5 NUTRITION AND WEIGHT MANAGEMENT

OBJECTIVES

After reading the chapter, you should be able to do the following:

- Define nutrition
- List and describe the six essential nutrients
- List and describe the energy nutrients
- Describe a healthy, well-balanced diet
- Describe the USDA's Food Guide Pyramid, MyPyramid, and ChooseMyPlate
- Define basal metabolic rate (BMR)
- Define exercise metabolic rate (EMR)
- Describe the energy balance theory of weight management
- List and describe common weight-loss myths and hoaxes
- Define and describe the eating disorders: anorexia nervosa, bulimia, and overeating

Nutrition is the study of food and how the body processes it. A well-balanced diet is necessary for an individual to function optimally and to achieve high-level wellness. In addition, diet directly affects one's susceptibility to disease. The U.S. Department of Health and Human Services states that more than 50 percent of all deaths in the U.S. each year are related to poor nutrition.[1] Many of these deaths could be prevented through simple diet modifications.

Most Americans are overweight, and many are obese.[2] Many of these individuals are searching for a way to manage their weight effectively. Sadly, however, these individuals often fall prey to misinformation and fad diets that are ultimately unsuccessful and do nothing but harm them and their health. With proper education and changes in diet, these obese Americans can learn to manage their weight. What is needed, however, is a basic understanding of nutrition and the principles of weight management.

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NUTRITION

Foods are made up of six essential nutrients: carbohydrates, fats, proteins, minerals, vitamins, and water (See Figure 5.1). These nutrients are essential to the maintenance of body tissues, and help regulate body processes.

Several nutrients have energy values. These energy values are expressed as calories. "A calorie is a measure used to express the heat or energy value of food and physical activity. It is defined as the amount of heat necessary to raise the temperature of 1 kg (1 liter) of water 1 degree Celsius from 14.5 to 15.5 degrees Celsius. Thus, a calorie is more accurately termed a kilocalorie (kcal)."[4] However, because of its common usage, in this text, the term "calorie" will be used for kilocalorie.

CARBOHYDRATES

Carbohydrates are organic compounds that provide the main energy source for the body. Each gram of carbohydrate has approximately 4 calories, and carbohydrates should make up approximately 55-60 percent of the total calories in the daily diet. Carbohydrates are divided into two groups: simple and complex.

Simple carbohydrates are simple sugars, such as monosaccharides (i.e., glucose, fructose, galactose) and disaccharides (i.e., sucrose, maltose, lactose). They are commonly found in table sugar, cakes, and sweets, and are usually considered "empty calories" because they provide very little nutritional value.

Carbohydrates should make up the majority of calories consumed in a healthy diet.

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Of the simple sugars, glucose is the most important because the body can process it in its natural form to provide fuel for the central nervous system. The other sugars must be converted to glucose in order to be utilized. Glucose is stored as a multi-chain molecule of glycogen in the liver, as well as the skeletal muscles. If an individual fails to eat adequate amounts of glucose, the body will cannibalize its own protein to make glucose for fuel, a highly problematic proposition, so adequate amounts of glucose must be ingested daily. However, most individuals consume too much of the simple sugars, which contributes to high obesity rates.

Figure 5.1

Essential Nutrients

Nutrient	Calories per Gram	Recommended Percentage of Calories in Diet
Carbohydrates	4	55-60%
Fats	9	20-30%
Proteins	4	10-15%
Minerals	0	—
Vitamins	0	—
Water	0	—
*Alcohol	7	in moderation

**Alcohol is not considered an essential nutrient; however, it is caloric and common in the diet, so its listing here is warranted.*

Complex carbohydrates, or polysaccharides, are the body's primary energy source. They are found in foods such as breads and grains, and are called starches—long chemical chains of sugars. Complex carbohydrates are the foundation of a well-balanced diet, especially those derived from whole grains.

Another form of complex carbohydrate is fiber, or indigestible cellulose. It is found in beans, oats, fruits, and vegetables. Fiber is non-caloric. It is not a fuel source, yet remains a necessary part of the diet. Fiber, or what used to be called bulk or roughage, plays a very important role in the diet. Its primary purpose is to speed waste products through the digestive system. It is believed that a diet high in fiber may reduce the risk of certain health problems (i.e., gastrointestinal disturbances and some forms of can-

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cer, specifically colon cancer), but new research indicates the benefits of fiber may have been overexaggerated, especially regarding its role in lowering cancer risk.[5] Nonetheless, fiber is definitely known to help regulate the bowels and keep a person "regular." Fiber also helps reduce high cholesterol levels in the blood, thus reducing the risk of heart disease. Adequate amounts of fiber are critical for a well-balanced diet.

A daily intake of 20-35 grams of fiber is recommended by the National Cancer Institute. However, to most individuals, this number means very little. An easy way to see if one is getting enough fiber in the diet is to visually examine one's feces. The feces should be round, about the diameter of a quarter, several inches in length, and should float. If not, then more fiber should be included in the diet. Caution should be applied here because too much fiber in the diet can cause constipation, as well as reduce the absorption of several key vitamins and minerals.

FATS

Fat, or more technically, a lipid, is made up of triglycerides, phospholipids, and sterols. Everyone must have fat in the body and diet. In fact, an individual must have a specific amount of fat in order to function optimally. This fat is termed essential fat and is approximately 12 percent of body weight in women and 3 percent in men.[4] Fat provides valuable services to the body, such as protection for the internal organs, insulation, a means of energy and vitamin storage, and maintenance of the cells.

STUDY TIP:

Everyone must have fat in the body and diet. In fact, you need a specific amount of fat to function optimally.

Fat is highly caloric, with approximately 9 calories for every gram. Excessive calories that are eaten and not burned off through exercise and body maintenance are stored as adipose tissue (i.e., fat), regardless of their source, be it from carbohydrate, protein, or fat.

Fat that is eaten in the diet is typically either saturated or unsaturated. The term "saturated" refers to the chemical nature of the fat and its hydrogenation level. A saturated fat is solid at room temperature, whereas an unsaturated fat is liquid at room temperature. Saturated fats are usually derived from animal products (e.g., milk, cheese, meats). Unsaturated fats are typically derived from plant sources (e.g., vegetable oil).

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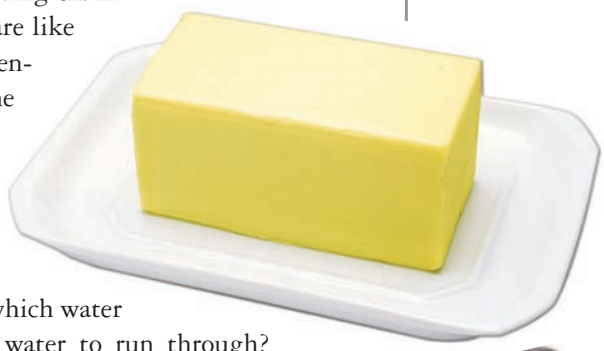
Excessive amounts of saturated fat in the diet, coupled with cholesterol, are thought to be responsible for atherosclerosis (i.e., clogging of the arteries). This is easy to see with the following example. Imagine that the arteries in the body are like a water hose. What would happen if two identical water hoses were filled with fats, one with lard (a saturated fat because it is solid at room temperature) and the other with vegetable oil (an unsaturated fat because it is liquid at room temperature)? If the two water hoses were hooked up to a water faucet and the water was turned on, which water hose would be most likely to allow the water to run through? Obviously, the water hose that was filled with vegetable oil would eventually allow the water to flow through it if the pressure was great enough. It would take a very long time, if ever, for water to flow through the water hose filled with lard. This is exactly what happens to blood vessels in the body when one eats excessive amounts of saturated fats. The blood vessels eventually clog with fatty plaque, which increases blood pressure, and may eventually cause a heart attack or stroke if the clogging occurs in a coronary or brain artery.



Saturated fats, such as butter, are typically derived from animal sources, and are solid at room temperature. Unsaturated fats, such as olive oil, are usually derived from plant sources, and are liquid at room temperature.

Compounding attempts to curb the amount of saturated fat in the diet is the fact that many oils on the market today are partially "hydrogenated," meaning they have become partially saturated. However, the hydrogenation process produces a special unsaturated fatty acid called trans fat. Trans fats are problematic because they seem to be unsaturated, yet they increase cholesterol levels, just like saturated fats do. Experts suggest that trans fats "are, gram for gram, twice as damaging as saturated fats."[6]

Fats are not all bad; in fact, they must be a part of the diet. Fats, particularly unsaturated fats, are an essential part of a well-balanced diet and should comprise approximately 20-30 percent of the calories ingested. Without fat in the diet, the body cannot function properly. Thus, one should incorporate fats into a normal, healthy diet.

PROTEINS

Protein is a key ingredient in a healthy diet, and has approximately 4 calories per gram. It is responsible for building and repairing the cells of the body, synthesizing hormones and enzymes, and even boosting the immune system. Protein can be used as an energy source, but the body prefers to use carbohydrates and fat first. Only in dire circumstances does it use protein.

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To ensure that an individual has the proper components necessary for cellular maintenance, protein should make up approximately 10-15 percent of the calories in the diet. As a general rule, approximately 0.8 grams of protein are recommended for each kilogram of body weight.

Proteins are made up of twenty amino acids. Of these, eleven can be synthesized by the body, and are called nonessential amino acids; however, the remaining nine must be obtained through the diet, and are referred to as essential amino acids. Foods that include all of the essential amino acids are called complete proteins. These foods are primarily animal based (e.g., meats, dairy products). Plant foods do not contain all of the essential amino acids, and are referred to as incomplete proteins. This is a key factor for vegetarians—individuals who eat only plants. Vegetarians should take supplements or carefully combine foods in the diet in order to get all the necessary amino acids.

Protein is used by the body for building and repairing cells, synthesizing hormones and enzymes, and boosting the immune system.

Some special groups need extra protein—children and pregnant and lactating women. They need extra protein because of the increased demands on their bodies to create the basic building blocks of cells. Children are obviously growing, and they need the extra protein in their diets to meet the demand. Pregnant and lactating women must have more protein because of the increased demands placed on their bodies due to pregnancy and nursing.

On the other hand, and contrary to popular belief, high-performance athletes generally do not need excessive amounts of protein. Instead, they simply need more calories within the recommended percentages of carbohydrates, fats, and protein to offset the extra calories that they burn through increased physical activity. Indirectly, athletes will get more protein, but levels should remain well within the recommended percentage values of a healthy, well-balanced diet.

Sushi is high in protein and low in saturated fat.

MINERALS

Minerals are chemical elements that are supplied by the diet and serve to help the body perform important functions (See Figure 5.2). Minerals are responsible for the maintenance of body structures, and help with muscular contraction and conduction of nerve impulses. The most widely acclaimed minerals are calcium, iron, and sodium because of their link to

well-known and prevalent health problems, such as osteoporosis, anemia, and hypertension.

Calcium is very important in building strong bones, and is found most commonly in milk and dairy products. Without adequate calcium in the diet, the bones can become brittle and prone to breaking, a condition called osteoporosis. This problem is most pronounced in women because they commonly fail to consume adequate amounts of calcium. Osteoporosis also results from a sedentary lifestyle (specifically, not being involved in weight-bearing activities, such as resistance training, walking, etc.), smoking, and menopause.

Iron is extremely important because it is used by the body to form hemoglobin, the oxygen-carrying component in the blood. A deficiency in iron is called anemia, and is marked by fatigue and paleness. It is common in young women because of menstrual blood loss, especially among those who do not eat red meat.

Fresh fruits and vegetables have high mineral and vitamin contents.

Sodium is very important for proper muscular contraction and the maintenance of proper hydration levels. However, excessive sodium intake has been linked to hypertension, a leading risk factor for cardiovascular disease (NOTE: Sodium promotes water retention, thus increasing blood volume, which in turn, increases blood pressure). Moderate sodium intake is necessary for proper body functioning. However, most individuals get adequate amounts of sodium from processed foods. So, the salting of table foods is usually unnecessary.

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VITAMINS

Vitamins are small, organic compounds that are vital for the body to function properly, especially regarding growth and metabolism (See Figure 5.2). Only a few vitamins can be synthesized in the body (i.e., A, D, and K), and then, only in small amounts; all the remaining vitamins must be acquired through the diet. Vitamins are classified as either fat- or water-soluble. The fat-soluble vitamins

OSTEOPOROSIS/OSTEOPENIA - ROBERT RYAN, MA, ATC

From birth until death, the body is constantly remodeling (i.e., building up and breaking down) the bones in an attempt to maintain a healthy skeleton. Early in life more building up than breaking down occurs, and at 20-25 years of age a person's bones are at their strongest (most dense). For about 10 years, the bone density remains constant while the remodeling has equal break down and build up. After around 35 years of age the breakdown begins to exceed build up, and the bones gradually begin to weaken.

