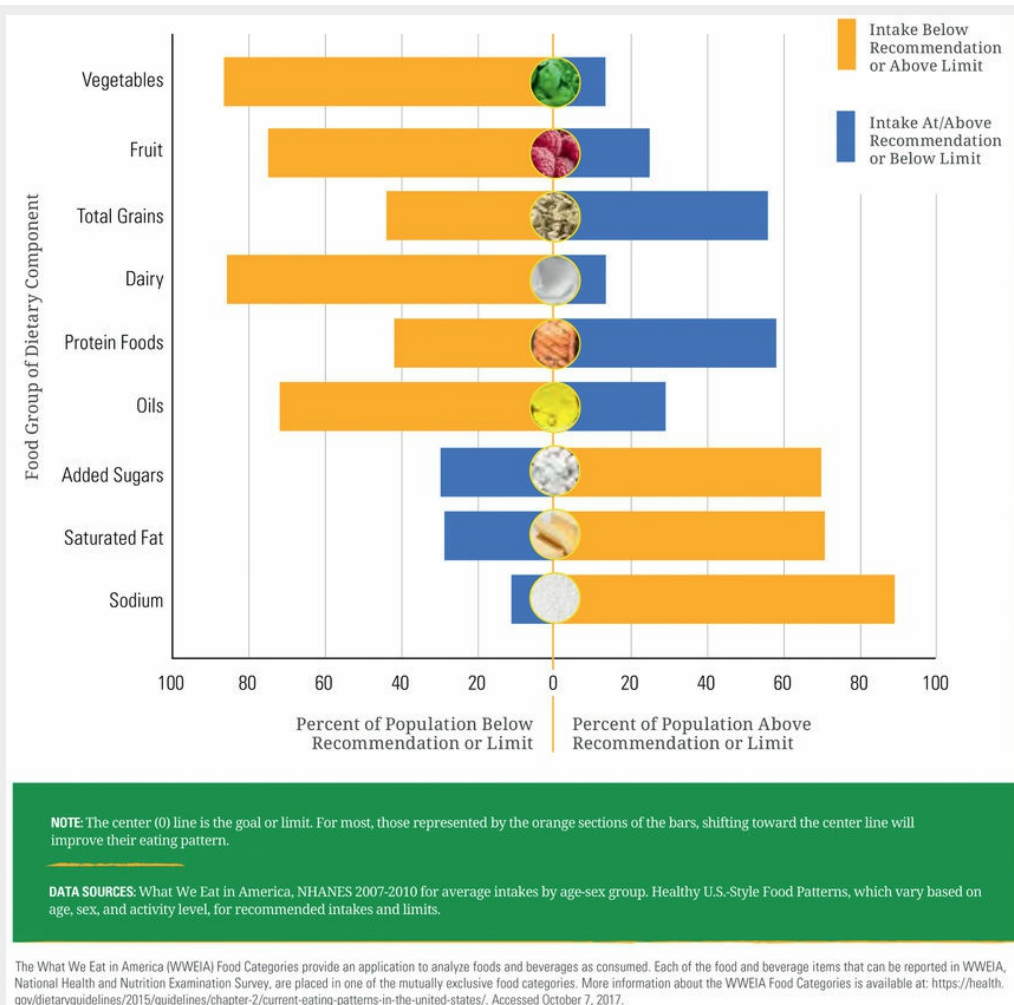


FIGURE 1.3 Dietary intakes compared to recommendations. Percent of the U.S. population ages 1 year & older who are below, at, or above each dietary goal or limit.

- A large proportion of Americans, regardless of their weight, are malnourished in terms of vitamin and mineral intake. However, they should not be told to eat less food but rather to choose more nutrient-dense foods.
- Remind patients that a serving size is a measured amount of food or drink (as indicated on a nutrition label) and portion is the amount actually consumed.

+ Nutritional Directions

- The *Dietary Guidelines* support healthful eating habits to improve health and quality of life, as shown in the sample menu in Fig. 1.4.

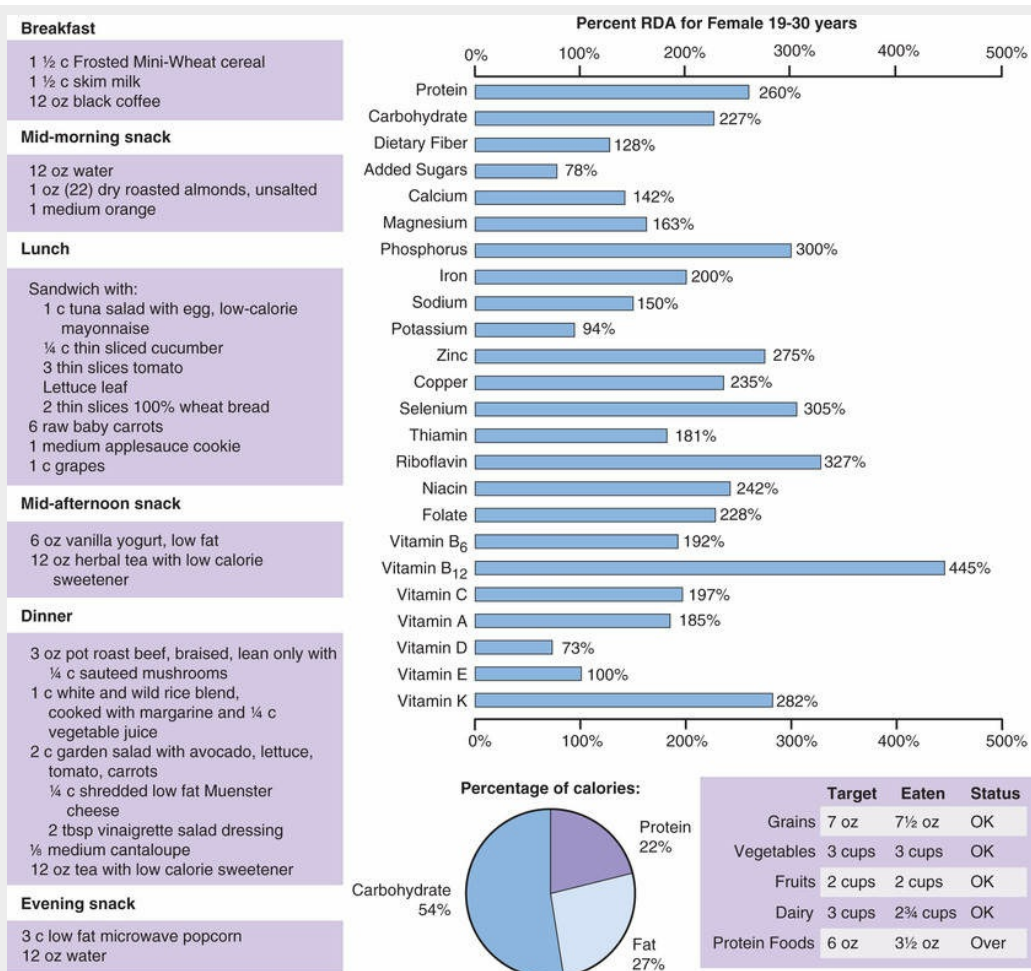


FIGURE 1.4 Sample menu based on the *Dietary Guidelines for Americans* and *MyPlate*.*

- Choosing foods that follow the *Dietary Guidelines* will provide all the nutrients needed for growth and health.
- Make your plate look like a rainbow—consume dark-green, orange, and red vegetables; legumes; fruits; whole grains; and low-fat milk and milk products.
- Choose fewer refined grains, total fats (especially saturated and *trans* fats), added sugars, and calories.
- Read food labels when choosing foods high in fiber or low in fats to determine whether the calories or grams of sugar have increased.
- Limit saturated fat intake to 20 g or less if trying to limit intake to 2000 cal daily.
- Fruits, vegetables, grains, and milk are important sources of many nutrients but should be chosen wisely, within the context of a calorie-

controlled diet.

- By reducing frequency and duration of oral exposure to fermentable carbohydrate intake and optimizing oral hygiene practices, such as drinking fluoridated water, brushing, and flossing, dental caries can be minimized.
- A person's preference for salt is not fixed; the desire for salty foods tends to decrease after consuming foods lower in salt for a period of time.
- The recommended dietary fiber intake is 14 g per 1000 cal consumed.
- Within each food group, individual foods can vary widely in the number of calories furnished; therefore, knowledge about serving sizes is important.
- If nutrient-dense foods are selected from each food group in the amounts recommended, a small amount of discretionary calories can be consumed as added fats or sugars, alcohol, or other foods.
- Dairy products are poor sources of iron and vitamin C, but they are good sources of protein, calcium, and riboflavin.
- Caloric consumption can be decreased by substituting low-fat or skim milk for whole milk. The nutrient content is the same for whole milk and low-fat milk, except for the amount of fat and calories. Skim milk (1%) or fat-free milk is recommended for all healthy Americans older than age 2 years.
- Foods in the grains group are economical as well as nutritious; they may be staple items for those in lower socioeconomic groups. However, whole-grain products may be more expensive; thus, encourage patients to increase these food choices as much as possible.
- Elimination or reduction of one or more food groups will reduce the variety of food intake, thereby reducing the number or amount of nutrients consumed.
- Adults watching their weight should choose minimal amounts of servings from all groups and limit portion sizes.

Support Healthy Eating Patterns for All

The final guideline discusses a social-ecological model for understanding individual lifestyle and motivators affecting food choices. To achieve a healthful eating pattern, food must be readily accessible and safe to eat (free from harmful diseases or bacteria). Food access is influenced by many factors, including distance to a store that stocks healthy foods, financial resources, and neighborhood-level resources (e.g., average income of the neighborhood and availability of public transportation). An individual's perception and food preferences are also influenced by race/ethnicity, socioeconomic status, and geographic location (see [Chapter 16](#)). The presence of a disability can be a real hindrance to having access to healthful foods.

