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Food Consumption of Farm Families

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FOOD CONSUMPTION OF FARM FAMILIES

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INTRODUCTION

For some years a number of home makers in widely separated counties of Ohio have been keeping family account books in which amounts and values of the different commodities used in the farm home have been recorded. These books contain records not only of goods purchased for use in the home but also of goods produced on the farm and used in the home and therefore present a fairly accurate picture of the consumption habits of individual farm families.

The families that have been keeping these records cannot be said to be representative of farm families of Ohio in general but must be considered as a selected group, since certain qualities are necessary in the home maker who voluntarily cooperates in such a project. At least one of the cooperating home makers was given the award of master farm home maker.

The records of 47 of the 50 families reporting for the year 1926 were sufficiently complete in regard to food to justify a detailed study. The results of such a study are herein reported.

THE FAMILIES STUDIED

PERSONNEL

The personnel of the 47 families varied considerably. The number of individuals in a family ranged from 2 to 9; the ages represented were from 1 to 83 years. In 11 families all were adults; in each of 14 families there was one child in addition to the adults; and in each of the remaining 22 families there were two or more children. Only 6 of the 47 families were what has sometimes been called the typical or average family, consisting of mother and father and three children.

BASIS OF COMPARISON

Because of these variations in the families it was necessary to use a method whereby the food needs of all the families as well as the food used could be put on a comparable basis. Otherwise it would have been impossible to make comparisons between families,

or with commonly accepted standards of food consumption for good nutrition. For this purpose a double dietary scale devised by Edith Hawley, food economist of the Bureau of Home Economics, was available. By the use of this scale it was possible to compare the food used by one family with that used by another and also to judge of the adequacy of the diets. The Hawley scale, published in Technical Bulletin Number 8, United States Department of Agriculture is given in Table 1.

TABLE 1.—Double Scale for Calculating the Energy and the Protein and Mineral Needs of a Family

Age of individual (years)	Degree of activity	Energy scale		Protein and minerals scale	
		Male	Female	Male	Female
Over 60	Moderately active	0.9	0.7	0.9	0.7
Over 60	Sedentary	.8	.6	.8	.6
18 to 60	Active	1.2	.9	1.1	.9
18 to 60	Moderately active	1.0	.8	1.0	.8
18 to 60	Sedentary	.8	.7	1.	.8
15 to 17	Moderately active	1.1	.9	1.5	1.2
10 to 14	Moderately active	.8	.....	1.3	.....
13 to 14	Moderately active	.....	.9	.....	1.3
10 to 12	Moderately active	.....	.8	.....	1.2
6 to 9	Moderately active	.6	.6	1.0	1.0
Under 6	Moderately active	.4	.4	.8	.8

Note—The standard for each nutrient is based on food as eaten and indicates the nutritive need of a moderately active man 70 kilograms (154 lb.) in weight.

As shown by this scale the moderately active man weighing 70 kilograms (154 lb.) and between 18 and 60 years of age is considered the equivalent of one adult male unit with food needs adequately supplied by 3,000 calories, 67 grams of protein, 1.32 grams of phosphorus, 0.68 gram of calcium and 0.015 gram of iron (5). Since this standard is for food as eaten and since the figures obtained from the account books were for food as purchased, and therefore included waste, the customary 10 percent allowance for waste has been added to the above standard. As used in this study for the purpose of comparison, therefore, the standard per adult male unit is 3,300 calories, 74 grams protein, 1.45 grams phosphorus, 0.75 gram calcium, and 0.0165 gram iron. No measurement of the vitamin value of the diets was attempted.

According to the Hawley scale, the moderately active man from 18 to 60 years of age is considered as one adult male unit on the basis of his food needs. The man of corresponding age and weight whose degree of activity is such that he may be considered active, has a higher energy need than the moderately active man. His energy needs are therefore represented as being equivalent to those of 1.2 adult male units and his protein and mineral needs

equivalent to those of 1.1 adult male units. In like manner the man of sedentary habits is considered in this scale as having an energy requirement less than that of the moderately active man, or 0.8, but a protein and mineral requirement equivalent to that of the moderately active man, or 1. So with other individuals of a group. By the use of the scale, therefore, the nutritive needs of a group may be expressed in terms of the needs of the adult male unit.

Furthermore, the fact that the food requirements of children differ from those of adults has been recognized and allowance has been made for the additional needs for growth. For example, in recognition of this requirement for growth, a boy from 15 to 17 years of age has been regarded as having an energy requirement equivalent to that of 1.1 adult male units and a mineral and protein requirement equivalent to that of 1.5 adult male units.

In determining the food needs of each family group, it was assumed that persons between 18 and 60 years of age living on a farm should be classified as "active" and that all others should be considered as "moderately active".

For example, in one houshold there were 9 persons as follows: 3 men, aged 30, 32, and 35, respectively; 2 women aged 35 and 67, respectively; a boy of 14; one girl of 12 and another of 9; and a boy of 4. According to Hawley's scale, this group would have a food requirement equivalent to that of 7.8 adult male units on the basis of energy needs and of 9.2 adult male units on the basis of protein and mineral needs. The following example shows the method by which the food needs of this family were determined.

TABLE 2.—Energy and Protein Needs of the Members of a Household Calculating According to Hawley's Double Scale

Age of individual, years	Energy scale	Protein and minerals scale
Man 30	1.2	1.1
Man 32	1.2	1.1
Man 35	1.2	1.1
Woman 35	0.9	0.9
Woman 67	0.7	0.7
Boy 14	0.8	1.3
Girl 12	0.8	1.2
Girl 9	0.6	1.0
Boy 4	0.4	0.8
Total	7.8	9.2

Calculations of the nutritive value of the food used by this family show that a total of 20,336 calories; 665.2 grams of protein; 9.79 grams of calcium; 12.715 grams of phosphorus and 0.1129 gram of iron were used daily. This meant an allowance for each

adult male unit of 2,607 calories, 72.3 grams of protein, 1.064 grams of calcium, 1.382 grams of phosphorus, and 0.0123 gram of iron daily.

A comparison of these figures with the standard shows that for this family group the calories were low, the protein was just about adequate, the calcium need was well provided for, the phosphorus was a little below the standard and the iron was decidedly low.

By applying the same scale in the same manner to each of the family groups, the food used by each family was put on such a basis that the amount used could be compared with that used by each of the other families and also with the commonly accepted standards. Costs also were compared in the same way.

In calculating the number of adult male units in the families studied, any person who lived in the home one week or more was counted for the time he was present. If any member of the family group were away from home one week or more his food needs were estimated only for the time he was actually in the home. For example: a daughter of 19 who was away from home 9 months and in the home 3 months was considered as part of the household only for the time she was actually in the home, or one-fourth of the year. She was therefore considered for the time she was in the home as having a food requirement equivalent to one-fourth that of an adult female for a year.

Table 3, which shows the number of adults and the number of children in each family, shows also the nutritive needs of each family for energy as well as for protein and minerals as expressed in terms of the adult male unit.

As shown by this table, altho the average number of individuals per family was 4.75, the family groups averaged 4 adult male units on the basis of energy and 4.6 adult male units on the basis of protein and mineral needs.

Data concerning the amount of food used by each family as shown by the records in the account books were tabulated in two ways. First, the foods with amounts used by each individual family for the year were tabulated and the nutritive value calculated to show the average number of calories, the average amount of protein, calcium, phosphorus, and iron per adult male unit per day. The cost was also calculated on the basis of energy needs per adult male unit (Table 3). The nutritive value of the food used by each family was then compared to the Sherman standard as explained on a preceding page. Second, a list of foods with

amounts used by the entire group was compiled, its nutritive value calculated, and the average per adult male unit compared with the standards. Total expenditures as well as expenditures for the various food groups were also determined. Before discussing in detail the results of each of the two compilations, it may be well to discuss briefly some of the methods used in collecting data concerning food habits of groups or of individuals.