Osteoporosis is a skeletal disorder characterized by compromised bone strength, predisposing one to an increased risk of fracture. Osteoporosis is defined as a bone mineral density (BMD) value greater than 2.5 standard deviations below the mean for normal young Caucasian women. Osteopenia is defined as individuals who have low bone mass (BMD value of 1-2.5 standard deviations below the mean). An estimated 10 million individuals (men and women) over age 50 in the United States have osteoporosis. An additional 33.6 million individuals over age 50 have osteopenia and thus are at risk of osteoporosis and its potential complications later in life.

The key to preventing osteoporosis is to take steps to make your bones as strong as possible before and during the inevitable decrease in BMD. A well-balanced diet with the recommended daily allowance of Vitamin D and calcium combined with daily weight-bearing exercise will help increase and maintain bone density and strength. Smoking, excessive alcohol or caffeine consumption, irregular menstrual cycles, endocrine diseases such as diabetes and thyroid disorders, and long-term use of a variety of medications can impair bone health. It is vital that everyone be cognizant of these factors and work toward proper bone health.

Source: National Osteoporosis Foundation, Clinicians guide to prevention and treatment of osteoporosis, 2010 Washington DC Bone Health and Osteoporosis: A Report of the Surgeon General (2004) http://www.surgeongeneral.gov/library/bonehealth/content.html

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are A, D, E, and K. These vitamins can be stored in the body's fat; thus, if taken in large enough doses, dangerous toxicity levels can develop. The water-soluble vitamins, which are constantly being excreted through the urine, consist mainly of the B-complex and C vitamins. Contrary to popular belief, vitamins do not give a person energy; vitamins are non-caloric. Instead, the B vitamins help the body release energy from the energy nutrients. Caution must be exercised to prevent excessive ingestion of vitamins, especially through supplementation, because some water-soluble vitamins have been shown to be toxic.

Figure 5.2

Major Minerals and Vitamins

Mineral	Main Role in the Body	Good Source	Deficiency	Dangers of Excess
Calcium	Bone and tooth development; cellular wall maintenance; nerve transmission	Dairy products; dark green, leafy vegetables	Osteoporosis; poor bone development in children	Lethargy; calcium deposits
Sodium	Fluid balance; muscle function	Salt; canned foods	Weakness; cramps	Hypertension; CVD
Potassium	Muscular contraction; fluid balance; nerve transmissions	Bananas; orange juice; meats	Abnormal heartbeat; lethargy; irritability	Abnormal heartbeat; EKG anomalies
Iodine	Cell activity; growth	Iodized salt	Impaired growth; apathy	Goiter; hyperthyroidism
Selenium	Enzyme/hormone development	Meats; fish; grains	Muscular myopathy	Skin lesions; brittle hair
Magnesium	Enzymatic reactions	Legumes; nuts	Hypertension; arrhythmias	Diarrhea
Phosphorous	Metabolism; building bones	Dairy products	Vomitting; weakness	Bone loss
Flouride	Tooth development	Water; seafood	Tooth decay	Mottled tooth enamel
Iron	Hemoglobin formation	Red meats; liver	Anemia; paleness; shortness of breath	Hemochromatosis
Zinc	Enzyme development; growth and maintenance	Seafood; meat; liver; eggs	Poor growth; lethargy	Nausea; anemia; atherosclerosis
Fat Soluble				
A	Vision; skin, hair, and mucous membrane development	Liver; dairy products; vegetables	Night blindness; rough, dry skin	Nausea; vomiting; headache
D	Bone growth	Sunlight; dairy foods	Weak bones	Headaches; irritability
E	Red blood cell formation; antioxidant	Vegetable oils; liver; green vegetables	Anemia	Neurological abnormalities
K	Promotes blood clotting	Green, leafy vegetables	Thin blood; difficult to stop bleeding	None known
Water Soluble				
Thismim (B_1)	Energy production; enzyme development	Pork; liver; oysters; cereals; peas; beans	Berberi; lethargy; nerve problems	None known
Riboflavin (B_2)	Energy production	Milk; liver; fruits; vegetables	Skin problems; cracked lips	None known
B_6	Metabolism; energy production	White meats; bananas	Seizures; dermatitis	None known
B_{12}	Enzyme catalyst	Organ meats; oysters	Dementia; depression	None known
Niacin	Coenzyme formation	Yeast; meats; milk	Pellagra; diarrhea	Flushing of the skin
Folate	Formation of hemoglobin	Green vegetables; peas	Enlarged red blood cells	Diarrhea; insomnia
C	Collagen; bone formation	Citrus fruits; vegetables	Scurvy; bleeding gums	Kidney stones

Source: American Society for Nutritional Sciences[7]

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Additionally, athletes do not need excessive levels of vitamins. For years, vitamin companies suggested that excessive doses of vitamins could improve athletic performance[8]; however, research indicates otherwise.[9] In fact, excessive nutritional supplementation can cause health problems, especially if dangerous toxicity levels develop. Nonetheless, recent research has shown that certain vitamins (i.e., A, E, and C) and minerals (i.e., beta-carotene, zinc, and selenium), called antioxidants, can be beneficial in higher doses. Antioxidants help combat free radicals—damaging derivatives of oxygen that cause harm to the cells and are known to be contributing factors for cancer and cardiovascular disease. It is believed that additional antioxidants can combine with free radicals to neutralize them before they can cause any harm. Interestingly, free radicals appear to be produced via increased muscular metabolism.[10] Some research suggests that individuals who are highly active should consume higher levels (i.e., 400 I.U.) of antioxidants, primarily vitamin E, to thwart free-radical damage.[10]

WATER

Water is essential for humans. From thermoregulation to digestion, water plays a very important role in the body. Some 65-70 percent of the body is composed of water, and without it, a person could survive for a few days, at most.

Maintaining proper hydration levels is critical to maintaining high-level wellness. Research indicates that drinking large amounts of water reduces the risk of certain cancers and kidney stones.[11] Additionally, hydration levels affect performance. A small reduction of 3-5 percent of one's optimal hydration level can produce negative effects upon mental and physical performance; and a loss of greater than 15 percent is likely to be fatal.[12] Thus, proper hydration is very important, especially for active individuals. (NOTE: Hydration and fluid replacement are covered more fully in Chapter 7.)

Maintaining proper hydration levels is critical to maintaining high-level wellness. Even a small reduction in the optimal hydration level can negatively affect mental and physical performance.

An easy way to determine if one's fluid consumption is adequate to maintain proper hydration levels is to simply look at one's urine. If the urine is clear or very pale yellow, then enough fluid is being consumed. However, if the urine is yellow or dark-yellow to green in color, then the person is dehydrated, and more water should be included in the diet. Caution should be applied here. A condition known as hyponatremia, or "water intoxication," can occur when excessive amounts of water are consumed with no electrolytes (e.g., sodium). Nonetheless, the recommendation of drinking eight, 8-ounce glasses of water each day, while not an absolute necessity, is not going to be harmful and can promote proper hydration.[26]

THE RECOMMENDED DIETARY ALLOWANCES (RDAs) AND THE DIETARY REFERENCE INTAKES (DRIs)

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The National Academy of Sciences[3] developed a set of nutrient and energy standards called the Recommended Dietary Allowances (RDAs) to help individuals eat better diets to improve their health. The scientific community began to debate the usefulness of RDAs for the general population, and in 1997, the Dietary Reference Intakes (DRIs) were created to be more effective in guiding individuals' food intake. These recommendations, while highly technical and scientific, can be helpful in determining a healthy, well-balanced diet. The DRIs differ from the RDAs in that they provide a more comprehensive approach to nutritional recommendations. Specifically, the DRIs are more encompassing than the RDAs, taking into consideration RDAs, but also the Estimated Average Requirements (EARs), the Adequate Intakes (AIs), and the Tolerable Upper Intake Levels (UL) for nutrient requirements. Moreover, the DRIs are more focused on health promotion and the reduction of nutrient-dependent diseases (e.g., diabetes, heart disease, hypertension), rather than the prevention of vitamin-deficiency diseases (e.g., scurvy, beriberi), as was the case with the RDAs (See Figures 5.3-5.9).

THE USDA FOOD GUIDE PYRAMID

A healthy, well-balanced diet traditionally was broken down into the four basic food groups—1) dairy; 2) fruits and vegetables; 3) breads and cereals; and 4) meats—with recommended numbers of servings for each group, each day. In 1992, the United States Department of Agriculture (USDA)[13] initiated a new program to help individuals eat a better diet; this program is The Food Guide Pyramid (See Figure 5.10).

The Food Guide Pyramid is a 4-tiered pyramid, with each tier representing certain foods. It is meant to be used as an "outline of what to eat each day" and not a "rigid prescription."[13] The Food Guide Pyramid's goal is to guide an individual to eat a variety of foods, thus ensuring consumption of the proper nutrients and, at the same time, ensuring consumption of the proper amount of calories to maintain the proper body weight.

At the base of the Food Guide Pyramid is the Bread, Cereal, Rice, & Pasta Group, where 6-11 servings are recommended. This is where the majority of calories should be consumed. It represents carbohydrates. The next tier is broken up into two groups: the Vegetable Group, and the Fruit

Figure 5.3

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

Life Stage Group	Calcium (mg/d)	CHO (g/d)	Protein (g/kg/d)	Vit A (µg/d)[a]	Vit C (mg/d)	Vit D (µg/d)	Vit E (mg/d)[b]	Thiamin (mg/d)	Ribo-flavin (mg/d)	Niacin (mg/d)[c]	Vit B_6 (mg/d)	Folate (µg/d)[d]	Vit B_{12} (µg/d)	Copper (µg/d)	Iodine (µg/d)	Iron (mg/d)	Magnes-ium (mg/d)	Molyb-denum (µg/d)	Phos-phorus (mg/d)	Sele-nium (µg/d)	Zinc (mg/d)
Infants																					
0 to 6 mo																					
6 to 12 mo			1.0													6.9					2.5
Children																					
1–3 y	500	100	0.87	210	13	10	5	0.4	0.4	5	0.4	120	0.7	260	65	3.0	65	13	380	17	2.5
4–8 y	800	100	0.76	275	22	10	6	0.5	0.5	6	0.5	160	1.0	340	65	4.1	110	17	405	23	4.0
Males																					
9–13 y	1,100	100	0.76	445	39	10	9	0.7	0.8	9	0.8	250	1.5	540	73	5.9	200	26	1,055	35	7.0
14–18 y	1,100	100	0.73	630	63	10	12	1.0	1.1	12	1.1	330	2.0	685	95	7.7	340	33	1,055	45	8.5
19–30 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.1	320	2.0	700	95	6	330	34	580	45	9.4
31–50 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.1	320	2.0	700	95	6	350	34	580	45	9.4
51–70 y	800	100	0.66	625	75	10	12	1.0	1.1	12	1.4	320	2.0	700	95	6	350	34	580	45	9.4
> 70 y	1,000	100	0.66	625	75	10	12	1.0	1.1	12	1.4	320	2.0	700	95	6	350	34	580	45	9.4
Females																					
9–13 y	1,100	100	0.76	420	39	10	9	0.7	0.8	9	0.8	250	1.5	540	73	5.7	200	26	1,055	35	7.0
14–18 y	1,100	100	0.71	485	56	10	12	0.9	0.9	11	1.0	330	2.0	685	95	7.9	300	33	1,055	45	7.3
19–30 y	800	100	0.66	500	60	10	12	0.9	0.9	11	1.1	320	2.0	700	95	8.1	255	34	580	45	6.8
31–50 y	800	100	0.66	500	60	10	12	0.9	0.9	11	1.1	320	2.0	700	95	8.1	265	34	580	45	6.8
51–70 y	1,000	100	0.66	500	60	10	12	0.9	0.9	11	1.3	320	2.0	700	95	5	265	34	580	45	6.8
> 70 y	1,000	100	0.66	500	60	10	12	0.9	0.9	11	1.3	320	2.0	700	95	5	265	34	580	45	6.8
Pregnancy																					
14–18 y	1,000	135	0.88	530	66	10	12	1.2	1.2	14	1.6	520	2.2	785	160	23	335	40	1,055	49	10.5
19–30 y	800	135	0.88	550	70	10	12	1.2	1.2	14	1.6	520	2.2	800	160	22	290	40	580	49	9.5
31–50 y	800	135	0.88	550	70	10	12	1.2	1.2	14	1.6	520	2.2	800	160	22	300	40	580	49	9.5
Lactation																					
14–18 y	1,000	160	1.05	885	96	10	16	1.2	1.3	13	1.7	450	2.4	985	209	7	300	35	1,055	59	10.9
19–30 y	800	160	1.05	900	100	10	16	1.2	1.3	13	1.7	450	2.4	1,000	209	6.5	255	36	580	59	10.4
31–50 y	800	160	1.05	900	100	10	16	1.2	1.3	13	1.7	450	2.4	1,000	209	6.5	265	36	580	59	10.4

NOTE: An Estimated Average Requirement (EAR) is the average daily nutrient intake level estimated to meet the requirements of half 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.

