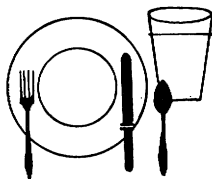


Calories and Body Weight

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PEOPLE need a continual supply of food to supply energy for good health and well-being. The energy of food, in the form of stored chemical energy, is released as heat when the food is oxidized by the body. How much food a person needs depends on his activity and the weight he should maintain.

National and international groups of specialists in nutrition have suggested energy needs for people of all ages. The recommended energy allowances of the Food and Nutrition Board of the National Academy of Sciences-National Research Council (NRC) are the standards used in the planning of food supplies and in the evaluation of diets of Americans. The Committee on Calorie Requirement of the Food and Agriculture Organization of the United Nations (FAO) has prepared recommendations for use elsewhere.

In both systems of caloric assessment, the suggested energy values do not represent actual requirements but rather caloric levels that take into account the variations that occur within a population group.

The addition of carbohydrate to a diet provides a source of energy that the body may later oxidize to produce

heat (Calories), or it may be stored as fat, or its energy may be represented by muscular exercise.

The recommended energy allowances for normal, healthy Americans have been grouped into two general categories: The Calorie allowances for adults and the Calorie allowances for children and adolescents.

The allowances for adults were patterned after the needs of a man who weighs 154 pounds and is 69 inches tall and a woman who weighs 128 pounds and is 64 inches tall, who are 25 years old, live in a temperate climate, and are fairly active physically. Adjustments for age and pregnancy and lactation were made so as to include adults who differ from such a "reference" man and woman.

The Calorie allowances suggested for children and adolescents were based mostly on standard patterns of growth rates early in life.

Although the recommended allowances are to be used solely as a guide in assessment of Calories, the values suggested for children and adolescents are less applicable to individuals than are those proposed for adults. The reasons therefor stem from the differences in physical activity, appetite,

and size and composition of the body among children of all ages.

CALORIE ALLOWANCES for adults have been proposed by the NRC in terms of levels at ages 25, 45, and 65 years.

During early adulthood, when physical performance may be high, daily intakes of 3,200 and 2,300 Calories have been proposed for the 25-year-old man and woman, respectively.

As adults approach middle age and physical activity lessens, 3,000 and 2,200 Calories each day, respectively, have been suggested as enough to meet the energy demands of most 45-year-old men and women.

A further reduction in caloric intake has been recommended at age 65 in order to account for still lower physical expenditures and for the gradually decreasing basal metabolism. (Basal metabolism is the energy expenditure of the body during physical, digestive, and emotional rest.)

The daily Calorie values suggested for older people are 2,550 Calories for men and 1,800 Calories for women.

Extra Calories are needed to compensate for the increased energy demands of women during pregnancy and lactation. Because the energy costs and the reduced activity in the early stages of pregnancy balance one another, the addition of 300 Calories each day has been recommended only for the second half of the reproduction period.

The extra needs for Calories during lactation, however, are greater and more constant. It has been suggested that a daily supplement of 1,000 Calories should more than satisfy the energy needed for the average rate of human milk production (about 29 ounces a day). Nevertheless, about 130 Calories of food energy should be allotted for each 3.5 ounces of milk produced.

Size, activity, and rate of growth are the standards used in assessing the caloric needs of infants 12 months old or less. Based on body weight, a

recommendation of about 55 Calories per pound (age 2 to 6 months) and about 45 Calories per pound (age 7 through 12 months) has been made to meet the energy demands during this period of fast growth. No recommendation was made for the first month of life, when many babies are breast fed.

The same caloric value has been recommended for both boys and girls in the preschool and early school years. The 1- to 3-year-old child has a daily need of about 1,300 Calories, and 1,700 Calories should provide enough energy for the 4- to 6-year-old boy or girl. For boys and girls 7 to 9 years old, 2,100 Calories are recommended; for those 10 to 12 years old, 2,500 Calories.

The adolescent years, 13 through 19, have an additional need for all nutrients, including food for energy. Because the curves of maximum growth are different for boys and girls at this period, separate energy values have been proposed.