TABLE 3.—Average Daily Food Consumption of 47 Ohio Farm Families

Family*	No. of individuals	No. of children	Adult male units (energy)	Adult male units (protein and minerals)	Food consumption per adult male unit per day					Cost per	
					Calories	Protein	Phosphorus	Calcium	Iron	Family	Adult male unit (energy)
1	9	4	7.8	9.2	2607	72 3	1.382	1.064	.0123	$3.08	$0.39
2	6	4	5.2	6.5	2563	68.1	1.310	0.984	.0128	2.14	.41
3	4	1	3.0	3.0	2817	83.6	1.293	0.844	.0121	1.16	.38
4	3	1	2.3	2.2	5828	162.8	2.788	1.369	.0320	1.45	.63
5	6	4	6.1	7.6	3530	74.6	1.349	0.806	.0158	2.98	.49
6	6	2	4.8	5.6	4910	103.9	1.934	1.456	.0217	3.50	.73
7	5	1	5.3	5.5	3261	94.6	1.541	0.956	.0164	2.08	.39
9	9	7	7.3	9.8	2810	62.4	1.123	0,866	.0096	2.01	.28
10	6	3	5.0	6.1	3093	68.3	1.061	0.623	.0129	2.02	.40
11	6	3	5.9	6.9	3521	79.2	1.413	1.123	.0123	1.88	.32
12	5	3	3.1	3.8	3924	90.6	1.731	1.364	.0156	1.19	.38
13	4	0	3.4	3.3	4296	129.6	2.149	1.493	.0205	1.82	.54
14	8	5	7.0	8.2	2757	72.5	1.237	0.874	.0134	2.30	.33
15	5	2	3.6	4.2	4323	119.3	2.325	2.026	.0184	1.87	.52
16	9	5	6.2	8.0	4031	84.0	1.330	0.696	.0155	2.32	.37
17	5	3	3.5	4.6	5267	124.9	2.204	1.287	.0200	2.16	.61
18	7	3	5.6	6.6	3214	84.5	1.362	1.041	.0123	2.06	.37
19	4	0	3.4	3.2	3921	119.0	2.166	1.510	.0189	1.44	.42
20	4	0	4.4	4.3	3502	101.4	1.745	1.053	.0235	1.88	.43
21	7	3	6.3	7.4	2266	54.8	0.849	0.495	.0089	2.02	.32
22	6	0	5.8	5.6	2503	77.5	1.168	0.634	.0129	1.74	.30
23	5	2	4.9	5.6	4702	115.4	1.691	0.944	.0177	1.81	.37
24	6	4	5.8	7.0	4765	103.4	1.395	0.650	.0143	2.21	.38
25	4	2	3.4	3.8	3791	79.5	1.758	1.444	.0168	1.20	.35
27	4	2	3.3	4.0	4833	114.3	1.850	1.002	.0205	1.74	.53
28	3	1	3.0	3.0	4375	118.3	2.151	1.512	.0225	1.67	.56
29	4	1	3.0	3.0	2968	71.4	1.469	1.263	.0120	0.98	.33
30	6	2	4.9	5.5	2699	62.3	1.052	0.750	.0161	1.37	.28
31	3	1	2.7	3.0	4214	115.3	2.062	1.694	.0175	1.39	.51
32	9	4	6.6	8.0	3554	99.0	1.397	1.084	.0114	1.93	.29
33	6	4	4.3	5.9	3284	77.0	1.306	1.005	.0099	1.59	.37
34	3	1	3.2	3.5	3848	105.2	1.761	1.290	.0190	1.20	.38
35	4	0	3.7	3.6	2696	66.1	1.280	0.718	.0150	1.22	.33
36	3	1	2.9	3.2	2081	62.4	0.952	0.370	.0122	0.86	.30
37	2	0	2.1	2.0	3770	83.4	1.624	0.918	.0208	1.08	.51
38	3	1	2.4	2.7	4343	107.7	2.543	2.711	.0225	1.19	.50
39	3	1	2.7	3.0	3315	91.1	1.457	0.815	.0173	1.12	.41
40	6	4	5.5	7.1	2226	46.8	0.777	0.346	.0091	1.44	.26
41	4	1	2.6	2.8	3956	115.8	2.218	2.153	.0179	1.19	.46
43	3	1	2.5	2.8	4990	137.5	1.981	1.340	.0243	1.18	.47
44	4	1	2.5	2.4	3360	110.7	2.069	1.720	.0208	1.10	.44
45	2	0	1.7	1.6	2803	80.3	1.503	1.118	.0138	0.76	.45
46	2	0	2.1	2.0	3504	91.0	1.226	0.450	.0154	0.60	.29
47	2	0	1.6	1.6	4742	146.9	2.575	1.740	.0231	0.88	.55
48	3	0	3.0	2.9	2890	74.8	1.042	0.427	.0136	1.03	.34
49	3	1	2.5	2.8	2550	70.6	1.165	0.618	.0118	0.81	.32
50	2	0	2.1	2.0	3401	90.2	1.169	0.428	.0140	0.71	.34
Av.	4.7	1.9	4.0	4.6	3587	92.9	1.594	1.087	.0163	1.60	.41

*Records of 50 families were obtained. For families 8, 26, and 42 the data were too incomplete to justify analysis.

METHODS OF DETERMINING AMOUNT OF FOOD CONSUMED

THE INDIVIDUAL METHOD

To obtain an exact record of the amount of food eaten by an individual, the food served the individual must be weighed. Calculations based on the actual amounts of food eaten give the nutritive value of the diet for the period studied. This procedure was followed in the study of the food consumption of children reported in Bulletin 400, Ohio Agricultural Experiment Station (3). Altho such a method is laborious and time consuming it can be used to secure accurate results in studies that cover only a short period of time.

INVENTORY METHOD

A second method of making a dietary study is to weigh all food used by the group under observation during a definite period of time. The nutrients provided by these amounts are calculated. Samples of waste are analyzed to determine the nutrients thus lost. The difference between the nutrients of the food as purchased and the nutrients of the food waste gives a measure of the food actually eaten. The study reported by Sherman and Gillett in Publication No. 121, of the New York Association for Improving the Condition of the Poor (7) is an example of a dietary study made by the inventory method. Altho not as time-consuming nor as laborious as the individual method, such weighing of food and analysis of waste for 47 families for a year's time manifestly would be impossible. Moreover, the results of such a study would give average figures only since the group and not the individual is the unit studied.

SURVEY METHOD

A third method of gathering food consumption data is the survey method. In using this method, trained agents visit the home makers and obtain estimates from them concerning the foods which have been used in the home during the period to be included in the study. This method has been of service in collecting large numbers of records of the quantity and value of goods used by family groups. In such a way food records for a year may be obtained with ease and rapidity. Two preliminary reports of food consumption figures obtained by this method have recently been made by Edith Hawley, of the Bureau of Home Economics (1) (2), who notes one of the possible sources of errors in figures obtained by this method when she says, "The figures upon which the

analysis is based are estimates made by the home maker of the amount of food consumed during the past year by her family." This method and the inventory method are concerned with the food used by the group rather than with that of the individual and figures given are for averages.

ACCOUNT BOOK METHOD

A record of amounts of food used with the price paid if the food is purchased and its value if produced on the farm is kept by the homemaker and would seem to show fairly accurately the amounts of food used in the home, since the entries in the account book are made at regular frequent intervals. Such a method was used in the study here reported. With this method, also, only average figures are possible.

Regardless of the care and accuracy of the homemaker in keeping her records, however, it is probably impossible to eliminate errors in this method as successfully as in either the individual or the inventory method.

In the first place, the measures of many foods rather than their weights are given. Carrots and beets may be recorded by the bunch; apples and potatoes by the bushel; grapes by the basket; eggs, oranges, and grapfruit by the dozen. Any computation of the nutritive value of such foods must be based on weight and there is always the question of the correct conversion factor to use. Eggs are not all of the same weight, neither are grapefruit, oranges, nor any of the other foods cited. The best that can be done is to use an average figure and assume that the items which are above the average will be balanced by those which are below.

A second source of error lies in the fact that the figures as recorded in the account books are for food "as purchased" and include skin, bone, seeds, parings, and other inedible portions. Altho such inedible portions have been taken into consideration in the calculations, all homemakers do not discard the same percentage of material. Some may discard more than has been assumed in the figures used, which would make the food consumption figures seem higher than they actually are.

A third source of possible error may be in the amount of food which was recorded in the account books as being used in the home but which may have been fed to poultry, dogs, or other animals or which may have been discarded because of spoilage.

Notwithstanding these and other possible sources of error in the material as used, it is probable that the figures as compiled and

presented in Tables 3 and 16 do present a reasonably accurate picture of the food habits of the rural families studied and may be of service in drawing certain conclusions.

FOOD CONSUMPTION OF INDIVIDUAL FAMILIES

Table 3 shows, in terms of nutrients, the food used by each of the 47 families as well as the average for all the families. Altho, as shown by this table, the average of the food used by all the families was well above the Sherman standard, examination of figures for the individual families showed a wide variation from family to family as far as adequacy and cost of the diet were concerned. As Sherman says, "The high intakes of some families raise the average but do not confer any benefit upon the families whose intake is low. The important question is the frequency with which dietary deficiencies occur (5)." It is a well recognized fact that the average is not representative of the individual and to an extent hides it.

ADEQUACY AND COST OF DIET

As shown by Table 4, fewer than half of the families studied, 43 percent, had diets that were adequate in every respect when compared to the standard. A much smaller number, 6 families, 13 percent, had diets that were inadequate in every factor, while for the remaining 21 families, or 45 percent, the diets were unsatisfactory in from one to four of the dietary essentials.

TABLE 4.—A Comparison of Adequacy and Cost of the Diets of 47 Ohio Farm Families

Adequacy of diet	Number of families	Percent of total number	Number of adult male units (basis of energy)	Cost per adult male unit (basis of energy)
Adequate in every factor	20	42.55	3.1	$0.50
Inadequate in one factor	1	2.13	3.1	0.38
Inadequate in two factors	5	10.64	5.1	0.39
Inadequate in three factors	8	17.02	4.0	0.35
Inadequate in four factors	7	14.89	5.9	0.33
Inadequate in all factors	6	12.77	4.3	0.32

When the adequacy of each diet was compared to the cost, as shown in Table 4, there was a fairly uniform agreement between the two. In the main, as the cost decreased, the adequacy of the diet also decreased. Those diets which were inadequate in all the factors considered were provided at an average cost of 32 cents per adult male unit per day as compared to an average cost of 50 cents per adult male per day for the families whose diets were adequate in every respect. In addition the families whose diets were

adequate averaged fewer adult male units per family than did the families whose diets were lacking in one or more essentials. This is in accord with Hawley's findings that smaller families tend to report a larger food consumption per unit than do the larger families (1).

