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THE FUNCTIONS AND USES OF FOOD.[a]

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In this circular a number of the terms used in discussing food are defined and some of the principles of nutrition are briefly stated. The average composition of a number of the more common American foods is quoted as well as the commonly accepted dietary standards. With the aid of such data, the nutritive value of any given diet may be computed and its comparative value ascertained. The method of making such calculations is given, as is also a method for calculating the digestibility of different foods.

Ordinary food materials, such as meat, fish, eggs, potatoes, wheat, etc., consist of—

Refuse.—As the bones of meat and fish, shells of shellfish, skins of potatoes, bran of wheat, etc.

Edible portion.—As the flesh of meat and fish, the white and yolk of eggs, wheat flour, etc. The edible portion consists of water and nutritive ingredients, or nutrients. The nutritive ingredients are *protein*, *fats*, *carbohydrates*, and *mineral matters*.

The water, refuse, and salt of salted meat and fish are called non-nutrients. In comparing the values of different food materials for nourishment they are left out of account.

USE OF NUTRIENTS.

Food is used in the body to build and repair tissue and to furnish energy. The manner in which the valuable constituents are utilized in the body may be expressed in tabular form as follows:

Protein White (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.	Forms tissue (muscles, tendon, and probably fat)	All serve as *fuel* and yield *energy* in form of heat and muscular strength.
Fats Fat of meat, butter, olive oil, oils of corn and wheat, etc.	Form fatty tissue.	
Carbohydrates Sugar, starch, etc.	Transformed into fat.	
Mineral matters (ash) Phosphates of lime, potash, soda, etc.	Aid in forming bone, assist in digestion, etc.	

[a] This article, which was originally published under the title "Food for Man" in the U. S. Dept. Agr. Yearbook, 1897, pp. 676–682, has been revised and contains some additional matter.

The fuel value of food.—Heat and muscular power are forms of force or energy. The energy is developed as the food is consumed in the body. The unit commonly used in this measurement is the calorie, the amount of heat which would raise the temperature of a pound of water 4° F.

Instead of this unit some unit of mechanical energy might be used—for instance, the foot-ton, which represents the force required to raise one ton one foot. One calorie is equal to very nearly 1.53 foot-tons.

The following general estimate has been made for the average amount of potential energy in 1 pound of each of the classes of nutrients:

	Calories.
In 1 pound of protein	1,860
In 1 pound of fats	4,220
In 1 pound of carbohydrates	1,860

In other words, when we compare the nutrients in respect to their fuel values, their capacities for yielding heat and mechanical power, a pound of protein of lean meat or albumen of egg is just about equivalent to a pound of sugar or starch, and a little over two pounds of either would be required to equal a pound of the fat of meat or butter or the body fat.

Within recent years analyses of a large number of samples of foods have been made in this country. In the table below the average results of a number of these analyses are given.

Average composition of American food products.[a]