The adolescent girl has her greatest daily energy need between the ages of 13 and 15 years—2,600 Calories. In the postadolescent period (16 through 19 years), 2,400 Calories are recommended.

The period of greatest energy need of adolescent boys occurs during the years 16 through 19. A daily intake of 3,600 Calories is recommended for them. Before this period of maximum energy intake, 3,100 Calories a day (age 13 to 15) are suggested.

The number of Calories should be adjusted when the conditions of environmental temperature, size of body, or activity differ from the factors used in determining the standard energy allowances of adult men and women.

The average temperature within the continental United States corresponds rather closely to 68° F. (20° C.) used in the standard energy allowances. Although metabolism is affected by environmental temperature, most people avoid actual exposure to excessive heat or cold by means of clothing and control of indoor temperatures.

Desirable Weights for Height

Height in inches	Weight in pounds	
	Men	Women
58.....	112 ± 11
60.....	125 ± 13	116 ± 12
62.....	130 ± 13	121 ± 12
64.....	135 ± 14	128 ± 13
66.....	142 ± 14	135 ± 14
68.....	150 ± 15	142 ± 14
70.....	158 ± 16	150 ± 15
72.....	167 ± 17	158 ± 16
74.....	178 ± 18

Calorie Allowances for Individuals of Various Body Weights

[At mean environmental temperature of 68° F. and assuming moderate physical activity.]

Desirable weight Pounds	MEN		
	Calorie allowances		
	25 years	45 years	65 years
110.....	2,500	2,350	1,950
121.....	2,700	2,550	2,150
132.....	2,850	2,700	2,250
143.....	3,000	2,800	2,350
154.....	3,200	3,000	2,550
165.....	3,400	3,200	2,700
176.....	3,550	3,350	2,800
187.....	3,700	3,500	2,900
	WOMEN		
88.....	1,750	1,650	1,400
99.....	1,900	1,800	1,500
110.....	2,050	1,950	1,600
121.....	2,200	2,050	1,750
128.....	2,300	2,200	1,800
132.....	2,350	2,200	1,850
143.....	2,500	2,350	2,000
154.....	2,600	2,450	2,050
165.....	2,750	2,600	2,150

When a person's body size differs from the values stated for the "reference" man and woman (154 pounds and 128 pounds, respectively), an adjustment in the energy intake must be made.

The first step in calculating the approximate Calorie need of an individual is to determine his desirable weight for his height (table 1, above).

For example, the desirable weight of a man 5 feet 6 inches tall (66 inches) is 142 ± 14 pounds. This means that the desirable weight may be from 128 to 156 pounds.

The second step in calculating the approximate Calorie need of an individual is a consideration of age for this desirable weight (table 2). For example, a 43-year-old woman, weighing 110 pounds, needs about 1,950 Calories a day.

The one factor that may cause considerable variation in the actual energy requirement of adults, children, and adolescents is the amount of physical activity they perform. An adjustment must be made when a person's degree of physical performance differs from the rate of activity described in the standard energy allowance.

In the normal person who maintains a desirable and constant body weight, the fluctuation in the rate of activity is accompanied by a corresponding fluctuation in his voluntary intake of food.

No simple formula has been devised to adjust for these variations in need for energy. It is suggested that for heavy work the addition of 25 percent of the standard allowance of energy should be sufficient to meet the demands for the extra activity. For example, a 45-year-old farmer who does heavy work would need about 3,000 Calories (the standard allowance) plus 750 Calories (25 percent of 3,000 Calories), or 3,750 Calories.

Persons who work in a sedentary occupation or lead a sedentary life should reduce their standard energy allowance in order to balance the lesser expenditures for a lower physical activity.

Because these adjustments for differences in size and activity must be made on an individual basis, it is best to consult the family physician or a nutritionist (available in departments of public health) in the determination of one's best energy intake.

IDEALLY, you should maintain at each stage of life the body weight that

is desirable for you. It has been suggested that one's desirable weight at age 25 should be maintained throughout life. We estimate, however, that one out of every five adults in the United States is overweight.