Healthful choices (both food choices and activity) should be supported by all systems (e.g., governments, education, health care, and transportation), organizations (e.g., public health, community, and advocacy), and businesses and industries (e.g., planning and development, agriculture, food and beverage, retail, entertainment, marketing, and media). All sectors can have an important role in encouraging individuals to make healthful choices. Not only should available food be healthful and affordable but foods must be safe (free of microbes and contaminants) to prevent foodborne illness (see [Chapter 16](#)).

MyPlate System

MyPlate is part of a comprehensive communications initiative to promote healthful food choices. The *MyPlate* icon (Fig. 1.5), replaced the well-known *MyPyramid* symbol in 2011. The *MyPlate* food guidance system provides assistance in implementing the recommendations of the *Dietary Guidelines* and the DRIs. *MyPlate* has been well received; nearly two-thirds of Americans recognize the icon.⁹

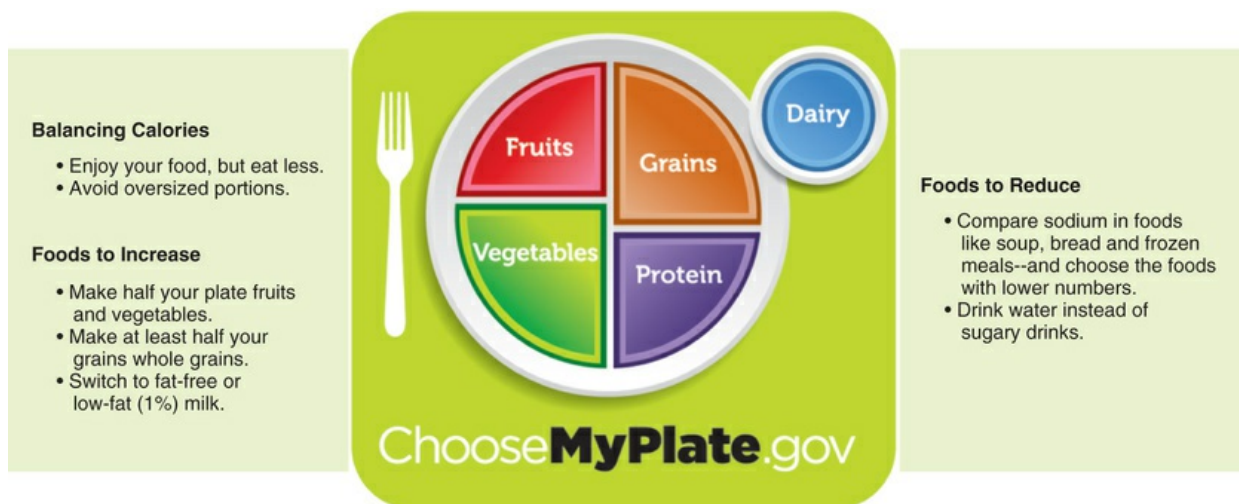
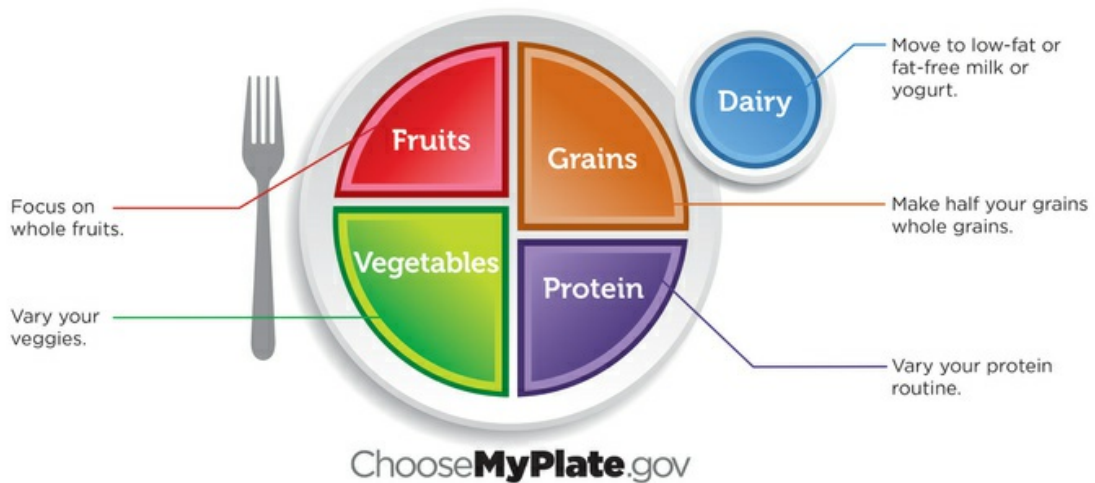


FIGURE 1.5 The *MyPlate* icon. (From United States Department of Agriculture: ChooseMyPlate.gov, 2011.)

The *MyPlate* icon is divided into four quadrants; each section is a different color that represents a food type. The quadrants indicate the recommended proportions on a plate for protein, grain, fruit, and vegetables at each meal, the same food groups discussed in the *Dietary Guidelines*. This icon does not indicate specific amounts to eat, however. Portion sizes in relation to items consumer can relate to are shown in Fig. 1.2. The main message of the plate to consumers is: (a) fruits (red section) and vegetables (green section) should fill half the plate; (b) lean protein foods (purple section) should occupy one-fourth of the plate; (c) whole grains (brown section) should fill about one-fourth of the plate; and (4) dairy products (blue circle) should also be chosen. Fig. 1.6 is a concise synopsis of the *Dietary Guidelines*; it is available online in English and Spanish.

MyPlate, MyWins: Make it yours

Find your healthy eating style. Everything you eat and drink over time matters and can help you be healthier now and in the future.



Limit the extras.
Drink and eat beverages and food with less sodium, saturated fat, and added sugars.



Create 'MyWins' that fit your healthy eating style.
Start with small changes that you can enjoy, like having an extra piece of fruit today.

Fruits	Vegetables	Grains	Dairy	Protein
<p>Focus on whole fruits and select 100% fruit juice when choosing juices.</p> <p>Buy fruits that are dried, frozen, canned, or fresh, so that you can always have a supply on hand.</p>	<p>Eat a variety of vegetables and add them to mixed dishes like casseroles, sandwiches, and wraps.</p> <p>Fresh, frozen, and canned count, too. Look for "reduced sodium" or "no-salt-added" on the label.</p>	<p>Choose whole-grain versions of common foods such as bread, pasta, and tortillas.</p> <p>Not sure if it's whole grain? Check the ingredients list for the words "whole" or "whole grain."</p>	<p>Choose low-fat (1%) or fat-free (skim) dairy. Get the same amount of calcium and other nutrients as whole milk, but with less saturated fat and calories.</p> <p>Lactose intolerant? Try lactose-free milk or a fortified soy beverage.</p>	<p>Eat a variety of protein foods such as beans, soy, seafood, lean meats, poultry, and unsalted nuts and seeds.</p> <p>Select seafood twice a week. Choose lean cuts of meat and ground beef that is at least 93% lean.</p>
<p>Daily Food Group Targets — Based on a 2,000 Calorie Plan Visit SuperTracker.usda.gov for a personalized plan.</p>				
<p>2 cups</p> <p>1 cup counts as:</p> <ul style="list-style-type: none"> 1 large banana 1 cup mandarin oranges ½ cup raisins 1 cup 100% grapefruit juice 	<p>2½ cups</p> <p>1 cup counts as:</p> <ul style="list-style-type: none"> 2 cups raw spinach 1 large bell pepper 1 cup baby carrots 1 cup green peas 1 cup mushrooms 	<p>6 ounces</p> <p>1 ounce counts as:</p> <ul style="list-style-type: none"> 1 slice of bread ½ cup cooked oatmeal 1 small tortilla ½ cup cooked brown rice ½ cup cooked grits 	<p>3 cups</p> <p>1 cup counts as:</p> <ul style="list-style-type: none"> 1 cup milk 1 cup yogurt 2 ounces processed cheese 	<p>5½ ounces</p> <p>1 ounce counts as:</p> <ul style="list-style-type: none"> 1 ounce tuna fish ¼ cup cooked beans 1 Tbsp peanut butter 1 egg
<p>Water</p> <p>Drink water instead of sugary drinks.</p> <p>Regular soda, energy or sports drinks, and other sweet drinks usually contain a lot of added sugar, which provides more calories than needed.</p>	<p>Activity</p> <p>Don't forget physical activity!</p> <p>Being active can help you prevent disease and manage your weight.</p> <p>Kids ≥ 60 min/day Adults ≥ 150 min/week</p>			



Center for Nutrition Policy and Promotion
May 2016
CNPP-29

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FIGURE 1.6 MyPlate miniposter. Used in conjunction with the MyPlate icon (Fig. 1.5), this concisely summarizes the food groups and portions providing 2000 calories. (From U.S. Department of Agriculture, Center for Nutrition Policy and Promotion: *MyPlate* Miniposter (ChooseMyPlate.gov).

MyPlate, MyWins. Center for Nutrition Policy and Promotion, May 29, 2016.

The key tool of this guidance system is the website, www.chooseMyPlate.gov. This food guidance system is revolutionary for a number of reasons. The website is an interactive nutrition education tool intended to help consumers apply personalized dietary guidance to achieve a healthful lifestyle through better eating and increased physical activity. This website continues to change through “facelift designs” and expand and update information available.

