A STUDY OF THE DIETS OF TEN LOW-INCOME FAMILIES

by

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INTRODUCTION

The present economic situation has focused attention upon problems of nutrition in a manner unparalleled in the past. The tremendous increase in the number of unemployed and of those rural families whose income has fallen below the subsistence level due to successive crop failures, has necessitated the provision of dietary needs at public expense. Thus the adequacy of diets of individual families has become a matter of public concern. In order to obtain the information needed to enable relief agencies to effect economy in administration of funds and yet supply the kind and quantity of foods necessary to meet the nutritional needs of this large number of dependent families, a number of dietary studies have been conducted in various sections of the United States and in foreign countries as well.

REVIEW OF LITERATURE

Bigwood and Roost reported a nutritional study of Belgian unemployed, the data being obtained from an analysis of the diets for one month of families chosen at random from the lists of unemployed (6). According to the scale adopted, which employed the woman requiring 2600 Calories as the unit, five families were more than 10 per cent below the standard for energy. The mineral intake per unit averaged for calcium, 0.74 gram; phosphorus, 1.44 grams; and iron, 0.015 gram. The amount of vitamin B complex was probably sufficient, that of A and D was approximately half of the standard requirement, and of C, somewhat more than half.

An outstanding study was conducted by Okey and Smythe (8), who analyzed the food purchased by 25 families dependent on the Berkeley Welfare Society. The study was made for the purpose of determining the manner in which dependent families chose their food when given relatively free choice. The results were intended for use in evaluating the methods of administering relief on the basis of the best provision of nutritional needs with the least expenditure of public funds. Their study indicated the use of fats and sweets in too large amounts at the expense of vitamin carriers and the great tendency to consider any one vegetable or fruit the equivalent of any other vegetable or fruit. The number of pounds of vegetables bought was 28 per cent below the minimum provided by the Alameda County food schedule. They found lack of milk to be the outstanding deficiency. The average amount bought was 35 per cent less than the lowest amount recommended by the food budget. All but one family bought sufficient protein to meet their minimum standard of 60 grams per adult male unit. Calcium averaged 2 per cent above the allowance of 0.7 gram; phosphorus, 6 per cent above the standard of 1.2 grams; and iron, 15 per cent above the 13-milligram allowance. However, 40 per cent of the families were below the standard for phosphorus, 44 per cent for calcium, and 36 per cent for iron. There was no striking surplus of vitamins nor widespread deficiency, although no family's purchases were entirely adequate with respect to all or even three of the vitamins. Forty-four per cent of the families were below the energy standard of 3000 calories, but the median was $1\frac{1}{2}$ per cent above.

Another study by Okey and Luck (7) on the nutritive value of foods purchased by 233 families on relief during a period of two weeks, revealed the average amount of food purchased per equivalent adult male unit per day furnished 2551 Calories, 63 grams protein, 0.65 gram calcium, 1.08 grams phosphorus, and 10.8 milligrams iron. The vitamin A content of the diet apparently was ample and G was probably sufficient, but B and C were seriously low. This study indicated that the average American family, receiving an unrestricted grocery order barely large enough to purchase a carefully planned adequate food allowance, cannot be expected to choose foods that will fulfill all the requirements of a normal diet.

A two-year study made by Gray (3) of one family's food during the depression indicated that even intelligent persons living on a very low income are likely to have a deficient diet. The dietary of the three women in this family, two of whom were college students, furnished per person per day 2372 Calories, 41 grams protein, 0.59 gram calcium, 0.79 gram phosphorus, and 0.000754 gram iron.

Wiehl (12) analyzed the diets of 100 low-income families in each of nine different localities in the East as part of a study of the health of low-income families conducted by the United States Public Health Service. A large number of these families were on relief, receiving aid from some organized agency. Records were obtained of the food supply of each family for one week. Relief families in five northern cities averaged 2700 Calories per adult male unit per day; in New York City, 2910 Calories; in Birmingham, Alabama, 2960 Calories; and in coal mining towns in West Virginia, 2910 to 3540 Calories. As in the study reported by Okey and Smythe (8), the amount of milk purchased by the lowest-income families was too low in all the communities, the deficiency amounting to one-third less than the minimum requirement. The amounts of fresh and canned vegetables and fruits were either below or about equal to minimum requirements. Fats and sweets were used in excess. As a result the average dietary was low in calcium and vitamins.