CALORIE VALUE OF FOOD USED BY INDIVIDUAL FAMILIES

The statement is frequently made that the amount of food used by the average person is in excess of his needs. Considering the Sherman standard as representing the calorie needs of an adult male unit, Table 5 shows that 19 families, about 40 percent of the 47, averaged fewer than the desirable 3,300 calories per adult male unit per day. On the other hand, about 30 percent of the 47 families averaged 4,000 calories or more, an amount at least 20 percent in excess of the standard.

TABLE 5.—Frequency Distribution of Calories

Number of calories	Number of families	Percent of total number	Average number adult male units per family
Less than 3300 calories	19	40.42	4.7
3300—3600 (0 to 10 percent above standard)	8	17.02	4.0
3600—4000 (10 to 20 percent above standard)	6	12.77	3.0
4000 or more (20 percent or more above standard)	14	29.79	3.6

Those families for whom the calorie intake was found to be less than the standard averaged a larger number of adult male units per family than did the families that were having 3.300 calories or more per adult male unit per day. In addition, the average cost of the low calorie diets was 35 cents per adult male unit per day as compared to an average cost of 46 cents for the families whose energy requirements were adequately met.

For the purpose of this study, the foods used by each individual family were grouped as follows: (1) meat, eggs, cheese; (2) milk; (3) fruits and vegetables; (4) cereals and cereal products; (5) sugars and fats. A comparison of the percentage of calories derived from each of the groups by those families that were having fewer calories than the standard with corresponding percentages for families whose calories were up to or above the standard brought out the following facts. Families whose food intake averaged 3,300 calories or more per adult male unit daily had somewhat fewer calories from sugar and fat with somewhat more

calories from fruits and vegetables than did those families whose diets averaged fewer than 3,300 calories per adult male unit per day (Table 6).

TABLE 6.—Percentage of Calories Derived From Each of the Food Groups

Calorie value of diets	Meat eggs cheese	Milk cream	Fruits and vegetables	Cereals	Sugar and fats
Diets containing 3300 calories or more per adult male unit daily	17.62	14 25	17.36	23.71	25.84
Diets containing less than 3300 calories per adult male unit daily	18.22	13.69	15.09	23.48	29.48

PROTEIN VALUE OF FOOD USED BY INDIVIDUAL FAMILIES

Considering 74 grams as a desirable amount of protein to be used daily, Table 7 brings out the fact that 12 families, or 26 percent, were averaging less than that amount and that 24 families, or more than one-half of the entire number, were averaging at least 20 percent more protein daily than the amount considered necessary. These findings are in accord with the results of other dietary studies and with the opinion generally held, namely, that the average diet is more generally protected against a protein deficiency than against deficiencies of other essentials.

TABLE 7.—Frequency Distribution of Protein

Grams of protein	Number of families	Percent of total number	Average number adult male units per family
Less than 74 grams	12	25.53	6.0
74—81 (0 to 10 percent above standard)	7	14.89	4.9
81—89 (10 to 20 percent above standard)	4	8.51	4.9
89 or more (20 percent or more above standard)	24	51.06	3.8

Table 8 shows that diets which contained 74 grams of protein or more contained fewer calories derived from sugar and fat than did those diets which contained too little protein.

TABLE 8.—Percentage of Calories Derived From Each of the Food Groups

Protein value of diets	Meat eggs cheese	Milk cream	Fruits and vegetables	Cereals	Sugar and fats
Diets containing 74 grams or more of protein	17.86	14.08	16.13	24.14	26.65
Diets containing less than 74 grams of protein	17.86	13.94	17.37	22.10	29.25

CALCIUM VALUE OF FOOD USED BY INDIVIDUAL FAMILIES

Table 9, which shows the frequency distribution of calcium as averaged in the food used by the 47 families, indicates that about one-fourth of the number were having less than 0.75 gram of calcium daily. On the other hand, more than one-half, almost 60 percent of the families, were averaging at least 20 percent more calcium than the standard, and 51 percent were using one gram or more daily. For these rural families, at least, the statement that calcium is more likely to be lacking in the diet than any other chemical element does not hold. The generous amounts of milk and of cheese used by the group assure for almost three-fourths of the number a liberal provision of calcium.

TABLE 9.—Frequency Distribution of Calcium

Grams of calcium	Number of families	Percent of total number	Average number adult male units per family
Less than 0.75 gram	12	25.53	4.8
0.75—0.82 (0 to 10 percent above standard).....	3	6.38	5.4
0.82—0.90 (10 to 20 percent above standard).....	3	6.38	7.0
0.90 or more (20 percent or more above standard)	29	61.71	4.1
1.0 gram or more.....	25	51.06	3.9

Table 10 shows the importance of milk as a source of calcium in the diets studied. Diets that were adequate in calcium derived 16 percent of their calories from milk as compared to 8 percent for those diets inadequate in calcium. This of course emphasizes the well known fact that unless milk is used in liberal amounts it is difficult to provide adequately for one's calcium needs. Fruits and

TABLE 10.—Percentage of Calories Derived From Each of the Food Groups

Calcium value of diets	Meat eggs cheese	Milk cream	Fruits and vegetables	Cereals	Sugar and fats
Diets containing 0.75 gram or more of calcium	16.53	16.17	17.05	22.93	26.77
Diets containing less than 0.75 gram of calcium ...	21.74	7.83	14 68	25.61	28.89

vegetables also as sources of calories were more prominent in those diets which contained enough calcium than in those which contained less than the standard calcium. On the other hand, the cereals, meat, sugars, and fats were more prominent as sources of calories in those diets inadequate in calcium than in the diets in which calcium was provided in satisfactory amounts.

PHOSPHORUS VALUE OF DIETS OF INDIVIDUAL FAMILIES

A surprisingly large number, about one-half the families, were found to be averaging less than the desirable 1.45 grams of phosphorus daily (Table 11). On the other hand, more than one-third, 36 percent, averaged at least 20 percent more than the standard.

TABLE 11.—Frequency Distribution of Phosphorus

Grams of phosphorus	Number of families	Percent of total number	Average number adult male units per family
Less than 1.45 grams	23	48.94	5.9
1.45—1.60 (0 to 10 percent above standard)	4	8.51	3.3
1.60—1.74 (10 to 20 percent above standard)	3	6.38	3.8
1.74 grams or more (20 percent or above standard)	17	36.17	3.4

There are probably a number of reasons why so many diets were deficient in phosphorus. For about one-half the number the deficiency in phosphorus was accompanied by a deficiency in protein. Since the two are generally found together, a diet low in protein would tend to be low in phosphorus also. In a number of cases the low phosphorus intake was accompanied by a low calorie intake. In about one-half of these cases increasing the calories to 3,300 with the same type of diet would have increased the phosphorus to the point of adequacy.

In other cases a deficiency in phosphorus was associated with a deficiency in calcium. Where such a combination occurred, it was found that milk, an excellent source of both calcium and phosphorus, was used in small amounts. Increasing the amount of milk in these cases would have improved the diets in both phosphorus and calcium.

In still other instances, in which the only deficiencies in the diet were iron and phosphorus, it seemed probable that the use of highly milled cereal products rather than the whole cereal predominated.

Table 12 shows a higher percentage of calories derived from milk and from fruits and vegetables in those diets well provided with phosphorus than in those which contained less than the amount indicated in the standard.

TABLE 12.—Percentage of Calories Derived From Each of the Food Groups

Phosphorus value of diets	Meat eggs cheese	Milk cream	Fruits and vegetables	Cereals	Fats and sugars
Diets containing 1.45 grams or more of phosphorus	17.89	15.82	18.42	20.99	25.58
Diets containing less than 1.45 grams of phosphorus	17.85	12.73	14.99	25.52	28.60

IRON VALUE OF FOOD USED BY INDIVIDUAL FAMILIES

Earlier in this report the statement was made that, according to the food consumption figures, 20 of the 47 families were using diets which were adequate in every one of the factors considered. For the remaining 27 families, whose diets were found to be inadequate in one or more factors, each diet contained less iron than the standard. That is, more than one-half of the entire 47 families averaged less than 0.0165 gram of iron daily (Table 13). Only about one-fourth of the 47 families averaged at least 20 percent more iron than the standard.

TABLE 13.—Frequency Distribution of Iron

Grams of iron	Number of families	Percent of total number	Average number adult male units per family
Less than 0.0165 gram	27	57.45	5.5
0.0165—0.0182 (0 to 10 percent above standard)	5	10.64	3.6
0.0182—0.0198 (10 to 20 percent above standard)	3	6.38	3.6
0.0198 or more (20 percent or more above standard)	12	25.53	3.2

As shown by these figures iron is more likely to be lacking in the diet of the rural family than is any of the other dietary factors considered.

A more liberal use of fruits and vegetables undoubtedly would improve the diets in regard to iron. Calculations based on the foods contained in the family dietaries showed that those families that were averaging 0.0165 gram or more iron daily per adult male unit were getting almost twice as much iron from fruits and vegetables as the families whose diets showed too little iron.

Meat, a good source of iron, was used in liberal amounts by practically all the families studied, but the whole cereals, also excellent sources of iron, seemed not to be used as freely as is desirable in view of their value as sources of iron.