Underweight is apparently less prevalent among adult Americans. These marked deviations among our citizens are of major concern to medical and nutritional specialists.

Desirable body weights for individuals of the same age, sex, and height may vary considerably from the weight values given in height-weight tables. These weight standards, which are commonly used in the United States to predict ideal weight, represent average values of thousands of measurements but do not consider individual variations of body size or composition.

Standard values therefore should not be used as exact values but rather as a guide for predicting desirable weight. For example, the standard weight value for two men (A and B) may be stated to be 150 pounds, but actually A weighs 140 pounds and B weighs 160 pounds. According to the standard weight value, A would be 10 pounds underweight and B would be 10 pounds overweight, but the actual weight of A and of B may be desirable for his own build (table 1).

The control of body weight is based on the law of the conservation of energy: Energy can neither be created nor destroyed, but it can be changed from one form to another. Body tissue therefore is neither lost nor gained when the intake of food energy equals the actual body need for energy. If, however, the intake exceeds the body's need for energy, the extra energy intake may be stored as fat in the tissues. But when the caloric intake is below the body's energy requirement, the body has to use fats stored in the tissues for fuel.

Control of weight has been compared to a bank balance. If more money is deposited in the bank than is needed for expenditures, money

accumulates. Deficits occur when more money is spent than deposited.

Changes in body weight from day to day should not be interpreted at face value, for there may be a gain in weight due to retention of water even when the body is losing fat. Weights obtained at the same time of day at weekly intervals constitute a more reliable measure of the extent and direction of actual change in the body weight.

The terms commonly used to describe a deviation from the desirable weight are overweight, obesity, and underweight.

Overweight means an excess of 10 to 20 percent in body weight.

When the excess weight represents more than 20 percent of the desirable weight, we refer to the condition as obesity.

If the actual weight of an individual is 20 percent or more below the desirable weight, the person may be considered to be underweight.

OVERWEIGHT occurs when a person day after day takes in more energy than his body needs.

The pounds of excess body weight he accumulates are related directly to the amount of extra food he eats. For example, you may gain 11 pounds of body fat in a year if you drink only one bottle of soft drink (which contains about 105 Calories) each day beyond the energy your body needs.

All age groups—not only adults—have overweight persons.

Dr. Ercel S. Eppright, at Iowa State College, studied about 1,200 Iowa schoolchildren. Almost 11 percent of the boys and 17 percent of the girls were very heavy or obese.

Among 325 college freshmen examined at the Cooper Union for the Advancement of Science and Art, Dr. Charlotte M. Young, of Cornell University, found that about 23 percent of the men and almost 36 percent of the women were overweight.

Overweight and obesity are symptoms of overeating.

Dr. Jean Mayer, of the Harvard School of Public Health, suggested that the primary causes of obesity may be classified as genetic, traumatic, and environmental.

In the first one, the cause of overeating is related to the influence of heredity.

The traumatic factor relates the cause to an injury to some part of the body's metabolic processes.

The third factor relates the cause of overeating to environmental conditions—that is, the influences of the availability of food.

It is hard to classify the cause of overeating that results from emotional disturbances into one of these three general primary causes. Since this cause may be due to any one of the three factors, it could be included in any category. Some productive studies of the primary causes of overweight and obesity have been made, but more research is needed before we can establish fully the definite causes and different types of obesity.

The place of genetic factors in the causes of obesity has been observed in studies with animals.

Yellow obesity, a condition that may occur in litters of mice, has been directly related to heredity. The affected animals have a yellow coat of hair and are obese as compared with their littermates, who are normal in size and have nonyellow hair. The dominant gene that causes the disorder carries both the characteristic for yellow hair and the characteristic for obesity.

The results from these studies with animals cannot be translated directly to man, but there is less tendency now to disregard heredity completely as a factor tending toward a greater food intake than is required for good health.

