The Adequacy and Economy of Some City Dietaries

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A Study of the Adequacy and Economy of Some City Dietaries

Since nearly half of the income of the majority of families is spent in the purchasing of food supplies, and since food is such an important factor in the welfare of the family, it is important both economically and physiologically that expenditure for food be made in such a way as will give the best returns for the money spent.

Any suggestions, however, as to how to improve upon present food habits should be based on a knowledge of the adequacy of present family dietaries and the relation existing between nutritive value and the different types of food.

To this end, 102 family dietaries have been carefully collected and analyzed, each dietary being an exact record of the amount and cost of the food eaten by a family for a period of seven days during 1914-1915.

The records were secured in three ways. Two-thirds of them were collected by the investigator who reached the families through settlements, mothers' clubs, health centers, and schools. She made daily visits, sometimes two visits daily, to the homes of the families, weighed the food, and supervised very closely the keeping of the records. Some studies were made by women who were interested and intelligent enough to keep an accurate record under the general direction of the investigator but without detailed supervision. The remaining studies were obtained through teachers of Home Economics who incorporated the keeping of the record into a lesson in household accounts or dietetics. Only such of these records were used as gave every evidence of accuracy as shown by the data of the record itself, the reputation of the girl, and the opinion of the teacher.

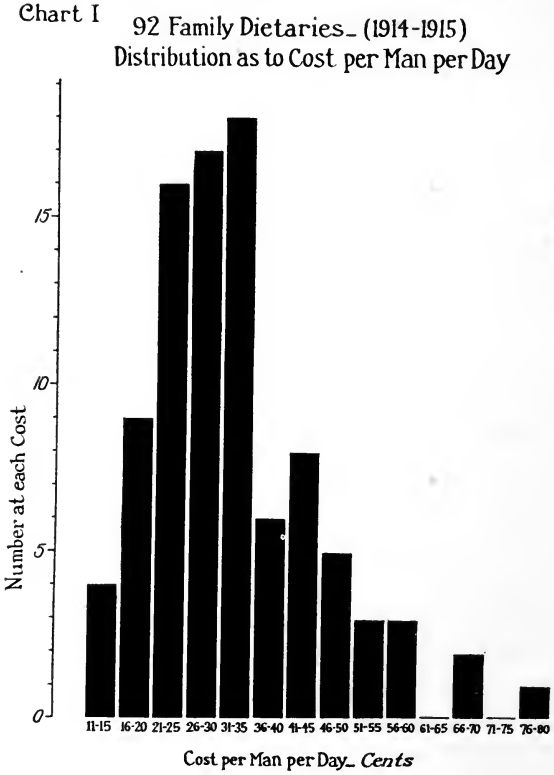
Of the 102 studies, 87 were made in New York City, 9 in Cleveland, Ohio, 5 in Long Beach, California, and 1 in Stamford, Connecticut.

Among these 102 families there were 10 which, as supervised pensioners in the New York Association for Improving the Condition of the Poor, had been so influenced by a dietitian that they showed food habits which could hardly be taken as typical. The results of these 10 studies were not included in the general averages.

In the 92 remaining families from which the general averages have been made there were 343 children and 287 adults, or 3.7 children and 3.1 adults per family. As to nationality they were divided as follows: 23 Irish, 20 Americans, 17 Hebrews, 13 Germans, 10 Italians, 5 Scotch, and 4 of mixed races. The studies were quite equally distributed as to the season of the year, 46 having been collected during October, November, and December in 1914 and January, February, and March in 1915, and 46 during the months of April, May, June, July, August, and September in 1915.

The average cost per man per day was 32.9 cents, with a range from 11.2 cents to 76.0 cents. The distribution according to cost per man per day

Chart I



(Chart I) shows the greatest frequency from 25 to 35 cents, with approximately one-fourth spending less than 25 cents and one-fourth more than 40 cents.

These divisions as to nationality, season of the year, cost and make-up of the family seemed to us to be fairly representative of social groups and well suited to our purpose.

Each dietary was analyzed to determine cost per man per day and the distribution of this food expenditure among the various types of food such as meat and fish, eggs, cheese, milk, cream, butter, and other fats, grain products, sugar, vegetables, fruits, nuts and a miscellaneous group including tea, coffee, spices, yeast, vinegar, etc. In each case the food value was calculated in terms of calories, protein, phosphorus, calcium (lime), and iron per man per day. Where necessary this work was supplemented by laboratory analyses to determine the composition of the food. Calories and protein were quite generally assumed from standard tables,* but much ash analysis was necessary where there had not been sufficient work done to establish an average.†

* Those contained in Rose's Laboratory Hand book for Dietetics were chiefly used for calories and protein.

† For analyses done in connection with this study see Table VI, page 30 of the appendix.

On the basis of these results the studies have been classified, averaged, and examined, to trace relationships between the different types of food and the resulting food value, and to determine the adequacy of the ordinary diet in so far as the five factors mentioned above are concerned.

In considering the adequacy of the various food factors, it is obviously necessary to have some basis for judgment as to what is adequate for proper nutrition.

Since considerable work has been done to determine the energy requirement, a standard allowance for this factor is quite commonly agreed upon as 3,400-3,500 calories for a man working moderately hard, and that is the basis of the allowance used in this study.

A review of the work done on protein metabolism indicated that in about 100 experiments which seemed of such a character as to throw light on this question, the average protein requirement was approximately 50 grams per man per day. If this be increased by 50 per cent "for safety," one obtains a standard allowance of 75 grams of protein per man per day.

Since very little work had been done on the phosphorus and calcium requirement, however, it was thought advisable to investigate these factors by means of laboratory experiments, and thus get more reliable information than was available. Five metabolism experiments of a month each were performed on healthy individuals, and upon these results in connection with what had previously been done an adequate allowance for each was estimated according to the plan used in estimating the allowance for protein.

No revision of the iron figures was made.

The results of the dietaries were interpreted in the light of these allowances, which in view of all available evidence were judged as best expressing the requirements of human nutrition.

Many of the studies gave evidence of deficiencies in food value in one or more important aspects. These deficiencies occurred frequently where the amount of money spent for food was adequate to supply sufficient nourishment had it been spent wisely. Or in some cases, the amount of food consumed was such as to give nearly 40 per cent more energy than was probably needed, while the amount of calcium (lime) or iron was barely more than enough to provide for the needs of the body. The selection of food was such that had these families been getting energy at the rate of 3,500 calories per man, in many instances some of the important ash constituents would have been below the standard allowance.

The first classification of the dietaries was on the basis of cost. The 92 studies were arranged in the order of cost, and averaged in four groups of 23 each.* In Group I were the dietaries of the 23 families spending the least amount for food and Group IV contained those spending the largest amount.

Table I gives for each group the average cost and food value with a statement of the allowance used as a basis for judging the adequacy of the food value.

* All figures will be given on the "per man per day" basis.

Table 1. 92 Dietaries—Averaged in four groups according to cost. Average food value per man per day of each group

Group	Cost	Calories	Protein	Phosphorus	Calcium	Iron
	Cents		*Grams*	*Grams*	*Grams*	*Milligrams*
I	19.2	2043	78	1.14	0.51	12.1
II	28.2	2665	91	1.39	0.64	14.9
III	34.7	3106	109	1.60	0.72	17.7
IV	49.4	3889	126	1.95	1.01	20.6
Standard Allowance		2500–3500	75	1.44	0.69	15.0

Comparing these averages with the standard allowance given, it would seem as though energy and calcium were the factors most often deficient. This assumption is strengthened by the summary given in Table 2 of the number and percentage of dietaries above and below what is considered a safe allowance. By these figures we see that nearly 59 per cent of the families were getting below the ordinary accepted standard of 3,000 calories and that 76 per cent were below 3,500 calories per man per day, the amount upon which children's requirements have ordinarily been based.

Table 2. Number and percentage of dietaries distributed as to calories, protein, phosphorus, calcium, and iron

CALORIES		PROTEIN		PHOSPHORUS		CALCIUM		IRON	
	No. of Studies	Grams	No. of Studies	Grams	No. of Studies	Grams	No. of Studies	Milligrams	No. of Studies
Below 2000	11								
2000-2500	22	Below 50	0	Below 0.96	5	Below 0.45	13	Below 10	5
2500-3000	21	50-75	12	0.96-1.44	40	0.45-0.68	36	10-15	33
3000-3500	16	75-Above	80	1.44-Above	47	0.68-Above	43	15-Above	54
3500-Above	22								

CALORIES		PROTEIN		PHOSPHORUS		CALCIUM		IRON	
	Per cent	Grams	Per cent	Grams	Per cent	Grams	Per cent	Milligrams	Per cent
Below		Below		Below		Below		Below	
2500	35.9	50	0.0	0.96	5.4	0.45	14.1	10	5.4
3000	58.7	75	13.0	1.44	48.9	0.68	53.2	15	41.3
3500	76.1	100	51.0						

There seems to be little danger of protein deficiency, indicating that the money spent for food has been spent in such a way as to supply relatively high protein at a sacrifice to the energy. As regards the probable comparative danger of insufficient energy and protein, only 12 families were getting less than 75 grams of protein as against 54 getting less than 3,000 calories, while none were getting less than 50 grams of protein, but 33 were getting less than 2,500 calories. Since an adequate supply of energy is essential both to healthy growth and activity, and to the proper protection of body tissue, the frequent deficiency of energy value in these city dietaries must be regarded as an important factor in causing the large amount of malnutrition reported among school children.

Had the energy been 3,000 calories in each case, the cause for concern regarding the other food factors would have been much less, as shown in Table 3.