TABLE 14.—Percentage of Calories Derived From Each of the Food Groups

Iron value of diets	Meat eggs cheese	Milk	Fruits and vegetables	Cereals	Sugar and fats
Diets containing 0.0165 gram of iron or more daily	17.89	15.82	18.42	21.99	25.58
Diets containing less than 0.0165 gram of iron daily	17.85	12.73	14.99	25.52	28.60

Table 14 shows that milk, fruits, and vegetables were more prominent as sources of calories for those families whose diets contained an adequate amount of iron as indicated by the standard than for those families that were having less than the standard.

Because of differences in methods of collection and in dietary scales and standards used in this study and in the studies reported by Hawley, the results of the studies are not entirely comparable. Nevertheless, the same general trend in food habits may be observed. All three studies show a larger deficiency in iron than in any other of the dietary factors studied.

Table 15, which shows the number of diets that were adequate and the number that were inadequate in each of the dietary factors considered, brings out the following facts for the 47 rural families that reported the food used during the year:

27 families (57 percent) were inadequately provided with iron;
23 families (49 percent) were having too little phosphorus;
19 families (40 percent) were having too few calories;
12 families (26 percent) were having too little protein;
12 families (26 percent) were having too little calcium.

TABLE 15.—Adequacy of Diet in Terms of Nutrients Used by 47 Ohio Farm Families

Standards	Adequate as compared to standard		Inadequate as compared to standard	
	Number of families	Percent of total number	Number of families	Percent of total number
3300 calories	28	59.58	19	40.42
74 grams of protein	35	74.47	12	25.53
0.75 gram of calcium	35	74.47	12	25.53
1.45 grams of phosphorus	24	51.06	23	48.94
0.0165 gram of iron	20	42.55	27	57.45

The average expenditure for food for the 47 farm families ranged from 26 cents to 73 cents per male adult unit per day, with an average expenditure of 41 cents. This money was distributed among the food groups as follows: meat, cheese, and eggs, 29.17 percent; milk and cream, 14.05 percent; fruits and vegetables, 22.66 percent; cereals 10.38 percent; sugars and fats, 16.77 per cent; and miscellaneous 6.98 percent. Figure 1 shows how the average expenditure per male adult unit per day was distributed among the food groups.

FOODS USED BY RURAL FAMILIES

Table 16 shows the foods with the average amounts used by 47 rural families for the year 1926 as recorded in the account books. It also shows the number of families using each foodstuff with the cost per family and the smallest and the largest amounts used. These latter figures, showing the range in the amounts of foodstuffs used, give a fairly good indication of variations in amounts

used by different families. For example, altho the average amount of beef as shown in the records was 212.7 pounds per family per year, the range was from 2 pounds, the smallest amount, to 777.2 pounds, the largest amount recorded by any of the 47 families for the year. Other foods also were recorded in widely varying amounts. This was especially noticeable with fruits and vegetables. Table 16 shows also the percentage of the total amount of any food used that was purchased and the relative value of the foods purchased.

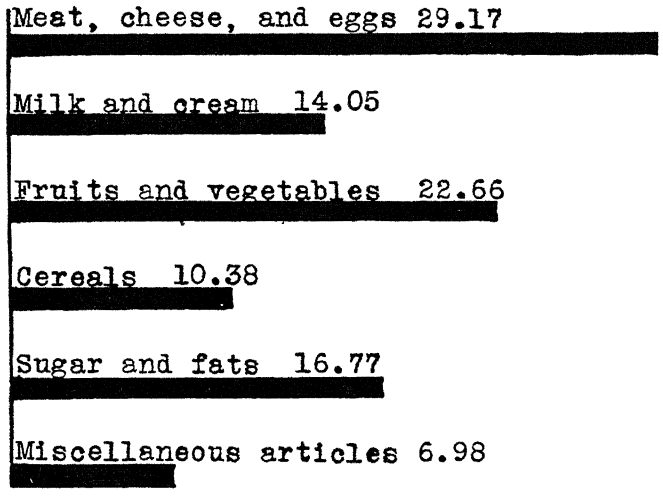

Fig. 1.—Percentage distribution of the average expenditures for food per adult male unit per day for 47 Ohio farm families

Computations based on figures given in Table 16 bring out the fact that the total amount of food used by the 47 families averaged daily, per adult male unit, 3,517 calories, 100.2 grams protein; 1.153 grams calcium; 1.712 grams phosphorus, and 0.0174 gram of iron.

Comparison of these figures with the commonly accepted Sherman standards for good nutrition, as quoted on page 4 (5). indicates that the average diet as shown by the computations referred to above, was about 6 percent above the standard for calories, 35 percent above for protein, 53 percent above for calcium, 18 percent above for phosphorus, and 5 percent above the standard for iron. In other words, if the total amount of food as recorded in the account books had been distributed equally on the basis of their food needs, among all the individuals of the families concerned, every individual would have had a diet well above the standard as far as the factors mentioned were concerned.

TABLE 16.—Average Amounts and Values of Foods Used by 47 Ohio Farm Families During the Year 1926

Food	Total amount used	Average per family		Average per adult male unit		Families using					Proportion purchased	
		Quantity Lb.	Value $	Quantity Lb.	Value $	No.	Lb. per family using	Value $ per family using	Least amount used	Greatest amount used	Pound percent	Value percent
Meat, fish and eggs												
Beef	9994.6	212.7	44.67	53.2	11.17	47	212.7	44.67	2.0	777.2	67.1	78.6
Mutton	60 5	1.3	0.23	0.3	0.06	3	20.1	3.65	7.5	33.0	0.0	0.0
Pork	13699.4	291.5	49.18	72.9	12.30	37	370.3	62.47	12.0	858.0	0.0	0.0
Poultry	4446.8	94.6	25.63	23.6	6.41	44	101.1	27.37	7.0	273.0	0.0	0.0
Fish, fresh	377.6	8.0	1.70	2.0	0.42	34	11.1	2 35	1.0	53.0	68.0	78.4
Fish, canned	413.9	8.8	2.36	2 2	0.59	39	10.6	2.85	1.0	41.0	100.0	100.0
Eggs	8685.1	184.8	9.47	46 2	2.37	47	184.8	9.47	44.5	480.0	1.2	1.4
Oysters	120.0	2.6	1.10	0.6	0.28	29	4.1	1.78	0.9	12.2	100.0	100.0
Milk, cream and cheese												
Whole milk	84708.5	1802.3	52.80	450.6	13.20	46	1841.5	53.95	42.4	5128.3	0.4	0.6
Skimmilk	10640.8	226.4	2.77	56.6	0.69	18	591.2	7.23	23.3	2692 4	0.0	0.0
Cream	5168.4	110.0	22.87	27.5	5.72	39	132.5	27.57	2.0	888 0	0.1	0.2
Buttermilk	1695.5	36.1	0.91	9.0	0.23	26	65.2	1.65	8.5	298.9	0 0	0.0
Cheese	535.1	11.4	4.10	2.8	1.02	45	11.9	4.28	1.5	37.0	100.0	100.0
Cottage cheese	810.2	17.2	2.45	4.3	0.61	33	24.6	3.49	2.0	190.0	0.2	0.3
Ice cream	498.1	10.6	2.70	2.6	0.68	39	12.8	3.25	0.2	90.0	100.0	100.0
Canned milk	58.0	1.2	0.15	0.3	0.04	5	11.6	1.41	1.0	26.0	100.0	100.0
Fatty foods												
Butter	4263.4	90.7	42.71	22.7	10.68	47	90.7	42.71	21.5	194.0	40.4	42.1
Salad oils	20.8	0.4	0.15	0.1	0.04	6	3.5	1.18	0.2	6.0	100.0	100.0
Peanut butter	162.5	3.5	0.86	0.9	0.22	30	5.4	1.35	0.2	19.5	100.0	100.0
Other table fats	79.0	1.7	0.49	0.4	0.12	6	13.2	3.86	1.0	63.0	100.0	100 0
Lard	3017.7	64.2	12.89	16.0	3.22	46	65.6	13.17	2.0	136.5	17.0	16.2
Other cooking fat	.....	.....	0.12	.....	.....	.....	.....	.....	.....	.....	100.0	100.0
Salad dressing	8.0	0.2	0.21	0.05	0.05	12	0.7	0.82	0.4	1.0	100.0	100.0
Sugars and sirups												
Honey	250.8	5.3	1.12	1.3	0.28	19	13.2	2.78	0.3	63.0	13.5	13.8
Molasses and sorghum	1047.7	22.3	3.72	5,6	0.93	28	37.4	6.25	1.5	264.0	15.5	12.4
Sugars	19085.8	406.1	26.89	101.5	6.72	47	406.1	26.89	119.5	942.0	100.0	100.0
Candy	609.5	13.0	4.70	3.2	1.18	46	13.2	4.81	1.0	48.8	100.0	100.0
Cereals												
Pretzels	1.5	0.03	0.06	0.01	0.02	2	0.8	0.15	0.5	1.0	100.0	100.0
Bread	11098.5	236.1	21.02	59.0	5.26	47	236.1	21.02	16.2	950.0	100.0	100.0
Cookies and cake	613.7	13.1	3.37	3.3	0.84	42	14.6	3.77	0.4	125.0	100.0	100.0
Doughnuts	43.9	0.9	0.20	0.2	0.05	11	4.0	0.85	1.0	17.5	100.0	100.0