Bingham (1), in an investigation of how families buy food, found that the poorer families spent approximately as much for food per week as did those of the upper middle class. His findings were as follows: top wealth, $10.71 per week; upper middle class, $9.60 per week; lower middle class, $8.91 per week; and poor families, $9.46 per week. The figures were average expenditures for the average-sized families in the groups. Reasons advanced for these inconsistencies were that the poor families rarely took advantage of sales and bought only when they had both the need and the money, and that they consumed much meat, bought "quality national brands", and frequently bought delicacies.

No local studies comparable to those listed have been made. Therefore it seemed desirable to obtain information regarding the adequacy of the diets of a representative group of low-income families in Manhattan, Kansas.

PROCEDURE

The problem of securing the cooperation of 10 relief families for the study was simplified by appealing to the local relief agency. The case worker suggested a number of families who might be willing to participate in the project and accompanied the investigator on the first visit to each home to determine their willingness to cooperate. The manner and purpose of keeping the data were explained to each family and an appointment was made with the housewife for taking the initial inventory. (form 1).

On the second visit, the investigator helped the housewife to make an inventory of all supplies on hand, weighing articles on household scales as necessary. On blanks provided for the purpose (form 2), records were kept of food purchased, food obtained from other sources, food given away, food eaten between meals, the number of guest meals, and the number of meals taken away from home by members of the household. All of the families except one, an aged couple, kept a more or less complete record of their daily menus, which served as a check on their food record and provided a means of determining the manner of utilizing their food. The blanks were collected three times a week.

Form 1. INVENTORY BLANK.

Name ______________________ Date ______________________

Food	Size of Container	Amount on hand	Cost per unit	Total cost
Dairy products				
Butter				
Cheese				
Cheddar				
Cottage				
Milk				
Condensed (sweetened)				
Dried				
Evaporated				
Fresh - whole				
- skimmed				
Eggs				
Fats and Oils				
Fats				
Compound				
Lard				
Oleomargarine				
Oils				
Corn oil				
Cottonseed				
Olive				
Fruits				
Canned				
Apples				
Apricots				

Sample Page. Other food groups used were grain products, meats, sugars, vegetables, food adjuncts, nuts, and miscellaneous.

HOME RECORD

Day of week______________ Name of family_______________

I. Foods eaten for breakfast

II. Foods eaten for dinner

III. Foods eaten for supper

IV. Foods purchased today

food	amount	cost

V. Foods obtained from other sources

food	amount

VI. Foods eaten between meals, including candy, popcorn, fruits, etc.

VII. Meals away from home.

VIII. Meals to guests

No. of guests	No. of Meals

IX. Food given away.

food	amount

Form 2.

Information regarding the age and sex of the members of each family and the amount of the family income was obtained during these visits.

At the end of the period of 28 consecutive days, another inventory was taken, and the amount of food on hand at that time was subtracted from the sum of the food obtained during the period and the amount on hand at the beginning. From this total was deducted the amount of food given away, and allowances were made for meals eaten outside the home and for meals for guests in the home. This adjustment was made (table 1) by calculating the total number of meals served on the basis of adult male units per family, subtracting the number of meals out in excess of meals for guests, or adding the number of meals for guests in excess of meals out, and converting the resulting number to days per adult male unit. The total number of grams of each nutrient per family was divided by this factor to obtain the amount of each nutrient per adult male unit per day.

In most cases the housewife recorded on the daily record blanks the amount by weight of food purchased or obtained otherwise. Whenever this was not indicated, the investigator made inquiry. If the amount was not known definitely, an estimate was made on the basis of cost. The data on the daily record blanks were transferred to

Table 1. COMPUTATION OF MEALS PER ADULT MALE UNIT PER DAY.