Table 3. 92 Dietaries distributed as to food value on the basis of 3,000 calories

PROTEIN			PHOSPHORUS			CALCIUM			IRON		
Grams	Number	Per Cent	Grams	Number	Per Cent	Grams	Number	Per Cent	Milligrams	Number	Per Cent
Below 50	0	0.0	Below 0.96	0	0.0	Below 0.45	4	4.4	Below 10	0	0.0
Below 62	1	1.1	Below 1.20	4	4.4	Below 0.57	17	18.5	Below 12.5	3	3.3
Below 75	2	2.2	Below 1.44	28	30.5	Below 0.68	37	40.2	Below 15.0	18	19.6
Below 100	36	39.2	Above 1.44	64	69.5	Above 0.68	55	59.8	Above 15.0	74	80.4
Above 100	56	60.8									

In only 2 cases was there less than 75 grams of protein at 3,000 calories, while 40 per cent of the families were getting less than the standard allowance of calcium, 30 per cent less than the standard allowance of phosphorus, and 19 per cent less than that of iron. Next to energy, then, calcium deficiency seems to offer the largest problem. The importance of calcium deficiency must not be overlooked even though one may not be able to point to clinical symptoms. Professor Mendel of Yale says of his recent nutrition experiments that "animals may be in excellent nutritive condition in so far as protein is concerned for long periods of time while they are still losing calcium from their bones. It then happens that suddenly a collapse comes for which there is frequently no obvious explanation." Since this element plays such an important part, not only in bone and teeth formation but in organic functions as well, the frequent deficiency of calcium in the diet is a serious defect in present food habits.

In the economic study of dietaries it is necessary to consider the different types of food used, the influence which each has on the total food value, and the relation between cost and nutritive return. For these comparisons foods have been divided into the various types as represented in Table 4.

Table 4. Average distribution of expenditure among various types of food in 92 families (divided into 4 groups on the basis of cost per man per day)

	Group I	Group II	Group III	Group IV
Cost per man per day	19.2 cents	28.2 cents	34.7 cents	49.4 cents
Cost per 3000 calories	26.1 cents	30.3 cents	34.3 cents	44.7 cents
Type of Food		**Percentage Distribution***		
	Per cent	*Per cent*	*Per cent*	*Per cent*
Meat-fish	36.8	29.4	34.9	31.8
Eggs	4.5	6.4	5.4	5.9
Milk	9.1	9.2	7.8	8.4
Cream	0.3	0.2	0.1	1.2
Cheese	0.9	1.6	0.8	1.2
Fats	6.7	8.1	7.9	9 8
Grain products	22.6	17.7	17.9	13.1
Sugars	3.4	4.4	3.8	3.6
Vegetables	9.0	9.0	9.2	9.3
Fruit	2.3	7.2	6.4	8.2
Nuts	0.1	0.6	0.1	0.6
Miscellaneous	4.3	6.2	5.7	6.9
		Food Value per Man per Day*		
Calories	2043	2665	3106	3889
Protein	78 grams	91 grams	109 grams	126 grams
Phosphorus	1.14 grams	1.39 grams	1.60 grams	1.95 grams
Calcium	0.51 grams	0.64 grams	0.72 grams	1.01 grams
Iron	12.1 milligrams	14.9 milligrams	17.7 milligrams	20.6 milligrams
		Food Value per 3000 Calories		
Protein	107 grams	104 grams	102 grams	116 grams
Phosphorus	1.59 grams	1.57 grams	1.54 grams	1.69 grams
Calcium	0.70 grams	0.77 grams	0.71 grams	0.81 grams
Iron	16.7 milligrams	16.7 milligrams	17.1 milligrams	17.9 milligrams

* For the amount of each type of food consumed see Table I of the appendix.

In this table is given the distribution of expenditure for the various types of food in each of the four groups as described on page 5 with the corresponding return in food value.

It is clearly evident that the average expenditure in Group I was too low to provide sufficient energy for that group. If, however, the cost and food factors for each group be recalculated in proportion to 3,000 calories we have a basis for comparison which indicates: (1) that if energy be sufficient the

other food factors will on the average be adequately supplied, and (2) that Group I was getting practically the same amount of food value for 26 cents for which Group IV was paying 45 cents. It should also be noted that while only one-fourth were spending for food less than 25 cents per man per day, about 50 to 75 per cent were not getting enough energy.

In order that we may judge intelligently with regard to the relative value and economy of various foods, we must know to what extent each factor is supplied by the various types of food. Hence special attention has been given to those types which supply the largest amounts of the various factors considered here, namely, calories, protein, phosphorus, calcium, and iron (Table 5).

Table 5. Average of 92 dietary studies—percentage expenditure for each type of food with the corresponding return in food values

Type of Food	Range of Expenditure	Average Expenditure	Calories	Protein	Phosphorus	Calcium	Iron
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Meat-fish	6.4-49.1	33.2	16.5	36.3	26.7	3.7	31.4
Eggs	0.0-15.9	5.6	1.7	4.5	4.0	3.2	6.2
Milk-cream	1.3-21.9	9.1	8.1	10.1	18.5	50.2	4.7
Cheese	0.0-8.9	1.1	0.9	2.1	2.9	7.3	0.5
Fats	0.0-21.8	8.1	10.3	0.3	0.3	0.7	0.4
Grain products	3.8-42.8	17.9	37.8	35.8	28.9	15.3	25.0
Sugar	0.0-9.2	3.8	10.8	0.1	0.1	0.7	0.2
Vegetables	0.4-19.1	9.1	9.1	8.9	14.6	13.2	26.2
Fruit	0.0-17.1	6.0	3.9	1.1	2.4	4.7	4.1
Nuts	0.0- 7.7	0.4	0.3	0.2	0.3	0.1	0.2
Miscellaneous	0.0-17.6	5.7	0.6	0.6	1.3	0.9	1.1

Be rearranging the dietaries according to the expenditure for the various types of food (which ranged for meat from 6 to 49 per cent, and for grain products from 4 to 43 per cent) it was evident that deficiencies frequently occurred where there had been enough money to supply sufficient food value, but where the relation between the various types of food was not well adjusted.

MEAT AND FISH

The largest expenditure for any one type of food was for meat and fish, or an average for the 92 studies of 33.2 per cent (wherever meat is used in this discussion both meat and fish are included). The dietaries were arranged in order according to the proportion spent for meat. It was found that only 17 were spending less than 25 per cent, while 49 were spending more than 33 per cent of their total food expenditure for this type of food.

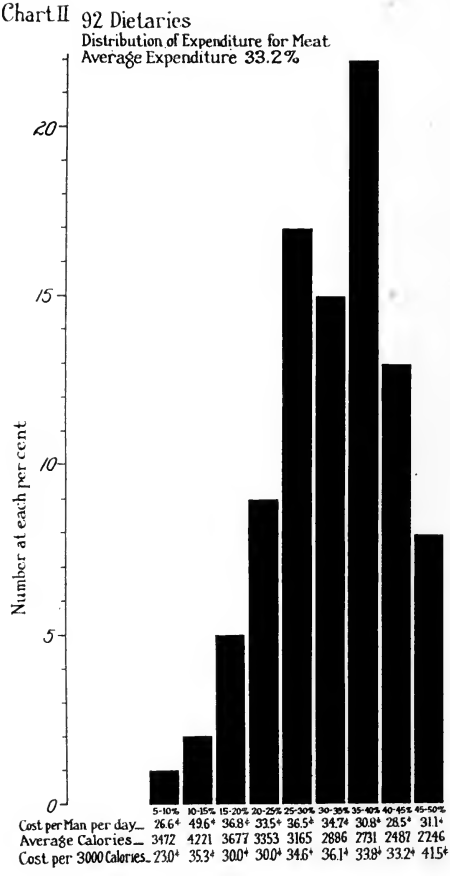


Chart II represents the distribution of expenditure for meat with the corresponding cost and calories for each group. With the exception of the first group where only 5 to 10 per cent of the food expenditure was for meat, the calories decreased gradually with the increase in the percentage of total expenditure for meat. While it is true that those spending relatively most for meat were spending least for total food, it is apparent from the chart that for 3,000 calories it would have cost those spending over 25 to 30 per cent for meat more than they were already spending for food, while those spending

less than 25 per cent for meat were getting more than 3,000 calories. In other words, the greater the percentage expenditure for meat the more expensive the dietary for adequate energy. It would have cost the families spending from 5 to 10 per cent for meat only 23 cents for 3,000 calories, whereas it would have cost those families spending from 45 to 50 per cent for meat 41.5 cents for an equal amount of energy.

When the 92 dietaries were arranged according to the percentage expenditure for meat and averaged in 4 groups of 23 each, as shown in Table 6, the point mentioned above that the percentage spent for meat seems to increase with the decrease in total food expenditure, is strengthened.

Table 6. 92 Dietaries arranged according to the percentage expenditure for meat and averaged in groups of 23 each

Group	AVERAGE AMOUNT AND DISTRIBUTION OF EXPENDITURE							AVERAGE FOOD VALUE				
	Cost per Man per Day	Meat	Eggs	Cheese	Milk	Grain Products	Vegetables and Fruit	Calories	Protein	*Phosphorus	*Calcium	Iron
	Cents	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*		*Grams*	*Grams*	*Grams*	*Milligrams*
I	34.8	21.3	6.0	1.6	9.3	20.6	18.9	3386	102	1.64	0.86	17.3
II	35.7	30.3	6.5	1.5	8.7	16.1	21.9	3129	105	1.62	0.80	17.4
III	31.5	37.3	5.5	0.6	8.0	18.2	13.4	2747	98	1.38	0.61	15.4
IV	29.8	42.0	4.3	0.9	8.5	16.5	12.2	2445	99	1.44	0.61	15.3

* Figures here given are for the element. To find the amount of lime (CaO) from the amount of calcium (Ca), multiply by 1.4. To find the amount of phosphorus pentoxide (P_2O_5), "phosphoric acid," from the amount of phosphorus (P), multiply by 2.29.