The *MyPlate* homepage provides quick access to the food groups and their content, website organization for various age groups, social media sharing, access to online tools, and interactive quizzes to test basic nutrition knowledge.¹⁰ Most of the materials (brochures, tip sheets, graphics, and archived material) on the website can be printed or forwarded in English or Spanish.

MyPlate serves as a simple, research-based icon that sends a clear message on proportionality (balance, variety, and moderation) and exemplifies what should be on a plate of healthful foods. The tools, particularly the graphics, are designed to help Americans make food choices adequate to meet nutritional needs. They also promote food choices moderate in energy level (calories) and in food components or nutrients often consumed in excess (fats, added sugars, and sodium). *MyPlate* is intended to be used as food guidance for the general public and not a therapeutic diet for any specific health condition.

The ChooseMyPlate.gov/website (also available in Spanish, choosemyplate.gov/en-espanol.html) provides numerous materials and useful information to help implement the principles of the *Dietary Guidelines* for both consumers and health professionals. The *MyPlate, MyWins* initiative helps consumers find solutions for common problems experienced in trying to provide healthful meals considering time, budget, and cooking skills. Through the *MyPlate, MyWins* video series, the USDA Center for Nutrition Policy and Promotion has added (1) upbeat animated videos to educate consumers about the components of healthful eating and how to make small changes to live a healthier lifestyle, and (2) documentary interviews with testimonial videos of American families.

SuperTracker is an interactive food, physical activity, and weight tracking tool to help implement the *Dietary Guidelines*. A database of over 8000 foods provides information about a specific food (calories, serving

size, food group, and nutrient content) to evaluate a consumer's diet. Approximately 600 types of physical activity are available to assist in balancing food intake with activity to help achieve a healthier weight. Continual updates to this part of the *MyPlate* website include recipe analysis and the ability to track intake of added sugars. *What'sCooking* features tips for healthful meal planning, cooking, and grocery shopping with an extensive database of healthy recipes and cookbooks.

Other Food Guides

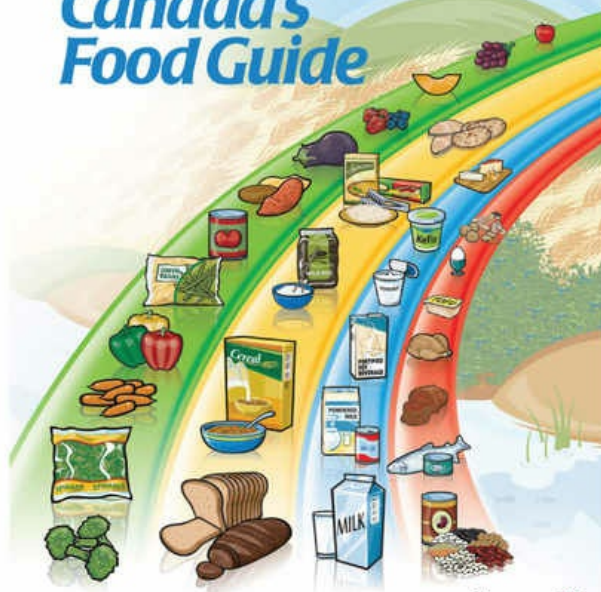
Not all health care professionals agree that *MyPlate* is the ideal method to promote health and wellness. However, the recommendations in *MyPlate* are remarkably consistent with other population-based recommendations designed to control obesity, diabetes, CVD and stroke, hypertension, cancer, and osteoporosis. Although different guides were derived from different types of nutrition research and for different purposes, they share consistent messages: eat more fruits, vegetables, legumes, and whole grains; eat less added sugar and saturated fat; and emphasize plant oils. Primary differences are in the types of recommended vegetables and protein sources, and the amount of recommended dairy products and total oil/fats. Overall nutrient values are also similar for most nutrients.

The recommendations in *MyPlate* are similar to the guidelines of the DASH eating plan (discussed in [Chapter 12](#)), the American Heart Association (discussed in [Chapter 6](#)), the American Diabetes Association (discussed in [Chapter 7](#)), the National Cholesterol Education Program Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III), and the American Cancer Society. Calculated nutrient intakes associated with following any of these guidelines are generally within the ranges of nutrient recommendations of the *Dietary Guidelines*. Another alternative food guide is the Healthy Eating Plate created by nutrition faculty at the Harvard School of Public Health (see the Evolve website). While their goal is similar to the USDA's *MyPlate*, more specific information is provided, including visual reminders for increasing fluid intake and physical activity.

Canada's Food Guide

Canada has also developed a pictorial food guide to help Canadians choose food wisely ([Fig. 1.7](#)). The *Food Guide* rainbow encourages consumers to find their own healthy lifestyle—a pot of gold. The website (<https://www.hc-sc.gc.ca/fn-an/food-guide-aliment/order-commander/myguide-monguide/index-eng.php>) is interactive, allowing consumers to personalize the food guide, providing recipes, tips for healthful eating and physical activity, and other educational materials.

Eating Well with Canada's Food Guide



Canada

Recommended Number of Food Guide Servings per Day

Age in Years Sex	Children			Teens		Adults			
	2-3	4-8	9-13	14-18		19-50		51+	
	Girls and Boys	Females	Males	Females	Males	Females	Males	Females	
Vegetables and Fruit	4	5	6	7	8	7-8	8-10	7	7
Grain Products	3	4	6	6	7	6-7	8	6	7
Milk and Alternatives	2	2	3-4	3-4	3-4	2	2	3	3
Meat and Alternatives	1	1	1-2	2	3	2	3	2	3

The chart above shows how many Food Guide Servings you need from each of the four food groups every day.

Having the amount and type of food recommended and following the tips in Canada's Food Guide will help:

- Meet your needs for vitamins, minerals and other nutrients.
- Reduce your risk of obesity, type 2 diabetes, heart disease, certain types of cancer and osteoporosis.
- Contribute to your overall health and vitality.

A

What is One Food Guide Serving?
Look at the examples below.

Oils and Fats

- Include a small amount – 30 to 45 ml (1/2 to 3 Tbsp) – of unsaturated fat each day. This includes oil used for cooking, salad dressings, margarine and mayonnaise.
- Use vegetable oils such as canola, olive and soybean.
- Choose soft margarines that are low in saturated and trans fats.
- Limit butter, hard margarine, lard and shortening.

Make each Food Guide Serving count... wherever you are – at home, at school, at work or when eating out!

- ▶ **Eat at least one dark green and one orange vegetable each day.**
 - Go for dark green vegetables such as broccoli, romaine lettuce and spinach.
 - Go for orange vegetables such as carrots, sweet potatoes and winter squash.
- ▶ **Choose vegetables and fruit prepared with little or no added fat, sugar or salt.**
 - Enjoy vegetables steamed, baked or stir-fried instead of deep-fried.
- ▶ **Have vegetables and fruit more often than juice.**

- ▶ **Make at least half of your grain products whole grain each day.**
 - Eat a variety of whole grains such as barley, brown rice, oats, quinoa and wild rice.
 - Enjoy whole grain breads, oatmeal or whole wheat pasta.
- ▶ **Choose grain products that are lower in fat, sugar or salt.**
 - Compare the Nutrition Facts table on labels to make wise choices.
 - Enjoy the true taste of grain products. When adding sauces or spreads, use small amounts.

- ▶ **Drink skim, 1%, or 2% milk each day.**
 - Have 300 mL (2 cups) of milk every day for adequate vitamin D.
 - Drink fortified soy beverages if you do not drink milk.
- ▶ **Select lower fat milk alternatives.**
 - Compare the Nutrition Facts table on yogurts or cheeses to make wise choices.

- ▶ **Have meat alternatives such as beans, lentils and tofu often.**
- ▶ **Eat at least two Food Guide Servings of fish each week.***
 - Choose fish such as cod, herring, mackerel, salmon, sardines and trout.
- ▶ **Select lean meat and alternatives prepared with little or no added fat or salt.**
 - Trim the visible fat from meats. Remove the skin on poultry.
 - Use cooking methods such as roasting, baking or poaching that require little or no added fat.
 - If you eat frozen meats, sausages or prepackaged meats, choose those lower in salt (sodium) and fat.



* Health Canada provides advice for limiting exposure to mercury from certain types of fish. Refer to www.healthcanada.gc.ca for the latest information.

Advice for different ages and stages...

Children

Following Canada's Food Guide helps children grow and thrive. Young children have small appetites and need calories for growth and development.

- Serve small nutritious meals and snacks each day.
- Do not restrict nutritious foods because of their fat content. Offer a variety of foods from the four food groups.
- Most of all... be a good role model!

Women of childbearing age

All women who could become pregnant and those who are pregnant or breastfeeding need a multivitamin containing **folic acid** every day. Pregnant women need to ensure that their multivitamin also contains **iron**. A health care professional can help you find the multivitamin that's right for you.

Pregnant and breastfeeding women need more calories. Include an extra 2 to 3 Food Guide Servings each day.

Here are two examples:

- Have fruit and yogurt for a snack, or
- Have an extra slice of toast at breakfast and an extra glass of milk at supper.

Men and women over 50

The need for **vitamin D** increases after the age of 50.

In addition to following Canada's Food Guide, everyone over the age of 50 should take a daily vitamin D supplement of 10 µg (400 IU).

Eat well and be active today and every day!

The benefits of eating well and being active include:

- Better overall health.
- Lower risk of disease.
- A healthy body weight.
- Feeling and looking better.
- More energy.
- Stronger muscles and bones.

Be active

To be active every day is a step towards better health and a healthy body weight. Canada's Physical Activity Guide recommends building 30 to 60 minutes of moderate physical activity into daily life for adults and at least 90 minutes a day for children and youth. You don't have to do it all at once. Add it up in periods of at least 10 minutes at a time for adults and five minutes at a time for children and youth.