Obesities caused by a traumatic factor have been observed in mice by Dr. Jean Mayer and his coworkers at Harvard University. The thin littermates of genetically obese mice were subjected to two types of lesions, which interfered with the normal metabolic processes of the animals.

In one study, obesity was produced by injections of a chemical substance

(LD₅₀—lethal dose required to kill 50 percent of animals—of goldthioglucose).

In another study, a lesion to the interbrain (the hypothalamus) led to obesity. The goldthioglucose-obese animals, which showed normal patterns of physical activity, ate 50 to 75 percent more food than normal. The hypothalamic-obese animals showed a lower amount of physical activity, although their intake of food was 50 to 100 percent above normal.

Again, these observations cannot be translated directly to man in order to explain types or causes of human obesity, but the data are significant in that they show that obesity can be induced in the animal organism when some phase of the metabolic processes is interfered with.

Overeating caused by environmental factors is apparently the commonest cause of overweight and obesity. The more important environmental factors that may be responsible for overeating are availability of food, nature of the diet, and too little physical activity.

A relationship seems to exist between the incidence of overweight and obesity and the availability of food within a population group. In India, where the food supply is short, for example, overweight and obesity are not a problem as they are in the United States. Advances in the processing, marketing, and storage of food have increased the availability of more kinds of food to our people. We must consider also the ability of most families to purchase enough food or more food than they actually need.

The nature of the diet as a contributing cause of overweight and obesity may have been overrated in the past, but it is still a factor that we cannot disregard. Poor food habits and attitudes about food undoubtedly are responsible for many instances of overeating. The intake of large quantities of high-energy foods—for example, sweets, with no regard to other dietary essentials—will lead to overweight.

The place of food in our social life is another factor. The custom of serving food at parties and giving gifts of food often invites overeating.

A main environmental factor that gives rise to overweight and obesity is the lack of enough physical activity to balance the food intake. The average rates of physical activity are less than they were 50 years ago. Few occupations today require heavy work because of the development of laborsaving machines and devices. Working hours are shorter. More people are in occupations that we can consider sedentary. Time and distance and maybe laziness mean that few of us now walk to work and school. More leisure time and more dollars to spend for food tend to create an imbalance between intake and outgo of energy.

Psychological or emotional disturbances sometimes are a direct cause of obesity. In this type of obesity, the value of food and the obese condition acquire exaggerated values for the person, who may use eating as a substitute for love and security or his obesity as a kind of security.

The most obvious effect of overweight and obesity is the accumulation of surplus body fat. That in itself presents both economic and esthetic problems to man. The extra pounds add a great physical burden to the body's work—25 pounds of excess weight is like a 25-pound bag of flour tied to the back of a person and carried during all his activities.

The onset of certain human degenerative diseases has been attributed to obesity, although in studies Ancel Keys made of men in Minnesota it was reported, "There is no tendency for coronary disease to single out overweight men." (*Weight Changes and Health of Men*, Iowa State College Press, 1955.) Other studies also have indicated that overweight is not related to coronary heart disease.

Statistics from life-insurance companies, however, have indicated that the overweight policyholders are predisposed to diabetes, cirrhosis of the

liver, appendicitis, chronic nephritis, cerebral hemorrhage, gallbladder disease, and heart disease.

Excess weight throws out of balance the body's entire system of energy exchanges. For that reason alone it is a hazard.

THE ONLY KNOWN CURE for overweight or obesity is to eat food that furnishes less energy than one needs for body maintenance. Then body fat will be oxidized as a supplemental contribution to the total energy requirement.

A successful reducing program, however, is not a simple matter. At least five factors must be considered if one is to lose weight successfully.

First, one should consult a medical doctor to determine whether or not weight reduction is desirable from a health standpoint.

Second, one must want to lose weight.

Third, the amount of weight to be lost and the rate of loss should be decided upon and approved by a medical doctor or a nutritionist.

Fourth, the diet used for weight reduction should be nutritionally adequate in protein, minerals, and vitamins as well as low in Calories.

Fifth, after weight is reduced, the new weight should be maintained by controlling the intake of Calories and having enough physical activity regularly.