This relative increase in meat seems to be more at the expense of vegetables and fruit than of any other one type of food. Both energy and calcium seem to decrease with an increase in the expenditure for meat. It would have cost Group I, 30.8 cents for 3,000 calories with only 21 per cent of the food money spent for meat, whereas it would have cost Group IV, 36.6 cents with an average meat expenditure of 42 per cent. (For further details with regard to the amount of meat consumed and for prices paid for meat, see Tables I, II, and V of the appendix.)

GRAIN PRODUCTS

Under the head of grain products we include such foods as bread, cereals, macaroni, and rice. The 92 dietaries were arranged according to the percentage expenditure for this type of food and averaged in 4 groups of 23 each, Group I representing the 23 families spending least for grain products and Group IV, the 23 spending the largest amount. The results are given in Table 7.

Table 7. 92 Dietaries arranged according to the percentage expenditure for grain products and averaged in groups of 23 each

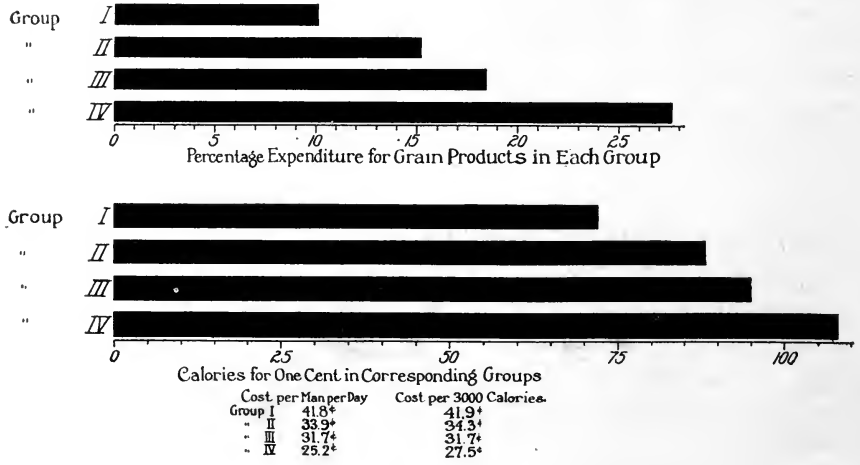
Group	AVERAGE AMOUNT AND DISTRIBUTION OF EXENDITURE							Calories	AVERAGE FOOD VALUE PER 3000 CALORIES			
	Cost per Man per Day	Cost per 3000 Calories	Grain Products	Milk	Meat	Vegetables and Fruit	Fats and Sugar		Protein	*Phosphorus	*Calcium	Iron
	Cents	*Cents*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*		*Grams*	*Grams*	*Grams*	*Milligrams*
I	41.8	41.9	10.1	8.7	35.2	18.5	15.9	3010	107	1.66	0.84	17.91
II	33.9	34.3	15.2	8.1	32.9	16.0	12.5	2967	108	1.63	0.77	17.66
III	31.7	31.7	18.4	10.2	32.0	15.0	12.8	3007	104	1.57	0.78	16.08
IV	25.2	27.5	27.6	7.6	32.8	11.4	10.6	2719	108	1.53	0.63	16.81

* See note at the foot of Table 6 (page 11).

The most apparent correlation here is the decrease in total cost of food as the percentage expended for grain products increases. In Group I, where only 10 per cent of total food expenditure was for grain products, the cost per man per day was 41.8 cents, while in Group IV, where the percentage expenditure for grain products was over 27 per cent, the cost was only 25.2 cents. The average number of calories in Group IV was only 2,719, but for 3,000 calories it would have cost this group only 27.5 cents, while it would have cost Group I for the same amount of energy 41.9 cents. It will be noted by studying Table 6 that less meat, fat, and sugar were used as the amount of

Chart III
GRAIN PRODUCTS

Relation of the Percentage Expenditure for Grain Products and the Energy received in proportion to Money spent. (92 studies arranged according to the percentage expenditure for grain and averaged in 4 groups—23 in each group)



grain products increased, and when the food values are calculated to the basis of 3,000 calories neither protein, phosphorus, or iron is decreased in amount by this increase. The calcium seems to have been affected, but it will become evident when we consider the influence of the amount of milk used that this factor is controlled almost entirely by the milk consumption.

On Chart III there is represented the relative return in calories for the money spent for food by these four groups. Group I, spending 41.8 cents, was getting in return only 72 calories for every cent spent, while Group IV, with an expenditure of only 25.2 cents, was getting in return 108 calories for every cent. It appears then that the greater the expenditure for grain products the cheaper the dietary for energy, while the amount of the other food factors are not seriously affected. (For the amounts and prices of the various grain products used see Tables I, III, and V of the appendix.)

MILK

When the 92 studies were arranged in four groups according to the expenditure for milk in the same manner as for the meat and fish (Table 6), or grain products (Table 7), there seemed to be no close correlations evident. The percentage spent for milk increased slightly and the percentage spent for meat decreased, as the total food expenditure decreased (Table 8).

Table 8. 92 Dietaries arranged according to the percentage expenditure for milk and averaged in groups of 23 each

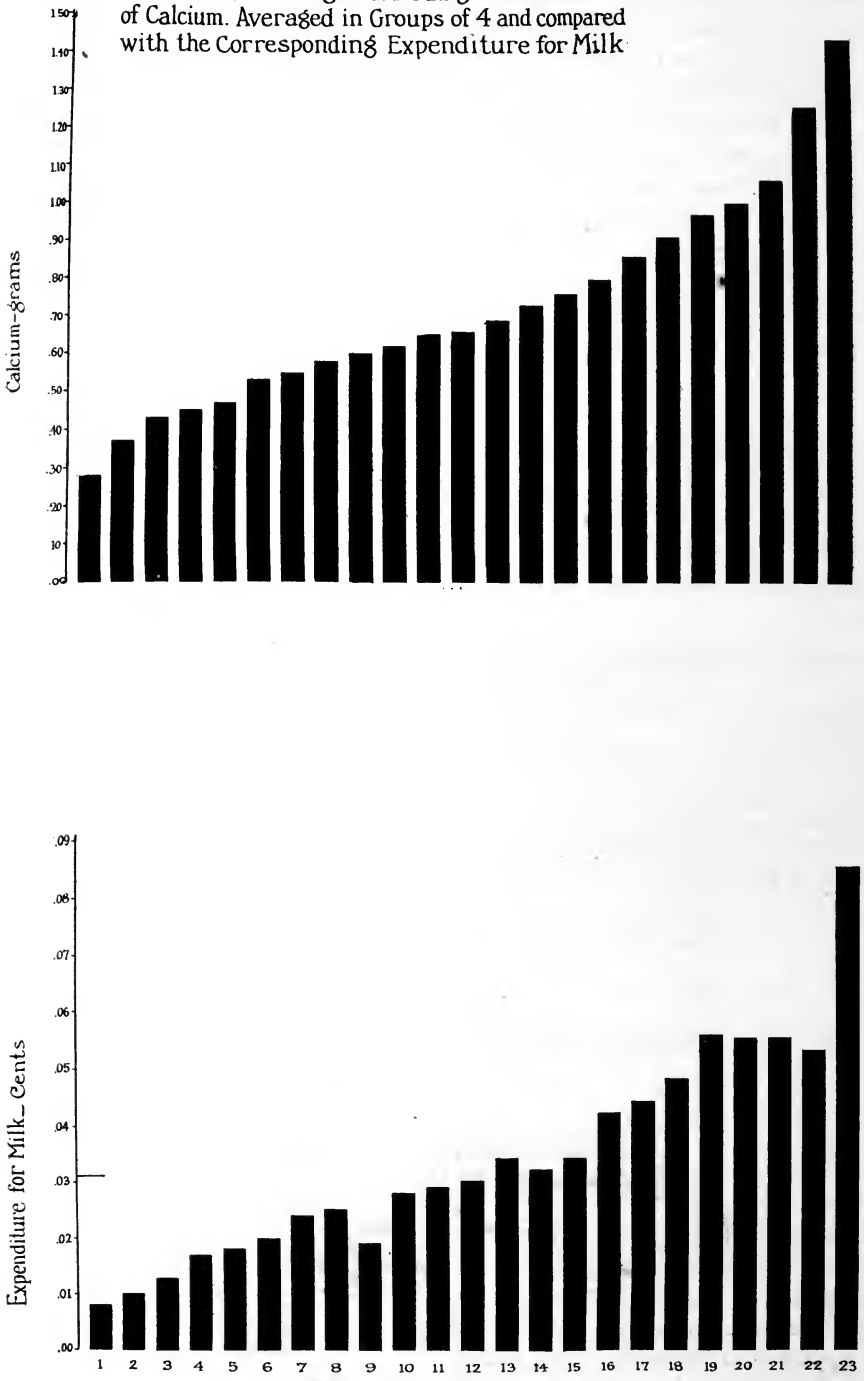
Group	AVERAGE AMOUNT AND DISTRIBUTION OF EXPENDITURE							AVERAGE FOOD VALUE				
	Cost per Man per Day	Cost per 3000 Calories	Milk	Cream	Cheese	Meat	Vegetables and Fruit	Calories	Protein	*Phosphorus	*Calcium	Iron
	Cents	*Cents*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*		*Grams*	*Grams*	*Grams*	*Milligrams*
I	33.3	34.7	4.1	0.4	1.4	33.5	16.4	2884	95	1.35	0.55	16.3
II	38.0	34.8	6.8	0.8	1.1	32.1	15.8	3259	111	1.64	0.74	18.4
III	29.9	33.2	9.4	0.2	1.4	35.0	14.6	2655	94	1.43	0.70	14.9
IV	31.4	32.8	14.2	0.3	0.7	32.2	13.8	2906	104	1.65	0.90	15.7

* See note at the foot of Table 6 (page 11).