[a]As retinol activity equivalents (RAEs). 1 RAE = 1 µg retinol, 12 µg β-carotene, 24 µg α-carotene, or 24 µg β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is two-fold greater than retinol equivalents (RE), whereas the RAE for preformed vitamin A is the same as RE.

[b]As α-tocopherol. α-Tocopherol includes *RRR*-α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the *2R*-stereoisomeric forms of α-tocopherol (*RRR*-, *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.

[c]As niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan.

[d]As dietary folate equivalents (DFE). 1 DFE = 1 µg food folate = 0.6 µg of folic acid from fortified food or as a supplement consumed with food = 0.5 µg of a supplement taken on an empty stomach.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride* (1997); *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, 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.

Figure 5.4

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Vitamins

Food and Nutrition Board, Institute of Medicine, National Academies

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)	Pantothenic Acid (mg/d)	Biotin (µg/d)	Choline (mg/d)[g]
Infants														
0 to 6 mo	400*	40*	10	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	1.7*	5*	125*
6 to 12 mo	500*	50*	10	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1.8*	6*	150*
Children														
1–3 y	**300**	**15**	**15**	**6**	30*	**0.5**	**0.5**	**6**	**0.5**	**150**	**0.9**	2*	8*	200*
4–8 y	**400**	**25**	**15**	**7**	55*	**0.6**	**0.6**	**8**	**0.6**	**200**	**1.2**	3*	12*	250*
Males														
9–13 y	**600**	**45**	**15**	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14–18 y	**900**	**75**	**15**	**15**	75*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	25*	550*
19–30 y	**900**	**90**	**15**	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
31–50 y	**900**	**90**	**15**	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
51–70 y	**900**	**90**	**15**	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[h]	5*	30*	550*
> 70 y	**900**	**90**	**20**	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4**[h]	5*	30*	550*
Females														
9–13 y	**600**	**45**	**15**	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14–18 y	**700**	**65**	**15**	**15**	75*	**1.0**	**1.0**	**14**	**1.2**	**400**[i]	**2.4**	5*	25*	400*
19–30 y	**700**	**75**	**15**	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**[i]	**2.4**	5*	30*	425*
31–50 y	**700**	**75**	**15**	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**[i]	**2.4**	5*	30*	425*
51–70 y	**700**	**75**	**15**	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[h]	5*	30*	425*
> 70 y	**700**	**75**	**20**	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4**[h]	5*	30*	425*
Pregnancy														
14–18 y	**750**	**80**	**15**	**15**	75*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
19–30 y	**770**	**85**	**15**	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
31–50 y	**770**	**85**	**15**	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[i]	**2.6**	6*	30*	450*
Lactation														
14–18 y	**1,200**	**115**	**15**	**19**	75*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
19–30 y	**1,300**	**120**	**15**	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
31–50 y	**1,300**	**120**	**15**	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*

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 percent) 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, and thus calculate 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.

[a] As retinol activity equivalents (RAEs). 1 RAE = 1 µg retinol, 12 µg β-carotene, 24 µg α-carotene, or 24 µg β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is two-fold greater than retinol equivalents (RE), whereas the RAE for preformed vitamin A is the same as RE.

[b] As cholecalciferol. 1 µg cholecalciferol = 40 IU vitamin D.

[c] Under the assumption of minimal sunlight.

[d] As α-tocopherol. α-Tocopherol includes *RRR*-α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the *2R*-stereoisomeric forms of α-tocopherol (*RRR*-, *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.

[e] As niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan; 0–6 months = preformed niacin (not NE).

[f] As dietary folate equivalents (DFE). 1 DFE = 1 µg food folate = 0.6 µg of folic acid from fortified food or as a supplement consumed with food = 0.5 µg of a supplement taken on an empty stomach.

[g] Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

[h] Because 10 to 30 percent of older people may malabsorb food-bound B_{12}, it is advisable for those older than 50 years to meet their RDA mainly by consuming foods fortified with B_{12} or a supplement containing B_{12}.

[i] In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 µg from supplements or fortified foods in addition to intake of food folate from a varied diet.

Figure 5.5

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

Life Stage Group	Calcium (mg/d)	Chromium (µg/d)	Copper (µg/d)	Fluoride (mg/d)	Iodine (µg/d)	Iron (mg/d)	Magnesium (mg/d)	Manganese (mg/d)	Molybdenum (µg/d)	Phosphorus (mg/d)	Selenium (µg/d)	Zinc (mg/d)	Potassium (g/d)	Sodium (g/d)	Chloride (g/d)
Infants															
0 to 6 mo	200*	0.2*	200*	0.01*	110*	0.27*	30*	0.003*	2*	100*	15*	2*	0.4*	0.12*	0.18*
6 to 12 mo	260*	5.5*	220*	0.5*	130*	**11**	75*	0.6*	3*	275*	20*	**3**	0.7*	0.37*	0.57*
Children															
1–3 y	**700**	11*	**340**	0.7*	**90**	**7**	**80**	1.2*	**17**	**460**	**20**	**3**	3.0*	1.0*	1.5*
4–8 y	**1,000**	15*	**440**	1*	**90**	**10**	**130**	1.5*	**22**	**500**	**30**	**5**	3.8*	1.2*	1.9*
Males															
9–13 y	**1,300**	25*	**700**	2*	**120**	**8**	**240**	1.9*	**34**	**1,250**	**40**	**8**	4.5*	1.5*	2.3*
14–18 y	**1,300**	35*	**890**	3*	**150**	**11**	**410**	2.2*	**43**	**1,250**	**55**	**11**	4.7*	1.5*	2.3*
19–30 y	**1,000**	35*	**900**	4*	**150**	**8**	**400**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
31–50 y	**1,000**	35*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
51–70 y	**1,000**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.3*	2.0*
> 70 y	**1,200**	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.2*	1.8*
Females															
9–13 y	**1,300**	21*	**700**	2*	**120**	**8**	**240**	1.6*	**34**	**1,250**	**40**	**8**	4.5*	1.5*	2.3*
14–18 y	**1,300**	24*	**890**	3*	**150**	**15**	**360**	1.6*	**43**	**1,250**	**55**	**9**	4.7*	1.5*	2.3*
19–30 y	**1,000**	25*	**900**	3*	**150**	**18**	**310**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
31–50 y	**1,000**	25*	**900**	3*	**150**	**18**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
51–70 y	**1,200**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.3*	2.0*
> 70 y	**1,200**	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.2*	1.8*
Pregnancy															
14–18 y	**1,300**	29*	**1,000**	3*	**220**	**27**	**400**	2.0*	**50**	**1,250**	**60**	**12**	4.7*	1.5*	2.3*
19–30 y	**1,000**	30*	**1,000**	3*	**220**	**27**	**350**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
31–50 y	**1,000**	30*	**1,000**	3*	**220**	**27**	**360**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
Lactation															
14–18 y	**1,300**	44*	**1,300**	3*	**290**	**10**	**360**	2.6*	**50**	**1,250**	**70**	**13**	5.1*	1.5*	2.3*
19–30 y	**1,000**	45*	**1,300**	3*	**290**	**9**	**310**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*
31–50 y	**1,000**	45*	**1,300**	3*	**290**	**9**	**320**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*

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 percent) 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, and thus calculate 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, Phosphorous, Magnesium, Vitamin D, and Fluoride* (1997); *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline* (1998); *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids* (2000); and *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.

Figure 5.6

Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Total Water and Macronutrients

Food and Nutrition Board, Institute of Medicine, National Academies

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

NOTE: This table (take from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDA) in **bold type** and Adequate Intakes (AI) 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 percent) 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, and thus calculate 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.

[a] *Total* water includes all water contained in food, beverages, and drinking water.

[b] Based on g protein per kg of body weight for the reference body weight, e.g., for adults 0.8 g/kg body weight for the reference body weight.

[c] Not determined.

SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (2002/2005) and *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate* (2005). The report may be accessed via www.nap.edu.

Figure 5.7

Dietary Reference Intakes (DRIs): Acceptable Macronutrient Distribution Ranges

Food and Nutrition Board, Institute of Medicine, National Academies

	Range (percent of energy)		
Macronutrient	Children, 1–3 y	Children, 4–18 y	Adults
Fat	30–40	25–35	20–35
n-6 polyunsaturated fatty acids[a] (linoleic acid)	5–10	5–10	5–10
n-3 polyunsaturated fatty acids[a] (α-linolenic acid)	0.6–1.2	0.6–1.2	0.6–1.2
Carbohydrate	45–65	45–65	45–65
Protein	5–20	10–30	10–35

[a] Approximately 10 percent of the total can come from longer-chain *n*-3 or *n*-6 fatty acids.

SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (2002/2005). The report may be accessed via www.nap.edu.

Dietary Reference Intakes (DRIs): Acceptable Macronutrient Distribution Ranges

Food and Nutrition Board, Institute of Medicine, National Academies

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

[a]Not a recommended intake. A daily intake of added sugars that individuals should aim for to achieve a healthful diet was not set.

SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids* (2002/2005). The report may be accessed via www.nap.edu.

Figure 5.8

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

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}	Pantothenic Acid	Biotin	Choline (g/d)	Carotenoids[d]
Infants															
0 to 6 mo	600	ND[e]	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6 to 12 mo	600	ND	38	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Children															
1–3 y	600	400	63	200	ND	ND	ND	10	30	300	ND	ND	ND	1.0	ND
4–8 y	900	650	75	300	ND	ND	ND	15	40	400	ND	ND	ND	1.0	ND
Males															
9–13 y	1,700	1,200	100	600	ND	ND	ND	20	60	600	ND	ND	ND	2.0	ND
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
51–70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
> 70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
Females															
9–13 y	1,700	1,200	100	600	ND	ND	ND	20	60	600	ND	ND	ND	2.0	ND
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
51–70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
> 70 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
Pregnancy															
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
Lactation															
14–18 y	2,800	1,800	100	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19–30 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
31–50 y	3,000	2,000	100	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND

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 B_{12}, 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.

[a] As preformed vitamin A only.

[b] As α-tocopherol; applies to any form of supplemental α-tocopherol.

[c] The 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.

[e] ND = 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.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride* (1997); *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, Pantothenic Acid, Biotin, and Choline* (1998); *Dietary Reference Intakes for Vitamin C, Vitamine 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.

Figure 5.9

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

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/d)	Nickel (mg/d)	Phosphorus (g/d)	Selenium (µg/d)	Silicon[c]	Vanadium (mg/d)[d]	Zinc (mg/d)	Sodium (g/d)	Chloride (g/d)
Infants																			
0 to 6 mo	ND[e]	ND	1,000	ND	ND	0.7	ND	40	ND	ND	ND	ND	ND	45	ND	ND	4	ND	ND
6 to 12 mo	ND	ND	1,500	ND	ND	0.9	ND	40	ND	ND	ND	ND	ND	60	ND	ND	5	ND	ND
Children																			
1–3 y	ND	3	2,500	ND	1,000	1.3	200	40	65	2	300	0.2	3	90	ND	ND	7	1.5	2.3
4–8 y	ND	6	2,500	ND	3,000	2.2	300	40	110	3	600	0.3	3	150	ND	ND	12	1.9	2.9
Males																			
9–13 y	ND	11	3,000	ND	5,000	10	600	40	350	6	1,100	0.6	4	280	ND	ND	23	2.2	3.4
14–18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700	1.0	4	400	ND	ND	34	2.3	3.6
19–30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
31–50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
51–70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
> 70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000	1.0	3	400	ND	1.8	40	2.3	3.6
Females																			
9–13 y	ND	11	3,000	ND	5,000	10	600	40	350	6	1,100	0.6	4	280	ND	ND	23	2.2	3.4
14–18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700	1.0	4	400	ND	ND	34	2.3	3.6
19–30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
31–50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
51–70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	1.8	40	2.3	3.6
> 70 y	ND	20	2,000	ND	10,000	10	1,100	45	350	11	2,000	1.0	3	400	ND	1.8	40	2.3	3.6
Pregnancy																			
14–18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700	1.0	3.5	400	ND	ND	34	2.3	3.6
19–30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	3.5	400	ND	ND	40	2.3	3.6
61–50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	3.5	400	ND	ND	40	2.3	3.6
Lactation																			
14–18 y	ND	17	3,000	ND	8,000	10	900	45	350	9	1,700	1.0	4	400	ND	ND	34	2.3	3.6
19–30 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	ND	40	2.3	3.6
31–50 y	ND	20	2,500	ND	10,000	10	1,100	45	350	11	2,000	1.0	4	400	ND	ND	40	2.3	3.6

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 B_{12}, 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.

[a]Although the UL was not determined for arsenic, there is no justification for adding arsenic to food or supplements.