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
ANIMAL FOOD.							
Beef, fresh:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Chuck, including shoulder	17.3	54.0	15.8	12.5	.....	0.7	820
Chuck ribs	19.1	53.8	15.3	11.1	.....	.8	755
Flank	5.5	56.1	18.6	19.9	.....	.8	1,185
Loin	13.3	52.9	16.4	16.9	.....	.9	1,020
Porterhouse steak	12.7	52.4	19.1	17.9	.....	.8	1,110
Sirloin steak	12.8	54.0	16.5	16.1	.....	.9	985
Neck	31.2	45.3	14.2	9.2	.....	.7	650
Ribs	20.1	45.3	14.4	20.0	.....	.7	1,110
Rib rolls	.....	64.8	19.4	15.5	.....	.9	1,015
Round	8.5	62.5	19.2	9.2	.....	1.0	745
Rump	19.0	46.9	15.2	18.6	.....	.8	1,065
Shank, fore	38.3	43.2	13.2	5.2	.....	.6	465
Shoulder and clod	17.4	57.0	16.5	8.4	.....	.9	660
Fore quarter	20.6	49.5	14.4	15.1	.....	.7	905
Hind quarter	16.3	52.0	16.1	15.4	.....	.8	950
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	.....	4.6	1,271
Tongue, pickled	6.0	58.9	11.9	19.2	.....	4.3	1,030
Dried, salted, and smoked	4.7	53.7	26.4	6.9	.....	8.9	780
Canned boiled beef	.....	51.8	25.5	22.5	.....	1.3	1,425
Canned corned beef	.....	51.8	26.3	18.7	.....	4.0	1,280
Veal:							
Breast	23.3	52.5	15.7	8.2	.....	.8	635
Leg	11.7	63.4	18.3	5.8	.....	1.0	585
Leg cutlets	3.4	68.3	20.1	7.5	.....	1.0	690
Fore quarter	24.5	54.2	15.1	6.0	.....	.7	535
Hind quarter	20.7	56.2	16.2	6.6	.....	.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	.....	.6	1,815
Leg, hind	17.7	51.9	15.4	14.5	.....	.8	900
Shoulder	22.1	46.8	13.7	17.1	.....	.7	975
Fore quarter	21.2	41.6	12.3	24.5	.....	.7	1,265
Hind quarter, without tallow	19.3	43.3	13.0	24.0	.....	.7	1,255
Lamb:							
Breast	19.1	45.5	15.4	19.1	.....	.8	1,090
Leg, hind	13.8	50.3	16.0	19.7	.....	.9	1,130
Pork, fresh:							
Flank	18.0	48.5	15.1	18.6	.....	.7	1,065
Ham	10.3	45.1	14.3	29.7	.....	.8	1,520
Loin chops	19.3	40.8	13.2	26.0	.....	.8	1,340
Shoulder	12.4	44.9	12.0	29.8	.....	.7	1,480
Tenderloin	.....	66.5	18.9	13.0	.....	1.0	900
Pork, salted, cured, and pickled:							
Ham, smoked	12.2	35.8	14.5	33.2	.....	4.2	1,670
Shoulder, smoked	18.9	30.7	12.6	33.0	.....	5.0	1,625
Salt pork	.....	7.9	1.9	86.2	.....	3.9	3,670
Bacon, smoked	8.7	18.4	9.5	59.4	.....	4.5	2,685
Sausage:							
Bologna	3.3	55.2	18.2	19.7	.....	3.8	1,170
Farmer	3.9	22.2	27.9	40.4	.....	7.3	2,225
Frankfort	.....	57.2	19.6	18.6	1.1	3.4	1,170
Soups:							
Celery, cream of	.....	88.6	2.1	2.8	5.0	1.5	250
Beef	.....	92.9	4.4	.4	1.1	1.2	120
Meat stew	.....	84.5	4.6	4.3	5.5	1.1	370
Tomato	.....	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	.....	.7	295
Fowls	25.9	47.1	13.7	12.3	.....	.7	775
Goose	17.6	38.5	13.4	29.8	.....	.7	1,505
Turkey	22.7	42.4	16.1	18.4	.....	.8	1,075
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	.....	.8	215
Halibut, steaks or sections	17.7	61.9	15.3	4.4	.....	.9	470
Mackerel, whole	44.7	40.4	10.2	4.2	.....	.7	365
Perch, yellow, dressed	35.1	50.7	12.8	.7	.....	.9	265
Shad, whole	50.1	35.2	9.4	4.8	.....	.7	380
Shad, roe	.....	71.2	20.9	3.8	2.6	1.5	600
Fish, salt: Cod	24.9	40.2	19.0	.4	.....	18.5	315

[a] Condensed from detailed tables in Bulletin No. 28, revised, of the Office of Experiment Stations of this Department.

Average composition of American food products—Continued.