When the dietaries were arranged according to the amount of calcium in the diet, averaged in groups of 4, the average amount of calcium in each group calculated, and these figures were compared with the amount spent for milk, cream, and cheese in the corresponding groups, a very interesting correlation appeared as shown on Chart IV.

Chart IV

92 Dietaries arranged according to the Amount of Calcium. Averaged in Groups of 4 and compared with the Corresponding Expenditure for Milk



The standard allowance for calcium (0.69 gram) is not reached until the thirteenth group. By comparing the amount spent for the milk with the calcium in the diet it appears that the families were in danger of insufficient calcium when they were spending on an average of less than 3 cents per man per day for milk. Since milk was quite generally 9 cents a quart when these studies were made, it would seem as though every family should be using at the rate of *at least* one-third of a quart of milk per man per day to provide the calcium requirements of that family. More milk should be provided whenever there are small children, as nearly as possible "a quart of milk a day for every child." In the average of these dietaries over 57 per cent of the total calcium was obtained from milk and cheese. The grain products and the vegetables contributed 12 and 15 per cent respectively, leaving a very small margin to be derived from the several remaining types of food. Since the calcium is so important, and since the amount in the diet is dependent to such a large extent upon the amount of milk used, the use of milk cannot be too strongly urged. (For further correlation between the amount of milk used and the amount of calcium in the diet see Table IV of the appendix. See also Tables I and V for amounts used and prices paid for milk.)

VEGETABLES AND FRUIT

Because of the similarity of the function of vegetables and fruit in nutrition these foods may be discussed here as one type.

The dietaries were arranged according to the percentage expenditure for vegetables and fruit combined, and averaged in 4 groups as previously. The results are shown in Table 9.

Table 9. 92 Dietaries arranged according to the percentage expenditure for Vegetables and Fruit—and averaged in groups of 23 each.

Group	AVERAGE AMOUNT AND DISTRIBUTION OF EXPENDITURE							AVERAGE FOOD VALUE				
	Cost Per Man Per Day	Cost Per 3000 Calories	Vegetables	Fruit	Meat	Milk	Grain Products	Calories	Protein	*Phosphorus	*Calcium	Iron
	Cents	*Cents*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*		*Grams*	*Grams*	*Grams*	*Milligrams*
I	25.6	31.2	5.6	2.5	38.2	9.0	21.5	2428	93	1.36	0.61	13.8
II	35.0	34.6	8.9	4.5	36.3	8.2	19.1	3072	109	1.60	0.70	17.3
III	32.7	34.5	10.5	6.3	30.4	9.4	17.4	2905	100	1.53	0.77	16.5
IV	39.4	35.0	10.9	10.9	27.8	7.9	13.4	3359	102	1.60	0.81	17.6

* See note at the foot of Table 6 (page 11).

Each of the ash constituents seems to be favorably influenced by the increase in the use of vegetables and fruit, the iron and calcium rather more so than the phosphorus. The relation between the amount of iron and vegetables and fruit is shown in Chart V.

Chart V

IRON. Relation between the Amount of Iron in the Diet and the Percentage Expenditure for Vegetables and Fruits. (92 dietaries arranged according to the amount of iron in the diet, averaged in 4 groups)

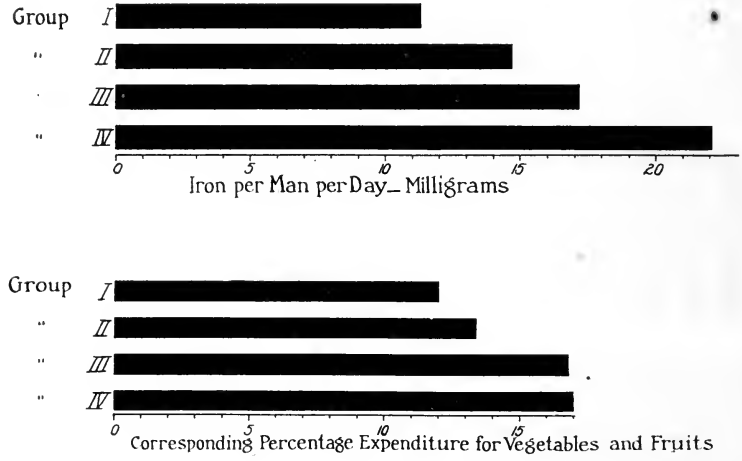


Table 10 might indicate that the amount of iron was more especially influenced by the expenditure for meat, but when the iron figures are calculated to 3,000 calories in Tables 6, 7, 8, and 9 the amount of iron per 3,000 calories seems to be practically the same for each group. We shall see in Chart VII that by reducing the expenditure for meat and increasing the expenditure for vegetables the iron is increased slightly. This will depend, obviously, on the kind of vegetables used. (For the amounts and prices of vegetables and fruits used see Tables I and V of the appendix.)

BUTTER AND OTHER FATS, AND SUGAR

According to these dietaries, the fats and sugars contribute on an average about 20 per cent of the total energy of the diet, but very little of any of the other factors considered in this study. The question arises whether there may not be danger of a deficiency of some of the ash constituents through too liberal a use of fat and sugar? When the dietaries were averaged according to the amount of iron at 3,000 calories the relation between the iron and the percentage of energy from the fats and the sugar appeared as shown in Table 10, and as represented on Chart VI. As the amount of iron increased there was a decided decrease in the percentage of the calories from fats and sugar.

Table 10. 92 Dietaries arranged according to the amount of iron in the diet at 3,000 calories and averaged in 4 groups

Group	FOOD VALUE AND COST AT 3,000 CALORIES					AVERAGE AMOUNT AND DISTRIBUTION OF EXPENDITURE						Calories from Fats and Sugars
	Cost per Man per Day	Iron	Protein	*Phosphorus	*Calcium	Meat	Milk	Vegetables and Fruit	Grain Products	Fats	Sugar	
	Cents	*Milligrams*	*Grams*	*Grams*	*Grams*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
I	31.7	13.90	90	1.37	0.71	28.8	9.7	15.9	17.8	10.8	4.7	26.7
II	33.9	16.16	104	1.58	0.77	32.7	8.1	14.5	18.2	8.6	3.8	21.8
III	31.2	17.94	109	1.66	0.76	31.4	9.2	15.9	19.6	7.7	3.7	19.1
IV	38.4	20.40	128	1.78	0.75	39.9	7.5	14.3	15.9	5.5	3.0	16.7

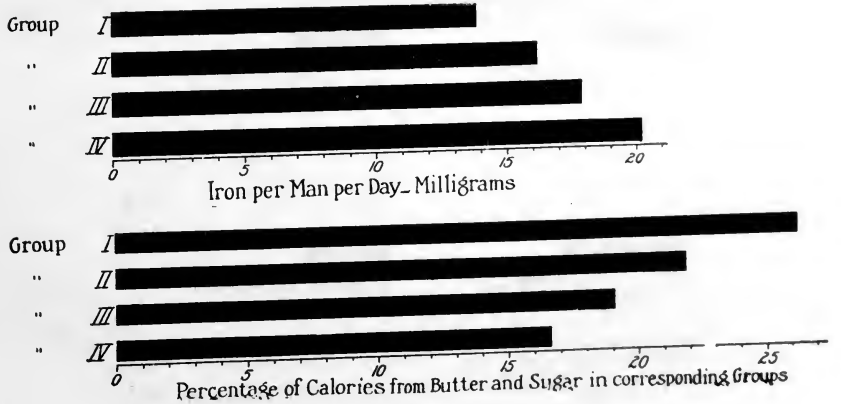
* See note at the foot of Table 6 (page 11).

When the dietaries were arranged according to the percentage expenditure for butter and sugar, the same relationship between fats and sugar and the amount of iron in the diet was apparent. In Group I, where only 7.7 per cent of the money was spent for fats and sugar there were 18.5 milligrams of iron per man per day. In group IV, 16.4 per cent of the money was spent for fats and sugar with only 15 milligrams of iron per man per day. In many individual cases where the amount spent for fats and sugar was above the average, the iron figures were considerably below what seemed a safe allowance.

It would seem then as though some of the money spent for fats and sugar might better be spent for vegetables and fruit. (For the amounts and prices of fats and sugars used see Tables I and V of the appendix.)