[b]The ULs for magnesium represent intake from a pharmacological agent only and do not include intake from food and water.

[c]Although silicon has not been shown to cause adverse effects in humans, there is no justification for adding silicon to supplements.

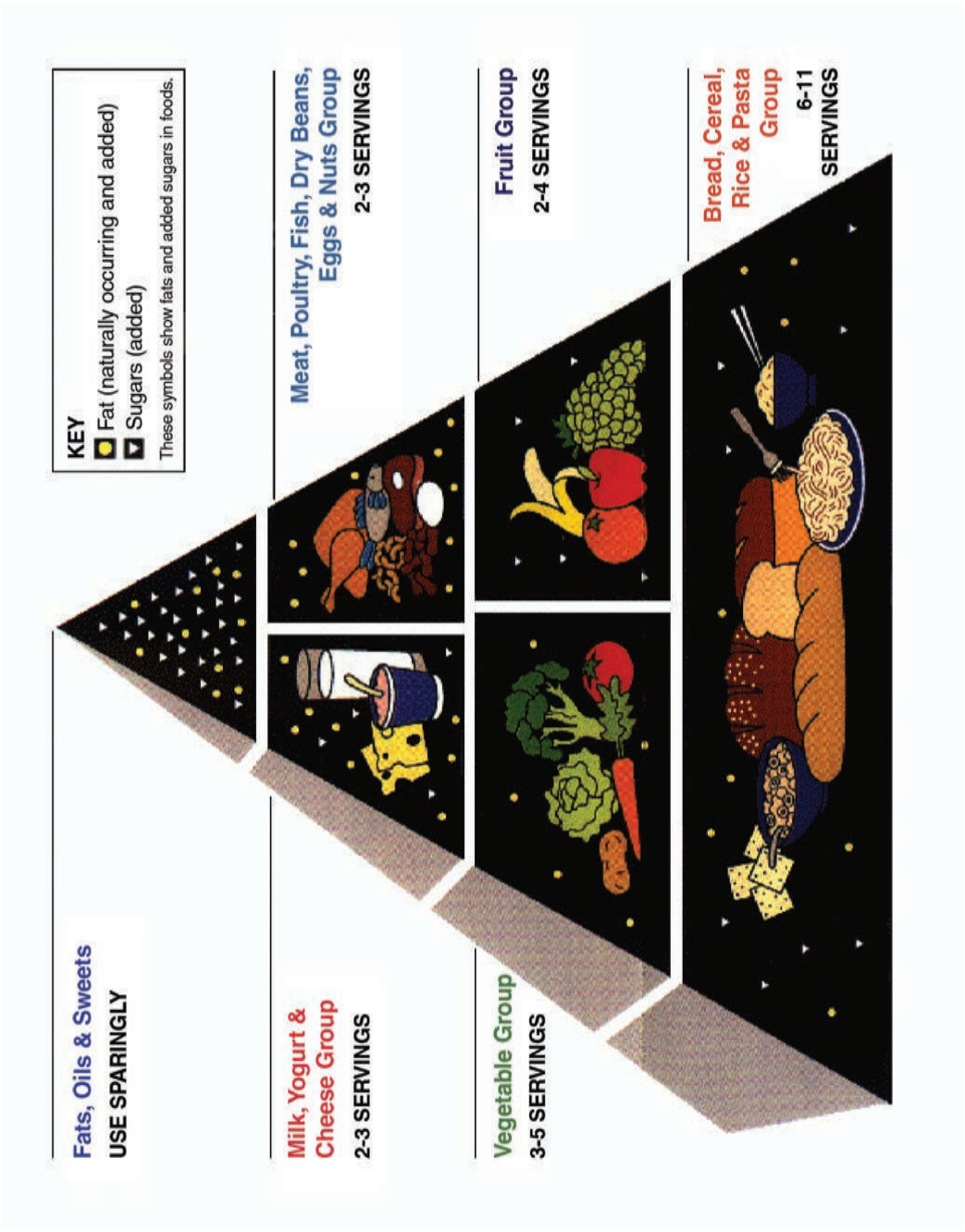
[d]Although vanadium in food has not been shown to cause adverse effects in humans, there is no justification for adding vanadium to food and vanadium supplements should be used with caution. The UL is based on adverse effects in laboratory animals and this data could be used to set a UL for adults but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

[e]ND = 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.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride* (1997); *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B_6, Folate, Vitamin B_{12}, 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.

Figure 5.10

USDA Food Guide Pyramid



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Group, with 3-5 servings and 2-4 servings being recommended, respectively. These groups are important because they provide necessary vitamins, minerals, and additional carbohydrates, especially fiber, to the diet. The third tier is broken into the Milk, Yogurt, & Cheese Group, and the Meat, Poultry, Fish, Dry Beans, Eggs, & Nuts Group. Vitamins, minerals, and, most importantly, protein are accounted for with these groups. At the top of the pyramid is the final tier, representing Fats, Oils, & Sweets. These are recommended sparingly because excessive consumption can lead to atherosclerosis and obesity, both contributing factors for cardiovascular disease.

To use the Food Guide Pyramid properly, one must know what constitutes a "serving." The USDA[14] defines a serving as follows:

- ***Bread, Cereal, Rice, & Pasta Group:*** *1 slice of bread; 1 ounce of ready-to-eat cereal; 1/2 cup of cooked rice or pasta*
- ***Vegetable:*** *1 cup of raw leafy vegetables; 1/2 cup of other vegetables cooked or chopped raw; 3/4 cup of vegetable juice*
- ***Fruit:*** *1 medium apple, banana, orange; 1/2 cup of chopped, cooked, or canned fruit; 3/4 cup of fruit juice*
- ***Milk, Yogurt, & Cheese:*** *1 cup of milk or yogurt; 1 1/2 ounces of natural cheese; 2 ounces of processed cheese*
- ***Meat, Poultry, Fish, Dry Beans, Eggs, & Nuts:*** *2-3 ounces of cooked lean meat, poultry, or fish; 1/2 cup of cooked, dry beans or 1 egg counts as 1 ounce of meat; 2 tablespoons of peanut butter or 1/3 cup of nuts count as 1 ounce of meat.*

STUDY TIP:

The Food Guide Pyramid's goal is to guide an individual to eat a variety of foods to ensure proper nutrition and caloric intake.

In addition to the Food Guide Pyramid, the USDA, in conjunction with the U.S. Department of Health and Human Services (HHS), suggests that healthy Americans over the age of 2 should follow these Dietary Guidelines:[13]

- *Eat a variety of foods to get the energy, protein, vitamins, minerals, and fiber you need for good health.*
- *Balance the food you eat with physical activity—maintain or improve your weight to reduce your chances of developing high blood pressure, heart disease, a stroke, certain cancers, and the most common kind of diabetes.*

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- *Choose a diet with plenty of grain products, vegetables, and fruits that can help you lower your intake of fat and provide needed vitamins, minerals, fiber, and complex carbohydrates.*
- *Choose a diet low in fat, saturated fat, and cholesterol to reduce your risk of heart attack and certain types of cancer and to help you maintain a healthy weight.*
- *Choose a diet moderate in sugars. A diet with lots of sugars has too many calories and too few nutrients for most people, and can contribute to tooth decay.*
- *Choose a diet moderate in salt and sodium to help reduce your risk of high blood pressure.*
- *If you drink alcoholic beverages, do so in moderation. Alcoholic beverages supply calories, but little or no nutrients. Drinking alcohol is also the cause of many health problems, and can lead to accidents.*

Contrary to what many believe, breads and pasta do not make a person fat. Excessive calories eaten and not burned off make a person gain unwanted fat.

A diet rich in grain products, vegetables, and fruits can help lower your intake of fat and provide needed vitamins, minerals, fiber, and complex carbohydrates.

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MyPyramid and ChooseMyPlate

In 2005, the USDA revised the Food GuidePyramid and created an Internet-based model called MyPyramid (see Figure 5.11). As with the Food Guide Pyramid, MyPyramid suggests that one's diet should be based on grains, fruits, and vegetables, with an acknowledgment of the role of vegetable oil in a healthy diet. Furthermore, MyPyramid emphasizes physical activity as important in one's lifestyle, with the addition of a human-like figure walking a staircase. The major problem with MyPyramid is that it was complex and required Internet access to be used correctly. It referred individuals back to a website where specifics could be obtained based on age, sex, and physical activity. Nonetheless, while being complex and Internet-dependent, MyPyramid did serve as a solid, general guideline for forming a dietary plan.

In 2011, the USDA created a new dietary system entitled ChooseMyPlate (www.ChooseMyPlate.gov) to replace the MyPyramid. Away went the whole concept of a pyramid, and the idea of a dinner plate was introduced (see Figure 5.13).

The dinner plate is designed to provide an excellent visual reference for the consumer, especially for serving sizes. General consumer guidelines for the ChooseMyPlate are as follows:

Balancing Calories

- Enjoy your food, but eat less.
- Avoid oversized portions.

Foods to Increase

- Make half your plate fruits and vegetables.
- Make at least half your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.

Foods to Reduce

- Compare sodium in foods like soup, bread, and frozen meals—and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

STUDY TIP:

In addition to the nutrition guidelines offered by the Food Guide Pyramid, MyPyramid emphasizes the importance of physical activity for optimal health.

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Figure 5.11

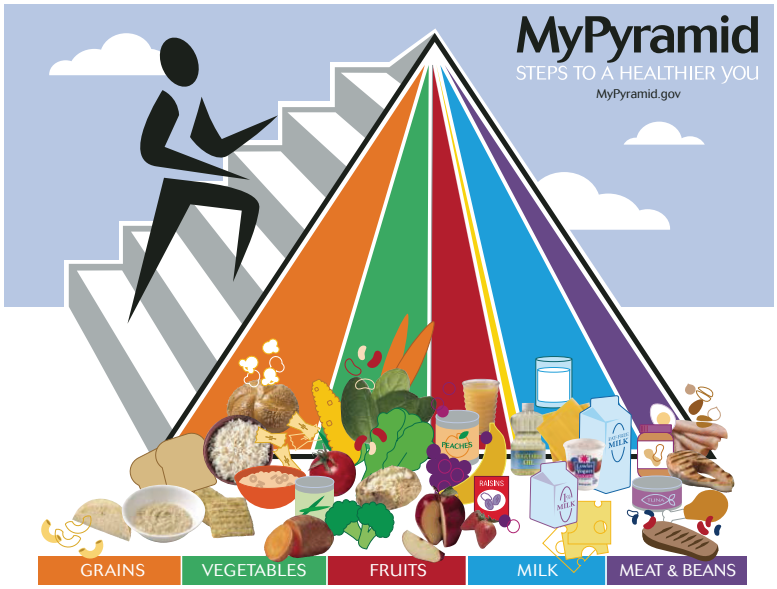
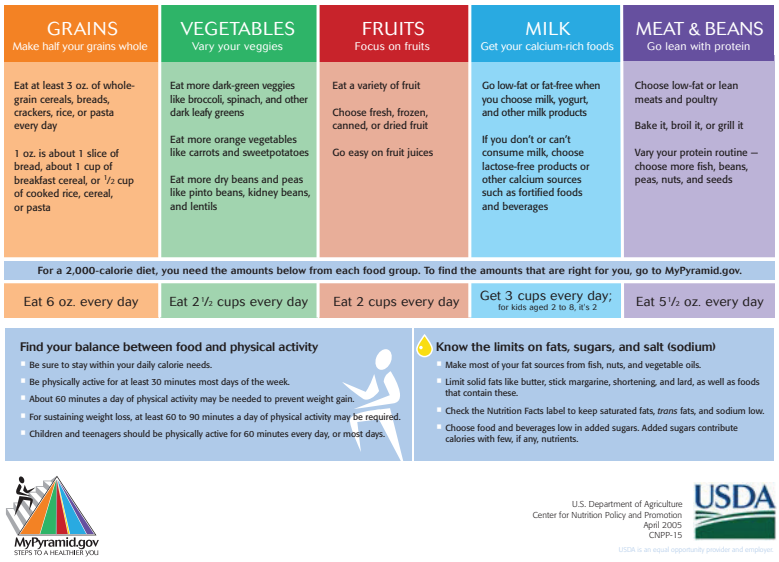


Figure 5.12



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In addition to focusing on portion sizes with a visual key in the logo, which is a solid improvement, more guidelines were given for physical activity, and this is an excellent improvement that was needed. Specifically, the USDA states the following with respect to physical activity:

WHAT IS PHYSICAL ACTIVITY?

Physical activity simply means movement of the body that uses energy. Walking, gardening, briskly pushing a baby stroller, climbing the stairs, playing soccer, or dancing the night away are all good examples of being active. For health benefits, physical activity should be moderate or vigorous intensity.