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
ANIMAL FOOD—continued.							
Fish, canned:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Salmon	14.2	56.8	19.5	7.5	-------	2.0	680
Sardines	[a] 5.0	53.6	23.7	12.1	-------	5.3	950
Shellfish:							
Oysters, "solids"	-------	88.3	6.0	1.3	3.3	1.1	230
Clams	-------	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	195
Lobsters	61.7	30.7	5.9	.7	.2	.8	140
Eggs: Hen's eggs	[b] 11.2	65.5	11.9	9.3	-------	.9	635
Dairy products, etc.:							
Butter	-------	11.0	1.0	85.0	-------	3.0	3,605
Whole milk	-------	87.0	3.3	4.0	5.0	.7	325
Skim milk	-------	90.5	3.4	.3	5.1	.7	170
Buttermilk	-------	91.0	3.0	.5	4.8	.7	165
Condensed milk	-------	26.9	8.8	8.3	54.1	1.9	1,520
Cream	-------	74.0	2.5	18.5	4.5	.5	910
Cheese, Cheddar	-------	27.4	27.7	36.8	4.1	4.0	2,145
Cheese, full cream	-------	34.2	25.9	33.7	2.4	3.8	1,950
VEGETABLE FOOD.							
Flour, meal, etc.:							
Entire-wheat flour	-------	11.4	13.8	1.9	71.9	1.0	1,675
Graham flour	-------	11.3	13.3	2.2	71.4	1.8	1,670
Wheat flour, patent roller process—							
High-grade and medium	-------	12.0	11.4	1.0	75.1	.5	1,650
Low grade	-------	12.0	14.0	1.9	71.2	.9	1,665
Macaroni	-------	78.4	3.0	1.5	15.8	1.3	415
Crushed wheat	-------	10.1	11.1	1.7	75.5	1.6	1,685
Buckwheat flour	-------	13.6	6.4	1.2	77.9	.9	1,620
Corn meal	-------	12.5	9.2	1.9	75.4	1.0	1,655
Oatmeal	-------	7.3	16.1	7.2	67.5	1.9	1,860
Rice	-------	12.3	8.0	.3	79.0	.4	1,630
Tapioca	-------	11.4	.4	.1	88.0	.1	1,650
Starch	-------	-------	-------	-------	90.0	-------	1,675
Bread, pastry, etc.:							
White bread	-------	35.3	9.2	1.3	53.1	1.1	1,215
Brown bread	-------	43.6	5.4	1.8	47.1	2.1	1,050
Graham bread	-------	35.7	8.9	1.8	52.1	1.5	1,210
Whole-wheat bread	-------	38.4	9.7	.9	49.7	1.3	1,140
Rye bread	-------	35.7	9.0	.6	53.2	1.5	1,180
Cake	-------	19.9	6.3	9.0	63.3	1.5	1,675
Cream crackers	-------	6.8	9.7	12.1	69.7	1.7	1,990
Oyster crackers	-------	4.8	11.3	10.5	70.5	2.9	1,965
Soda crackers	-------	5.9	9.8	9.1	73.1	2.1	1,925
Sugars, etc.:							
Molasses	-------	25.1	2.4	-------	69.3	3.2	1,290
Candy	-------	-------	-------	-------	96.0	-------	1,785
Honey [c]	-------	18.2	.4	-------	81.2	.2	1,520
Sugar, granulated	-------	-------	-------	-------	100.0	-------	1,800
Maple sirup	-------	-------	-------	-------	71.4	-------	1,330
Vegetables: [d]							
Beans, dried	-------	12.6	22.5	1.8	59.6	3.5	1,605
Beans, Lima, shelled	-------	68.5	7.1	.7	22.0	1.7	570
Beans, string	7.0	83.0	2.1	.3	6.9	.7	180
Beets	20.0	70.0	1.3	.1	7.7	.9	170
Cabbage	15.0	77.7	1.4	.2	4.8	.9	125
Celery	20.0	75.6	.9	.1	2.6	.8	70
Corn, green (sweet), edible portion	-------	75.4	3.1	1.1	19.7	.7	470
Cucumbers	15.0	81.1	.7	.2	2.6	.4	70
Lettuce	15.0	80.5	1.0	.2	2.5	.8	75
Mushrooms	-------	88.1	3.5	.4	6.8	1.2	210
Onions	10.0	78.9	1.4	.3	8.9	.5	205
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	240
Peas (*Pisum sativum*), dried	-------	9.5	24.6	1.0	62.0	2.9	1,655

[a] Refuse, oil.
[b] Refuse, shell.
[c] Contained on an average cane sugar 2.8 and reducing sugar 71.1 per cent. The reducing sugar was composed of about equal amounts of glucose (dextrose) and fruit sugar (levulose).
[d] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and can not be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

Average composition of American food products—Continued.