TABLE 16.—Average Amounts and Values of Foods Used by 47 Ohio Farm Families During the Year 1926—Continued

Food	Total amount used	Average per family		Average per adult male unit		Families using					Proportion purchased	
		Quantity Lb.	Value $	Quantity Lb.	Value $	No.	Lb. per family using	Value $ per family using	Least amount used	Greatest amount used	Pound percent	Value percent
Cereals												
Cornmeal	1397.0	29.7	0.45	7.4	0.11	16	87.3	1.33	5.0	238.0	6.9	28.8
Puffed wheat	26.2	0.6	0.28	0.2	0.07	17	1.5	0.78	0.2	9.0	100.0	100.0
Crackers	1258.6	26.8	4.77	6.7	1.19	47	26.8	4.77	2.0	92.0	100.0	100.0
Flour	21197.6	451.0	20.20	112.8	5.05	47	451.0	20.20	65.0	2296.0	73.6	86.0
Shredded wheat	349.1	7.4	1.32	1.8	0.33	21	16.6	2.96	0.8	102.0	100.0	100.0
Hominy	95.0	2.0	0.13	0.5	0.03	18	5.3	0.35	1.0	18.0	100.0	100.0
Macaroni	300.5	6.4	0.82	1.6	0.20	40	7.5	0.96	1.0	27.0	100.0	100.0
Rice	493.3	10.5	1.06	2.6	0 26	42	11.7	1.18	0.8	57.0	100.0	100.0
Rolled oats	1233.5	26.2	3.29	6.6	0.82	40	30.8	3.86	4.0	153.6	100.0	100 0
Tapioca	32.5	0.7	0.14	0.2	0.04	16	2.0	0.42	0.5	5.0	100.0	100.0
Corn flakes	179.6	3.8	1.09	1.0	0.27	31	5.8	1.66	0.5	25.0	100 0	100.0
Noodles	10.0	0.2	0.06	0.05	0.02	6	1.7	0.46	0.5	3.0	100.0	100.0
Popcorn	253.9	5.4	0.27	1.4	0.07	12	21.2	1.06	0.2	141.0	15.5	22.4
Grapenuts	62.9	1.3	0.32	0.3	0.08	13	4.8	1.15	1.5	18.0	100.0	100.0
Cornstarch	64.5	1.4	0.16	0.4	0.04	29	2.2	0.26	1.0	5.0	100.0	100.0
Fruits												
Canned	250.9	5.3	0.76	1.3	0.19	10	25.1	3.58	5.5	83.2	26.2	27.8
Jams and jellies	128.7	2.7	0.48	0.7	0.12	8	16.1	2.79	2.0	72.0	0.0	0.0
Apples	33433.3	711.3	19.49	177.8	4.87	47	711.3	19.49	32.0	3600.0	12.7	15.1
Bananas	1830.7	38.9	3.57	9.7	0.89	45	40.7	3.72	2.5	334 8	100.0	100.0
Berries	4403.6	93.7	11.20	23.4	2.80	47	93.7	11.20	9.1	313.8	22.7	28.5
Currants	61.5	1.3	0.19	0.3	0.05	12	5.1	0.75	0.9	25.0	100.0	100.0
Grapes	2412.5	51.3	1.61	12.8	0.40	37	65.2	2.04	0.5	264.0	9.8	21.3
Grapefruit	242.0	5.1	0.88	1.3	0.22	19	12.7	2.19	0.5	172.0	100.0	100.0
Lemons	415.8	8.8	1.00	2.2	0.25	44	9.4	1.07	1.7	32.1	100.0	100.0
Muskmelons	2866.0	61.0	2.67	15.2	0.67	36	79.6	3.49	2.0	400.0	22.3	36.8
Oranges	2041.7	43.4	3.71	10.8	0.93	46	44.4	3.79	2.6	351.4	100.0	100.0
Peaches	9239.0	196.6	6.00	49.2	1.50	46	200.8	6.13	2.0	1605.0	44.6	43 5
Pears	5654.7	120.3	2.41	30.1	0.60	41	137.9	2.76	3.0	400.0	12.0	9.3
Pineapple	649 9	13.8	1.20	3.4	0.30	33	19.7	1.71	1.9	66.0	100.0	100.0
Plums	1893 4	40.3	1.09	10.1	0.27	28	67.6	1.83	2.0	350.0	8.1	10.5
Rhubarb	534.0	11.4	0.36	2.8	0.09	17	31.4	0.99	5.0	160.0	0.0	0.0
Cherries	4807.4	102.3	5.00	25.6	1.25	33	145.7	7.12	1.8	448.0	3.3	3.9
Raisins	404.4	8.6	1.29	2.2	0.32	44	0.9	1.38	0.9	31.3	100.0	100.0
Quinces	219.0	4.7	0.15	1.2	0.04	6	36.5	1.20	3.0	78.0	11 0	16.7
Prunes	191.0	4.1	0.72	1.0	0.18	28	6.8	1.20	1.0	50.0	100.0	100.0
Dates and figs	108.5	2.3	0.46	0.6	0.12	31	3.5	0.70	1.0	17.0	100.0	100.0
Unclassified	.....	.....	0.64	.....	0.16	12	.....	2.52	.....	.....	100.0	100.0

TABLE 16.—Average Amounts and Values of Foods Used by 47 Ohio Farm Families During the Year 1926—Continued

Food	Total amount used	Average per family		Average per adult male unit		Families using					Proportion purchased	
		Quantity Lb.	Value $	Quantity Lb.	Value $	No.	Lb. per family using	Value $ per family using	Least amount used	Greatest amount used	Pound percent	Value percent
Vegetables												
Unclassified	.....	.....	0.47	.....	0.12	9	.....	2.47	.....	.....	100.0	100.0
Asparagus	219.4	4.7	0.75	1.2	0.19	15	14.6	2.34	1.5	60.0	22.0	9.2
Beans, dried lima	107.0	2.3	0.18	0.6	0.04	6	17.8	1.37	4.0	56.0	0.0	0.0
Beans, fresh lima	116.6	2.5	0.77	0.6	0.19	8	14.6	4.54	3.0	56.0	0.0	0.0
Beans, string	2172.5	46.2	2.12	11.6	0.53	41	53.0	2.43	1.8	390.0	0.3	0.8
Beans, canned	412.2	8.8	1.01	2.2	0.25	30	13.7	1.59	1.2	50.2	68.4	52.2
Beans, navy	1168.2	24.9	2.31	6.2	0.58	39	30.0	2.78	1.0	88.0	66.0	52.1
Beets	2141.7	45.6	0.97	11.4	0.24	40	53.5	1.14	1.7	238.0	1 3	1.7
Cabbage	6419.2	136.6	3.97	34.2	0.99	46	139.5	4.05	12.0	595 0	12.6	16.5
Carrots	1859.0	39.6	0.75	9.9	0.19	33	56.3	1.07	1.0	707.8	3.4	16.7
Cauliflower	44.0	0.9	0.10	0.2	0.02	6	7.3	0.83	3.0	12.0	100.0	100.0
Celery	418.5	8.9	1.42	2.2	0.36	42	10.0	1.60	0.6	45.9	38.7	51.5
Corn, fresh	4815.2	102.5	4.56	25.6	1.14	41	117.4	5.22	1.6	537.6	0.2	0.2
Corn, canned	560.7	11.9	1.11	3.0	0.28	25	22.4	2.09	2.9	126.7	57.3	64.7
Cucumbers	2559.5	54.5	2.04	13.6	0.51	32	80.0	3.00	0.5	511.0	0.4	1.9
Pickles	965 2	20 5	2.60	5.1	0.65	25	38.6	4.88	1.0	112.0	7.1	6.2
Lettuce	1380.7	29.7	3.71	7.4	0.93	47	29.7	3.71	2.0	209.5	22.5	35.0
Onions	1729.9	36.8	1 67	9.2	0.42	43	40.2	1.83	0.1	196.0	38.3	35.4
Parsnips	270.6	5.8	0.17	1.4	0.04	15	18.0	0.54	1.5	65.5	9.6	20.3
Peas, fresh	1231.8	26.2	1.90	6.6	0 48	37	33.3	2.41	3.1	105.5	0.5	1.0
Peas, canned	349.4	7.4	0.99	1.8	0.25	27	12.9	1.72	1.2	31.2	97.9	98.1
Peppers	15 7	0.3	0.06	0.1	0.02	10	1.6	0.28	0.2	4.0	57.3	50.7
Potatoes	41098.8	874.4	30.41	218.6	7.60	47	874.4	30.41	120.0	2070.0	16.2	17.2
Radishes	39.5	0.8	0 28	0 2	0 07	20	2.0	0.66	0.2	4.0	30.5	20.9
Other canned	56.0	1.2	0 09	0.3	0.02	7	8.0	0.62	2.0	22.0	100.0	100.0
Salsify	31.3	0.7	0.02	0.2	0.005	3	10.4	0.33	1.5	25.0	0.0	0.0
Spinach	583.2	12.4	0.97	3.1	0.24	29	20.1	1.57	1.0	110.2	21.7	33.3
Squash and pumpkin	4668.5	99.3	1.49	24.8	0.37	37	126.2	1.89	10.0	526.0	3.1	4.4
Sweet potatoes	1471.5	31.3	1.33	7.8	0.33	39	37.7	1.60	4.0	113.8	33.2	54.7
Tomatoes, fresh	8582.5	182.6	3.64	45.6	0.91	45	190.7	3.80	1.0	1344.0	4.8	7.5
Tomatoes, canned	463.0	9.9	0 51	2.5	0.13	12	38.6	1.98	2.0	74.0	35.9	53.0
Kohl-rabi	108 0	2.3	0.06	0.6	0.02	5	21.6	0.58	9.0	50.0	0.0	0.0
Egg plant	24.0	0.5	0.02	0 1	0.005	3	8.0	0.33	1.0	15.0	0.0	0.0
Turnips	298.8	27.6	0.44	6.9	0.11	29	44.8	0.72	0.5	172.5	31.1	24.6