Family	Adults	Children	Adult male units		Extra meals			Meals per adult male unit					
								Energy, fat, and carbohydrate			Protein, minerals, and vitamins		
			Energy	Protein and minerals	Guest meals	Meals out	Difference	Normal number per period (3x28xA.M.U.)	Adjustment for extra meals	Number per day	Normal number per period (3x24xA.M.U.)	Adjustment for extra meals	Number per day
I	1	3	3.7	4.6	1	0	1*	310.8	311.8	103.9	386.4	387.4	129.1
II	2	8	7.3	10.7	16	15	1*	613.2	614.2	204.7	898.8	899.8	299.9
III	2	4	4.2	5.8	0	0	0	352.8	352.8	117.6	487.2	487.2	162.4
IV	2	4	5.1	6.4	14	2	12*	428.8	440.4	146.8	537.6	549.6	183.2
V	2	0	1.6	1.6	53	2	49*	134.4	183.4	61.8	134.4	183.4	61.8
VI	2	4	3.8	5.4	2	24	22	319.2	297.2	99.1	453.6	431.6	143.9
VII	2	8	4.8	7.2	57	59	2	403.2	401.2	133.7	604.8	602.8	200.9
VIII	2	5	4.8	7.0	14	42	28	403.2	375.2	125.1	588.0	560.0	186.7
IX	2	2	2.8	3.6	63	0	63*	235.2	298.2	99.4	302.4	365.4	121.8
X	2	4	4.6	6.4	0	65	65	386.4	321.4	107.1	537.6	472.6	157.4
Total	19	42	42.5	58.5	163	209		3587.2	3595.8	1199.2	4930.8	4939.8	1647.1
Average	1.9	4.2	4.25	5.85	16.3	20.9		358.7	359.6	119.9	493.1	494.0	164.7

* These figures were added to the meals per adult male unit. The others were subtracted.

** 3 (meals per day) x 28 (days of the study) x A.M.U. (adult male units).

a daily record form (form 3) and summarized (form 4). Food products were grouped under the following headings: dairy products, fats and oils, fruits, grain products, meats, sugars, vegetables, food adjuncts, nuts, and miscellaneous.

The food quantities as purchased were converted to edible portion values using the table compiled by Rose (9). The total Calories, grams of protein, fat, carbohydrate, calcium, phosphorus, and iron and the units of vitamins A, C, and G were then calculated, item by item, for each dietary (form 5).

The values for the energy, protein, carbohydrate, fat, and mineral content of individual foods were taken from Rose (9) whenever possible. Calculations for such foods as were not included in these tables were made from data supplied by Chaney and Ahlborn (2), or by manufacturers. Gillett and Rice's tables (10) were used in estimating the vitamin A and C values. Vitamin G units in foods were calculated from Sherman's table (10).

For purposes of comparison, the members of the household were converted to equivalent adult male units, according to the Hawley double scale (4) which was modified to include vitamins. Except for vitamins, the standard used was that given by Sherman (10) for a moderately active man of 70 kilograms in weight, viz., energy, 3000 Calories;

Form 3. RECORD OF DAILY FOOD PURCHASES.

III (Name)

	Fourth week*															
Food	Friday		Saturday		Sunday		Monday		Tuesday		Wednesday		Thursday		Total for period	
	Item	Cost	Item	Cost	Item	Cost	Item	Cost	Item	Cost	Item	Cost	Item	Cost	Amount	Cost
Dairy products																
Butter																
Cheese																
Cheddar																
Cottage																
Milk																
Condensed																
Dried																
Evaporated																
Fresh - whole																
skimmed																
Eggs																
Fats and Oils																
Fats																
Compound																
Lard																
Oleomargarine																
Oils																
Fruits**																
Canned																
Apples																
Dried																
Fresh																
Apples																
Bananas																
Grapefruit																
Lemons																
Oranges																

* Similar forms were used for the first, second, and third weeks.

** Blank spaces were filled in with the name of fruits used by the families.

Form 4. SUMMARY OF FOOD PURCHASED.

II (Name)

	First Week		Second Week		Third Week		Fourth Week		Total for Period		First Inventory		Food purchased + first inventory		Final Inventory		Total amount used	
	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost	Amount	Cost
Dairy products*																		
Cheese																		
Cheddar																		
Milk																		
Dried																		
Evaporated																		
Fresh - whole																		
Eggs																		
Fats and Oils*																		
Compound																		
Oleomargarine																		
Fruits																		
Canned																		
Peaches																		
Dried																		
Apricots																		
Figs																		
Prunes																		
Raisins																		
Fresh																		
Apples																		
Bananas																		
Grain products*																		
Cereals																		
Best Yet Wheat Germ																		
Rice																		
Wheaties																		
Flour																		
White - bread																		
Cornmeal																		
Pancake																		
Bakery products																		
Bread																		
Crackers																		

*only such foods were listed as were actually used by the family.