No person should begin a reducing diet without first consulting a medical doctor to be certain that the physiological stresses encountered in losing weight will not injure the health. The doctor also can do much to encourage and manage his patient's campaign to gain better health.

How to convince overweight or obese people that they should lose weight often is a job in itself.

Dr. Young learned that grouping overweight people into three general types has been helpful.

The first type of patient, who has no apparent emotional problems, usually

overeats because he does not understand the relationship between caloric intake and caloric need. Giving him the information he needs about food and nutrition may be enough to make him want to lose weight.

A second type includes people who have minor emotional problems. They may or may not want to lose weight. They need to learn ways to relieve their anxieties before instruction about nutrition can be effective.

Patients who have deep emotional problems are included in the third group. Psychiatric help may be necessary before attempts at motivation can even begin. Some medical and nutritional specialists believe, however, that in this type of patient overeating itself is a better adjustment to life than are other manifestations of their emotional disturbances.

THE SURPLUS POUNDS will determine how much will have to be lost. This is an individual matter, and the family physician will be helpful in determining the goal.

The weekly rate of loss will depend on the caloric limitations of the diet. Some authorities recommend that nobody should lose more than 2 pounds in a week.

Since it takes a deficit of 3,500 Calories to lose 1 pound of body fat, a daily reduction of 500 Calories in the actual energy intake will result in the loss of 1 pound of body weight each week—500 (Calories) times 7 (days) equals 3,500 Calories. Because it is easy to overestimate the caloric need and underestimate the caloric intake, the actual loss of body weight may vary from this calculation.

"The merry-go-round of reducing diets" describes the many plans for weight reduction that have been published in recent years. They have been both sound and unsound in respect to nutritional content. The structure of many has been satisfactory nutritionally, but many persons have found some of them unsatisfactory for reducing because of the excessive hunger or

fatigue experienced while subsisting on them or because of the unfamiliar foods they call for.

The best diet for reducing weight is one that has been scientifically planned and then tested to prove its effectiveness.

A low-energy diet was developed at Michigan State University and tested there and at Cornell University. It is adequate in all dietary essentials except energy, is high in protein (90 grams) and moderate in fat (90 grams), and contains enough carbohydrate to supply 1,500 Calories each day. Actually, more than one-half of the energy in the diet comes from fat, which tends to reduce the feeling of hunger. After 16 weeks on this diet, 7 of the subjects at Michigan State University lost 19 to 37 pounds. At Cornell, where the diet was fed at the 1,400-Calorie level and contained only 80 grams of fat, 10 subjects lost between 9 and 23.5 pounds each in 8 to 9 weeks. Weight was lost without flabbiness of tissue or looseness of skin and without a feeling of hunger between meals.

Here is an example of a day's menu from a weight-reduction diet that provides almost 1,500 Calories, with about 40 percent coming from fat, 35 percent from carbohydrate, and 25 percent from protein:

Breakfast consists of one-half cup of orange juice; 1 cooked egg; 1 slice of bread; 1 teaspoon of butter; and 1 cup of skim milk.

The noon meal includes a 4-ounce broiled beef pattie; two-thirds cup of green beans, with 1 teaspoon of butter; 1 medium apple; and 1 cup of skim milk.

Dinner includes a 4-ounce serving of broiled halibut; two-thirds cup of cooked carrots, with 1 teaspoon of butter; one-half slice of bread, with 1 teaspoon of butter; 2 medium peach halves, with 2 tablespoons of sirup; and 1 cup of skim milk.

Coffee and tea may be used in this diet, but alcoholic and sweetened beverages are avoided because they contribute Calories to the food intake.

Other meats, fruit, and vegetables may be substituted in this pattern to give variety and to fit individual food likes and dislikes.

A 4-ounce serving of any lean meat, fish, or poultry can be used in this diet plan, but the fatty kinds should be avoided. Cheese may replace part of the meat. A medium slice or a 1-inch cube of cheese or 2 tablespoons of cottage cheese constitute a 1-ounce serving.