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
VEGETABLE FOOD—continued.							
Vegetables[a]—Continued.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Peas (*Pisum sativum*), shelled		74.6	7.0	0.5	16.9	1.0	465
Cowpeas, dried		13.0	21.4	1.4	60.8	3.4	1,590
Potatoes	20.0	62.6	1.8	.1	14.7	.8	310
Rhubarb	40.0	56.6	.4	.4	2.2	.4	65
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	640
Spinach		92.3	2.1	.3	3.2	2.1	110
Squash	50.0	44.2	.7	.2	4.5	.4	105
Tomatoes		94.3	.9	.4	3.9	.5	105
Turnips	30.0	62.7	.9	.1	5.7	.6	125
Vegetables, canned:							
Peas (*Pisum sativum*), green		85.3	3.6	.2	9.8	1.1	255
Corn, green		76.1	2.8	1.2	19.0	.9	455
Tomatoes		94.0	1.2	.2	4.0	.6	105
Fruits, berries, etc., fresh:[b]							
Apples	25.0	63.3	.3	.3	10.8	.3	220
Bananas	35.0	48.9	.8	.4	14.3	.6	300
Grapes	25.0	58.0	1.0	1.2	14.4	.4	335
Lemons	30.0	62.5	.7	.5	5.9	.4	145
Muskmelons	50.0	44.8	.3		4.6	.3	90
Oranges	27.0	63.4	.6	.1	8.5	.4	170
Pears	10.0	76.0	.5	.4	12.7	.4	260
Persimmons, edible portion		66.1	.8	.7	31.5	.9	630
Raspberries		85.8	1.0		12.6	.6	255
Strawberries	5.0	85.9	.9	.6	7.0	.6	175
Watermelons	59.4	37.5	.2	.1	2.7	.1	60
Fruits, dried:							
Apples		28.1	1.6	2.2	66.1	2.0	1,350
Apricots		81.4	.9		17.3	.4	340
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,450
Figs		18.8	4.3	.3	74.2	2.4	1,475
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,660
Beechnuts	40.8	2.3	13.0	34.0	7.8	2.1	1,820
Brazil nuts	49.6	2.6	8.6	33.7	3.5	2.0	1,655
Butternuts	86.4	.6	3.8	8.3	.5	.4	430
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	945
Chestnuts, dried	24.0	4.5	8.1	5.3	56.4	1.7	1,425
Cocoanuts	[c]48.8	7.2	2.9	25.9	14.3	.9	1,413
Cocoanut, prepared		3.5	6.3	57.4	31.5	1.3	3,125
Filberts	52.1	1.8	7.5	31.3	6.2	1.1	1,575
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,265
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,620
Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,935
Pinon (*Pinus edulis*)	40.6	2.0	8.7	36.8	10.2	1.7	1,905
Walnuts, California, black	74.1	.6	7.2	14.6	3.0	.5	805
Walnuts, California, soft-shell	58.1	1.0	6.9	26.6	6.8	.6	1,375
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,455
Miscellaneous:							
Chocolate		5.9	12.9	48.7	30.3	2.2	2,860
Cocoa, powdered		4.6	21.6	28.9	37.7	7.2	2,320
Cereal coffee, infusion (1 part boiled in 20 parts water)[d]		98.2	.2		1.4	.2	30

[a] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skins, seeds, etc. The amount varies with the method of preparing the vegetables, and can not be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

[b] Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

[c] Milk and shell.

[d] The average of five analyses of cereal coffee grain is: Water 6.2, proteiu 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

DIETARY STANDARDS.

Dietary studies have been made in considerable numbers in different countries. The results of such studies and experiments to determine the amount of food required by men engaged in different occupations have resulted in the adoption of dietary standards. Some of these follow:

Standards for daily dietaries.

Character of work to be performed.	Nutrients.			Fuel value.
	Protein.	Fat.	Carbohydrates.	
European:	*Pound.*	*Pound.*	*Pounds.*	*Calories.*
Man at moderate work	0.26	0.12	1.10	3,055
Man at hard work	.32	.22	.99	3,370
American:				
Man without muscular work	.20			3,000
Man with light muscular work	.22			3,000
Man with moderate muscular work	.28			3,500
Man with hard muscular work	.39			4,500

The table of composition of food materials shows the amount of water, protein, fat, carbohydrates, and ash content and the total fuel value per pound for each kind of food named. The protein, fat, and carbohydrates all furnish energy. In addition to furnishing energy, protein forms tissue. Since protein and energy are the essential features of food, dietary standards may be expressed in their simplest form in terms of protein and energy alone.