Moderate physical activities include:

- Walking briskly (about 3 1/2 miles per hour)
- Bicycling (less than 10 miles per hour)
- General gardening (raking, trimming shrubs)
- Dancing
- Golf (walking and carrying clubs)
- Water aerobics
- Canoeing
- Tennis (doubles)

Vigorous physical activities include:

- Running/jogging (5 miles per hour)
- Walking very fast (4 1/2 miles per hour)
- Bicycling (more than 10 miles per hour)
- Heavy yard work, such as chopping wood
- Swimming (freestyle laps)
- Aerobics
- Basketball (competitive)
- Tennis (singles)

You can choose moderate or vigorous intensity activities, or a mix of both each week. Activities can be considered vigorous, moderate, or light in intensity. This depends on the extent to which they make you breathe harder and your heart beat faster. Only moderate and vigorous intensity activities count toward meeting your physical activity needs. With vigorous activities, you get similar health benefits in two-thirds the time it takes you with moderate ones. You can replace some or all of your moderate activity with vigorous activity. Although you are moving, light intensity activities do not increase your heart rate, so you should not count these towards meeting the physical

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activity recommendations. These activities include walking at a casual pace, such as while grocery shopping, and doing light household chores. (N.B., quoted directly from www.choosemyplate.gov/foodgroups/physicalactivity).

Ultimately, the ChooseMyPlate system is an improvement over the previous models, but care must be taken to be sure to eat the proper portions with respect to each food group. Also, with respect to protein, lean protein that is absent of saturated fat should be eaten instead of protein, such as red meat, that often has higher levels of saturated fat in it. Red meat is not dangerous, per se, but the higher amounts of saturated fats in it can cause problems, especially related to heart disease and stroke. Thus, it is best if red meat is eaten more sparingly and reserved for special occasions. Including fish, poultry, legumes, and nuts in the diet, for protein, is a wise choice. Another key thing is to use butter and margarine sparingly and to replace it, when possible, with plant oils, such as olive oil, because these oils are known to be healthy for the heart with their help in the production of the "good" cholesterol, i.e., HDL cholesterol. In the end, the ChooseMyPlate system should be used as a general guideline for eating and not be looked upon as a rigid plan.

Figure 5.13

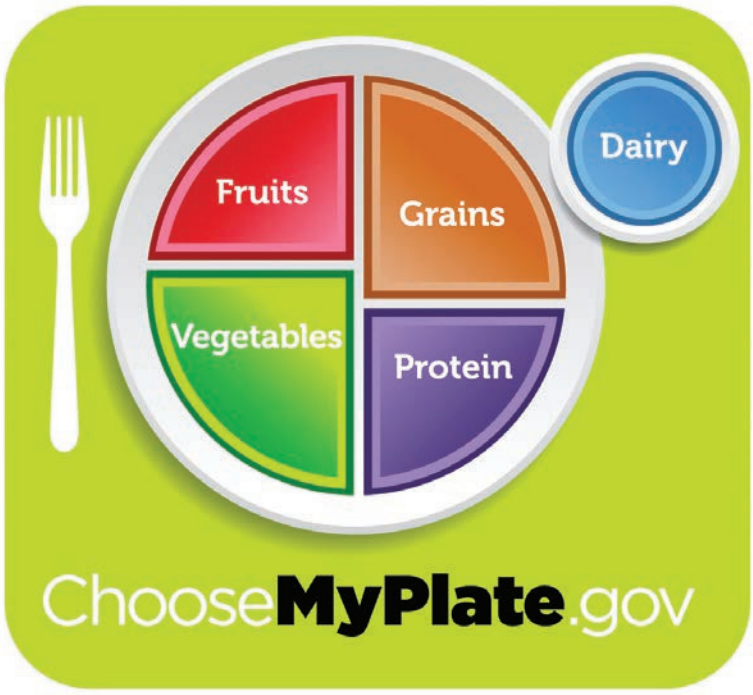
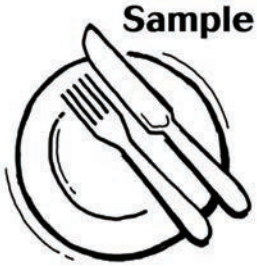


Figure 5.14

Sample Menus for a 2000 Calorie Food Pattern



Use this 7-day menu as a motivational tool to help put a healthy eating pattern into practice, and to identify creative new ideas for healthy meals. Averaged over a week, this menu provides the recommended amounts of key nutrients and foods from each food group. The menus feature a large number of different foods to inspire ideas for adding variety to food choices. They are not intended to be followed day-by-day as a specific prescription for what to eat.

Spices and herbs can be used to taste. Try spices such as chili powder, cinnamon, cumin, curry powder, ginger, nutmeg, mustard, garlic powder, onion powder, or pepper. Try fresh or dried herbs such as basil, parsley, cilantro, chives, dill, mint, oregano, rosemary, thyme, or tarragon. Also try salt-free spice or herb blends.

While this 7-day menu provides the recommended amounts of foods and key nutrients, it does so at a moderate cost. Based on national average food costs, adjusted for inflation to March 2011 prices, the cost of this menu is less than the average amount spent for food, per person, in a 4-person family.

DAY 1

BREAKFAST
Creamy oatmeal (cooked in milk):
- *½ cup uncooked oatmeal*
- *1 cup fat-free milk*
- *2 Tbsp raisins*
- *2 tsp brown sugar*

Beverage: 1 cup orange juice

LUNCH
Taco salad:
- *2 ounces tortilla chips*
- *2 ounces cooked ground turkey*
- *2 tsp corn/canola oil (to cook turkey)*
- *¼ cup kidney beans**
- *½ ounce low-fat cheddar cheese*
- *½ cup chopped lettuce*
- *½ cup avocado*
- *1 tsp lime juice (on avocado)*
- *2 Tbsp salsa*

Beverage:
1 cup water, coffee, or tea**

DINNER
Spinach lasagna roll-ups:
- *1 cup lasagna noodles(2 oz dry)*
- *½ cup cooked spinach*
- *½ cup ricotta cheese*
- *1 ounce part-skim mozzarella cheese*
- *½ cup tomato sauce**

1 ounce whole wheat roll
- *1 tsp tub margarine*

Beverage: 1 cup fat-free milk

SNACKS
2 Tbsp raisins
1 ounce unsalted almonds

DAY 2

BREAKFAST
Breakfast burrito:
- *1 flour tortilla (8" diameter)*
- *1 scrambled egg*
- *⅓ cup black beans**
- *2 Tbsp salsa*

½ large grapefruit
Beverage:
1 cup water, coffee, or tea**

LUNCH
Roast beef sandwich:
- *1 small whole grain hoagie bun*
- *2 ounces lean roast beef*
- *1 slice part-skim mozzarella cheese*
- *2 slices tomato*
- *¼ cup mushrooms*
- *1 tsp corn/canola oil (to cook mushrooms)*
- *1 tsp mustard*

Baked potato wedges:
- *1 cup potato wedges*
- *1 tsp corn/canola oil (to cook potato)*
- *1 Tbsp ketchup*

Beverage: 1 cup fat-free milk

DINNER
Baked salmon on beet greens:
- *4 ounce salmon filet*
- *1 tsp olive oil*
- *2 tsp lemon juice*
- *⅓ cup cooked beet greens (sauteed in 2 tsp corn/canola oil)*

Quinoa with almonds:
- *½ cup quinoa*
- *½ ounce slivered almonds*

Beverage: 1 cup fat-free milk

SNACKS
1 cup cantaloupe balls

DAY 3

BREAKFAST
Cold cereal:
- *1 cup ready-to-eat oat cereal*
- *1 medium banana*
- *½ cup fat-free milk*

1 slice whole wheat toast
- *1 tsp tub margarine*

Beverage: 1 cup prune juice

LUNCH
Tuna salad sandwich:
- *2 slices rye bread*
- *2 ounces tuna*
- *1 Tbsp mayonnaise*
- *1 Tbsp chopped celery*
- *½ cup shredded lettuce*

1 medium peach
Beverage: 1 cup fat-free milk

DINNER
Roasted chicken:
- *3 ounces cooked chicken breast*

1 large sweet potato, roasted
½ cup succotash (limas & corn)
- *1 tsp tub margarine*

1 ounce whole wheat roll
- *1 tsp tub margarine*

Beverage:
1 cup water, coffee, or tea**

SNACKS
¼ cup dried apricots
1 cup flavored yogurt (chocolate)

Figure 5.14 continued

Sample Menus for a 2000 Calorie Food Pattern (cont'd)

DAY 4	DAY 5	DAY 6	DAY 7
BREAKFAST 1 whole wheat English muffin *1 Tbsp all-fruit preserves* 1 hard-cooked egg Beverage: 1 cup water, coffee, or tea**	**BREAKFAST** Cold cereal: *1 cup shredded wheat* *½ cup sliced banana* *½ cup fat-free milk* 1 slice whole wheat toast *2 tsp all-fruit preserves* Beverage: 1 cup fat-free chocolate milk	**BREAKFAST** French toast: *2 slices whole wheat bread* *3 Tbsp fat-free milk and* *⅔ egg (in French toast)* *2 tsp tub margarine* *1 Tbsp pancake syrup* ½ large grapefruit Beverage: 1 cup fat-free milk	**BREAKFAST** Buckwheat pancakes with berries: *2 large (7") pancakes* *1 Tbsp pancake syrup* *¼ cup sliced strawberries* Beverage: 1 cup orange juice
LUNCH White bean-vegetable soup: *1 ¼ cup chunky vegetable soup with pasta* *½ cup white beans** 6 saltine crackers* ½ cup celery sticks Beverage: 1 cup fat-free milk	**LUNCH** Turkey sandwich *1 whole wheat pita bread (2 oz)* *3 ounces roasted turkey, sliced* *2 slices tomato* *¼ cup shredded lettuce* *1 tsp mustard* *1 Tbsp mayonnaise* ½ cup grapes Beverage: 1 cup tomato juice*	**LUNCH** 3-bean vegetarian chili on baked potato: *¾ cup each cooked kidney beans,* navy beans,* and black beans** *½ cup tomato sauce** *¼ cup chopped onion* *2 Tbsp chopped jalapeno peppers* *1 tsp corn/canola oil (to cook onion and peppers)* *¼ cup cheese sauce* *1 large baked potato* ½ cup cantaloupe Beverage: 1 cup water, coffee, or tea**	**LUNCH** New England clam chowder: *3 ounces canned clams* *½ small potato* *2 Tbsp chopped onion* *2 Tbsp chopped celery* *6 Tbsp evaporated milk* *¼ cup fat-free milk* *1 slice bacon* *1 Tbsp white flour* 10 whole wheat crackers* 1 medium orange Beverage: 1 cup fat-free milk
DINNER Rigatoni with meat sauce: *1 cup rigatoni pasta (2 oz dry)* *2 ounces cooked ground beef (95% lean)* *2 tsp corn/canola oil (to cook beef)* *½ cup tomato sauce** *3 Tbsp grated parmesan cheese* Spinach salad: *1 cup raw spinach leaves* *½ cup tangerine sections* *½ ounce chopped walnuts* *4 tsp oil and vinegar dressing* Beverage: 1 cup water, coffee, or tea**	**DINNER** Steak and potatoes: *4 ounces broiled beef steak* *⅔ cup mashed potatoes made with milk and 2 tsp tub margarine* ½ cup cooked green beans *1 tsp tub margarine* *1 tsp honey* 1 ounce whole wheat roll *1 tsp tub margarine* Frozen yogurt and berries: *½ cup frozen yogurt (chocolate)* *¼ cup sliced strawberries* Beverage: 1 cup fat-free milk	**DINNER** Hawaiian pizza *2 slices cheese pizza, thin crust* *1 ounce lean ham* *¼ cup pineapple* *¼ cup mushrooms* *1 tsp safflower oil (to cook mushrooms)* Green salad: *1 cup mixed salad greens* *4 tsp oil and vinegar dressing* Beverage: 1 cup fat-free milk	**DINNER** Tofu-vegetable stir-fry: *4 ounces firm tofu* *½ cup chopped Chinese cabbage* *¼ cup sliced bamboo shoots* *2 Tbsp chopped sweet red peppers* *2 Tbsp chopped green peppers* *1 Tbsp corn/canola oil (to cook stir-fry)* 1 cup cooked brown rice (2 ounces raw) Honeydew yogurt cup: *¾ cup honeydew melon* *½ cup plain fat-free yogurt* Beverage: 1 cup water, coffee, or tea**
SNACKS 1 cup nonfat fruit yogurt	**SNACKS** 1 cup frozen yogurt (chocolate)	**SNACKS** 3 Tbsp hummus 5 whole wheat crackers*	**SNACKS** 1 large banana spread with 2 Tbsp peanut butter* 1 cup nonfat fruit yogurt

Notes:

*Foods that are reduced sodium, low sodium, or no-salt added products. These foods can also be prepared from scratch with no added salt. All other foods are regular commercial products, which contain variable levels of sodium. Average sodium level of the 7-day menu assumes that no salt is added in cooking or at the table.