Form 5. TABLE OF FOOD VALUES

II (Name)

Food	Amount used	Conversion to: Calories**	Calories	Protein grams	Fat gms	Carbohydrate grams	Calcium grams	Phosphorus grams	Iron grams	Vitamins A Unit	C Unit	G Unit
Dairy Products*												
Cheese												
Cheddar	2#	2x2079	4158									
Milk												
Dried												
Evaporated												
Fresh - whole												
Eggs												
Total												
Fats & Oils*												
Compound												
Oleomargarine												
Total												
Fruits*												
Canned												
Peaches												
Dried												
Apricots												
Figs												
Prunes												
Raisins												
Fresh												
Apples												
Bananas												
Total												
Grain Products*												
Cereals												
Best Yet Wheat Germ												
Rice												
Wheaties												
Flour												
White - bread												
Cornmeal												
Pancake												
Bakery products												
Bread - white												
Cinnamon Rolls												
Crackers												
Total												
Meats*												
Beef - roast												
- dried												
- Liver												
Lunchmeat												
Wieners												
Bacon												
Fish												
Salmon												
Total												

* Only such foods were listed as were actually used by the family

**Indicates method used for purposes of rechecking.

protein, 70 grams; calcium, 0.68 gram; phosphorus, 1.32 grams; and iron 0.015 gram. The standard used for vitamins, as recommended by Stiebeling and Ward (11) and modified by Moser (5), was 4000 units of vitamin A, 100 units of vitamin C, and 750 units of vitamin G.

The cost of the diets was calculated, and expressed both as actual expenditure and as money value (tables 8,11), the latter including food obtained from other sources than by purchase. The cost of foods purchased as recorded on the daily records was used to compute the actual expenditure. To determine the money value of the diets, an estimate was made of the value of foods obtained from relatives, neighbors, gardens, or the relief agencies, based upon general market prices which would have had to be paid for the commodities if they had been purchased. The prices paid for the foods were used in evaluating the supplies on hand at the time the inventories were taken.

DISCUSSION

Personnel of the Families

Eight of the 10 families selected for the study lived within the city limits of Manhattan. The others (VII and VIII) lived a short distance from the city, but were not farmers. Family No. VIII owned their home; No. VII lived in a house belonging to the wife's father and were charged no rent. They also received considerable aid from the wife's parents in the form of foodstuffs, especially milk. Only one of the eight urban families was a home owner; the others were tenants. One family (V) rented a room to an elderly couple and another (IX), an apartment to a relative.

The families averaged 6.1 persons of whom 4.2 were children (table 2). One family (V) consisted of an aged couple and another (I) of a widow and three children, 12 to 16 years of age. Each of the other families included two adults and from two to eight children ranging in age from 16 years to two months. Families I, II, IV, and VI attempted to maintain a somewhat higher standard of living than the others.

The incomes of the 10 families ranged from $15.00 to $52.00 per month. Six received their wages from Works Progress Administration funds, two men (families III and

Table 2. PERSONNEL OF FAMILIES.

Family	Adults per family	Children													Total
		Under 6		6 - 9		10 -12		13 - 14		15 - 17		Total			Adults and children
		Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Both sexes	
I	1						1			1	1	1	2	3	4
II	2	1	1	1	1	1	1	1		1		5	3	8	10
III	2		1		2		1						4	4	6
IV	2			1			1		1		1	1	3	4	6
V	2														2
VI	2	1	1	1	1							2	2	4	6
VII	2	2	3	1		1	1					4	4	8	10
VIII	2	1	1	1		1		1				4	1	5	7
IX	2	1			1							1	1	2	4
X	2			1	1	1		1				3	1	4	6
Total	19	6	7	6	6	4	5	3	1	2	2	21	21	42	61
Average per family	1.9											2.1	2.1	4.2	6.1

VIII) receiving $52.00 per month as skilled laborers and the others $35.00 per month. Two families received $8.00 per month from county funds. One of these (I) supplemented this amount by taking in washings and working by the day in homes or the church. The other family (V), who rented one room of their home for $7.00 per month, had a total money income of $15.00 per month. In one of the two remaining families (VII), the husband was working on a farm for about $30.00 per month, receiving in addition two meals per day. In the other, the husband had been unemployed for several months, but during the record period he was working for his father and receiving about $0.75 per day or $18.00 per month for his services. The wife added about $2.00 per month to the income by means of laundry work.