Chart VI

IRON— Relation between the Amount of Iron in the Diet and the percentage of Calories from Fats and Sugar. (92 dietaries arranged according to the amount of iron (per 3000 calories)— averaged in groups of 23)

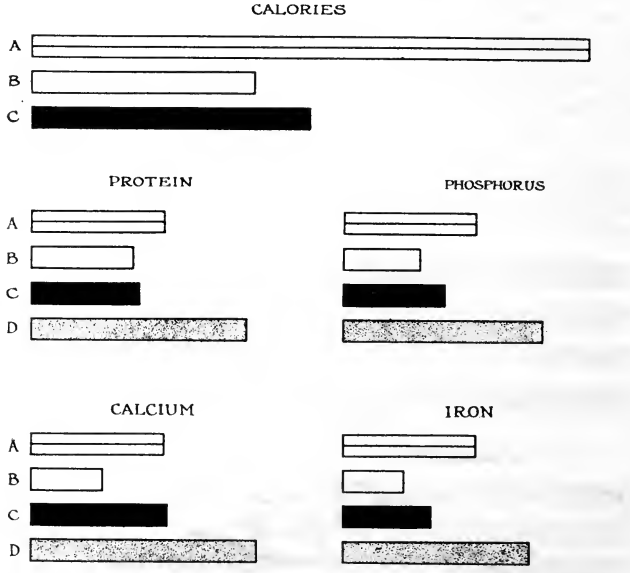


From these results it would seem as though the family dietary, at least among city people of limited means, is often relatively poor in energy and calcium, and sometimes also in iron or phosphorus. As the percentage expenditure for meat increases the diet tends to suffer in energy. As the relative expenditure for grain products increases, the energy is increased. Calcium seems to be dependent to a large extent on the amount of milk used, and both iron and calcium are favorably influenced by increasing the proportion of expenditure for vegetables and fruits. In the average diet the expenditure for milk, vegetables and fruit are much overbalanced by the expenditure for meat. If there were an equal expenditure for (1) meat, (2) milk, (3) fruit and vegetables, there is little doubt that the results in food value would be more favorable to a well balanced diet. In Chart VII we have reconstructed a dietary according to the suggested distribution. In each case, A represents the allowance as given on page 6 for each of the five chief food factors. B represents the amount of each corresponding food factor which this family was receiving where 49 per cent of its total food money was spent for meat, 26 per cent for grain products, 10 per cent for milk, and 7.8 per cent for vegetables.

Chart VII

Chart to show the Increase in Food Value when the expenditure for Milk, Meat, and Vegetables and Fruit are made equal.

A-Standard Allowance
B-Food Value from the Original Distribution of money
C-Food Value possible by Redistribution of money
D-Food Value at 3000 Calories (C)



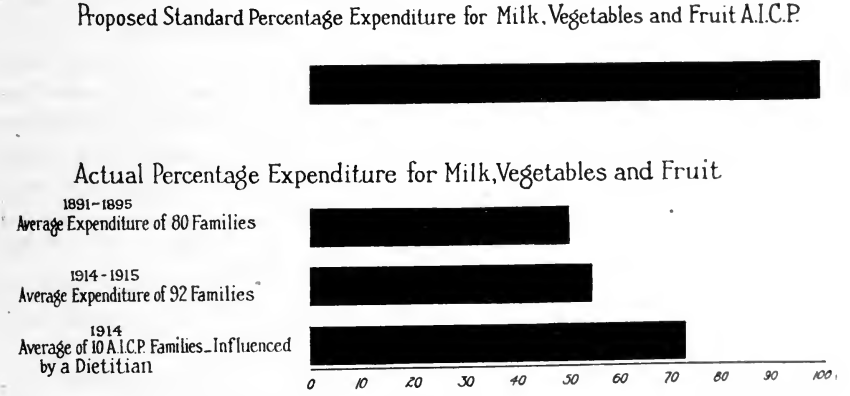
The Standard Allowances used are those given on page 6

Actual Expenditure per Man per Day 11.3¢
Cost of 3000 Calories (B) 28.0¢
Cost of 3000 Calories (C) 22.3¢

Since they were spending only 11.3 cents for food, it is evident that they could not have been getting what they needed. Had they been spending more for milk and vegetables and less for meat, or equal amounts for these three types of food, they would, however, have been getting more food value for the same money as represented by C in Chart VII. According to the way in which they were spending the money, it would have cost them 28 cents for 3,000 calories, whereas, had they spent equal amounts for milk, meat, and vegetables, it would have cost them only 22.3 cents for the 3,000 calories. Although this dietary was somewhat extreme in the amount of money spent for food, 18 dietaries similarly reconstructed give corresponding increases in food value. As none of the five food factors here represented would have suffered in any case by this redistribution, it would seem as though the average diet would be improved so far as food value is concerned by reducing meat and increasing milk, vegetables, and fruit.

The changing of food habits is a gradual process. That there is considerable room for improvement is fairly well recognized. That there has been some improvement through education and other forces is evidenced by Chart VIII.

Chart VIII Improvement in Food Habits through Education. Actual expenditure for Milk, Vegetables and Fruit Compared with a Proposed Standard



The upper line in Chart VIII represents an expenditure for milk, vegetables, and fruit as proposed by the Relief Department of the New York Association for Improving the Condition of the Poor. The average of 80 families in 1891-1895 shows an expenditure for these foods of only half what this allowance calls for. These families had a high average expenditure for meat. The average of 92 families in 1914-1915 shows a slight increase in the relative expenditure for milk, vegetables, and fruit. The average of 10 families which had been strongly influenced by the educational efforts of the New York Association for Improving the Condition of the Poor showed a materially greater increase.

A SUGGESTION FOR THE COMPARISON OF FOOD VALUES

Discussion of food values may seem confusing to the layman who is told that one food is valuable for certain factors, another for other factors plus some of those already given, and still another for some of those in one, some of those in the other, and has other valuable qualities in addition. If we compare the cost of each type of food with the energy and individual nutrients which it furnishes, it is difficult to decide which expenditures are more economical. Thus in Table 5 (page 9) meat and fish cost one-third of the total expenditure for food and furnished about one-third of the protein, phosphorus, and iron, but only one-sixth of the energy and about one-thirtieth of the calcium. Grain products were less than one-fifth of the cost but furnished over one-third of the energy and protein, one-fourth of the iron and phosphorus and about one-sixth of the calcium. Milk, costing less than one-tenth of the total food expenditure, furnished corresponding amounts of energy and protein but over half of the calcium and very little iron. It becomes difficult to judge the relative merits of different types of food as soon as we try to consider the various factors of food value which we now know to be important Certainly one not familiar with food composition and the terminology used is likely to become confused.

To assist in overcoming this confusion, it has seemed worth while to try to combine these various factors of food value in such a way that the relative values of foods may be expressed by single terms. We have endeavored to do this by means of assigning arbitrary values to each factor on the principle of a score card. In assigning these arbitrary values we have taken into consideration the fact that energy is the most frequent deficiency in American dietaries and that the majority of dietaries studied would furnish enough of all other factors if the energy were adequate. We have, therefore, assigned to energy a value of about half its total or combined food value. We have assigned equal values to protein,* calcium, phosphorus and iron. Since any score card has to be made arbitrarily and the results can be only indicative and relative, we have suggested two systems of scoring. The bases of the two systems are as follows:

If we give to energy a value of 60 on the scale of 100, and to protein, calcium, phosphorus, and iron each a value of 10, the combined value ("composite valuation") of a type of food like meat and fish which in the average of 92 dietaries furnished 16.5 per cent of the energy, 36.3 per cent of the protein, 26.7 per cent of the phosphorus, 3.7 per cent of the calcium, and 31.4 per cent of the iron, would score as given under I in Table 10.

If a value of 40 were assigned to the energy, and 15 to each of the other factors, meat and fish would score as given under II in Table 10. This system of weighting would give less prominence to sugar and fat, and slightly less to grain products, but place more emphasis on vegetables, milk, meat and eggs.

* In reality, this amounts to giving a higher valuation to protein since this is counted both as protein and as a part of the energy as well.

Because of this variation in emphasis, it has seemd advisable to give the two systems of weighting throughout for purposes of comparison.

Table 10. Score for meat and fish

	Per cent of Food Value Supplied by Meat and Fish in 92 Dietaries	I		II	
		Assigned Values	Points	Assigned Values	Points
Energy	16.5 per cent	60	9.90	40	6.60
Protein	36.3 per cent	10	3.63	15	5.45
Phosphorus	26.7 per cent	10	2.67	15	4.01
Calcium	3.7 per cent	10	0.37	15	0.56
Iron	31.4 per cent	10	3.14	15	4.71
			19.71		21.33

This gives us a score for the average combined food value of meat as purchased by 92 families. Similarly we would find milk to score 13.22 (I) or 15.78 (II), according to the values used. The relative value of meat and fish and milk may be expressed by (I) 19.7 for meat against 13.2 for milk, or (II) 21.3 for meat against 15.8 for milk. The combined food value ("composite valuation") for each type of food according to these two different values is given in Table 11.

Table 11. The relative food value of the various types of food, based on the combined food value

Type of Food	Score for the Combined Food Value ("Composite Valuation")	
	I	II
Meat and fish	19.7	21.3
Eggs	2.8	3.4
Milk (and cream)	13.2	15.8
Cheese	1.9	2.3
Butter and other fats	6.3	4.4
Grain products	33.2	30.8
Sugar and molasses	6.6	4.5
Vegetables	11.7	13.1
Fruit	3.6	3.4
Nuts	0.2	0.2
Miscellaneous	0.8	0.8

These figures would seem to suggest that meat scores higher as a food than milk. While this may be true per unit of weight, it is not true per unit of cost. For every cent spent for meat we get in these studies only 0.60 (I) of a point of food value in return, whereas for every cent spent for milk we get 1.45 (I) points of food value, or 0.64 (II) for meat against 1.73 (II) for milk.

The relation between cost and food value for each type of food is shown in Table 12.

Table 12. To show the relative return in combined food value for an equal amount of money spent for each type of food

Type of Food	Cost in Per cent of Total Expenditure	The Combined Food Value Divided by the Per cent of Total Expenditure.	
		I	II
	Per cent	*Points*	*Points*
Meat and fish	33.2	0.60	0.64
Eggs	5.6	0.50	0.61
Milk (and cream)	9.1	1.45	1.73
Cheese	1.1	1.73	2.09
Butter and other fats	8.1	0.78	0.54
Grain products	17.9	1.85	1.72
Sugar and molasses	3.8	1.74	1.18
Vegetables	9.1	1.29	1.44
Fruit	6.0	0.60	0.57
Nuts	0.4	0.50	0.50
Miscellaneous	5.7	0.14	0.14

By comparing the composite valuation with the cost it will be seen that if either of these methods of estimating comparative values is at all valid, the money spent in these 92 families for milk and cheese, grain products and vegetables brought a better relative return in food value and was therefore better invested than the money spent for meats and fish, eggs, and fruit.