TABLE 16.—Average Amounts and Values of Foods Used by 47 Ohio Farm Families During the Year 1926—Concluded

Food	Total amount used	Average per family		Average per adult male unit		Families using					Proportion purchased	
		Quantity Lb.	Value $	Quality Lb.	Value $	No.	Lb. per family using	Value $ per family using	Least amount used	Greatest amount used	Pound percent	Value percent
Miscellaneous												
Baking powder	156.9	3.3	1.25	0.8	0.31	44	3.6	1.34	0.5	10.5	100.0	100.0
Chocolate	19.5	0.4	0.15	0.1	0.04	16	1.2	0.43	0.1	2.3	100.0	100.0
Cocoa	105.0	2.2	0.78	0.6	0.20	37	2.8	0.99	0.5	13.0	100.0	100.0
Cocoanut	47.7	1.0	0.27	0.2	0.07	28	1.7	0.45	0.5	9.0	100.0	100.0
Catsup	14.5	0.3	0.04	0.1	0.01	4	3.6	0.52	0.4	11.0	100.0	100.0
Jello	49.0	1.0	0.55	0.2	0.14	35	1.4	0.74	0.2	3.8	100.0	100.0
Olives	16.3	0.3	0.15	0.1	0.04	14	1.2	0.50	0.2	2.0	100.0	100.0
Soup	9.5	0.2	0.02	0.05	0.005	5	1.9	0.24	1.0	4.0	100.0	100.0
Nuts	2127.2	45.3	2.90	11.3	0.72	45	47.3	3.03	1.5	358.5	13.1	46.3
Coffee	759.6	16.2	7.74	4.0	1.94	46	16.5	7.91	1.0	56.0	100.0	100.0
Tea	62.4	1.3	0.91	0.3	0.23	31	2.0	1.38	0.5	10.2	100.0	100.0
Vinegar	1792.9	38.1	1.39	9.5	0.35	20	89.6	3.26	4.2	510.0	54.8	48.0
Yeast	18.7	0.4	0.35	0.1	0.09	29	0.6	0.57	0.1	1.7	100.0	100.0
Extracts	14.7	0.3	0.90	0.1	0.22	39	0.4	1.09	0.06	2.0	100.0	100.0
Salt	2012.0	42.8	1.01	10.7	0.25	46	43.7	1.03	2.0	162.0	100.0	100.0
Soda	105.0	2.2	0.20	0.6	0.05	39	2.7	0.24	0.5	10.0	100.0	100.0
Spices	47.7	1.0	0.90	0.2	0.22	45	1.1	0.94	0.12	4.0	100.0	100.0
Postum	113.5	2.4	0.41	0.6	0.10	14	8.1	1.37	2.0	30.0	100.0	100.0
Certo	34.0	0.7	0.42	0.2	0.10	19	1.8	1.05	0.5	5.5	100.0	100.0
Cider	52.0	1.1	0.04	0.3	0.01	5	10.4	0.38	1.0	25.5	100.0	100.0
Miscellaneous						38					100.0	100.0

That such was not the case has been shown by the fact that for only 20 (45 percent) of the 47 families were the diets adequate in all the factors considered.

A comparison of two methods of collecting food consumption figures, namely, the survey method used in the studies reported by Hawley and the account-book method used in the study herein reported, may possibly be based on a comparison of the figures reported in each case. Altho the scale used for calculating the food needs of the family is not the same in the three studies, the difference is so slight that it would have little influence on the results. As shown by Table 17, the fairly close agreement of the findings of the Vermont and the Ohio studies would seem to indicate that either method is a suitable one for the collection of data concerning food used by family groups over a year's period.

TABLE 17.—Comparison of the Nutritive Value of the Average Diet as Shown by Three Food Consumption Studies

Study	Method	Nutritive value per adult male unit per day				
		Calories	Protein	Calcium	Phosphorus	Iron
(Average) Ohio, Kansas, Ky., Mo ...	Survey	4370	121.0	1.22	2.05	0.021
Vermont	Survey	3830	130.0	1.16	1.78	0.0193
Ohio	Account book	3517	100.2	1.153	1.712	0.0174

Table 18 shows how the average dollar spent for food by the 47 families was divided among the food groups. It also shows the percentage of calories, protein, phosphorus, calcium, and iron derived from each of these food groups.

TABLE 18.—Nutrients From Each Food Group in Percentages

Type of food	Relative cost	Calories	Protein	Phosphorus	Calcium	Iron
Grain products	11.05	24.07	26.97	16.46	5.52	15.16
Milk	15.40	13.97	22.12	36.68	69.81	9.36
Vegetables	13.65	9.28	11.06	16.38	9.47	30 32
Fruits	12.15	7.15	2.53	4.99	4.84	8.75
Meat, fish, eggs, cheese	26.39	17.51	35.30	24.13	8.26	32.29
Sugar and other sweets	6.82	15.50	0.17	0.19	1.29	3.02
Fatty foods	10.73	11.60	0.61	0.56	0.40	0.50
Miscellaneous	3.81	0.91	1.23	0.61	0.42	0.59

GRAIN PRODUCTS

Grain products include breadstuffs, cereal breakfast foods, flour, meals, hominy, cornstarch, macaroni, and spaghetti. For the entire number of families studied, the calories derived from this food group averaged about one-fourth, 24 percent, of the total

calories. Cereals are considered the most inexpensive source of energy and when extreme economy in food selection is necessary may be used in larger amounts, as much as 40 percent of the total calories being suggested. In addition, cereals are also of value for their protein content, but are not satisfactory as sources of minerals and vitamins.

In this study, grain products averaged 11 percent of the total cost of food per year and provided 24 percent of the calories, 27 percent of the protein, 16 percent of the phosphorus, 6 percent of the calcium, and 15 percent of the iron (Table 18). A more extensive use of the entire cereal products would have increased the amounts of phosphorus and iron used and, therefore, would have improved the diets which were low in these two elements.

As indicated by the percentage of total calories derived from cereals, the Ohio families used cereal products less liberally than did the groups studied by Hawley. Figure 2 shows graphically the place of cereals in the diets of 47 Ohio families.

MILK

Whole milk, skimmilk, buttermilk, canned milk, cream, and ice cream were all included in this group. Of these, whole milk was used in the largest amounts and may be considered the most important from the standpoint of amount used and because of its value in the diet. Of milk, Sherman says, "It is important as a source of energy, protein, mineral elements and vitamins and is the most efficient of all foods in making good the deficiencies of grains and in insuring the all round adequacy of the diet (5)."

The amount of milk used by the 47 families ranged from 42 to 5,128 pounds per family for the year, with an average of 450 pounds per adult male unit. This is slightly over a pint a day, an amount somewhat lower than that reported by Hawley as being used by rural families in Vermont (2).

Whether or not a diet is adequate in calcium is largely dependent upon the amount of milk used. Since 12 families, about one-fourth of the entire number, had less than the desirable amount of calcium in the diet it would seem that the importance of this food is not fully appreciated by all rural families, even by all members of such a selected group as was included in this study.

As shown by Table 18, about one-sixth of the food dollar was used for milk. It is interesting to note that this 16 percent of the total expenditure for food provided 14 percent of the calories, 22 percent of the protein, 70 percent of the calcium, 37 percent of the phosphorus, and 9 percent of the iron. See Figure 2.