**Unless indicated, all beverages are unsweetened and without added cream or whitener.

Italicized foods are part of the dish or food that precedes it.

Figure 5.14 continued

Sample Menus for a 2000 Calorie Food Pattern (cont'd)

Average amounts for weekly menu:

Food group	Daily average over 1 week
GRAINS	6.2 oz eq
Whole grains	3.8
Refined grains	2.4
VEGETABLES	2.6 cups
Vegetable subgroups (amount per week)	
Dark green	1.6 cups per week
Red/Orange	5.6
Starchy	5.1
Beans and Peas	1.6
Other Vegetables	4.1
FRUITS	2.1 cups
DAIRY	3.1 cups
PROTEIN FOODS	5.7 oz eq
Seafood	8.8 oz per week
OILS	29 grams
CALORIES FROM ADDED FATS AND SUGARS	245 calories

Nutrient	Daily average over 1 week
Calories	1975
Protein	96 g
Protein	19% kcal
Carbohydrate	275 g
Carbohydrate	56% kcal
Total fat	59 g
Total fat	27% kcal
Saturated fat	13.2 g
Saturated fat	6.0% kcal
Monounsaturated fat	25 g
Polyunsaturated fat	16 g
Linoleic Acid	13 g
Alpha-linolenic Acid	1.8 g
Cholesterol	201 mg
Total dietary fiber	30 g
Potassium	4701 mg
Sodium	1810 mg
Calcium	1436 mg
Magnesium	468 mg
Copper	2.0 mg
Iron	18 mg
Phosphorus	1885 mg
Zinc	14 mg
Thiamin	1.6 mg
Riboflavin	2.5 mg
Niacin Equivalents	24 mg
Vitamin B6	2.4 mg
Vitamin B12	12.3 mcg
Vitamin C	146 mg
Vitamin E	11.8 mg (AT)
Vitamin D	9.1 mcg
Vitamin A	1090 mcg (RAE)
Dietary Folate Equivalents	530 mcg
Choline	386 mg

Figure 5.15


Let's eat
for the health of it
Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov
Start by choosing one or more tips to help you...
Build a healthy plate
Cut back on foods high in solid fats, added sugars, and salt
Eat the right amount of calories for you
Be physically active your way

Figure 5.15 continued

Build a healthy plate

Before you eat, think about what goes on your plate or in your cup or bowl. Foods like vegetables, fruits, whole grains, low-fat dairy products, and lean protein foods contain the nutrients you need without too many calories. Try some of these options.

Make half your plate fruits and vegetables.

- Eat red, orange, and dark-green vegetables, such as tomatoes, sweet potatoes, and broccoli, in main and side dishes.
- Eat fruit, vegetables, or unsalted nuts as snacks—they are nature's original fast foods.

Switch to skim or 1% milk.

- They have the same amount of calcium and other essential nutrients as whole milk, but less fat and calories.
- Try calcium-fortified soy products as an alternative to dairy foods.

Make at least half your grains whole.

- Choose 100% whole-grain cereals, breads, crackers, rice, and pasta.
- Check the ingredients list on food packages to find whole-grain foods.

Vary your protein food choices.

- Twice a week, make seafood the protein on your plate.
- Eat beans, which are a ***natural*** source of fiber and protein.
- Keep meat and poultry portions small and lean.

Keep your food safe to eat—learn more at www.FoodSafety.gov.

Cut back on foods high in solid fats, added sugars, and salt

Many people eat foods with too much solid fats, added sugars, and salt (sodium). Added sugars and fats load foods with extra calories you don't need. Too much sodium may increase your blood pressure.

Choose foods and drinks with little or no added sugars.

- Drink water instead of sugary drinks. There are about 10 packets of sugar in a 12-ounce can of soda.
- Select fruit for dessert. Eat sugary desserts less often.
- Choose 100% fruit juice instead of fruit-flavored drinks.

Look out for salt (sodium) in foods you buy—it all adds up.

- Compare sodium in foods like soup, bread, and frozen meals—and choose the foods with lower numbers.
- Add spices or herbs to season food without adding salt.

Eat fewer foods that are high in solid fats.

- Make major sources of saturated fats—such as cakes, cookies, ice cream, pizza, cheese, sausages, and hot dogs—occasional choices, not everyday foods.
- Select lean cuts of meats or poultry and fat-free or low-fat milk, yogurt, and cheese.
- Switch from solid fats to oils when preparing food.*

*Examples of solid fats and oils

Solid Fats	Oils
Beef, pork, and chicken fat	Canola oil
Butter, cream, and milk fat	Corn oil
Coconut, palm, and palm kernel oils	Cottonseed oil
Hydrogenated oil	Olive oil
Partially hydrogenated oil	Peanut oil
Shortening	Safflower oil
Stick margarine	Sunflower oil
	Tub (soft) margarine
	Vegetable oil

Figure 5.15 continued

Eat the right amount of calories for you

Everyone has a personal calorie limit. Staying within yours can help you get to or maintain a healthy weight. People who are successful at managing their weight have found ways to keep track of how much they eat in a day, even if they don't count every calorie.

Enjoy your food, but eat less.

- Get your personal daily calorie limit at www.Choose**MyPlate**.gov and keep that number in mind when deciding what to eat.
- Think before you eat...is it worth the calories?
- Avoid oversized portions.
- Use a smaller plate, bowl, and glass.
- Stop eating when you are satisfied, not full.

Cook more often at home, where *you* are in control of what's in your food.

When eating out, choose lower calorie menu options.

- Check posted calorie amounts.
- Choose dishes that include vegetables, fruits, and/or whole grains.
- Order a smaller portion or share when eating out.

Write down what you eat to keep track of how much you eat.

If you drink alcoholic beverages, do so sensibly—limit to 1 drink a day for women or to 2 drinks a day for men.

Be physically active your way

Pick activities that you like and start by doing what you can, at least 10 minutes at a time. Every bit adds up, and the health benefits increase as you spend more time being active.

Note to parents

What you eat and drink and your level of physical activity are important for your own health, and also for your children's health.

You are your children's most important role model. Your children pay attention to what you ***do*** more than what you ***say***.

You can do a lot to help your children develop healthy habits for life by providing and eating healthy meals and snacks. For example, don't just ***tell*** your children to eat their vegetables—***show*** them that you eat and enjoy vegetables every day.

Figure 5.15 continued

Use food labels to help you make better choices

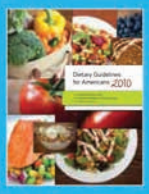
Most packaged foods have a Nutrition Facts label and an ingredients list. For a healthier you, use this tool to make smart food choices quickly and easily.

Check for calories. Be sure to look at the serving size and how many servings you are actually consuming. If you double the servings you eat, you double the calories.

Choose foods with lower calories, saturated fat, *trans* fat, and sodium.

Check for added sugars using the ingredients list. When a sugar is close to first on the ingredients list, the food is high in added sugars. Some names for added sugars include sucrose, glucose, high fructose corn syrup, corn syrup, maple syrup, and fructose.

Dietary Guidelines for Americans



The *Dietary Guidelines for Americans, 2010* are the best science-based advice on how to eat for health. The Guidelines encourage all Americans to eat a healthy diet and be physically active.

Improving what you eat and being active will help to reduce your risk of chronic diseases such as diabetes, heart disease, some cancers, and obesity. Taking the steps in this brochure will help you follow the Guidelines.

For more information, go to:

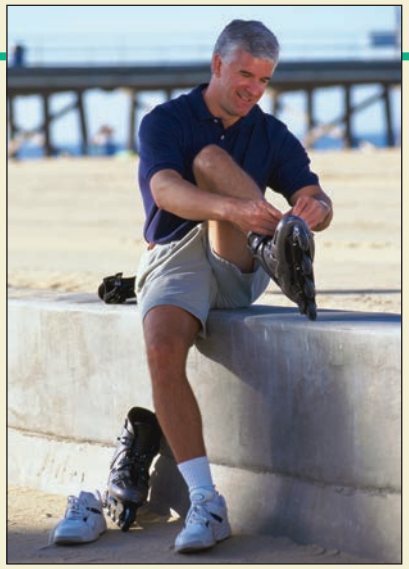
- www.DietaryGuidelines.gov
- www.Choose**MyPlate**.gov
- www.Health.gov/paguidelines
- www.HealthFinder.gov

USDA

USDA Publication number: Home and Garden Bulletin No. 232-CP
HHS Publication number: HHS-ODPHP-2010-01-DGA-B

June 2011

DIETARY GUIDELINES FROM PROFESSIONAL HEALTH ORGANIZATIONS



Regular, physical activity is one of the keys to maintaining a healthy body weight.

The American Heart Association and the American Cancer Society both have published dietary guidelines to promote health and reduce disease. Their guidelines follow:

American Heart Association's Dietary Guidelines "With Your Heart in Mind"

- Eat five or more servings of a variety of fruits and vegetables per day.
- Eat six or more servings of a variety of whole-grain products per day.
- Eat fat-free and low-fat milk products, fish, legumes (beans), skinless poultry, and lean meats.
- Use vegetable oils (canola, olive) and liquid or tub margarines.
- Balance the number of calories you eat with the number you utilize each day for living and physical activity. To lose weight, utilize more calories in physical activity than you consume in food.
- Be physically active. Walk or do other activities for 30 minutes on most days of the week.
- Limit intake of foods high in calories and low in nutrition.
- Eat less than 6 grams of salt (sodium chloride) per day (2,400 milligrams of sodium).
- Limit foods high in saturated fat, trans fat, and cholesterol, such as full-fat dairy products, fatty meats, tropical oils, partially hydrogenated vegetable oils, and egg yolks.
- Consume no more than one (women) or two (men) alcoholic drinks per day.

American Cancer Society's Dietary Guidelines for Reducing Your Risk of Cancer

- Eat five or more servings of a variety of fruits and vegetables each day.
- Eat other foods from plant sources, such as whole-grain breads, cereals, grain products, rice, pasta, or beans, several times each day.
- Choose foods low in fat.
- Limit consumption of meats, especially high-fat meats.
- Be at least moderately active for 30 minutes or more on most days of the week.
- Stay within your healthy weight range.
- Limit consumption of alcoholic beverages, if you drink at all.

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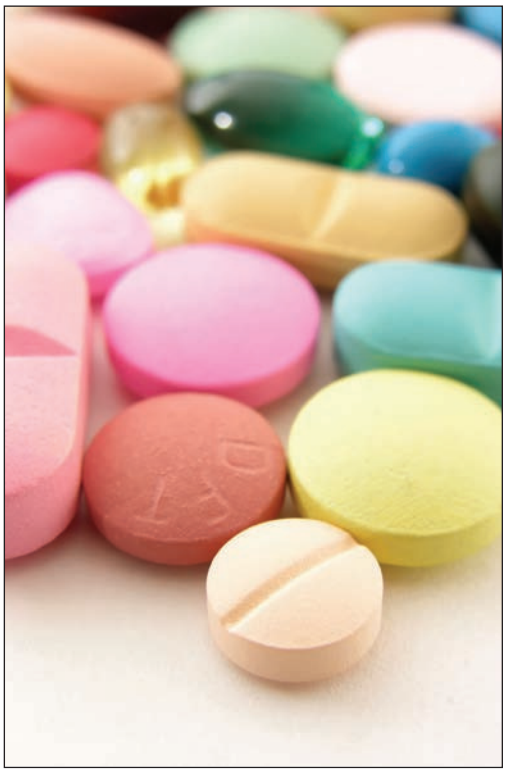
SUPPLEMENTS

Many individuals take supplements to ensure that they ingest an adequate amount of vitamins and minerals. A multi-vitamin/mineral tablet can be taken daily; however, one should try to get recommended nutrients from the diet and only use supplements as a "safety net" to ensure adequate vitamins and minerals are consumed. One should avoid megadoses of vitamins because of the possibility of developing harmful toxicity levels, especially for the fat-soluble vitamins A, D, E, and K.



Taking megadoses of vitamins can lead to harmful toxicity levels, especially for the fat-soluable vitamins A, D, E, and K.

WEIGHT MANAGEMENT

The American College of Sports Medicine (ACSM) estimates that each year millions of Americans try to lose weight.[14] In fact, some 40 percent of women and 25 percent of men are regularly involved in some form of weight-loss program.[15-16] Unfortunately, only 5 percent of individuals are successful at long-term weight loss.[17] The rest fail because they do not make fundamental changes in their eating behaviors. Instead, they simply starve themselves through fad diets, lose weight very quickly, and then return to their normal eating habits, only to gain all the weight back, plus a few additional pounds. It is a vicious cycle, called yo-yo dieting, which can be broken through education. Individuals must be educated about legitimate weight management techniques that are scientifically sound, include behavior modification, and last throughout a lifetime. There simply is no "quick fix" with respect to weight management.