In making any such comparison, it must be kept prominently in mind (1) that the values assigned to the different factors of food value must necessarily be more or less arbitrarily chosen so that the resulting "combined value," or "score value," rests partly on facts and partly on assumptions; (2) that not all the important factors of food value are taken into account in these valuations, the "vitamine values" being wholly omitted from the calculations because as yet we have not the data necessary to permit us to give them numerical expression (it is quite possible that when it becomes feasible to state the "vitamine values" in numerical terms and give them due weight in the composite

valuation, the expenditures for eggs and butter may appear more economical than is indicated by the above table); (3) that the assumption that a given amount of protein, of phosphorus, of calcium, or of iron, is of the same value in whatever food found, which is certainly not true in detail, and may be very far from true in many cases; (4) that any attempt to reduce foods to a single basis for comparison necessarily tends to obscure these differences which must be kept in mind in order to give each food its proper place in a well balanced dietary. Any comparisons based on the use of such arbirtary valuations as can at present be assigned must therefore be used with much discretion if misconceptions are to be avoided; if so used, however, they may be found serviceable as a guide in the economical choice of food, and to some extent in teaching relative food values.

While this method may be open to criticism, it seems much fairer to the various foods than stating the relative value in terms of calories only. Chart IX compares the two methods. In one case we have the return per unit of cost in calories and in the other case the return per unit of cost in terms of the "combined" food value ("composite valuation"). Fats and sugars occupy a much more prominent place when calories alone are considered, while milk, cheese, and vegetables rank much higher in the scale where the ash constituents are taken into consideration.

Chart IX Return in Food Value for Money Spent for Food

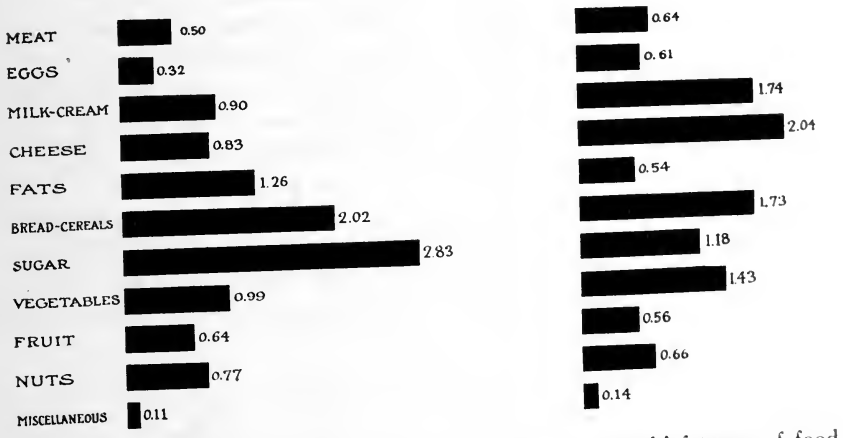
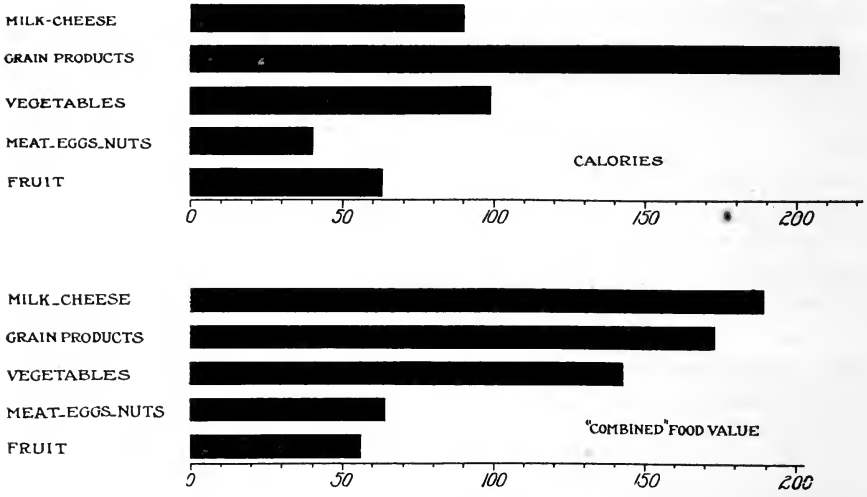


Chart X shows the relation of the food value of the chief types of food. According to the score card method, milk ranks first as our most valuable food in proportion to cost, the grain products second, and vegetables third. When stated in terms of calories, sugar appeared as the most valuable food in proportion to cost, grain products second, and butter and other fats third. In view of the lack of ash constituents in both sugar and fats and oils, comparison on the basis of calories alone is plainly not fair to milk and vegetables.

Chart X Comparison Between Calories and "Combined" Food Value per unit of Cost for Each of the Main Types of Food. Average of 92 Studies.



Individual articles of food may be calculated to a basis of combined food value in a similar manner. Thus if 100 calories be given a value of 40 on the scale of 100, and such quantities of protein, phosphorus, calcium, and iron as should accompany 100 calories in an adequate economical diet be given a value of 15 each, the score for almonds might be ascertained as follows:

To every 100 calories of almonds there are 3.23 grams of protein, 0.071 gram of phosphorus, 0.039 gram of calcium, and 0.0006 gram of iron. If we accept for the standard allowance* of man 75 grams of protein, 1.44 grams of phosphorus, 0.69 gram of calcium, and 15 milligrams of iron, to every 100 calories of the 3,000 ordinarily taken as the requirement of a man at ordinary labor, there should be 2.5 grams of protein, 0.048 gram of phosphorus, 0.02 gram of calcium and 0.0005 gram of iron. Then to every 100 calories of almonds there is 1.3 (3.23 divided by 2.5) the amount of protein required to "balance" the energy value; 1.48 the amount of phosphorus, 1.85 the amount of calcium, and 1.2 the amount of iron. Scoring these as indicated above, we have the score value for almonds as follows:

Assumed Values		Score
		Points
Calories (100)	40	40
Protein	1.3 x 15	19.5
Phosphorus	1.48 x 15	22.2
Calcium	1.85 x 15	27.8
Iron	1.20 x 15	18.0
		127.5

* See Page 6

Since a pound of almonds contains 16.14 100-calorie portions, then a pound of almonds has a score value of 2058 (127.5 multiplied by 16.14). Table 14 gives the score value of the common typical foods:

Table 14. Score Value (Composite Valuation) per pound of some common typical foods.

	I	II		I	II
Meat—Beef, medium fat	1480	1630	Vegetables—		
Bacon	1750	1324	Asparagus, fresh	279	368
			Beans, dry, white	2767	3367
Fish—Cod, salt	1310	1710	" " limas	2380	780
Salmon, canned	930	1074	" fresh limas	363	420
			" string	374	472
Eggs	1092	1341	Beets	246	286
			Cabbage	285	367
Cheese—Cottage	1287	1688	Carrots	278	338
Hard	4460	5690	Cauliflower	487	661
			Celery	256	350
Milk—Condensed, sweetened	2005	2267	Corn, canned	497	523
" unsweetened	1556	1955	Cucumbers	125	153
Skimmed	514	688	Lentils	2834	3464
Whole	612	761	Lettuce	223	299
			Onions	263	295
Butter	2320	1744	Peas, dry	2510	2960
			" fresh	400	475
Cream—10% fat	869	862	Parsnips	349	405
40% fat	1342	1150	Potatoes, sweet	399	374
			" white	377	414
Lard	2450	1645	Radishes	161	195
			Rhubarb	170	224
Olive oil	2449	1630	Spinach	576	810
			Squash	130	144
Sugar—Brown	1231	983	Tomatoes	162	192
White	1090	725	Turnips	246	307
Corn syrup	960	800			
Maple syrup	1080	974	Fruit—		
Molasses	1978	2315	Apples, fresh	175	156
			" dry	1075	955
Grain Products—			Bananas	254	236
Barley, pearled	1513	1470	Dates	1298	1240
Bread, entire wheat	1325	1429	Figs	1667	1782
" graham	1409	1525	Grapefruit	167	169
" white	1098	1060	Grapes	286	266
" rye	1125	1111	Lemons	199	228
Cornmeal	1444	1360	Olives	1000	1004
Crackers	1579	1433	Oranges	209	228
Cornflakes	1270	1090	Peaches, fresh	169	177
Cream of Wheat	1460	1370	Pears	236	228
Farina	1418	1308	Pineapple	234	253
Force	2078	2316	Plums	345	337
Flour, graham	2001	2188	Prunes	1144	1135
" rye	1502	1459	Raisins	1290	1235
" white	1372	1257	Strawberries	293	355
Hominy	1301	1147			
Macaroni	1502	1444	Nuts		
Oatmeal	2245	2465	Almonds	1900	2045
Rice	1289	1139	Cocoa	2900	3231
Shredded Wheat	2028	2214	Filberts	1676	1752
Tapioca	1262	1091	Peanuts	2010	2078
			Pecans	1556	1440
			Walnuts	798	768

APPENDIX

Table I. Number of ounces of food used per man per day in each of four groups where 92 dietaries are divided on the basis of expenditure.