Start slowly and build up.

Eat well

Another important step towards better health and a healthy body weight is to follow Canada's Food Guide by:

- Eating the recommended amount and type of food each day.
- Limiting foods and beverages high in calories, fat, sugar or salt (sodium) such as cakes and pastries, chocolate and candies, cookies and granola bars, doughnuts and muffins, ice cream and frozen desserts, french fries, potato chips, nachos and other salty snacks, alcohol, fruit flavoured drinks, soft drinks, sports and energy drinks, and sweetened hot or cold drinks.

Take a step today...

- Have breakfast every day. It may help control your hunger later in the day.
- Walk wherever you can – get off the bus early, use the stairs.
- Benefit from eating vegetables and fruit at all meals and as snacks.
- Spend less time being inactive such as watching TV or playing computer games.
- Request nutrition information about menu items when eating out to help you make healthier choices.
- Enjoy eating with family and friends!
- Take time to eat and savour every bite!

How do I count Food Guide Servings in a meal?

Here is an example:

Food Item	Food Guide Serving
250 mL (1 cup) mixed broccoli, carrot and sweet red pepper	2 Vegetables and Fruit Food Guide Servings
75 g (2 1/2 oz) lean beef	1 Meat and Alternatives Food Guide Serving
250 mL (1 cup) brown rice	2 Grain Products Food Guide Servings
5 mL (1 tsp) canola oil	part of your Oils and Fats intake for the day
250 mL (1 cup) 1% milk	1 Milk and Alternatives Food Guide Serving
1 apple	1 Vegetables and Fruit Food Guide Serving

Read the label

Compare the Nutrition Facts table on food labels to choose products that contain less fat, saturated fat, trans fat, sugar and sodium.

Keep in mind that the calories and nutrients listed are for the amount of food found at the top of the Nutrition Facts table.

Limit trans fat

When a Nutrition Facts table is not available, ask for nutrition information to choose foods lower in trans and saturated fats.

Nutrition Facts	
Per 0 mL (0 g)	
Amount	% Daily Value
Calories 0	0%
Fat 0 g	0%
Saturated fat 0 g	0%
Trans fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 0 mg	0%
Carbohydrate 0 g	0%
Fiber 0 g	0%
Sugars 0 g	0%
Protein 0 g	0%
Vitamin A 0%	Vitamin C 0%
Calcium 0%	Iron 0%

For more information, interactive tools, or additional copies visit Canada's Food Guide on-line at: www.healthcanada.gc.ca/foodguide

or contact:
 Publications Health Canada
 Ottawa, Ontario K1A 0K9
 E-Mail: publications@hc-sc.gc.ca
 Tel: 1-866-225-0709
 Fax: (613) 941-5366
 TTY: 1-800-367-1245

Également disponible en français sous le titre : *Bien manger avec le Guide alimentaire canadien*

This publication can be made available on request on diskette, large print, audio-cassette and braille.

FIGURE 1.7 Eating well with Canada's food guide. (From *Canada's Food Guide*. Last modified: May 23, 2012. © Her Majesty the Queen in Right of Canada, represented by the Minister of Health Canada, 2011. This publication may be reproduced without permission. No changes permitted. HC Pub.: 4651 Cat.: H164-38/1-2011E-PDF ISBN: 978-1-100-19255-0. Web site: <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/order-commander/index-eng.php>. Accessed March 20, 2017.)

Other Nations' Guides

Many nations eat very differently than Americans. No one food is essential for good health. People in many countries are healthy (sometimes healthier than Americans) despite eating very different types of foods. This is further discussed in [Chapter 16](#); food guides from other countries are shown on the inside of the back cover.

Nutrition Labeling

Nutrition Facts Label

In a concerted effort by the USDA and FDA to help people make informed decisions about choosing foods to improve their health and well-being, the Nutrition Facts label graphic was designed. It is encouraging that half of all adults read this Nutrition Facts label “always” or “most of the time.”¹¹ Initially introduced approximately 20 years ago, the Nutrition Facts label was revised in 2016 to reflect new recommendations of the *Dietary Guidelines*, changes in the modern American diet, and to improve the graphics to make information clearer to consumers (Fig. 1.8). The Nutrition Facts label enhances nutritional knowledge by focusing attention on information important for addressing current public health problems, such as obesity. The label indicates the nutrients in a food, enabling consumers to compare the nutrient content of various products. The labeling regulation requires that approximately 90% of all foods sold in the United States provide specific information based on the nutrient content, including imported foods.

The New and Improved Nutrition Facts Label – Key Changes

The U.S. Food and Drug Administration has finalized a new Nutrition Facts label for packaged foods that will make it easier to make informed food choices that support a healthy diet. The updated label has a fresh new design and reflects current scientific information, including the link between diet and chronic diseases.

1. Servings

The number of "servings per container" and the "Serving Size" declaration have increased and are now in larger and/or bolder type. Serving sizes have been updated to reflect what people actually eat and drink today. For example, the serving size for ice cream was previously ½ cup and now is ¾ cup.

There are also new requirements for certain size packages, such as those that are between one and two servings or are larger than a single serving but could be consumed in one or multiple sittings.

2. Calories

"Calories" is now larger and bolder.

3. Fats

"Calories from Fat" has been removed because research shows the type of fat consumed is more important than the amount.

4. Added Sugars

"Added Sugars" in grams and as a percent Daily Value (%DV) is now required on the label. "Added Sugars" include sugars that have been added during the processing

NEW LABEL

Nutrition Facts	
8 servings per container	
Serving size	2/3 cup (55g)
Amount per serving	
Calories	230
% Daily Value*	
Total Fat 8g	10%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 160mg	7%
Total Carbohydrate 37g	13%
Dietary Fiber 4g	14%
Total Sugars 12g	
Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Manufacturers will need to use the new label by January 1, 2020, and small businesses will have an additional year to comply. During this transition time, you will see the current Nutrition Facts label or the new label on products.

or packaging of a food. Scientific data shows that it is difficult to meet nutrient needs while staying within calorie limits if you consume more than 10 percent of your total daily calories from added sugar.

5. Nutrients

The lists of nutrients that are required or permitted on the label have been updated. Vitamin D and potassium are now required on the label because Americans do not always get the recommended amounts. Vitamins A and C are no longer required since deficiencies of these vitamins are rare today. The actual amount in grams in addition to the %DV must be listed for vitamin D, calcium, iron, and potassium. The daily values for nutrients have also been updated based on newer scientific evidence. The daily values are reference amounts of nutrients to consume or not to exceed and are used to calculate the %DV.

6. Footnote

The footnote at the bottom of the label has changed to better explain the meaning of %DV. The %DV helps you understand the nutrition information in the context of a total daily diet.



For more information about the new Nutrition Facts label, visit:

www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm385663.htm

JULY 2016

FIGURE 1.8 Changes finalized in May 2016 to the Nutrition Facts label for packaged foods to reflect new scientific information. (From Geiger CJ. Deconstructing the updated Food Label for informed consumer choices. Presented at the Food and Nutrition Conference and Exhibition, Academy of Nutrition and Dietetics, Boston, MA. October 2016.)

The USDA's Food Safety and Inspection Service requires packages of ground or chopped meat and poultry and the most popular whole, raw cuts of meat and poultry (such as chicken breast or steak) to have nutritional information either on the package labels or on display for consumers. Currently, these products are labeled with the number of calories and grams of total fat and saturated fat in the product. For foods not packaged, the information must be displayed at the point of purchase (e.g., counter card, sign, or booklet). These nutrition labels differ from the Nutrition Facts label required by the FDA; the USDA's Food Safety and Inspection Service has proposed amending nutrition labeling for meat and poultry products to be more consistent with the FDA Nutrition Facts panel.

The updated design of the Nutrition Facts label requires calories and portion sizes to be in large bold type. Serving sizes more closely reflect the amounts of food Americans currently consume, but this amount may not be consistent with portion sizes. Packages containing between one and two servings (e.g., a 20-oz soft drink) list the calories and other nutrients as one serving because typically the full amount is consumed in one sitting. Individuals sometimes consume certain multi-serving foods in one sitting; these foods (e.g., one pint of ice cream) must indicate both “per serving” and “per package” calorie and nutrition information, displaying this information in a two-column format.

Because research indicates that the type of fat consumed is more important than the amount of fat, only total fat, saturated fat, and *trans* fat amounts are listed. *Trans* fats, while practically absent from processed foods, still appear on the label because ruminant sources, while not harmful, contribute to intake. Dietary fiber and total and added sugars are all itemized under the bolded Total Carbohydrate. Grams and percent daily value (%DV) for dietary fiber and added sugars must be listed. Only specific added fibers can be reflected in the carbohydrate count. Other fibers currently added to foods will be reviewed by the FDA before they can be counted. This may be confusing for consumers during the transition period. Consuming required nutrients and staying within one's calorie limit is difficult when added sugars make up more than 10% of the total calories.

Sodium, dietary fiber, and vitamin D are based on updated daily values, consistent with the National Academy of Medicine recommendations and *Dietary Guidelines* (Box 1.3). The updated footnote better clarifies the %DV and puts calories in the context of the daily diet. Both the actual amount and %DV are revealed for vitamin D, calcium, iron, and potassium. Survey data indicate that Americans do not consume adequate amounts of vitamin D and potassium. Vitamins A and C are no longer required because deficiencies are rare, but this information may be included voluntarily.