In order to understand weight loss, one must first understand obesity. Specifically, one must know how obesity develops, how obesity negatively affects health, and how obesity can be controlled.

OBESITY

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Obesity, or overfatness, is defined "as excessive enlargement of the body's total quantity of fat," and is considered greater than 20 percent body fat for men and 30 percent for women.[4] It is very prevalent in the United States today; in fact, a majority of Americans are obese.[2] Obesity is linked to many diseases, and is a primary contributing factor to premature death.[4]

Often, obesity begins in childhood. Children who are obese are three times more likely to be obese as adults; they do not, as is commonly believed, "grow out" of obesity.[4] However, simply being obese as a child does not mean that a person is destined to be overweight forever.

Additionally, many individuals gradually gain a few pounds each year after the age of 30, a condition called creeping obesity. Creeping obesity is problematic because many believe that gaining weight as one ages is natural and healthy. This is not the case! A lack of physical activity is the primary reason for gradual weight gain, not aging.

Research indicates that obesity is influenced by many factors, from genetics to environment, but the two most obvious factors are overeating and physical inactivity. Many will argue this and say that individuals are genetically determined to be obese via the set point theory—a theory that states an individual's weight is established around a "set point" that is controlled via an area within the brain, much like a thermostat. While it is true that the body does self-regulate its metabolism to a degree, it is irresponsible to state that this self-regulation is responsible for obesity. This is easy to see when one looks at the last 50 years of American history.

As discussed in Chapter 2, America is no longer an agrarian society. Industrialization has moved people from "active" jobs, where they burned many calories through physical work, to "desk jobs" that are very demanding mentally, but not physically. And, thus, fewer calories are burned. Additionally, today, food is readily available, highly processed, and full of calories. Currently, individuals simply eat more calories than are necessary, and are not as active as previous generations. The present obesity rates in America reflect this. A further argument against the idea of a "fat gene," or an unyielding genetic predisposition to becoming obese, is the fact that 50 years ago, very few individuals in the U.S. were obese. One simply has to look at old photographs and newsreels to see this. For instance, many have seen old photographs of Americans celebrating out in the streets of New York City at the conclusion of World War II. Most will agree that New York City is a cosmopolitan area that represents many diverse populations; so it is a

In this photograph taken during the first half of the 20th century, it is virtually impossible to find an obese person. Would the same be true of a similar photograph taken today?

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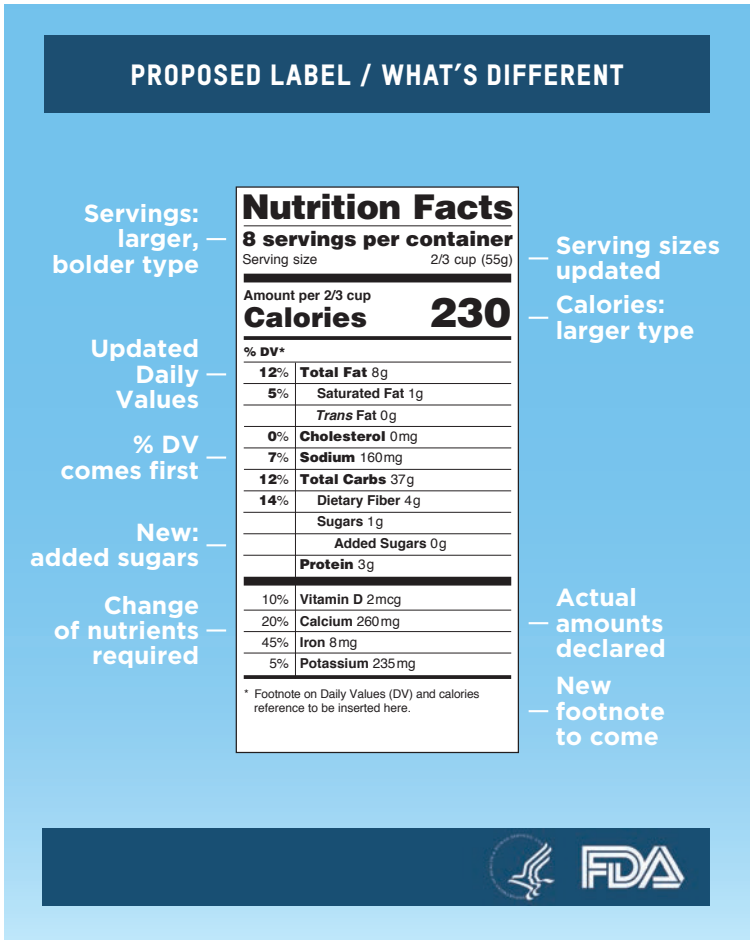
Figure 5.16



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"snapshot" in time, and quite representative of the U.S. at that period. If one looks closely at these photographs, it is nearly impossible to find one obese person! If the same snapshot were taken today, however, more than one-half of the individuals would be obese. Have Americans evolved in the last 50 years and developed some new "gene" or "set point" that makes them fat? Of course they have not. In all but a few cases (e.g., thyroid problems), obesity is caused by lifestyle. Simply put, individuals eat too much, and move too little! There simply is no other legitimate explanation.

Lastly, to completely discredit the set point theory, the example of prisoners of war (POWs) must be used. If individuals truly had a genetically determined "set point" that caused them to be obese, why would POWs always lose weight when placed on restrictive diets and forced to perform great amounts of physical work? This is an extreme example, but it shows that the set point theory has little, if no, merit in explaining the cause of obesity. Lifestyle, on the other hand, is the true controlling factor for obesity.

ENERGY BALANCE

The idea that "calories in" must equal "calories out" is the key concept behind the energy balance theory of weight control. This is simply a matter of thermodynamics. If calories (i.e., energy) are consumed and not burned, they are stored in the body as fat, regardless of their original form (i.e., carbohydrates, fat, protein). On the other hand, if more calories are burned through physical activity than are eaten, an individual will lose stored fat. Weight control is that simple. For this technique to be successful, however, an individual must be able to accurately determine the amount of calories ingested and the number of calories burned daily through normal body functioning and physical activity.

Determining the calories in the diet is relatively easy today. Food products that are packaged for sale in the U.S. are labeled with the U.S. Department of Health and Human Services Food and Drug Administration-approved Nutrition Facts (See Figure 5.16). These labels are very informative and make counting calories quite easy, especially if accurate serving sizes are measured.

Accurately determining the number of calories burned is a little more complicated, but it can be done. The body burns calories three different ways: 1) normal body processing called the basal metabolic rate (BMR); 2) physical activity called the exercise metabolic rate (EMR); and 3) digestion of foods called the specific dynamic effect (SDE).

The BMR is "the minimum level of energy required to sustain the body's vital functions in the waking state" and accounts for approximately

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60-75 percent of the daily calories that are burned.[4] An average person's BMR ranges from 1,200 to 2,000 calories per day, depending mainly upon the musculature of the individual. A crude, yet easy, way to estimate one's BMR is to simply add a zero to the body weight in pounds (NOTE: This is only valid if the individual is relatively trim, i.e., below 20-25% body fat). For example, if a woman is relatively trim, say 23% body fat, and weighs 120 pounds, her estimated BMR would be approximately 1,200 calories per day. This is only a crude estimate, however, and could be off by 5-15 percent. The BMR is very important because it represents the minimum amount of calories that a person must eat to simply survive without forcing the body to cannibalize itself.

If someone does not eat enough calories to support the BMR, the body responds by slowing down its processes in order to conserve fuel, thus reducing the BMR,[18-19] sometimes as much as 45 percent.[20] This is called famine response, and is an evolutionary throwback for survival in periods of starvation. However, this can be very problematic for individuals who go on crash, starvation diets, as seen in the following example.

> Sally is 5'5", weighs 135 pounds, and is a sophomore in college. It is the first of March, and she has two weeks to "get in shape" for spring break. She has decided that she must lose 10-12 pounds in order to be "in-shape" and look good in her bikini. So, she goes on a crash, starvation diet. Sally decides she will skip breakfast each morning and have only an apple and a plain bagel for lunch with a glass of water with lemon. For supper, she decides she will drink a diet Coke and eat some crackers. After the first week, she has lost 8 pounds. She is tired, but excited about the weight loss. The next week is very difficult because she is weak and prone to fainting, but she perseveres and loses another 5 pounds. In all, she is able to lose 13 pounds in two weeks, and she is satisfied that she "looks good" in her bikini. She goes on spring break, returns home, and resumes her normal eating habits. Three months later, she has gained back the 13 pounds she lost, plus another 7 pounds (some of this was simply water). She now weighs 142 pounds, is depressed, feels "fat," and doesn't know what to do. She then decides she will "diet" again, saying, "It worked once; it will work again!" She goes on the diet, loses 15 of the 20 pounds, and returns back to her normal eating habits only to gain back all the weight plus an additional 5 pounds. She now weighs 147 pounds, is horribly depressed, and gives up, saying, "I am just destined to be fat because of my genetics."

A CASE STUDY: HOW PHYSICAL ACTIVITY LEADS TO EFFECTIVE WEIGHT LOSS

The following example illustrates just how effective physical activity is at successful weight loss:

Greg is 34 years old and works a sedentary job as an architect. He decides that he would like to lose some weight and wants to incorporate some physical activity in his lifestyle. Because he only lives a half-mile from his office, he decides he will walk to work everyday. So for the next year, Greg walks to and from work for a total of a mile each day. He burns roughly 100 calories extra each day by walking. How many pounds do you think he loses in the next year?

100 calories per day
x 5 days per week
500 calories per week
x 52 weeks per year
26,000 calories per year

26,000 ÷ 3,500 = 7.4 pounds per year (NOTE: 3,500 calories equals a pound of fat.)

Just by walking 1 extra mile a day, Greg would lose 7.4 pounds of fat in one year!

Exercise is, indeed, an effective way to lose weight, especially fat. However, combining dietary modifications with exercise is even more effective.

Greg is so excited about his weight loss through exercise, he now would like to modify his diet to lose some more weight. Greg does not want to starve himself, but he decides he can forgo his normal soda pop at lunch and drink water instead. An average soda pop has approximately 150 calories per 12-fluid ounce serving. How many pounds will Greg lose the next year by excluding his soda pop at lunch?

150 calories per day
x 5 days per week
750 calories per week
x 52 weeks per year
39,000 calories per year

39,000 ÷ 3,500 = 11.14 pounds per year!

And if Greg combines his walking regimen with his dietary change, he would lose 18.5 pounds in a year!

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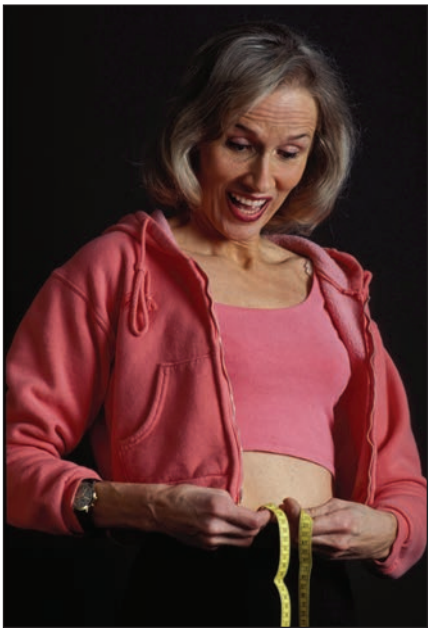
Sally's efforts are disciplined, but become frustrating when she sees no long-term success. Sadly, this type of dieting is very common, but never works. The reason it fails is because the individual inadvertently reduces the BMR. When Sally began starving herself (NOTE: Her diet was well under 500 calories per day), her body responded by slowing its metabolic rate in order to survive. Sally lost a lot of weight quickly, albeit most of it water and muscle. However, she quickly gained back the lost weight and more because her BMR was reduced from its normal level. And, it can take weeks, if not months, for the BMR to return to its pre-starvation level. That is why Sally continued to gain back more weight than was originally lost. And, what truly complicates this cycle is that the BMR is prone to dropping even further with repeated bouts of dieting. One can never underestimate the role the BMR plays in weight management!

The body's second means of burning calories is through physical activity. On average, exercise accounts for some 15-30 percent of the calories that are burned by the body each day.[4] This number can go much higher, especially for high-performance athletes who train several hours each day. The EMR is a useful tool for weight management.

Lastly, the SDE associated with digestion accounts for a minimal amount of expended calories each day. Anywhere from 5-10 percent of the calories consumed is utilized for digestion. Additionally, another 5-10 percent of calories eaten is absorbed by fiber in the diet and simply passes through the digestion system. The SDE plays a negligible role in weight management.