In this diet, the fruit juice at breakfast contributes about 50 Calories. The fruit at lunch and dinner contains approximately 100 Calories.

Other portions of commonly eaten fruits that supply about 100 Calories are: Apricots (canned, 4 medium halves plus 2 tablespoons sirup); banana (1 medium); cantaloupe (1 melon); grapefruit (one-half); grapes (1 cup); grape juice (one-half cup); orange (1 large); peach (raw, 2 medium); pear (raw, 1 medium); raspberries (1 cup); and fresh strawberries (2 cups).

Vegetables differ in their caloric values. In the diet we gave, the portion of green beans served at lunch supplies fewer than 25 Calories. The carrots served at dinner contribute 25 to 50 Calories.

Other vegetables that supply fewer than 25 Calories per two-thirds cup are asparagus, cabbage, cauliflower, celery, cucumber, endive, escarole, kale, lettuce, mustard greens, parsley, pepper, radishes, sauerkraut, spinach, summer squash, and tomatoes.

A two-thirds cup of beets, broccoli, brussels sprouts, or rutabaga supplies between 25 and 50 Calories. That amount of corn, green peas, onions, lima beans, parsnips, sweetpotatoes, white potatoes, or winter squash contains more than 50 Calories.

One should avoid certain foods in any weight-reduction program—candy, jelly, jams, and other sweets; rich desserts (cake, pie, ice cream, and pudding); salad dressings (mayonnaise and french dressing); nuts; and rich gravies and dessert sauces.

We suggest several points you can

use for judging the acceptability of a reducing diet.

First, the energy content of the diet must be below the caloric need, otherwise you will not lose weight. You must take care, however, that your intake of nutrients other than energy remains adequate. A 1,200- to 1,600-Calorie diet, with slower loss of weight, therefore will be a better diet than a 1,000-Calorie diet, which very likely lacks one or more food essentials.

Beware of the reducing plan that advocates eating all the Calories you want—such a program simply does not make sense.

Second, the plan of the diet should include familiar foods that you can easily get. Because weight reduction may be a long-range project, a dietary plan that specifies seasonal or costly food items may not be feasible.

Third, the diet should be composed of a variety of foods, which with some additions can serve as the dietary pattern after weight loss has been achieved. Some reducing diets highlight the intake of one particular food at each meal—for example, cereal, or eggs, or fruit. Such a diet soon becomes monotonous and cannot be used for long periods.

Fourth, the diet should contain a mixture of foods that satisfy you in order to check and train the appetite.

Dr. Margaret A. Ohlson and her coworkers at Michigan State University said:

“The most frequent patient reaction to the classical reduction diets providing a gram or less of protein per kilogram weight, almost no fat, and 1,000 to 1,200 Calories is that such mixtures result in an almost constant desire for food.” (*Control Through Nutritionally Adequate Diets*; M. A. Ohlson, W. D. Brewer, D. Kereluk, A. Wagoner, and D. C. Cederquist; Iowa State College Press, 1955.)

A sound reducing diet therefore will contain enough fat to curb the appetite even though equal portions of either carbohydrate or protein contain less than one-half as many Calories.

Fifth, the diet should provide for three meals a day. Some people try to diet by skipping meals—particularly breakfast. We now know from research studies that a person's efficiency is reduced in the late morning hours when breakfast is omitted.

Sixth, tablets or pills that depress the appetite should be followed in a reducing program only under the prescription and continuous supervision of a medical doctor.

AFTER WEIGHT has been reduced to the right point, the next step is to maintain it at a constant level. This can be managed only by a controlled intake of Calories and enough physical activity. That may require supplemental exercise.

A person's best energy intake for the maintenance of desirable body weight after weight reduction can be estimated in the following way. Extra portions of food should be gradually added to the low-calorie diet used for weight loss until little or no fluctuation occurs in the body weight in a week's time. If weight gain should occur, however, it is suggested that the extra food portions be reduced until the weight is stabilized.