Box 1.3

Daily Values (Updated)

Total fat: 65 g to 78 g

Total carbohydrate: 300 g to 275 g

Dietary fiber: 25 g to 28 g

Sodium: 2400 mg to 2300 mg

Potassium: 3500 mg to 4700 mg

Calcium: 1000 mg to 1300 mg

Vitamin D: 400 IUs (10 µg)

Daily Values (%) on the label provide a rough guide indicating whether the food contains a small or large amount of a nutrient for comparison purposes. Foods that provide 20% or more of the DV are considered high in a nutrient. The requirement to label products has resulted in reformulation of many foods to provide healthier products. The 2016 Nutrition Facts label must be implemented by large food manufacturers by January 2020, but smaller companies will have an additional year to comply. Some large food manufacturers have requested additional time for compliance due to a lack of consensus regarding the definition of dietary fiber.

Nutrient Content and Health Claims

Two categories of claims currently can be used on foods in the United States: nutrient content claims and health claims. **Nutrient content claims** identify the nutrients in a product and provide information to assess its relative value. **Health claims** describe a relationship between a food or food component and its ability to reduce risk of a disease or health-related condition. These claims are based on a very high standard of scientific evidence.

Nutrient content claims describe the quantity of a nutrient in a product using words defined by the FDA, such as “free,” “low,” or “high.” Comparative terms—such as “more” or “reduced”—can be used to indicate a difference to a similar food. “Healthy,” “lean,” or “light” are descriptions of nutrient contents. The food must meet FDA definitions to use these terms. A label cannot include an explicit or implied nutrient content claim unless it uses terms defined by the FDA. [Box 1.4](#) defines some of the established terms and definitions used on food labels.

Box 1.4

Definitions of Commonly Used Nutrient Content Claims

Calories

- *Calorie free*: Fewer than 5 calories per RACC (reference amounts customarily consumed)
- *Low calorie*: 40 calories or less per RACC, or per 50 g of the food
- *Reduced or fewer calories*: At least 25% fewer calories per RACC than reference food

Fat

- *Fat free*: Less than 0.5 g of fat per RACC
- *Saturated fat free*: Less than 0.5 g per RACC, and the level of *trans* fatty acids does not exceed 1% of total fat
- *Low fat*: 3 g or less per RACC, or per 50 g of the food
- *Low saturated fat*: 1 g or less per RACC and not more than 15% of calories from saturated fatty acids
- *Reduced or less fat*: At least 25% less per RACC than reference food
- *Reduced or less saturated fat*: At least 25% less per RACC than reference food

Cholesterol

- *Cholesterol free*: Less than 2 mg of cholesterol and 2 g or less of saturated fat per RACC
- *Low cholesterol*: 20 mg or less or 2 g or less of saturated fat per RACC, or per 50 g of the food
- *Reduced or less cholesterol*: At least 25% less and 2 g or less of saturated fat per RACC than reference food

Sodium

- *Sodium-free*: Less than 5 mg per RACC
- *Low sodium*: 140 mg or less per RACC, or per 50 g of the food
- *Very low sodium*: 35 mg or less per RACC, or per 50 g of the food
- *Reduced or less sodium*: At least 25% less per RACC than reference food

Fiber

- *High fiber*: 5 g or more per RACC (foods with high-fiber claims must meet the definition for low fat or the level of total fat must appear next to the high-fiber claim)
- *Good source of fiber*: 2.5–4.9 g per RACC
- *More or added fiber*: At least 2.5 g more per RACC than reference food

Sugar

- *Sugar free*: Less than 0.5 g per RACC
- No added sugar, without added sugar, or no sugar added:
 - No sugars are added during processing or packaging, including ingredients that contain sugars (e.g., fruit juices, applesauce, or dried fruit).
 - Processing does not increase the sugar content to an amount higher than is naturally present in the ingredients (a functionally insignificant increase in sugars is acceptable from processes used for purposes other than increasing sugar content).
 - The food that resembles it and for which it substitutes normally contains added sugars.
 - If it does not meet the requirements for a low- or reduced-calorie food, that product bears a statement that the food is not low calorie or reduced calorie and directs consumers' attention to the nutritional panel for additional information on sugars and calorie content.
- *Reduced sugar*: At least 25% less sugar per RACC than reference food

Healthy*

The regulatory criteria for use of the nutrient content claim "healthy" is being re-evaluated, a lengthy process, but enforcement discretion may be exercised during this period. Products may use the term "healthy" in the product name or as a claim on the label or in the labeling of a food that is useful in creating a diet that is consistent with dietary recommendations. If the product is not low in fat, it should have a fat profile makeup of predominantly mono- and polyunsaturated fats (i.e., sum of monounsaturated fats and polyunsaturated fats are greater than the total saturated fat content of the food). The food must supply at least 10% of the Daily Value per reference amount customarily consumed (RACC) of for at least one of six nutrients: vitamins A and C, calcium, iron, protein, or fiber, or if the food instead contains at least 10% of the DV of potassium or vitamin D. Whichever nutrient is used as the basis for eligibility should be declared in the Nutrition Facts label. From U.S. Food and Drug Administration: *Food labeling guide*. Revised January 2013.

<https://www.fda.gov/downloads/Food/GuidanceRegulation/UCM265446.pdf>

*U.S Department of Health and Human Services, Food and Drug Administration. *Use of the Term "Healthy" in the Labeling of Human Food Products: Guidance for Industry*. Center for Food Safety and Applied Nutrition; College Park, MD, September 2016.

<https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ucm>

Only health claims that have been approved and authorized by the FDA can be used on food products and dietary supplements (Box 1.5). To use a health claim, the food must meet specific criteria regarding the amount of that specific nutrient and sometimes other nutrients in the product. Products making a claim are required to use the FDA's exact wording.

Box 1.5

Health Claims Authorized by the U.S. Food and Drug Administration

- Calcium and reduced risk of osteoporosis; calcium, vitamin D, and reduced risk of osteoporosis

- Sodium and increased risk of hypertension
 - Dietary fat and increased risk of cancer
 - Saturated fat and cholesterol and increased risk of heart disease
 - Fiber-containing grain products, fruits, and vegetables, and reduced risk of cancer
 - Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, and reduced risk of heart disease
 - Fruits and vegetables and reduced risk of cancer
 - Folate and reduced risk of neural tube defects during pregnancy
 - Noncariogenic carbohydrate sweeteners (D-tagatose, sugar alcohols, isomaltulose, sucralose) and reduced risk of dental caries
 - Soluble fiber from certain foods (oat products, barley, and soluble fiber from psyllium husk) and reduced risk of coronary heart disease
 - Soy protein and reduced risk of coronary heart disease
 - Plant sterol/stanol esters and reduced risk of coronary heart disease
- The following must meet specific nutrient requirements and use specific wording:
- Whole-grain foods and risk of heart disease and certain cancers
 - Whole-grain foods with moderate fat content and risk of heart disease
 - Potassium and reduced risk of hypertension and stroke
 - Fluoride and decreased risk of dental caries
 - Saturated fat, cholesterol, and *trans* fats and reduced risk of heart disease
 - Substitution of saturated fat with unsaturated fatty acids and decreased risk of heart disease

Health claims on foods require preapproval from the FDA; these are

limited and regulated in an effort to protect consumers from false or misleading claims. **Unqualified health claims** must be supported by qualified experts agreeing that scientific evidence is available determining a relationship between a nutrient and a specific disease. **Qualified health claims** are supported by some evidence, but they lack significant scientific agreement; thus, their claim must be accompanied by a disclaimer as specified by the FDA. Since 2002, when the FDA began allowing companies to petition for qualified health claims, fewer than 20 qualified health claims have been approved. A health claim must use the exact wording specified by the FDA. For instance, the first qualified claim allowed by the FDA was the association between nuts and heart disease; verbiage on the package must read: “Scientific evidence suggests but does not prove 1.5 ounces per day of most nuts such as (insert name of specific nut) as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease.”¹²

Additional Nutrition Labels

Many consumers are confused by the Nutrition Facts panel and prefer information in a quicker and easy-to-read format. Food manufacturers, supermarket chains, trade associations, and health organizations have developed comprehensive mechanisms to provide information about the nutritional quality of foods and beverages either on product packaging or shelf tags in retail setting nutrition labeling systems.

Since 1985, the American Heart Association has tried to make heart-healthy grocery shopping easier with its heart check symbol. A food has to meet certain criteria to qualify for using this symbol. The Whole Grain Council has different stamps indicating two different levels of whole grain in a serving (see [Chapter 4](#)). The Produce for Better Health Foundation's More Matters icon, Kraft's Sensible Solutions, and Sara Lee's Nutritional Spotlight are several other programs that have been developed. These food rating programs can help individuals make better food choices, as will the revised Nutrition Facts label. Furthermore, in order to make wise choices, food should be selected within the context of the whole diet.

The FDA is apprehensive about these different labeling programs, fearing they may mislead consumers about the health benefits of the food. Multiple systems may create more confusion, and other systems' criteria may not be stringent enough or consistent with the *Dietary Guidelines*. Another concern is that they may encourage consumers to choose highly processed foods and refined grains rather than fruits,

vegetables, and whole grains. The FDA has considered developing a single standardized guidance system for front-of-package labels. Whether all nutrition and health claims from the front of processed food packages will be eliminated is yet to be determined.

● Dental Considerations

- The dental hygienist must ensure that the appropriate RDIs are used for the patient's age or grouping (e.g., when talking to a pregnant patient, the RDI for pregnancy should be used).
- To prevent confusion, the acronym RDI is not used on labels; however, dental hygienists need to be aware of the basis for the information presented.
- Review a label together with the patient and family. Ask the patient to bring in several labels of commonly used foods in the household for you to discuss.
- Encourage patients to keep portion sizes consistent with activity level.
- On a label, point out the DVs that indicate calories (carbohydrate, fat, and protein), those indicating they should be limited (saturated and *trans* fat, cholesterol, and sodium), and how to determine whether a product contains a small or large amount of a nutrient (see [Fig. 1.8](#)).