LOSING WEIGHT SUCCESSFULLY



Losing weight successfully is much like the fable of The Tortoise and the Hare—the winner is the one who goes "slow and steady." In this famous fable, the hare was very fast, but not consistent. He would run ahead then goof off, thinking he would win because he was naturally faster than the tortoise. However, in the end, the tortoise was able to beat the hare by working at a slow, but steady, rate. The same principle is

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Many individuals, especially women, fall prey to unrealistic body expectations. Is it physically possible for every woman to become a ballerina?

true with respect to weight loss. Those individuals who progress "slow and steady" will be victorious. Remember, there is no "quick fix" to successful weight loss.

In order for an individual to lose weight successfully and keep it off permanently, two key factors must be employed. First, an individual must make a commitment to be physically active, so muscle is not lost instead of fat. Second, diet must be modified, and a life-long eating plan developed. Remember, dieting alone is dangerous and is not a successful strategy for permanently losing weight. Being physically active is a necessity.

Minor changes do add up, especially over the long haul. Successful weight-loss programs include both dietary modifications and, most importantly, physical activity.

The ACSM[14] has developed the following statements describing weight-loss programs:

1. *Prolonged fasting and diet programs that severely restrict caloric intake are scientifically undesirable and can be medically dangerous.*
2. *Fasting and diet programs that severely restrict caloric intake result in the loss of large amounts of water, electrolytes, mineral, glycogen stores, and other fat-free tissue (including proteins within fat-free tissues), with minimal amounts of fat loss.*

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3. *Mild calorie restriction (500-1000 kcal less than the usual daily intake) results in a smaller loss of water, electrolytes, minerals, and other fat-free tissue, and is less likely to cause malnutrition.*
4. *Dynamic exercise of large muscles helps to maintain fat-free tissue, including muscle mass and bone density, and results in losses of body weight. Weight loss resulting from an increase in energy expenditure is primarily in the form of fat weight.*
5. *A nutritionally sound diet resulting in mild calorie restriction coupled with an endurance exercise program along with behavioral modification of existing eating habits is recommended for weight reduction. The rate of sustained weight loss should not exceed 1kg (2 lbs) per week.*
6. *To maintain proper weight control and optimal body fat levels, a lifetime commitment to proper eating habits and regular physical activity is required.*

PHYSICAL ACTIVITY'S ROLE IN WEIGHT LOSS

Physical activity is key to any successful weight-loss program for several reasons.[21] One, physical activity is responsible for the EMR. Basically, through exercise, an individual can burn all the calories ingested and force the body to use its stored fat as fuel. Two, regular exercise makes the body more efficient at burning fat instead of stored glycogen, thus helping the body decrease stored fat. Three, exercise can increase the musculature of an individual and, therefore, increase the BMR. With a higher BMR, individuals can actually lose weight while they rest! As one can see, exercise is truly the key to losing weight effectively and successfully. However, it cannot be used alone.

As discussed in Chapter 4, it is recommended that every American adult should accumulate at least 30 minutes of moderate-intensity exercise on most, if not all, days. The caloric equivalent would be roughly 200-250 calories for the average person. If this were conducted each day, in a week, a person would burn an additional 1,750 calories. That may not sound like much, but if it is coupled with a reduction of 250 calories in the diet each day, an additional 1,750 calories would be negated, for a total of 3,500 for the week. That equates to 1 pound of lost fat. This may not sound like much, but over a period of six months, it is more than 25 pounds! Small changes add up. And it is these small changes that individuals must incorporate into their lifestyles to be successful at losing and controlling their weight throughout their lifetime.

The ACSM[14] recommends that a desirable weight-loss program do the following:

1. *Provide a caloric intake not lower than 1200 kcal/day for normal adults in order to get a proper blend of foods to meet nutritional requirements.*

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2. *Include foods acceptable to the dieter from the viewpoints of socio-cultural background, habit, cost, and ease in acquisition and preparation.*
3. *Provide a negative caloric balance (not to exceed 500-1000 kcal/day lower than recommended), resulting in gradual weight loss without metabolic derangements. Maximal weight loss should be 1 kg/wk.*
4. *Include the use of behavior modification techniques to identify and eliminate dieting habits that contribute to improper nutrition.*
5. *Include an endurance exercise program of at least 3 d/wk, 20-30 minutes in duration, at a minimum intensity of 60% maximum heart rate.*
6. *Provide that the new eating and physical activity habits can be continued for life in order to maintain the achieved lower body weight.*

WEIGHT-LOSS MYTHS AND HOAXES

The only truly successful and healthy weight-loss programs combine both dietary changes and physical activity. However, with obesity being so prevalent in America, and with so many individuals wanting a "quick fix" for their weight problems, many fall prey to misinformation and scams. The following are some prevalent weight-loss myths and hoaxes.

Cellulite. Cellulite does not exist. This is probably one of the most common myths about fat. Many believe that cellulite is a special, lumpy fat that is stored on the thighs and buttocks and is "different" from other fat. This is absolutely false! Fat is fat. The reason the fat on the thighs and buttocks appears "lumpy" or "dimpled," or what many call "cottage-cheese," is because the fat in these areas gets trapped in the connective tissues and is "bunched" together, causing it to pucker. Women are more prone to "cellulite" than men simply because they store more fat subcutaneously (i.e., directly underneath the skin). As with any fat, exercise and diet modification are the true means to eliminate it. No magic elixirs or plastic wraps are going to remove the fat. So, be a wise consumer. Do not purchase such scams.

Diet Pills and Weight-Loss Elixirs. Diet pills and weight-loss elixirs are commonplace today. These are hoaxes! They will not help an individual lose weight permanently. Most of these so-called "weight-loss remedies" are simply mild stimulants that try to artificially increase the metabolism and depress the appetite. However, these pills and concoctions are ineffective in permanent weight loss. Also, they can be very dangerous to a person's health. They should never be used.

Fad Diets. Fad diets are the norm, not the exception, today. Many individuals desire to lose weight, yet because they want a "quick fix," they will try almost anything, often jeopardizing their own health and wellness. Fad diets such as "The Cabbage Soup Diet" and "The Grapefruit Diet," to

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name a few, are silly and purely worthless. There is absolutely no magical diet that will help an individual lose weight successfully. The only safe diet is a well-balanced one, based on the principles of The Food Guide Pyramid.

Passive-Exercise Machines. Passive-exercise machines are not as common today as they were in the 1970s and 1980s. However, some individuals believe that they can stand on a machine and have it vibrate their body to theoretically "break up the fat" so it can be used by the body. This is pure nonsense. Passive-exercise machines cannot and do not help one become fit and lose fat.

Recreational activities are useful in helping one, no matter the age, to boost the exercise metabolic rate.

Saunas, Steam Baths, and Rubberized Suits. Saunas, steam baths, and rubberized suits will not help one lose fat. Many assume that fat can be "melted" away by increasing the body temperature. This is not true; it is a pure misconception that this is an effective weight-loss strategy. Furthermore, elevating the body temperature too much is dangerous and can even be fatal. It is quite true that if someone sits in a sauna for an hour, weight will be lost. However, the weight loss is purely due to water loss from sweating! The weight simply returns when one returns to a normal hydration level. Saunas and steam baths are perfectly fine for therapeutic purposes and the like, but they do not help one lose fat.

Spot Reduction. Spot reduction is another major misconception. It is impossible to reduce fat in isolated areas of the body simply by exercising the underlying muscle. When muscles contract, they are provided fuel via stored glycogen and glucose in the bloodstream, not localized stored fat. A man can do 500 sit-ups a day and his abdominal muscles will be incredibly strong; however, if he does not modify his diet, he will never lose his abdominal fat. There simply is no scientific legitimacy to spot outside of cosmetic surgery such as liposuction.

EATING DISORDERS

Three major eating disorders are associated with the American public. The first two, anorexia nervosa and bulimia, are well known and come to mind. However, many individuals rarely can think of the third because it is so obvious—overeating. Each of these is briefly discussed below.

Anorexia Nervosa. A common eating disorder is anorexia nervosa. It is marked by a pathological fear of gaining weight, and leads to the individual not eating. Anorexics, also called anorectics, starve themselves to a sometimes skeleton-like appearance. Anorexia nervosa results from many varied factors, both societal and personal, but, primarily, anorexics have a well-developed fear of fatness. The incidence rate is highest in young,

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upper-middle-class females. About one-half of 1 percent of the female population is affected.[22] However, of those, some 15-20 percent die of self-inflicted starvation.[23] The American Psychiatric Association lists the following criteria for anorexia identification:[24]

1. *Inordinate fear of gaining weight and/or becoming fat, despite being significantly underweight.*
2. *Absence of at least three consecutive menstrual cycles when they would normally be expected to occur.*
3. *Unwillingness to maintain a minimal normal body weight for the person's age and height.*
4. *Weight loss that leads to body weight 15 percent or more below normal.*
5. *Disturbed and unrealistic perceptions of body weight, size, or shape; feelings of being fat although emaciated, and possibly perceiving one specific part of the body as too fat.*
6. *Excessive exercise, or exercising despite physical injury.*
7. *Rituals involving food, rigid dieting, maintenance of rigid control in lifestyle. Security is often found in control and order.*

The treatment for anorexia nervosa involves psychological counseling and often hospitalization to establish normal eating patterns. Anorexia nervosa can be very difficult to overcome on one's own, so professional care should be sought.

Bulimia. Bulimia is an eating disorder that involves binge eating (i.e., overeating) and purging (i.e., vomiting, using laxatives, or over-exercising). It is thought to affect approximately 2-8 percent of young women, but as with anorexia, it rarely affects men.[24] However, a rise in bulimia in men is being seen now.

The major health dangers associated with bulimia are tooth and esophageal damage resulting from exposure to stomach acids through excessive vomiting. Bulimics also can suffer from electrolyte imbalances and other psychological disorders. As with anorectics, bulimics need professional help, but usually do not require hospitalization. The common characteristics of bulimics are as follows:[24]

1. *Constant concern with body weight.*
2. *Regular, secret eating, characterized by bingeing (rapid consumption of large quantities of food in a short time).*
3. *Loss of control over eating behavior while eating binges are in progress.*
4. *At least two eating binges a week for at least three months.*
5. *Frequent purging after eating, using techniques such as self-induced vomiting, laxatives, or diuretics, often accompanied by frequent fasts, strict dieting, or excessive physical activity.*

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Overeating. The last eating disorder is overeating. It is the most prevalent eating disorder in America, affecting more than one-half of the population. However, unlike anorexia nervosa and bulimia, overeating does not get much attention. This is because overeating is not responsible for killing young girls. It is shocking to hear about a 15-year old girl who dies from self-inflicted starvation, and it evokes a strong emotional response. However, when one hears that an obese man died at the age of 39 from a heart attack, the response is nowhere near as strong. Nonetheless, millions more are killed each year from complications of overeating than any other eating disorder. The signs of overeating are obvious: excessive obesity, eating large quantities of food, and constant snacking.

The health problems associated with overeating are numerous. Individuals who overeat and become obese are[24]

- *three times more likely to have hypertension;*
- *more likely to have high cholesterol levels and atherosclerosis;*
- *three times more likely to develop diabetes;*
- *more likely to develop cancer; and*
- *nearly twice as likely to die prematurely.*

Overeating, which often leads to obesity, is very damaging to one's health. The direct relationship between obesity and premature death is well established.[25] In fact, some suggest that, "if everyone were at ideal weight there would be 25 percent less coronary heart disease and 35 percent fewer pulmonary disorders and strokes."[24] Overeating is, indeed, a major eating disorder today, and leads to many health problems.

SUMMARY

Nutrition is the study of foods and how the body processes them. Foods are made up of six essential nutrients (i.e., carbohydrates, fats, proteins, minerals, vitamins, and water), and a well-balanced diet should include ade-

STUDY TIP:

Millions of people are killed each year from complications of overeating than from any other eating disorder.

quate amounts of each. The U.S. Department of Human Services states that more than one-half of all deaths in the U.S. each year are related to poor nutrition. To combat this problem, The Food Guide Pyramid was designed and modified to the MyPyramid and later, ChooseMyPlate. Further complicating the nutrition problem in America today is the fact that many Americans are overweight, if not obese. Millions are currently trying to lose weight. However, many fall prey to common myths and hoaxes about weight loss. The only proven method of weight loss is one that combines a well-balanced diet with an exercise program. There simply is no "quick fix" to losing weight permanently.

–NOTES–

CHECK YOUR UNDERSTANDING

REVIEW QUESTIONS

1. What is nutrition?
2. What are the six essential nutrients?
3. What are the energy nutrients and their caloric values per gram?
4. What is a healthy, well-balanced diet?
5. What is the USDA Food Guide Pyramid? What is the USDA's MyPyramid? How do these pyramids differ? What is the USDA's ChooseMyPlate?
6. What are the basal and exercise metabolic rates (BMR and EMR)? What role do they play in weight loss?
7. How does the energy balance theory of weight management work?
8. What are the three eating disorders? How are they alike? How do they differ?