	Group I Cost per Man per Day—19.2 Cents		Group II Cost per Man per Day—28.2 Cents		Group III Cost per Man per Day—34.7 Cents		Group IV Cost per Man per Day—49.4 Cents	
	Ounces		*Ounces*		*Ounces*		*Ounces*	
Meat and fish—Total		6.74		7.34		9.59		11.64
Beef	2.96		2.87		4.46		4.09	
Veal	0.39		0.42		0.50		0.50	
Lamb and mutton	0.88		0.67		0.96		1.64	
Pork	0.56		1.36		1.81		2.12	
Fowl and game	0.29		0.89		0.80		1.69	
Fish	1.66		1.13		1.06		1.60	
Eggs		0.78		1.39		1.40		1.80
Cheese		0.15		0.37		0.20		0.45
Milk—Total		7.80		9.07		10.45		14.73
Fresh	7.49		8.94		10.25		14.53	
Condensed	0.31		0.13		0.20		0.20	
Cream		0.09		0.06		0.02		0.63
Butter and other fats		0.64		1.15		1.36		2.42
Grain products—Total		11.51		11.97		14.29		14.03
Bread	9.58		7.37		8.89		7.06	
Sugar		1.80		2.97		3.09		3.87
Vegetables—Total		11.78		13.01		13.97		18.07
Potatoes	7.80		8.11		8.04		10.58	
Dry vegetables	0.30		0.41		0.33		0.36	
Fruit—Total		2.48		5.55		8.37		11.63
Dry fruit	0.04		0.21		0.11		0.33	
Nuts		0.01		0.06		0.19		0.29
Coffee and tea		0.32		0.45		0.72		0.83
Total food—Ounces		44.10		53.39		63.65		80.49

APPENDIX

Table II. 92 Dietaries arranged according to the amount of meat used, and averaged in groups of 23 each.

Group	Amount of Meat per Man per Day	Cost of Total Food per Man per Day	Calories	Cost of Total Food per 3000 Calories	Amount of Meat Adjusted in Proportion to 3000 Calories
	Ounces	*Cents*		*Cents*	*Ounces*
I	5.0	24.6	2548	29.1	5.9
II	7.3	30.5	2857	31.7	7.7
III	9.5	32.8	2900	34.8	9.8
IV	13.5	44.7	3397	39.9	11.9

Table III. 92 Dietaries arranged according to the amount of grain products used, and averaged in 4 groups.

Group	Amount of Grain Products per Man per Day	Cost of Total Food per Man per Day	Calories	Cost of Total Food per 3000 Calories	Amount of Grain Products Adjusted in Proportion to 3000 Calories
	Ounces	*Cents*		*Cents*	*Ounces*
I	7.9	31.6	2473	37.9	9.6
II	10.8	30.7	2556	35.1	12.7
III	13.9	33.8	3061	32.5	13.6
IV	19.2	36.5	3613	29.7	16.0

Table IV. 92 Dietaries arranged according to the amount of milk used, and compared with the calcium.

Group	Amount of Milk Used per Man per Day	Amount of Calcium per Man per Day
	Ounces	*Grams*
I	4.11	0.473
II	8.68	0.616
III	11.95	0.747
IV	19.29	1.474

APPENDIX

Table V.* To show the range of prices, the average price paid by each of four groups (92 dietaries divided on the basis of cost) and the number of families using the most common articles of food.

	Range of Prices per Pound	Group I Spending 19.2 Cents per Man per Day		Group II Spending 28.2 Cents per Man per Day		Group III Spending 34.7 Cents per Man per Day		Group IV Spending 49.4 Cents per Man per Day	
		No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid
	Cents		*Cents*		*Cents*		*Cents*		*Cents*
MEAT—FISH									
Beef, uncooked	12-32	22	19.4	21	20	23	21	22	24
" cooked	36-70	3	39.0	2	40, 60	4	40	2	40, 70
" corned	10-14	2	10, 14	..	..	..	..	..	..
" dried	34-60	..	..	1	60	1	35	1	34
Brains, tripe, kidney, liver	8-15	3	13	3	11	3	10	2	12
Veal	16-40	6	19	5	21	7	24	5	29
Liver	..	..	..	..	..	..	..	1	30
Lamb—mutton	10-36	7	18	8	19.5	9	21.8	14	21
Pork	10-30	9	22	17	18.0	17	21	17	20
" cooked	23-40	..	..	5	25.0	8	38	8	40
Bacon	20-40	6	27	7	26	7	29	11	28
Salt pork	15-24	3	16	5	18	3	17	2	18, 24
Sausages	15-40	2	16, 22	10	24	11	23	8	25
Fish, fresh	4-25	18	8	13	12	12	11	16	19
Canned, pickled	10-36	8	19	4	23	5	23	8	24
Salt, dried and smoked	9-26	10	16	6	14	4	23	4	12
Smoked	18-80	..	..	4	27	1	24	6	53
Fowl	15-28	5	18	9	19	6	20	12	21
DAIRY PRODUCTS									
Eggs	25-60*	19	28*	23	32*	21	34*	23	43*
Milk, fresh	6-11†	20	6†	22	8†	23	8†	23	9†
" condensed	10-16	6	11.5	4	13	7	14	4	11
Cream	10-30‡	4	10.5‡	3	15‡	1	20‡	10	20‡
CHEESE									
American	20-28	5	23	10	22	8	29	9	25
Cottage	9-12	1	9	5	10	1	10	2	10
Cream	38-40	..	..	4	40	1	39	1	40
Neufchatel	20	1	20	..	..	1	20	4	20
Parmesan	50-54	2	50	2	52	1	50	1	52
Roquefort	40-44	..	..	..	..	..	..	2	40, 44
Swiss	40	1	40	1	40	3	40	3	40
FATS									
Butter	30-48	21	40	21	38	20	39	23	39
Lard and other fats	12-20	7	16	13	15	12	15	13	18
Oil	14-60	4	14, 44	6	21, 42	5	22, 38	9	32, 50
SUGAR									
Sugar	5- 8	21	6	23	6	22	6	23	6
Corn syrup	6- 7	2	7	3	6	3	6	2	6,7

* Price per dozen. † Price per quart. ‡ Price per pint.

APPENDIX

TABLE V.—Continued

	Range of Prices per Pound	Group I Spending 19.2 Cents per Man per Day		Group II Spending 28.2 Cents per Man per Day		Group III Spending 34.7 Cents per Man per Day		Group IV Spending 49.4 Cents per Man per Day	
		No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid
	Cents		*Cents*		*Cents*		*Cents*		*Cents*
GRAIN PRODUCTS									
Barley	6-10	7	8	3	8	8	8	2	9
Bread, white	4-10	19	5	19	6	22	6	22	7
Rolls	7-16	19	9	12	11	11	9	15	9
Cake and cookies	8-50	5	17	12	15	12	14	21	16
Crackers	9-40	4	22	8	12	13	10	10	16
Cornflakes	15-25	..	..	3	25	3	15	5	19
Cornmeal	3-10	..	..	3	3	2	3	6	6
Farina	5-12	4	8	4	10	2	9	6	9
Flour	4- 6	13	4.4	18	4.4	16	4.6	21	4
Macaroni	6-20	8	8	6	10	9	10	11	10
Oatmeal	5-12	6	6	6	5	13	7	14	7
Rice	6-10	14	8	12	9	11	9	16	8
VEGETABLES									
Beans, dry	5-10	12	9	8	8	5	8	16	8
" fresh	6-15	2	6, 9	2	8	2	7, 8	4	12
" string	5-10	..	..	..	..	3	6	3	7
Beets	2- 4	2	2	4	2.7	4	2.6	6	2.5
Cabbage	1- 5	12	2	4	2.7	7	3	11	3
Carrots	2-10	3	3	5	2.6	3	4	10	3
Celery	5-22	..	..	2	5	4	11	9	11
Corn, canned	6-12	3	8	3	10	6	9	8	10
Lentils	7- 9	..	..	1	7	1	9	1	7
Lettuce	5-40	3	15	7	15	7	15	13	18
Onions	1- 8	14	2.1	19	3	10	2.5	13	5
Peas, canned	5-17	..	..	3	8	6	8.5	6	12
" dried	6-12	1	8	3	8.6	4	8.0	3	8
" fresh	3-12	1	8	1	3	1	7	2	6, 12
Potatoes, sweet	2- 5	2	2	6	2.5	4	3	9	3
" white	1- 4	23	1.6	23	1.5	22	2	23	2
Spinach	2-10	2	7, 10	3	4	5	8	2	5, 7
Tomatoes, canned	4-15	8	5	7	8	13	6	11	7
" fresh	2-20	10	4	6	5	5	8	5	9
Turnips	2- 5	5	2	3	2	2	2.5, 5	4	2.5
FRUIT									
Apples	1-12	11	2.6	13	2.7	17	2.9	18	6
Bananas	3- 8	5	4	11	5.5	6	4	11	6
Currants, dry	10-13	..	..	2	10, 13	..	..	3	10
Dates	10-20	..	..	1	10	1	10	2	20
Figs	15-20	..	..	1	20	..	..	2	15, 20
Grapes	4-28	..	..	3	8	2	4, 5	5	14
Grapefruit	4-10	..	..	..	..	3	7	5	6
Jam	18-30	2	24	3	24	3	18	5	25
Jelly	10-20	5	10	8	12	2	12	5	15

APPENDIX

TABLE V.—Continued

	Range of Prices per Pound	Group I Spending 19.2 Cents per Man per Day		Group II Spending 28.2 Cents per Man per Day		Group III Spending 34.7 Cents per Man per Day		Group IV Spending 49.4 Cents per Man per Day	
		No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid	No. of Times Used	Average Price Paid
	Cents		*Cents*		*Cents*		*Cents*		*Cents*
FRUIT—*Continued*									
Oranges	3-25	2	3, 6	13	8	12	8	17	7
Peaches, canned	8-16	1	8	2	8	3	12	5	9.5
" fresh	6-16	3	8	2	6, 8	4	7	4	7
Pears	4-25	5	5	3	6	4	5	2	5, 25
Plums	5- 8	1	8	1	5	1	6	..	..
Raisins	10-16	2	12, 16	6	12	3	12	8	14
NUTS									
Filberts	16	..	..	..	..	1	16	..	..
Peanuts	20	..	..	..	..	..	..	3	20
Walnuts	18-24	..	..	4	24	..	..	7	22
Cocoa and chocolate	20-80	4	27	14	32	7	42	14	35
Coffee	20-45	15	26	19	27	18	29	21	30
Tea	20-80	15	36	15	44	15	45	20	52

Table VI.—Percentage composition of foods analyzed in connection with the dietary study and metabolism experiments. (Figures given are on edible portion.)