Exercise must be considered in the maintenance of body weight even though it cannot take the place of diet in weight control.

It is unrealistic to suggest that a man who is 10 pounds overweight can lose weight by exercise alone, because it would take work equal to about 35,000 Calories to remove this excess tissue. For example, if 1 hour of heavy work required 200 extra Calories of energy, it would take this man, working 8 hours a day, almost 22 days to use up the 10 pounds of body fat. On the other hand, it would have been possible for him to have prevented the accumulation of 10 pounds of weight by a small amount of exercise each day. For example, 30 minutes of heavy work each day will correspond to about 10 pounds a year.

UNDERWEIGHT occurs in an individual as a result of a food energy intake that is below the actual body need for energy. For example, an energy deficit of as few as 100 Calories each day, which is the amount of energy contained in about 1.5 slices of white bread or 2 pats of butter, will account for the loss of about 10 pounds of body fat in a year.

A survey of 223 farm, nonfarm, and village families in Groton Township, N.Y., revealed that 17 percent of the group examined (837 individuals) were underweight. Underweight was most prevalent among adults 20 to 39 years old.

A study of 39 families of miners in West Virginia disclosed that more of the men and children among them were underweight than overweight, even though more than one-half of the women were overweight and about one-fourth of them were underweight.

A survey of about 2,600 individuals from diverse population groups in the Northeastern States indicated that approximately one-fifth of them were underweight by 10 percent or more.

The problem of underweight has not received the same attention as has the problem of overweight, but underweight should be regarded as one of our nutritional problems.

Underweight sometimes is the result of certain diseases or glandular disturbances, but in healthy persons it is apparently caused by poor food and living habits.

Some persons who are underweight just do not eat enough food to meet the energy demands of the body. Others skip meals because they do not take the time to eat properly. Still others have not learned to use foods that contribute nutrients necessary for general good health.

Too little rest, the inability to relax, and tensions of modern living are factors that may give rise to poor food habits.

The underweight person may be

more susceptible to infection or to digestive disturbances, may lack ambition or the ability to concentrate, or may tire more easily than a person of desirable weight.

Underweight may be overcome by the intake of more food than is necessary for the body's energy expenditures. In such a case, the excess energy will be stored in the form of body tissue.

Although the prescription to eat more food than is actually needed may seem an easy thing to do, the management of a weight-gaining program may be just as difficult as one for weight reduction.

At least four factors must be considered for a successful program of weight gain.

An underweight person should undergo a complete examination by a medical doctor in order to discover any physical defects that may contribute to suboptimal body weight. The family physician may act as the principal figure in the encouragement and management of his patient's weight gain.

A person may have to correct his food and living habits before he can gain weight.

A nutritionally adequate diet with extra food energy must be eaten.

After the proper weight has been reached, the new body weight should be maintained at a constant level.

An underweight person may need to establish new eating and living habits before he can gain weight. For example, the person who does not drink milk because he prefers coffee will need to learn to use milk in addition to his coffee because of its excellent nutritional contribution. The person who skips breakfast because he is too tired to eat so early in the morning will need to acquire more rest at night in order to feel like eating this important meal.

The diet used for gaining weight must contain energy in excess of the body's need; extra amounts of protein, minerals, and vitamins may also be required. Since a pound of body fat

represents 3,500 stored Calories, a daily 500-Calorie intake above the actual energy need of a person will result in the gain of 1 pound of body fat each week.

It is easy to say that extra energy can be obtained by eating concentrated food sources of carbohydrates and fats—rich desserts and butter. Actually, however, such a directive may only lead to a feeling of extreme fullness, and an inadequate food intake may still prevail.

The most desirable weight-gaining diet is one that advocates three adequate meals each day plus snacks between meals.

The following example is a day's menu for a weight-gaining diet that provides about 3,500 Calories.

Breakfast comprises 1 cup of orange juice, 1 cooked egg, 2 slices of cooked bacon, 2 slices of bread with 2 teaspoons of butter and 1 tablespoon of jam, and 1 cup of whole milk. A banana in midmorning adds extra Calories.