Observation has shown that as a rule a woman requires less food than a man, and the amount required by children is still less, varying with the age. It is customary to assign certain factors which shall represent the amount of nutrients required by children of different ages and by women as compared with adult man. The various factors which have been adopted are as follows:

Factors used in calculating meals consumed in dietary studies.

One meal of woman equivalent to 0.8 meal of man at moderate muscular labor.
One meal of boy 14 to 16 years of age, inclusive, equivalent to 0.8 meal of man.
One meal of girl 14 to 16 years of age, inclusive, equivalent to 0.7 meal of man.
One meal of child 10 to 13 years of age, inclusive, equivalent to 0.6 meal of man.
One meal of child 6 to 9 years of age, inclusive, equivalent to 0.5 meal of man.
One meal of child 2 to 5 years of age, inclusive, equivalent to 0.4 meal of man.
One meal of child under 2 years of age equivalent to 0.3 meal of man.

These factors are based in part upon experimental data and in part upon arbitrary assumptions. They are subject to revision when experimental evidence shall warrant more definite conclusions.

The plan followed in making dietary studies is, briefly, as follows: Exact account is taken of all the food materials (1) at the beginning

of the study, (2) purchased during its progress, and (3) remaining at the end. The difference between the third and the sum of the first and second is taken as representing the amount used. From the figures thus obtained for the total quantities of the different food materials the amounts of the diffecrnt nutrients and the energy furnished by them are calculated. Deducting from these values the nutrients and energy found in the kitchen and table refuse, the amounts actually consumed are obtained. Account is also taken of the meals eaten by different members of the family or groups studied and by visitors, if there are any. From the total food eaten by all the persons during the entire period the amount eaten per man per day may be calculated. In making these calculations due account is taken of the fact that, as stated above, women and children eat less than men performing the same amount of work.

METHOD OF CALCULATING DIETARIES.

The following may be taken as an illustration of the way in which the table of composition of food products and the dietary standards may be practically applied. Suppose the family consists of four adults, and that there are on hand or may be readily purchased the following food materials: Oatmeal, milk, sugar, eggs, lamb chops, roast beef, potatoes, sweet potatoes, rice, bread, cake, bananas, tea, and coffee. From these materials menus for three meals might be arranged as follows:

Breakfast.—Oatmeal, milk, sugar, lamb chops, bread, butter and coffee.

Dinner.—Roast beef, potatoes (Irish), sweet potatoes, rice pudding, and tea.

Supper.—Bread, butter, cake and bananas.

The amounts required of the several articles of food may be readily approximated by any person experienced in marketing or preparing food for a family. Thus, it may be assumed that four adults would consume for breakfast 1.5 pounds lamb chops, one-half pound oatmeal, one-half pound bread, 6 ounces milk, 2 ounces sugar, and 2 ounces butter. From the table of composition of food materials the nutritive ingredients which these foods furnish may be easily calculated. Thus, if oatmeal contains 16.1 per cent of protein and furnishes 1,860 calories per pound, one-half pound would contain 0.081 pound protein ($0.5 \times 0.161 = 0.081$ pound) and yield 930 calories ($0.5 \times 1,860 = 930$), and if lamb chops contain 16 per cent protein and furnish 1,130 calories per pound, 1.5 pounds of lamb chops would furnish 0.24 pound protein (1.5 pounds $\times$ 0.16 = 0.24 pound) and 1,695 calories (1.5 pounds $\times$ 1,130 = 1,695 calories). The others may be calculated in the same way.

The assumed quantities of food materials which the four persons

would consume in a day, and the calculated protein content and fuel value, would be as follows:

Menu for family of four adults for one day.