	Moisture	Protein (N x 6.25)	Fat	Carbohydrate (By Difference)	Total Ash	CaO	Ca	P_2O_5	P	Fe
MEAT	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Beef, lean, round (free from visible fat)	..	20.55	..	..	..	0.015	0.011	0.443	0.193	..
Beef liver	67.87	20.84	4.74	..	1.13	0.008	0.006	0.927	0.405	..
Fowl	75.04	21.46	3.00	..	0.96	0.029	0.021	0.473	0.207	..
Ham, smoked	68.40	18.85	4.57	..	7.35	0.043	0.031	0.385	0.168	..
Mutton chops	74.90	19.31	4.38	..	1.17	0.023	0.016	0.547	0.239	..
FISH										
Blue	77.34	20.45	0.76	0.34	1.11	0.032	0.023	0.483	0.211	..
Cod, fresh	80.67	18.22	0.15	..	1.12	0.014	0.010	0.465	0.203	..
Halibut	..	..	..	..	..	..	..	..	..	.0007
Herring, fresh	..	..	..	..	..	..	..	..	..	.0016
Mackerel	66.91	20.34	12.45	..	1.35	0.015	0.011	0.692	0.302	..

APPENDIX

TABLE VI.—Continued

	Moisture	Protein (N x 6.25)	Fat	Carbohydrate (By Difference)	Total Ash	CaO	Ca	P_2O_5	P	Fe
FISH (*Continued*)	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Perch	..	..	..	..	..	..	..	..	..	.0014
Porgies	79.10	18.25	1.74	..	1.26	0.076	0.054	0.536	0.234	..
Salmon, canned	59.12	23.20	16.23	..	1.93	0.019	0.014	0.531	0.232	..
" fresh	69.94	20.90	7.86	0.21	1.09	0.023	0.016	0.589	0.257	..
Tuna, canned	60.67	26.60	11.35	..	2.16	0.009	0.006	0.831	0.363	..
White, smoked	68.20	20.86	7.30	..	3.70	0.031	0.022	0.627	0.274	..
Lobster, canned	..	..	..	..	..	0.096	0.069	..	..	..
Oysters	..	..	..	..	..	..	..	..	..	.0081
CHEESE										
American	..	28.32	..	..	..	1.184	0.846	1.392	0.608	0013
Cottage	72.68	21.34	0.48	4.22	1.28	0.140	0.100	0.747	0.326	..
Parmesan	24.85	34.86	28.86	5.48	5.95	1.540	1.101	2.001	0.874	..
Swiss	29.93	30.85	31.95	2.87	4.40	1.520	1.086	1.860	0.812	.0012
DAIRY PRODUCTS										
Milk	..	3.11	..	..	..	0.166	0.119	0.213	0.093	..
Cream (31% fat)	..	..	..	..	..	0.144	0.082	..	..	..
Butter	..	0.59	..	..	..	0.019	0.014	0.040	0.018	..
GRAIN PRODUCTS										
Bread, Boston brown	30.85	5.97	6.29	53.98	2.92	0.180	0.129	0.465	0.203	..
Bread, Graham	..	..	..	..	..	..	..	..	..	.0003
" entire wheat	..	..	..	..	..	0.045	0.032	..	..	..
Bread, rye	32.44	8.72	0.28	56.50	2.06	0.033	0.024	0.338	0.148	..
" white	..	9.22	..	..	..	0.029	0.021	0.201	0.088	..
Bran	..	..	..	..	..	..	..	..	..	.0114
Buckwheat	..	..	..	..	..	..	..	0.053	0.231	.0011
Cornflakes	..	..	..	..	..	..	..	0.112	0.049	..
Cornstarch	12.20	0.47	0.41	86.72	0.20	0.025	0.018	0.133	0.058	..
Cream of Wheat	10.90	11.84	1.12	75.78	0.36	0.030	0.021	0.355	0.155	.0008
Farina	9.64	11.34	1.23	..	..	..	..	0.286	0.125	.0008
Flour, graham	..	..	..	..	..	0.057	0.041	0.833	0.364	.0036
" rye	12.47	11.03	1.72	..	..	0.035	0.025	0.590	0.258	.0011
" white	..	..	..	..	..	..	..	..	..	.0007
" entire wheat	..	..	..	..	..	..	..	0.707	0.309	.0035
Force	5.95	9.61	1.13	81.32	2.00	..	..	0.856	0.374	..
Macaroni	11.18	12.67	0.64	74.82	0.69	0.030	0.022	0.344	0.150	.0011
Pretzels	10.29	10.97	0.37	73.51	4.86	..	..	0.469	0.205	..
Shredded Wheat	..	11.12	..	..	..	0.058	0.041	0.740	0.323	.0042
Tapioca—sago	11.60	0.20	0.23	87.71	0.26	0.024	0.017	0.207	0.090	.0016
Wafers—cheese	7.05	14.90	12.20	63.25	2.60	0.474*	0.339*	0.720	0.314	..
Fig Newtons	11.50	4.16	4.69	78.47	1.18	0.112†	0.080†	0.254	0.111	..
Social Teas	5.66	6.50	9.94	76.87	1.03	..	..	0.362	0.158	..

* Calculated from the protein in cheese and crackers.
† Calculated from the protein in figs and crackers.

APPENDIX

TABLE VI.—Continued

	Moisture	Protein (N x 6.25)	Fat	Carbohydrate (By Difference)	Total Ash	CaO	Ca	P_2O_5	P	Fe
SUGAR	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Sugar, brown (molasses)	4.90	0.20	..	93.50	1.40	0.107	0.076	0.085	0.037	..
Corn syrup	..	..	..	..	..	0.072	0.051	0.025	0.011	..
Maple syrup	..	..	..	..	..	0.156	0.112	0.002	0.001	..
MOLASSES										
Barbadoes	..	..	..	..	..	0.043	0.245	0.114	0.050	..
New Orleans	..	..	..	..	..	0.520	0.372	0.128	0.056	..
Porto Rican	..	..	..	..	..	0.730	0.522	0.127	0.055	..
VEGETABLES										
Artichokes, French	82.80	3.44	0.51	11.97	1.28	0.057	0.041	0.228	0.100	..
Beans, dry, lima	..	..	..	..	..	0.085	0.061	..	..	.0015
" fresh, string	..	..	..	..	..	..	..	..	..	.0010
Brussels sprouts	..	..	..	..	..	0.044	0.031	0.260	0.114	..
Carrots	..	..	..	..	..	..	..	..	..	.0003
Cauliflower	..	..	..	..	..	..	..	..	..	.0006
Cucumbers	..	..	..	..	..	..	..	..	..	.0002
Egg plant	93.04	1.03	0.11	5.34	0.49	0.016	0.011	0.078	0.034	.0005
Kohlrabi	..	..	..	..	..	..	..	..	..	.0006
Parsnips	..	..	..	..	..	..	..	..	..	.0006
Peas, dry	..	24.56	..	..	..	0.076	0.054	0.874	0.382	..
Peppers, green	94.20	0.73	0.10	4.59	0.38	0.008	0.006	0.060	0.026	.0004
Potatoes, sweet	..	..	..	..	..	..	..	..	..	.0005
Rhubarb	..	..	..	..	..	..	..	..	..	.0010
Tomatoes	..	..	..	..	..	..	..	..	..	.0004
FRUIT										
Apples	..	0.19	..	..	..	0.009	0.006	0.025	0.011	.0003
Bananas	..	..	..	..	..	..	..	..	..	.0005
Grapefruit	..	..	..	..	..	..	..	..	..	.0002
Grape juice, I	79.90	0.43	0.07	..	..	0.013	0.009	0.028	0.012	..
" " II	..	0.28	..	..	..	0.018	0.013	0.020	0.009	..
Grapes, Tokay*	..	..	..	..	..	..	..	..	..	.0004
" Concord*	..	..	..	..	..	..	..	..	..	.0002
Orange juice	..	0.62	..	..	..	0.016	0.011	0.045	0.020	..
JELLY (Commercial)										
Currant	..	..	..	..	..	0.020	0.014	0.019	0.008	..
Strawberry	..	..	..	..	..	0.018	0.013	0.018	0.008	..
NUTS										
Almonds†	..	..	..	..	..	0.300	0.214	1.071	0.468	.0055
Peanuts	..	29.81	..	..	..	..	..	0.825	0.360	..
Peanut butter	..	..	..	..	..	0.060	0.043	0.820	0.358	..
Pecans	6.11	11.28	70.62	10.37	1.62	0.121	0.086	0.767	0.335	.0026
MISCELLANEOUS										
Coffee infusion	..	0.12	..	..	..	0.002	0.001	0.007	0.003	..
Gelatine	..	..	..	..	..	0.350	0.250	..	..	..

* Tokay grapes analyzed with skins; Concord without skins.
† Almonds were not blanched.

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