+ Nutritional Directions

- Read labels carefully. Ingredients are listed in order of quantity (by weight). Choose products that have less fat or oils or in which fats are listed last.
- Food labels are a useful tool to compare nutrient values of foods and learn valuable sources of nutrients. Fortified foods and supplements should not be purchased in an attempt to meet 100% of the RDIs because this may result in greater nutrient consumption than is needed, especially for young children. Concerns should be addressed to a health care provider or RDN.

- A product labeled “low fat” or “low sodium” may or may not be more healthful than another product. These claims are comparative to a previous product's fat or sodium content, not the whole product. Other nutrients in the product may be modified also, possibly negatively. Read the whole Nutrition Facts label carefully to know if the product is healthful or nutrient dense.
- When looking at the Nutrition Facts label to compare products, consider portion sizes between products because these can vary.
- Products labeled as “dietetic,” “sugar-free,” or “reduced fat” may not be low in calories; this is dependent on other ingredients in the food.
- Unsweetened juices and milk contain significant amounts of natural sugars.

❖ Health Application 1

Obesity

The U.S. population is leading the rest of the world in obesity, but this health problem has become a global issue—affecting around 13% of people worldwide. By 2025, one-fifth of adults worldwide will be obese unless effective interventions are adopted. China and the United States now have the most obese people in the world, with the United States having the most severely obese people of any country.¹³ Obesity is a threat to the world's future food security and could precipitate a catastrophic epidemic of diabetes. The global cost of obesity is \$2 trillion annually, which is nearly as much as the global cost of smoking (\$2.1 trillion).¹⁴

Although the prevalence of obesity has shown signs of leveling off, obesity rates in 2016 were approximately 38% and extremely obese 8% (BMI >40.0).¹⁵ During the past 20 years, groups with the heaviest BMIs have been increasing at the fastest rates.¹⁶ As shown in [Fig. 1.9](#), approximately 6.6% of adults were severely obese (more than 100 pounds over a healthy weight) in 2010, up from 3.9% in 2000. More alarming is the forecast that the prevalence of obesity may reach 51% by 2030.¹⁷ Additionally, the statistics are very discouraging in ethnic groups (i.e., Hispanics, African Americans, Native Americans, and Alaska Natives) because the prevalence of obesity is markedly higher than in white Americans.

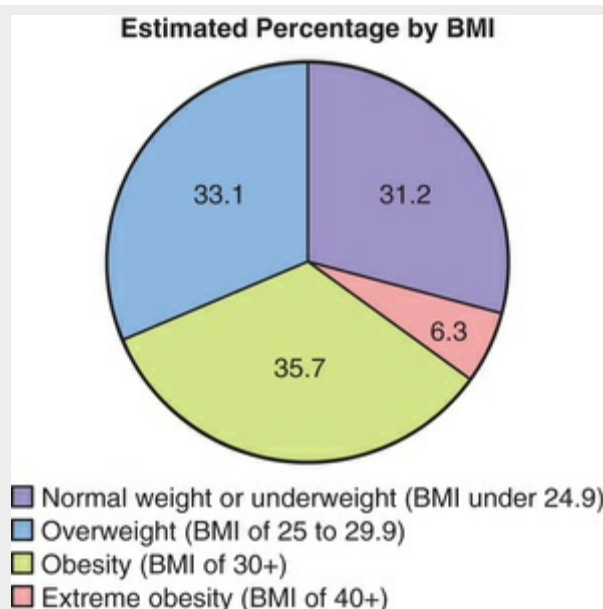


FIGURE 1.9 Overweight and obesity among adults age 20 and older, United States, 2009–2010. (Source: National Health and Nutrition Examination Survey, 2009–2010. <https://www.niddk.nih.gov/health-information/health-statistics/Pages/overweight-obesity-statistics.aspx>. Accessed March 20, 2017.)

The goals of the *Healthy People 2020* nutritional objectives include increasing the proportion of adults who are at a healthy weight to 33.9% compared with the current level of 30.8% in 2005 to 2008 and reducing the proportion of adults who are obese to 30.5% compared with 33.9% who were obese in 2005 to 2008.¹⁸ The Midcourse Review indicated little or no detectable change between 2005 and 2008 (30.8%) and 2009 and 2012 (29.5%) for increasing numbers of adults who are at a healthy weight and an undesirable change in the proportion of adults with obesity (from 33.9% to 35.3%).¹⁹

Other 2020 goals related to objectives to attain a healthy weight include (1) decreasing the proportion of adults who did not engage in any leisure-time physical activity, (2) increasing the proportion of adults who engaged in aerobic physical activity of light/moderate intensity for 150 minutes or more per week or vigorous intensity for 75 minutes or more per week, and (3) adults who met the physical activity guidelines for both aerobic physical activity and muscle strengthening. Midcourse review showed these objective exceeded their 2020 targets.²⁰

According to the *State of Obesity 2017*, five states exceed 35% rates of obesity, 25 states are at or above 30%, and all states have a more than 20% rate of obesity. U.S. adult obesity rates decreased in one state (Kansas), increased in four (Colorado, Minnesota, Washington, and West Virginia), and remained steady in the rest between 2015 and 2016.¹⁵

Preventing weight gain or maintaining a healthy weight is a major goal to reduce the burden of illness and its consequent reduction in

quality of life and life expectancy. Obesity and overweight in adulthood go hand in hand with preventable chronic diseases. These include hypertension, osteoarthritis, elevated blood cholesterol or triglyceride levels, heart disease, stroke, insulin resistance or type 2 diabetes, gallbladder disease, sleep apnea and respiratory problems, and certain types of cancers. Overweight takes a toll on the joints, especially knees, and overweight people are at increased risk of sleep apnea and asthma. Most of these conditions may have an impact on life expectancy but significantly impact quality of life.

Obesity affects many other aspects of life related to weight stigma or biases and discrimination: education, income, employability, and social position. Obesity also impacts psychological and social factors related to negative attitudes that affect interpersonal interactions.

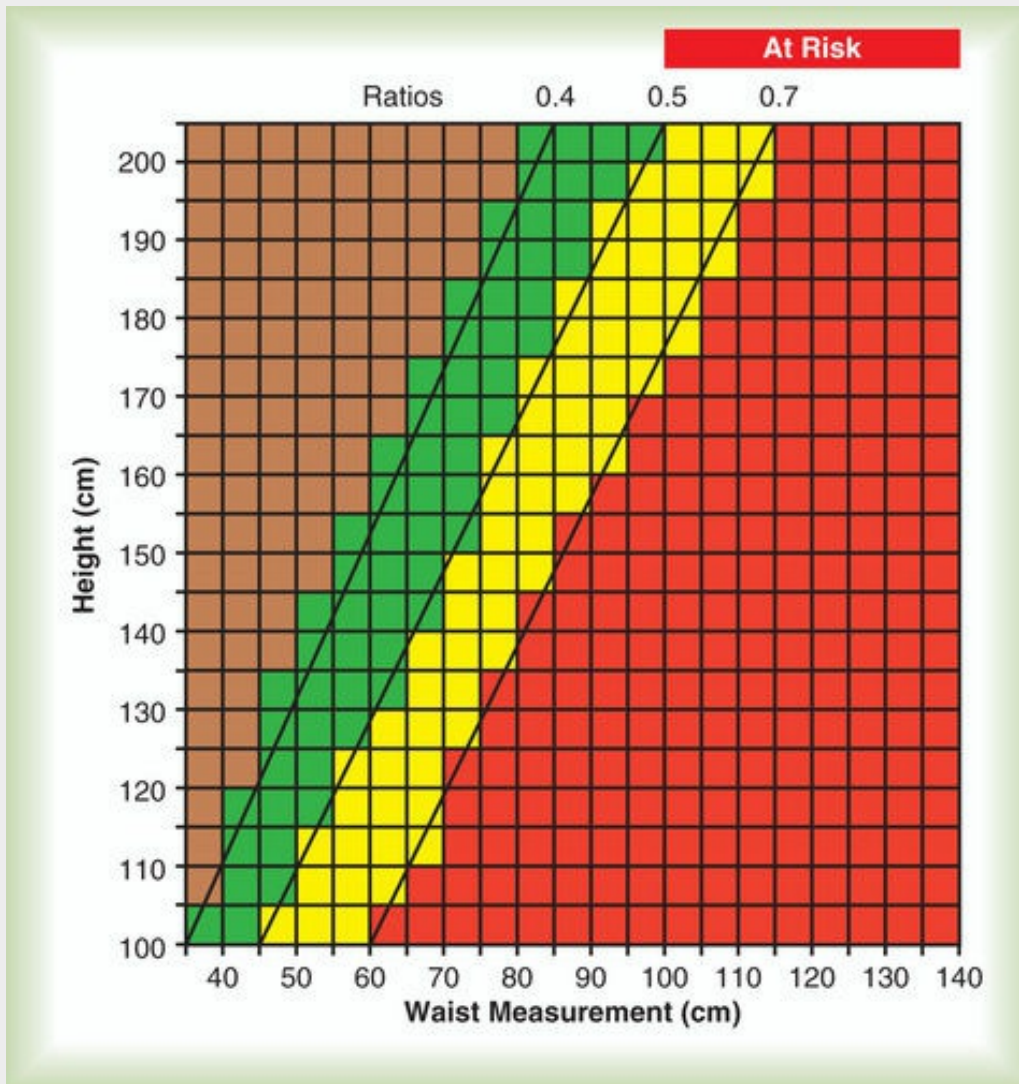
Because overweight and obesity contribute to other health problems, their economic impact on the health care system is immense. Obesity costs more than \$150 billion in health care costs in the U.S. and billions more in lost productivity.¹⁵ A U.S. adult who is “healthy” but obese could eventually cost society anywhere from about \$17,000 to just over \$36,000.²¹ Obesity-related medical costs in general are expected to rise significantly, especially because today's obese children are likely to become tomorrow's obese adults. Reducing obesity could save billions of dollars for the health care industry.