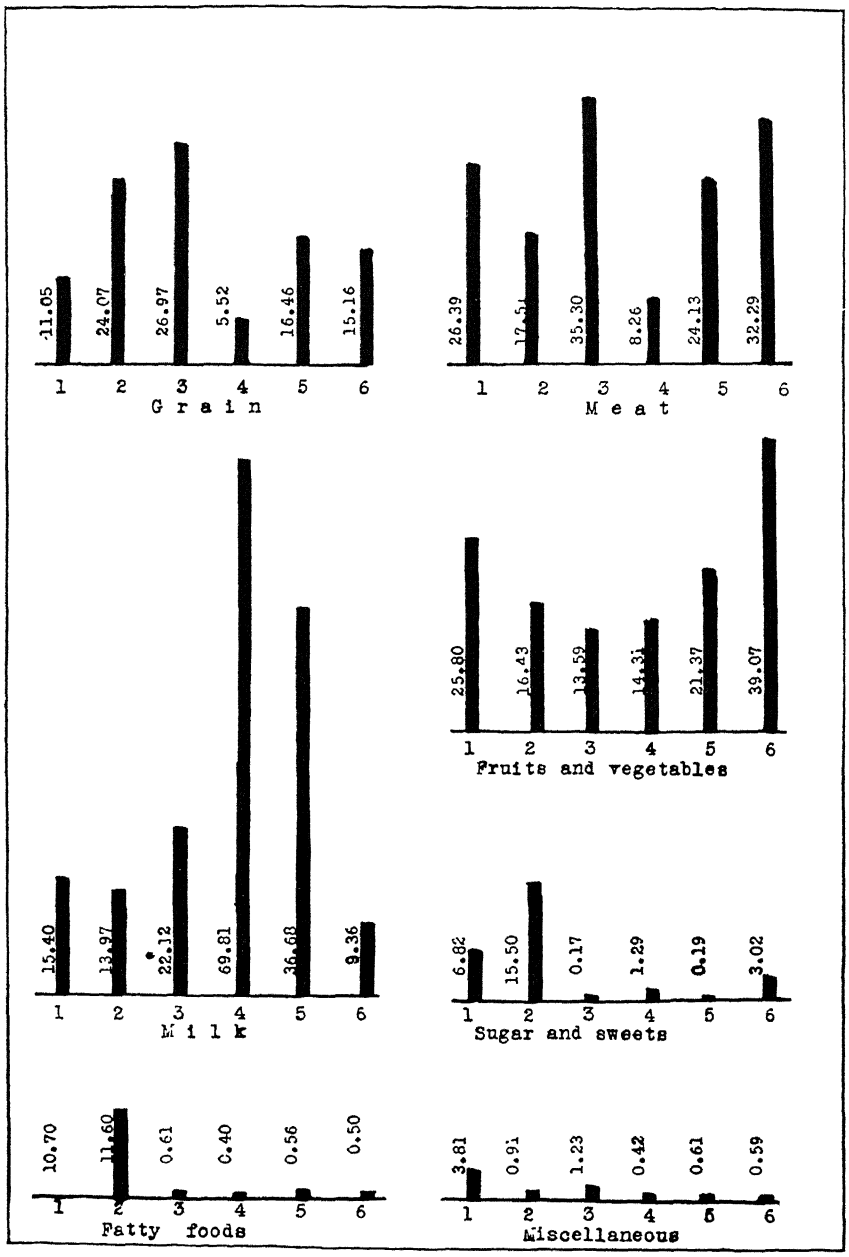

Fig. 2.—The place of typical food groups in the diets of 47 Ohio farm families shown in percentages

1. Cost
2. Calories
3. Protein
4. Calcium
5. Phosphorus
6. Iron

FRUITS AND VEGETABLES

The importance of fruits and vegetable in the diet is stressed by Sherman when he says, "Vegetables and fruits taken as a group may be ranked next after grain products and milk in importance as constituents of an economical and well balanced diet. They tend to correct both the mineral and the vitamin deficiencies of the grains products and in a sense they supplement the milk also in that many of the fruits and vegetables are rich in iron or vitamin C or both" (1).

A wide variety of fruits and vegetables were reported by the Ohio families. That the amounts used by different families varied greatly is shown in Table 16. For example, 12 pounds of cabbage was used by one family as compared to 595 pounds by another family; 1 pound of spinach as compared to 110 pounds; 1 pound of tomatoes as compared to 1344 pounds; 2 pounds of lettuce as compared to 210 pounds; 1 pound of carrots as compared to 708 pounds, 32 pounds of apples as compared to 3600 pounds, and 10 pounds of grapes as compared to 264 pounds. These illustrations emphasize the fact that the average amount cannot be considered an indication of the amount each family was using.

It is an interesting fact that of the 20 diets which were well protected in regard to every food factor considered, 18 percent of the calories were derived from fruits and vegetables as compared to 15 percent of calories from this group of foods for diets which were inadequate in one or more factors. Adequacy of diet and a liberal use of fruits and vegetables seem to accompany each other. The 27 diets that were found to be lacking in one or more of the factors considered would certainly have been improved by the more liberal inclusion of fruits and vegetables. Sherman says, "Increasing use of vegetables and fruits improves the food value of the diet at every point at which the American dietary is likely to need improvement (6)."

For an expenditure of 26 cents for fruits and vegetables from each dollar spent for food—the group averaged 16 percent of its calories; 14 percent of its protein; 14 percent of its calcium; 21 percent of its phosphorus; and 39 percent of its iron. See Figure 2.

MEAT, EGGS, FISH, CHEESE

In this group were included the high protein foods such as beef, mutton, pork, poultry, fresh and canned fish, oysters, eggs, and cheese. Sherman designates meats as "being rich in protein or fat or both but showing in general the same mineral and vitamin

deficiencies of the grains (1)." Eggs and cheese, however, differ from meats in these two respects. Of the meats used by Ohio farm families, pork was used in the largest amounts. The amount averaged 72.9 pounds per adult male unit per year as compared to an average of 36.8 pounds reported by Hawley for rural families in Vermont. Beef and eggs, as reported, both were being used in smaller amounts by the Ohio families than by the Vermont families.

As shown by Table 18, about 18 percent of the total calories used by the Ohio families were derived from the protein-rich group of foods. This is a somewhat larger amount than that reported by Hawley in her own studies and also for the studies she reviews. It is also larger than is indicated in the standard for good nutrition to which she refers.

The 47 Ohio families of this study spent 26 percent of their food money for this group of foods, as compared to 25 percent spent by the Vermont families and 28 percent by Kansas, Kentucky, Missouri, and Ohio families of Hawley's study; not a very significant difference. Rural families in such localities as have been studied all tend to spend about the same proportion of their food money for the protein-rich group of foods. Of every dollar spent for food by the 47 Ohio farm families, 11 more cents were spent for meat than for milk. For this expenditure for meat, which was 70 percent greater than the expenditure for milk, the farm family obtained 3.5 percent more calories, 13.2 percent more protein, and 23 percent more iron, but 12 percent less phosphorus and 61 percent less calcium than from the money spent for milk. See Figure 2.

SUGAR AND OTHER SWEETS

In this group of foods have been included honey, molasses and sorghum, syrups, sugar, and candy. Jams, jellies, and preserves have not been included in this group but have been considered with fruits and vegetables. From sugar and other sweets 16 percent of the total calories were derived as compared to 11 and 13 percent in the studies made by Hawley.

The amount of sugar used seems large. Each adult male unit averaged 101.6 pounds a year of sugar alone in addition to the other sweet foods used. The range per family was from 119.5 pounds to 942 pounds.

In discussing the use of large amounts of sugar as shown by per capita consumption figures, Sherman says, "The cheapening of a staple article of food, which is almost universally popular and

which, like the refined sugar of commerce, is of uniform and well known composition and practically free from danger of adulteration or harmful deterioration would be a source of great satisfaction but for the fact that refined sugar constitutes an extreme case of a one sided food, its sole nutritive function being to serve as a fuel so that as the energy requirement of the body is met to a larger and larger extent by the consumption of refined sugar, there is a constantly increasing danger of unbalancing the diet and making it deficient in some of the substances which are needed for the building and repair of body tissue and for the regulation of physiological processes (6)."

Rose says, "Sugars, while adding much to the palatability of the diet contribute fuel only and must not constitute a high proportion of the total calories or there will be danger of shortage of ash constituents (4)." That a shortage of ash constituents was found in more than one-half of the dietary records for the 47 families has been shown. Calcium, phosphorus, or iron was found to be lacking in more than one-half the records and for more than one-fourth of the number all three minerals were provided in too small amounts.

The lack of minerals in the diets here reported is probably at least partially accounted for by the very liberal use of sugar, since sugar tends to crowd out of the diet other foods, which, in addition to their calorie value, may also be sources of minerals and vitamins. Rose suggests the use of sugar in the diet not to exceed 10 percent of the calories (4). The average amount used by the 47 rural families was 15 percent, an excess of one-half the amount suggested.

FATTY FOODS

Fatty foods, as listed, included butter, salad oils, peanut butter, other table fats, lard and other cooking fats. Of these, butter and lard were used in the largest amounts. Butter was used in amounts ranging from 21.5 to 194 pounds per family per year. The amounts of lard used ranged from 2 to 136.5 pounds.

Fatty foods provided 11 percent of the total calories for the year, an amount lower than the 15 to 18 percent reported in the Hawley studies (1). Rose suggests that from 12 to 18 percent of the total calories may well be derived from fat (4). The fat content of the individual diets and of the total food list was not calculated. From the amounts of pork, eggs, and milk, all of which contain liberal amounts of fat, used, in addition to the foods classified as fatty, it is probable that the diets were sufficiently high in fat.

MISCELLANEOUS ARTICLES

Under this heading were included such foods as chocolate, cocoa, cocoanut, nuts, and olives; the condiments, such as tea, coffee, vinegar, and flavoring extracts; and the materials used as leavening agents, such as baking powder, yeast, and soda. Of these miscellaneous articles, nuts appeared in the largest amounts. The families averaged 45.3 pounds each per year. The range was from 1.5 pounds to 358.5 pounds per family.

Altho two other articles, vinegar and salt, in addition to nuts, exceeded in quantity the amount of coffee used, the cost of coffee exceeded that of any of the other articles included in the miscellaneous group. For all but one of the 47 families, coffee was recorded in the account books. The smallest amount recorded as being used by any family for the year was 1 pound, and the largest amount 56 pounds, slightly more than 1 pound a week.