Analysis of the Nutritive Value of the Diets

On the basis of adult male units, the average of the 10 diets for each of the nutrients (table 3) was as follows: Calories, 2792; protein, 68.4 grams; fat, 85.7 grams; carbohydrate, 417.1 grams; calcium, 0.69 gram; phosphorus, 1.13 grams; iron, 0.011 gram, vitamin A, 1922 units; vitamin C, 59 units; and vitamin G, 353 units. Thus the diets averaged low in Calories, phosphorus, iron, and vitamins. The amount of calcium was slightly above the

Table 3. NUTRITIVE VALUE PER ADULT MALE UNIT OF THE DIETS OF TEN LOW INCOME FAMILIES.

Family	Calories	Protein	Carbohydrate	Fat	Calcium	Phosphorus	Iron	Vitamins A	Vitamins C	Vitamins G
		grams	grams	grams	grams	grams	grams	units	units	units
I	2313	57.4	367.5	59.7	0.64	1.00	0.009	1962	52	407
II	1572	35.6	237.6	45.4	0.41	0.43	0.004	1111	49	186
III	2552	60.1	351.4	90.4	0.60	0.99	0.009	1526	31	336
IV	2596	75.9	338.5	102.4	0.54	1.24	0.013	1405	47	297
V	3204	109.6	446.1	108.5	0.95	1.62	0.016	3237	133	534
VI	3618	80.0	478.8	141.2	0.93	1.48	0.014	3061	76	501
VII	3937	92.8	569.9	122.8	1.18	1.61	0.013	2621	50	554
VIII	2828	59.0	456.7	72.5	0.58	1.02	0.011	1575	63	258
IX	3048	63.7	578.6	48.5	0.71	1.00	0.013	2118	61	317
X	2254	49.9	345.5	65.1	0.36	0.86	0.010	604	29	138
Average	2792	68.4	417.1	85.7	0.69	1.13	0.011	1922	59	353
Standard*	3000	70.0			0.68	1.32	0.015	4000	100	750

*Sherman's standard was used for Calories, protein, and minerals; Stiebeling and Ward's, for vitamins.

standard of 70 grams.

Although the 10 diets averaged per adult male unit per day 2792 Calories (median, 2574 Calories) which is only 6.9 per cent below the suggested 3000 Calories, six of the families had a low energy intake varying from 47.6 to 5.7 per cent below the standard (table 4). All of these were deficient also in protein, phosphorus, and minerals, except one family whose caloric intake was only 13.5 per cent low. The latter averaged 8.4 per cent above the standard for protein.

Family No. II, who had the lowest daily caloric intake amounting to 1572 Calories per adult male or 47.6 per cent below the standard, had a deficiency of 49.1 per cent of protein, 39.7 per cent of calcium, 67.4 per cent of phosphorus, 73.3 per cent of iron, 72.2 per cent of vitamin A, 51 per cent of vitamin C, and 75.2 per cent of vitamin G. Only one family (X) had a greater deficiency in calcium and vitamins A and G; three families had a greater deficiency in vitamin C. This family (II) contained eight children. During the record period, the father's wage check came almost two weeks late so that he had insufficient money to buy adequate food for his family. One morning when the investigator came to collect the data, the mother was almost in tears because her children were hungry. For

Table 4. PERCENTAGE OF VARIATION FROM STANDARD.

Family	Calories	Protein	Calcium	Phosphorus	Iron	Vitamins A	Vitamins C	Vitamins G
I	22.9	18.0	5.9	24.3	40.0	51.0	48.0	45.7
II	47.6	49.1	39.7	67.4	73.3	72.2	51.0	75.2
III	14.9	14.1	11.8	25.0	40.0	61.9	69.0	55.2
IV	13.5	8.4*	20.6	6.1	13.3	64.9	53.0	60.4
V	6.8*	56.6*	39.7*	22.7*	6.7*	19.1	33.3	28.8
VI	20.6*	14.3*	36.8*	12.1*	6.7	23.5	24.0	33.2
VII	31.2*	32.6*	73.5*	22.0	13.3	34.5	50.0	26.1
VIII	5.7	15.7	14.7	22.7	26.7	60.6	37.0	65.6
IX	1.6*	9.0	4.4*	24.3	13.3	47.1	39.0	57.7
X	24.9	28.7	46.2	34.8	33.3	84.9	71.0	81.6
Average	6.9	2.3	1.5*	14.4	26.7	52.0	41.0	52.9

Note: * indicates per cent above standard. The other percentages indicate the per cent of deficiency.

several days she had been unable to give them more than half as much as they ordinarily ate.