Weight management is very difficult for most individuals. Individuals who maintain a stable lean body shape throughout life have the lowest mortality.^{22,23} Obesity and overweight at a young age and substantial weight gain are significantly associated with low physical performance in old age.²⁴ Because weight loss is so difficult, prevention of weight gain should be strongly emphasized.

In addition to BMI, weight distribution is also a factor in predicting health risk. Excess fat in the abdominal area (the “apple-shaped” body) is characteristic of men, but some women also tend to accumulate more fat around the waist, especially after menopause. Accumulation of fat in the hips or thighs (the “pear-shaped body”) is typical of women. Any amount of increased abdominal fat (larger waist size) is a greater risk for heart attacks than body weight because it is associated with an accumulation of fat around the heart, liver, and other internal organs.^{25,26} In contrast, lower body obesity has been thought to be relatively benign. However, patients with gluteal adipose tissue of obesity have more difficulty losing weight and maintaining a healthy weight.

A quick way to help determine fat intraabdominal accumulation, thereby determining overall health risks, is waist-to-height ratio

(compares the waist measurement to height). A rule of thumb to determine abdominal fat is that the waist measurement should be less than half of the person's height (Fig. 1.10). A high BMI is associated with a high mortality risk, but waist-to-height ratio appears to be a more accurate indicator of mortality risk.²⁷



Waist-To-Height Ratio less than 0.5 - Low Risk Level. The boundary at a ratio of 0.4 represents low risks for 'normal' body shape (green) and potentially slight risks from being underweight for height (brown).

Waist-To-Height Ratio above 0.5 - Moderate to High Risk Level. The boundary at a ratio of 0.6 represents moderate risks (yellow) and high risks (red).

FIGURE 1.10 Waist circumference-to-height ratio chart. (Courtesy of Dr. John Anderson.)

Abdominal obesity increased in the United States through 2008, and a recent study reveals waist circumference increased progressively and

significantly from 37.6 inches in 1999 to 2000 to 38.8 inches in 2011 to 2012. At a time when the prevalence of obesity may have plateaued and BMIs have remained relatively stable, waistlines of U.S. adults continue to expand.²⁸

Researchers worldwide continue to study which method of measurement is best for different genders and nationalities. Gold standard methods that determine body fat more accurately—such as magnetic resonance imaging (MRI), dual-energy x-ray absorptiometry (DEXA) scans, and bioelectrical impedance scales—are significantly more expensive and require specialized equipment.

Obesity is the result of consistent caloric overconsumption in excess of energy expenditure. The average daily energy intake increased almost 7% for men and approximately 22% for women between 1971 and 2010. American men consume an average of 2600 cal, and women consume approximately 1850 cal.²⁹ This increased intake reflects a consumption level that is conducive for weight gain in inactive individuals.

Genetic influence is a significant factor contributing to obesity. Body weight is affected by genes, metabolism, hormones, food choices, behavior, environment, culture, and socioeconomic status. Although genetics and the environment may increase the risk of weight gain, environmental factors may overrule genetic risks.³⁰ The foods and portion sizes an individual consumes significantly affect body weight.

The United States has cultivated an environment with an abundance of foods containing hidden fats and sugars that can promote obesity. Many factors in the American culture have made food more accessible, including fast food restaurants, prepackaged food, and soft drinks. Fast foods account for 11.3% of total daily calories.³¹ Portion sizes have also increased, and more people are eating at home less often. When people eat out, they tend to consume more calories—many restaurant meals average almost 1500 calories.³² Contrary to popular belief, pizza, burgers, chicken, and french fries from restaurants and fast food establishments account for less energy than breads, grain-based desserts, pasta, and soft drinks from stores.³³

In some cases, understanding physiologic benefits of weight loss can be motivating for patients. Weight loss is highly desirable in individuals with certain risk factors and advisable for others. A 10% weight loss is associated with a decrease in serum glucose, cholesterol, systolic blood pressure, and uric acid. Other physical symptoms that can be expected to improve with weight loss include shortness of breath, easy fatigability, fluid retention, gastric disorders, headaches, energy level, sexual interest, joint pains, muscle cramps, elevated pulse rate, sleeping

disorders, urinary infection, and varicose veins.

Treatment of obesity has a high level of noncompliance and failure. Any caloric restriction triggers several biologic adaptations designed to prevent starvation. These adaptations may undermine the long-term effectiveness of lifestyle modification in most individuals who are overweight, particularly in an environment that promotes gluttony.³⁴ One of the reasons for regaining weight after struggling to lose it relates to appetite. People who successfully lose weight experience a surge in appetite—the body prompts a proportional increase in appetite to eat about 100 calories daily per kilogram of lost weight more than usual. The effect of appetite is three times stronger than the slowed metabolism.³⁵

The incidence of obesity needs to be approached on four levels: (1) individuals need to be accountable for their food choices; (2) families must assume responsibility for foods available to their children, with parents acting as role models for healthful diet and exercise habits; (3) communities should provide opportunities for exercise (parks, sidewalks, sports programs) and schools should provide healthful food choices; and (4) more research is needed in this area to discover optimal, effective ways of weight management.

Any treatment for weight loss should always be a serious undertaking with a high level of motivation and long-term commitment. Such an approach increases the likelihood both of successful weight loss and maintaining a healthy weight. To lose weight involves a lifelong commitment to change one's lifestyle—regular exercise, wise food choices, and behavior modifications. Weight loss should be motivated by internal rather than external reasons (“I am doing this for myself,” rather than “I will lose weight for my son's wedding”).

One pound of fat equals 3500 cal. Losing weight can be accomplished by eating fewer calories, increasing activity, or a combination of both. A 0.5- to 2-lb per week weight loss is recommended to lose body fat while minimizing muscle loss. To accomplish this goal, food intake must be 500 cal less than needed per day, which results in loss of 1 lb per week. An additional energy expenditure of 500 cal per day is recommended to lose an additional pound of weight. When weight loss is achieved slowly, it is usually more effective and is maintained for a longer period. A realistic goal regarding the rate and amount of weight loss must be established for each individual trying to lose weight. A 3% to 5% weight loss that is maintained may produce clinically relevant health improvement.³⁶

Numerous strategies have been implemented to treat overweight and obesity. No one treatment is best for everyone; each modality varies in

effectiveness, risk, and cost. Drugs, medical devices, and surgical procedures currently being used for weight loss are beyond the scope of this text.

Millions of obese individuals have chosen **bariatric surgery** (surgical procedure on the stomach or small intestine for weight reduction), which usually results in greater, sustained weight loss than conventional methods in addition to diabetes remission, reduced incidence of cardiovascular events and hypertension, and a longer life.³⁷⁻³⁹ This drastic but effective measure has many drawbacks and side effects, including limited absorption of many nutrients, pulmonary embolism, and some postoperative deaths.

Popular weight-reduction diets devised for weight loss are abundant (see the Evolve website). Although many different plans “guarantee” weight loss, no guaranteed easy cure exists for maintaining a healthy weight. A weight reduction diet needs to be followed for an extended time; it must be appealing, flexible, and affordable for the individual trying to lose weight. It can be balanced in terms of nutrients, yet hypocaloric. Reducing caloric intake to less than 1200 cal for women and 1400 cal for men is not recommended because adequate amounts of nutrients are not provided.

Popular diets vary in their nutritional adequacy and consistency with guidelines for risk reduction. The low-carbohydrate, high-protein diet has come into a favorable light as a result of numerous studies indicating that low-carbohydrate, high-protein diets are more effective in promoting weight loss and reducing blood lipid levels. A dietary regimen that stresses high-protein foods but eliminates sugar and most carbohydrates may be more successful at helping people lose weight because high-protein foods provide greater **satiety** (feeling of fullness). Higher-protein diets appear to have small to moderate improvements in weight loss, BMI, waist circumference, lean body mass, and a slightly negative effect on body fat storage.⁴⁰⁻⁴² Proteins may suppress **ghrelin** (an appetite-stimulating hormone) production better than carbohydrates and lipids. Diets that are considered high fat may cause undesirable cholesterol levels to increase, but weight loss as a result of inadequate calorie intake itself usually improves blood lipid levels regardless of the macronutrient composition. Reviews about various popular diets are available from the Academy of Nutrition and Dietetics at <http://www.eatright.org/resources/media/trends-and-reviews/bookreviews>.

Different diets work for different people; all components of energy balance—including energy intake from carbohydrates, protein, and fat,

and expenditure—interact with one another to impact body weight. A change to any one aspect will correspond to profound changes in the other side of the equation. Unreasonable expectations and unrealistic predictions are frequently made about weight-loss benefits of exercise and dietary interventions.

A diet that totally eliminates one category (fat or carbohydrate) or a specific group of foods (fruits or meats) is not advisable. The best diets are easy to follow, nutritious, safe, and effective for weight loss and prevent chronic health conditions associated with obesity.