On the other hand, tea was an item in only 31 account books, the smallest amount recorded being 0.5 pound and the largest amount 10.2 pounds. Cocoa was recorded by 37 families, in amounts ranging from ½ pound to 13 pounds. Postum was an item in only 14 of the account books; the range in amounts used being from 2 pounds to 30 pounds per family per year.

Baking powder and soda were recorded as used in almost identical amounts, the range for each being from ½ pound to about 10 pounds per family. The cost of the baking powder, however, greatly exceeded that of the soda.

For an expenditure of 3.8 percent of the food dollar for miscellaneous groceries, 0.91 percent of the calories; 1.23 percent of the protein; 0.61 percent of the phosphorus; 0.42 percent of the calcium, and 0.59 percent of the iron were provided. See Figure 2.

Altho some foods from each of the food groups were found in all the records, the variation in food habits among rural families is emphasized by the fact that only 12 articles of food, namely—beef, eggs, butter, sugar, bread, crackers, flour, apples, berries, lettuce, potatoes, and milk were found to be common to all the account books. Neither whole milk nor skimmilk was found in all the records, but one or the other was found in all and both in a number of records. See Table 19. This table also serves to show the wide variations in amounts of these dozen articles of food, which were found in each of the family records.

TABLE 19.—List of Foods Which Appear in Every Account Book of 47 Ohio Farm Families

Food	Average amount used per adult male unit	Least amount used per family per year	Greatest amount used per family per year
	Lb.	*Lb.*	*Lb.*
Beef	53.2	2.0	777.2
Eggs	46.2	44.5	480.0
Butter	22.7	21.5	194.0
Sugar	101.5	119.5	942.0
Bread	59.0	16.2	950.0
Crackers	6.7	2.0	92.0
Flour	112.8	65.0	2296.0
Apples	177.8	32.0	3600.0
Berries	23.4	9.1	313.8
Lettuce	7.4	2.0	209.5
Potatoes	218.6	120.0	2070.0
Milk	507.5	107.7	5128.3

MONEY COST OF FOOD USED BY RURAL FAMILIES

In Table 16 the average expenditure for each of the foods listed is given. The method by which these prices were determined was as follows. The homemaker recorded the amount paid for the foods which were purchased. For foods produced on the farm and used in the home, she recorded the price for which they could have been sold. The prices thus recorded were checked against a price index for the year by workers in the department of Rural Economics of the Ohio Agricultural Experiment Station and prices changed accordingly. This method ironed out any large discrepancy in prices recorded for foods produced on the farm and used in the home and what similar foods would have cost if purchased.

Table 18 shows the average division of the dollar spent for food by the 47 selected farm families of Ohio. About one-fourth (26.39 percent) of each dollar was spent for meat, poultry, fish, eggs, and cheese. The amount spent for these foods does not differ materially from the amount reported by Hawley for her two studies, 25 and 28 percent, respectively (2). The custom of spending somewhat more than one-fourth of the food dollar for meat and similar foods seems to be pretty well established in rural groups.

The expenditures for fruits and vegetables, 25.80 percent, were notably higher for the group here reported than for the groups reported by Hawley, 16 and 19 percent, respectively.

On the other hand, the amount as reported spent for milk was somewhat lower than amounts reported by Hawley for either of the groups whose expenditures for food she studied.

Sherman has made the following suggestions concerning food expenditures:

(1) At least as much should be spent for milk (including cream and cheese, if used) as for meats, poultry, and fish.

(2) At least as much should be spent for fruit and vegetables as for meat, poultry, and fish.

Commenting on these two rules he says, "These simple rules are said to have been found useful as a guide in both low-cost and liberal cost food budgets and can obviously be used in all cases where even the simplest of records of expenditures are kept (5)".

A re-distribution of costs according to the grouping referred to above shows the following division of the food dollar; for milk, and cream, and cheese, 16.62 percent; for fruits and vegetables 25.80 percent; for meat and fish and poultry 23.39 percent. This re-distribution shows the expenditures for fruits and vegetables well up to the standard suggested by Sherman with the expenditures for milk and cheese considerably below.

TABLE 20.—Group Expenditures for Food

	Milk and cheese	Meat and eggs	Fruits and vegetables	Bread and cereals	Fats, sugars, and other groceries
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Average of 224 families	10.59	37.66	15.86	18.29	17.60
Average of 47 Ohio families	16.62	25.17	25.80	11.05	21.46
Suggested division	20 or more	20 or less	20 more or less	20 or more	20 or less

Table 20 was compiled to compare the division of the food dollar of the 47 Ohio families whose expenditures were studied with corresponding food expenditures of 224 families, both rural and urban, as quoted by Sherman. As shown by this table, the rural Ohio families reported a more equable division of the food dollar than was reported for the 224 families. Rural Ohio families averaged 50 percent more for milk and cheese, 62 percent more for fruits and vegetables, 22 percent more for fats, sugars and other groceries, with one-third less for meat and somewhat more than one-third less for grain products than the 224 families referred to. The increased expenditure for milk and for fruits and vegetables by the Ohio group is significant of the increasing importance attached to these foods and seems to offer evidence of a changing habit in regard to food.

Where strict economy is desired, a larger expenditure for grain products than is shown by the record of the 47 Ohio families

might be advisable. The expenditure by the Ohio rural families of approximately 45 percent less than the 20 percent suggested above would seem to indicate that for the families whose expenditures were studied, economy was not a significant motive in the selection of food or that such families did not realize that they could provide an adequate diet more economically by the use of a larger amount of cereals.

An indication of the relative amount of each food listed that was purchased for use in the home is given in Table 16. As shown by this table, 59 percent of the total amount of food used in the 47 farm homes was purchased. This amount represents 60 percent of the total value of all the foods used.

A small number of articles, including among others, poultry, buttermilk, skimmilk, jams and jellies, lima beans, and egg plant were recorded only as being produced on the farm. A much larger list of foods and food adjuncts were recorded only in the list of purchases. The remaining items of the list were purchased in some instances and produced on the farm in other instances.

SUMMARY AND CONCLUSIONS

Food consumption records for the year 1926 as shown by family account books of 47 rural families have been studied in two ways.

A. The adequacy of the diet of individual families was determined.

B. A table showing the average quantity and value of the foodstuffs used by the group during the year was compiled and used as an indication of the food habits of the group.

A. Diets of individual families.

1. According to the double dietary scale of Hawley, the 47 families whose account books were studied averaged 4 adult male units on the basis of energy needs and 4.6 adult male units on the basis of mineral and protein needs.
2. Average nutrients used per adult male unit were as follows:
    a. Calories, 3,587
    b. Protein, 92.9 grams
    c. Phosphorus, 1.594 grams
    d. Calcium, 1.089 grams
    e. Iron, 0.0163 gram.

3. These nutrients were provided at an average cost of $1.60 per family, or 41 cents per adult male unit per day.
4. Altho the average food consumption, as shown by the figures cited above, indicates adequacy of the diet in every factor considered, only 20 families, 43 percent of the 47 families, had diets in which all the nutrients were provided in sufficient amounts.
5. For 27 families, 57 percent of the total number, the diets were inadequate in one or more factors as indicated below. (The standards as quoted allow 10 percent for waste.)
    a. For 12 families, 25.53 percent, the amount of protein was below the standard of 74 grams.
    b. For 12 families, 25.53 percent, the amount of calcium was less than the standard of 0.75 gram.
    c. For 19 families, the diet contained less than the accepted standard of 3,300 calories.
    d. For 23 families the diet contained less than 1.45 grams of phosphorus.
    e. For 27 families, the diet contained less than 0.0165 gram of iron daily.
6. As shown by these figures, rural families whose diets were inadequate in one way or another tended to provide for their protein and calcium needs first, then for their energy needs, then for phosphorus, and lastly for iron.
7. For these families, the statement that the average diet is more likely to be lacking in calcium than in any other factor does not hold.
8. In the main, more generous amounts of milk and of fruits and vegetables were provided in the diets that were adequate than in those that were inadequate. It would seem that the value of milk and of fruits and vegetables should be still further stressed in educational work designed to influence rural families in their food selection.
9. Those diets that were adequate in all factors averaged a higher cost per adult male unit than the diets that were inadequate in one or more factors.

B. Food habits of farm families.

1. A table showing the foods with the average amounts used, the costs, the percentage purchased, and the relative value of the percentage purchased is given. Figures are also given to show the range in the amounts of foods used.
2. When the nutritive value of the average diet, as determined from these figures, was compared to the standard of good nutrition, adequacy in every factor was found.
3. A comparison was made of the nutrients of the average diet referred to above with corresponding figures based on food consumption data collected by the survey method and given by Hawley in a preliminary report of the food consumption of rural families in Vermont. A fairly close agreement between the two sets of figures would indicate that the survey method and the account-book method are equally reliable methods of collecting food consumption data.
4. From figures recorded in the 47 family account books, it appears that these farm families tended to divide the food budget more evenly among the different food groups than did the 224, composed of urban and rural families whose diets have been summarized by Sherman. The changed emphasis would seem to indicate a greater realization by rural families of the importance of the "protective foods"—milk, fruits, and vegetables.
5. Altho approximately as much was spent for fruits and vegetables as for meat, the fact that the average diet was barely adequate in its iron content and that more than one-half the families were having less iron than is considered desirable would seem to indicate the need for a larger expenditure for fruits and vegetables. Such a change in the food budget would improve the diets in other respects also.

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