Lunch consists of a 4-ounce broiled beef patty; a medium-size baked potato, with 1 teaspoon of butter; one-half cup of green beans, with 1 teaspoon of butter; 1 slice of bread, with 1 teaspoon of butter and 1 tablespoon of jam; 2 medium peach halves, with 2 tablespoons of sirup; and 1 cup of whole milk. A one-half cup of ice cream is suggested for the afternoon snack.

Dinner consists of a 4-ounce ham steak; 1 small candied sweetpotato; one-half cup of cooked carrots, with 1 teaspoon of butter; 1 slice of bread, with 1 teaspoon of butter and 1 tablespoon of jam; 1 cup of vanilla pudding; and 1 cup of whole milk. A bedtime snack of 1 cup of whole milk and 2 graham crackers will add more energy.

Coffee or tea and other meat, fruit, vegetables, and miscellaneous foods may be substituted in the weight-gaining diet to give variety to the food intake and to coincide with the person's food likes.

After the desirable weight gain has been achieved, the new weight should be maintained at a constant level. The formula for this procedure is just the reverse of that prescribed in a weight-reduction program. Here, some of the extra food portions, such as the in-between-meal snacks, should be eliminated gradually until little or no fluctuation of body weight occurs within a week. Extra food portions

should be added back to the diet if and when weight loss does occur.

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100-CALORIE PORTIONS OF SOME COMMONLY USED FOODS

Cereals and Breads

biscuit or plain muffin	¾ medium
bread, white, enriched	1½ slices
corn flakes	1 cup
crackers, saltines	6 crackers
oatmeal, cooked	¾ cup
rice, white, cooked	½ cup
roll, plain	⅝ medium
wheat, puffed	2⅓ cups

Dairy Products

butter	1 tbsp.
buttermilk	1½ cups
cheese, Cheddar	⅞ oz.
cheese, cottage	3⅓ oz.
cream, heavy	2 tbsp.
ice cream, plain	⅓ cup
milk, whole	4⅓ oz.
milk, nonfat solids	3½ tbsp.

Vegetables

beans, lima, canned	¾ cup
beans, soup, green, canned	2⅓ cups
broccoli, cooked	2¼ cups
cabbage, shredded, raw	4⅓ cups
carrots, raw	4¾ medium
cauliflower, cooked	3⅓ cups
celery, diced, raw	5½ cups
corn, canned	¾ cup
lettuce	1½ lb. head
onion, cooked	1¼
peas, green, canned	¾ cup
pepper, green, raw	5⅓ medium
potato, white, baked	1 medium
potato, white, mashed	¾ cup
sweetpotato, baked	½ medium
spinach, cooked	2½ cups
tomatoes, canned	2⅓ cups

Fats and Oils

french dressing	1⅓ tbsp.
mayonnaise	1 tbsp.
salad oil	⅔ tbsp.

Fruit

apple, raw	1⅓ medium
apricot, canned	½ cup
banana	1⅓ medium
grapefruit juice, canned	1⅓ cups
orange juice, fresh	⅓ cup
peaches or pears, canned	⅓ cup
pineapple, canned, crushed	½ cup
strawberries, raw	1⅓ cups

Meat, Fish, Poultry, and Nuts

bacon, cooked	2 slices
beef, cooked	1 oz.
chicken, breast, cooked	3⅓ oz.
egg, whole	1¼
frankfurter	⅔
haddock, cooked	⅔ fillet
ham, cooked	⅓ oz.
liver, beef, cooked	1⅓ oz.
luncheon meat	1⅓ oz.
peanut butter	1⅓ tbsp.
pork, cooked	1⅓ oz.
tuna fish, canned	1⅓ oz.

Sugars and Sweets

carbonated beverages	8 oz.
candy bar, chocolate	⅓ oz.
cake, plain, iced	⅓ medium
cookies, plain	⅓ medium
jellies	2 tbsp.
pie, apple	⅓ medium
sirup, corn	1⅓ tbsp.
sugar, white	6¼ tbsp.