Indispensable to any weight-loss program is a preplanned food allotment with specified times for eating throughout the day to lessen feelings of deprivation and to eliminate excessive food intake. The total amount of food should be divided into at least three feedings. Eating only once or twice a day is associated with consuming more calories, impulsive snacking, and increased adipose tissue and serum cholesterol. Some “free” foods or beverages (foods containing less than 20 cal per serving) may be available for snack periods, but regular mealtimes are important. A diet that requires the least amount of change in usual dietary patterns has better long-term success. A 1200- to 1500-cal diet is relatively safe; when accompanied by an exercise program, the rate of weight loss is augmented, and muscle mass is maintained.

A weight-reduction diet should satisfy the following criteria: (a) meets all nutrient needs except energy, (b) suits tastes and habits, (c) minimizes hunger and fatigue, (d) is accessible and socially acceptable, (e) encourages a change in eating pattern, and (f) favors improvement in overall health. [Box 1.6](#) provides some questions to help determine the validity of a weight-reduction diet. Common reasons indicated for discontinuing a weight-loss regimen: (a) trouble controlling food choices, (b) difficulty motivating oneself to eat appropriately, and (c) using food as a reward.

Box 1.6

Evaluating Weight Loss Diets or Programs

The program should evaluate the individual's body mass index and whether the weight is principally from increased fat stores or increased muscle mass and possible contributing factors.

The cost of the program should be realistic and reasonable.

The program should be adaptable for various lifestyles and something an individual can continue indefinitely.

Tips for Evaluating Safety and Effectiveness of Reduction Diets

1. Stay current with scientific research. Nutrition is a relatively new science, and new developments are still evolving to increase our knowledge base.
2. Evaluate diet trends and claims for effects on overall health.
3. Compare recommendations with known nutrition science and recommendations, such as *MyPlate* and *Dietary Guidelines for Americans*.
4. Calculate nutritional requirements of the individual considering the diet and determine what nutrients would be lacking.
5. Evaluate diets using the following principles:
 - What is the weight loss recommendation?
 - What is the success rate of the program?
 - What is the basis for advertisements and endorsements?
 - Has any scientific research been done to evaluate the safety and effectiveness of the diet?
 - What is the cost of the program? Are special foods or nutrient supplements required and what do they cost? Are there other additional fees?
 - Is the program medically supervised?
 - Are any major food groups excluded?
 - Are the foods appealing to the individual? Does the program allow occasional consumption of favorite foods?
 - Is it permissible to eat in restaurants and other people's homes at least occasionally?
 - Are certain foods avoided because they cause specific problems?

- Are certain foods used to “cure”?
- Are dramatic statements made that contradict well-established nutrition principles or reputable scientific organizations?
- Are exercise and behavior modification included?
- Can an individual live on the program for a lifetime?
- Is there a maintenance plan?
- Does it promote good food habits?

Treatment of obesity is improved when increased energy expenditure occurs along with decreased caloric intake. Exercise alone has a modest effect on weight loss. Exercise positively affects energy metabolism, whereas decreased energy intake and loss of muscle mass will result in a lower metabolic rate. Initiation of an exercise regimen may lead to weight gain in the form of muscle mass, but the health benefits are significant, including improved cardiovascular fitness, improved plasma lipoprotein profile, improved carbohydrate metabolism, increased energy expenditure, and enhanced psychological well-being.

Comprehensive lifestyle interventions—including diet, physical activity, and behavior therapy provided by a skilled professional team of RDNs, exercise specialists, and behaviorists—have shown the highest success rate.⁴³ Behavior modification for weight control refers to getting in touch with the reality of foods being consumed and in what quantity, and when and why eating occurs (mindful eating). One of the most important components of an effective weight control program is learning new ways of dealing with old habits. Comprehensive behavior-modification programs include diet and exercise programs individually tailored for patients. A team approach—including a health care provider, a psychologist, an RDN, and family members—is effective in helping the individual make necessary long-lasting changes in food choices and lifestyle behaviors. A food diary for recording amounts and types of food eaten, emotional status, and environmental factors helps provide new insights to devise strategies for dealing with eating habits.

Although behavior-modification approaches to weight control are helpful, maintaining weight loss remains a major problem. Studies indicate that programs need to be approximately 20 to 24 weeks long and more comprehensive, including relapse prevention training and use of

social support systems.

◆ Case Application for the Dental Hygienist

A young healthy mother who has a 3-year-old son at home comes to the dental office for a 6-month recare appointment. She expresses concern about foods she should be eating and feeding her husband and son to improve and maintain their overall health for optimal growth and development of the child. She has learned a little about the food groups, the *Dietary Guidelines*, and nutrition labels from the press but does not know how to implement them.

Nutritional Assessment

- Willingness to seek nutritional information
- Desire for increased control of nutritional health habits
- Knowledge of community resources
- Cultural or religious influences
- Knowledge regarding the *Dietary Guidelines*, food labels, and *MyPlate*
- Definition of optimal nutrition

Nutritional Diagnosis

Health-seeking behaviors related to lack of knowledge concerning optimal nutrition and current standards.

Nutritional Goals

The patient verbalizes correct information concerning the *Dietary Guidelines* and food labels and can name the food groups, the number of servings needed, and portion sizes from each group of *MyPlate*.

Nutritional Implementation

Intervention: Ask the patient to write down everything she ate yesterday from the time she got up yesterday until this morning when she got up.

Rationale: This will help you tailor the information you provide to the

patient's needs.

Intervention: Encourage variety of food intake, using *MyPlate*. Review the number of servings needed and serving size.

Rationale: The total balance of food intake matters; the best balance incorporates variety to promote optimal nutrition. Providing the minimal number of servings prevents nutritional deficiencies in healthy individuals.

Intervention: (a) Suggest that the mother and her husband have their blood lipid profiles checked if not recently done; (b) emphasize a decreased intake of saturated and *trans* fats by trimming excess fat and eating smaller servings of meat (about the size of a fist or a deck of cards).

Rationale: Decreasing saturated and *trans* fats helps reduce the risk of heart disease. By decreasing these two types of fats, total fat and cholesterol should be within acceptable AMDRs.

Intervention: (a) Stress the importance of eating vegetables, fruits, and grains, and (b) explain that complex carbohydrates are not fattening.

Rationale: Dietary fiber is important for healthy bowel functioning and can reduce symptoms of chronic constipation, diverticular disease, and hemorrhoids, and decrease the risk of developing obesity, cancer, and diabetes.

Intervention: (a) Explain how to read labels for sugar. The names of most sugars end in “-ose.” (b) Emphasize moderation of sugar intake. (c) Explain that “dietetic” and “sugar-free” do not mean that the product is low in calories. (d) Explain the relationship between sugar and tooth decay and emphasize the importance of proper oral hygiene after sugar consumption.

Rationale: Refined sugar contains calories and no other nutrients but is acceptable when used in items that contain appreciable amounts of other nutrients (e.g., a pudding would provide more nutrients than a gelatin dessert or carbonated beverage).

Intervention: (a) Stress using sodium and salt in moderation; (b) emphasize that “no salt added” does not mean that the product is low

in sodium.

Rationale: Good habits that do not foster a high level of salt preference are recommended to prevent development of high blood pressure.

Intervention: Emphasize that any alcohol intake should be in moderation (one drink a day for women and two drinks a day for men), if at all.

Rationale: Alcohol is high in calories and contains few, if any, nutrients.

Intervention: (a) Review an entire label with the mother to help her understand how to interpret it. (b) Determine a serving size. (c) Explain the types of carbohydrates. (d) Determine the percentage of fat in a product by multiplying the grams of fat by 9, and compare this number with the total calories; if the amount is more than 30%, do not consume that product every day. (e) Emphasize that “no cholesterol” does not indicate that the product contains no saturated or *trans* fat. (f) Point out the sodium level, and if it is greater than 400 mg, encourage its use in moderation.

Rationale: Knowledge increases compliance and allows informed choices regarding food choice.

Intervention: Refer the patient to county extension agencies or to a registered dietitian.

Rationale: These agencies and nutritional professionals provide practical guidelines via newsletters, workshops, and written materials for healthy patients wanting to improve health.

Evaluation

To determine effectiveness of care, the patient reads labels and chooses the best buy for the nutrient content. The patient states the basic guidelines for nutrition; the hygienist explains to her that serving sizes for her son are different than the standard serving size (available on the *ChooseMyPlate* website). Additionally, the patient should be able to plan a menu using recommended foods and to state how to obtain and use community information/support. The patient should be able to indicate how changes in food choices would not only improve overall health, but also maintain health of the oral cavity and ensure optimal growth of her son with minimal or no problems in the oral cavity.

◆ Student Readiness

1. A patient asks you the difference between food and nutrition. What would you say?
2. Locate an advertisement in a popular magazine or newspaper for a weight-reduction product or program and list the merits of the product or program stated in the ad. Then, list information about the product or program that might have been omitted or should be questioned. Evaluate the product or program using information from [Box 1.6](#).
3. Discuss popular weight-reduction diets (see the Evolve website) and how they may have adverse effects.
4. Distinguish between nutrient recommendations and requirements.
5. Keep a record of all the foods you eat for 24 hours. Was your intake adequate as evaluated by *MyPlate*? In what areas did you do well? Where can you improve? Provide specific recommendations for making changes.
6. Collect nutrition labels for three similar products. Compare the nutrient values to determine which is a better source of nutrients. Which is a better buy for the amount of nutrients it contains?
7. List the *Dietary Guidelines*. In which areas do you do well? In which areas would you like to improve your choices? Do you believe you have enough information to make knowledgeable changes?
8. Discuss the pros and cons of allowing nutritional claims on products.
9. If a food label indicates that one serving of the product has 23 g of carbohydrate and 15 g of sugar with 140 cal (total), how many teaspoons of sugar does the product contain? What percentage of carbohydrate does this product contain?

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