Food materials.	Weights.		Protein.	Fuel value.
BREAKFAST.	*Pounds.*	*Ounces.*	*Pound.*	*Calories.*
Oatmeal		8	0.081	930
Milk		6	.012	122
Sugar		2		232
Lamb chops (from leg)	1	8	.240	1,695
Bread		8	.046	608
Butter		2	.001	451
Coffee[a]			.010	417
Total			.390	4,455
DINNER.				
Roast beef (chuck)	1	12	.277	1,435
Potatoes		12	.014	233
Sweet potatoes		12	.011	480
Bread		6	.035	456
Butter		2	.001	451
Rice		4	.020	408
Eggs		4	.030	160
Milk		6	.012	122
Sugar		2		232
Tea			.010	410
Total			.410	4,387
SUPPER.				
Bread		12	.070	912
Butter		2	.001	451
Bananas		12	.006	225
Cake		8	.032	838
Total			.109	2,426
Total for 3 meals			.909	11,268
Average for 1 person			.227	2,817

[a] Coffee or tea in themselves have little or no nutritive value. In the menu, allowance is made for the milk or cream and the sugar that would ordinarily be added.

The American dietary standard for a man at moderate muscular work calls for 0.28 pound protein and 3,500 calories. It will be seen that the menu suggested above is insufficient, that is, that more food must be supplied. For instance, cheese might be added for dinner, and pork and beans and milk for supper. The amounts of protein and energy which a sufficient quantity of these articles for four persons would supply are shown in the following table:

Food added to bring the day's menu up to the dietary standard.

Food materials.	Weights.		Protein.	Fuel value.
	Pounds.	*Ounces.*	*Pound.*	*Calories.*
Cheese		4	0.069	536
Beans		10	.141	1,003
Pork		4	.005	918
Milk	2		.066	650
Total amount added to menu			.281	3,107

These additions would make the total protein 1.190 pounds and

the total fuel value 14,375 calories for four persons, or for one person, 0.298 pound protein and 3,594 calories. (For the sake of simplifying calculation no distinction is made between the amounts required by men and women.) These values are approximately the amounts required by the dietary standard.

Following the above method, the value of any menu chosen may be easily calculated. It should be borne in mind that approximate rather than absolute agreement with the dietary standard is sought. It is not the purpose to furnish a prescription for definite amounts of food materials, but rather to supply the means of judging whether the food habits of families accord in general with what research has shown to be most desirable from a physiological standpoint. If economy is necessary, a study of the tables will show that it is possible to devise menus which will furnish the requisite amounts of nutrients and energy at comparatively low cost.

DIGESTIBILITY.

The value of a food is determined not alone by its composition, but also by its digestibility; that is, by the amount of it which the body can retain and utilize as it passes through the digestive tract. The term digestibility, as frequently employed, particularly in popular articles, has several other significations. Thus, to many persons it conveys the idea that a particular food "agrees" with the user, i. e., that it does not cause distress when eaten. The term is also very commonly understood to mean the ease or rapidity of digestion, and one food is often said to be more digestible than another because it is digested in less time. However, the term digestibility is most commonly understood in scientific treatises on the subject to mean thoroughness of digestion. The digestibility of any food may be learned most satisfactorily by experiments with man, although experiments are also made by methods of artificial digestion. In the experiments with man both food and feces are analyzed. Deducting the amounts of the several nutrients in the feces from the total amounts of each nutrient consumed shows how much of each was digested. The results are usually expressed in percentages and spoken of as coefficients of digestibility. From a large number of experiments with man it has been calculated that on an average the different groups into which foods may for convenience be divided have the following coefficients of digestibility:

Coefficients of digestibility of different groups of food.

Foods.	Protein.	Fat.	Carbohydrates.	Mineral matters.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Animal foods	98	97	100	75
Cereals and sugars	85	90	98	75
Vegetables and fruits	80	90	95	75

Making use of these figures, the digestible nutrients furnished by any food may be readily calculated. Thus, as shown by the table on composition above, sirloin steak contains 16.5 per cent protein. One and one-half pounds would therefore contain 0.2475 pound protein, or in round numbers, 0.25 pound ($1.5 \times 165 = 0.2475$). As shown by the coefficients of digestibility quoted above, 98 per cent of the protein of animal food is digestible. Therefore, 1.5 pounds sirloin steak would furnish 0.245 pound digestible protein ($0.25 \times 0.98 = 0.245$). The digestibility of the several nutrients in a given quantity of any food may be calculated in a similar way.

Recommended for publication.

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