Of the four families whose caloric intake exceeded the standard, one (V) was adequate in all respects except in vitamins A and G. Two (VI and VII) were adequate in protein, calcium, and phosphorus, slightly low in iron, and low in vitamins. The other (IX) was deficient in everything except calcium.

Only four of the families exceeded the standard of 70 grams for protein, the excess for families IV, V, VI, and VII amounting to 8.4, 56.6, 14.3, and 32.6 per cent, respectively. These families used a fairly large amount of grain products, dairy products, or meats. Family No. V owed the surplus of protein mainly to the large amount of bread used, the daily consumption averaging about three-fourths of a loaf per person per day.

Of the six families deficient in protein, two were very low, the one having only 35.6 grams per adult male or a deficiency of 49.1 per cent and the other 49.9 grams which was 28.7 per cent below standard. As might be expected with this low protein intake the consumption of meats and dairy products was low in these two families. The deficiency in protein in the other four families varied from 9 to 18 per cent. All of the families with a low protein intake were deficient in minerals except one whose calcium intake exceeded the standard by 4.4 per cent. Although the amount of fresh whole milk used by this family was small, only 3½ quarts, a considerable amount of calcium was obtained from evaporated and skim milk.

Since it is not unusual to find diets adequate as to calories and protein to be deficient in minerals, it is not surprising that most of the 10 families were deficient in all three minerals included in the study. Only one (V) had a surplus in all three, amounting to as much as 39.7 per cent for calcium, 22.7 per cent for phosphorus, and 6.7 per cent for iron. The man and wife in this family were about 80 years old so that their mineral requirement was lower than the amount needed by the adults in the other families, according to the Hawley scale (4). The adequacy of their diet in this respect was largely due to the relatively large proportion of dairy products, bread, and vegetables used. One of the stores gave them such vegetables and fruits as could not be sold on account of being wilted or partly decayed; but from them they salvaged much that was edible and thus enriched their diet in a way that would have been impossible otherwise.

The diets of two families (VI and VII) were adequate as to calcium and phosphorus but were slightly deficient in iron. The milk consumption of both families was fairly high (table 5), as compared with the others, the amount per child of fresh whole milk averaging 1.06 and 1.13 pints, and of all milk products, 1.49 and 1.48 pints per day, respectively.

One of the seven remaining families, as before noted, exceeded the standard for calcium by 4.4 per cent. This, no doubt, was due to the large amount of skim milk used, as the fresh whole milk averaged only 0.13 pint per child per day. Much of the skim milk was used for cottage cheese, however. The calcium deficiencies in the other six families ranged from 5.9 to 46.2 per cent. As in the study reported by Okey and Smythe (8), the families with the greatest deficiencies were those who were not getting a sufficient quantity of milk. The amount of fresh whole milk for these six families ranged from 0.29 to 1.35 pints per child per day (not counting adults) and, including all milk products, 0.41 to 1.35 pints per day.

Seventy per cent of the families received less phosphorus than the standard of 1.32 grams. Four of these received one gram or more per day, but the phosphorus intake of one family amounted to less than a third of the required amount. The deficiency ranged from 67.4 to 6.1 per cent. In contrast, three families had surpluses of 12.1 to 22.7

Table 5. MILK CONSUMPTION.

Family	Number of children per family	Milk: Fresh whole: Amount used	Fresh whole: Amount per child per day*	Skim	Evaporated	Dried	Total (equivalent)	Amount per child per day*
		Quarts	Pints	Gallons	Ounces	Pounds	Quarts	Pints
I	3	56.75	1.35				56.75	1.35
II	8	42.37	0.33		156.5	3# 2½ oz.	68.02	0.61
III	4	62.00	1.11				62.00	1.11
IV	4	33.50	0.60		174.0		45.50	0.81
V	0	14.75	(.54 per adult)**		133.5	1# 14 oz.	32.87	(1.17)**
VI	4	59.50	1.06	6.0			83.50	1.49
VII	8	126.75	1.13			8# 3 oz.	165.64	1.48
VIII	5	57.90	0.83		12.0		58.73	0.91
IX	2	3.50	0.13	7.5	255.0		51.09	1.82
X	4	16.50	0.29		94.5		23.02	0.41
Total	42	473.52	6.83	13.5	825.5	12# 3½ oz.	647.12	9.99
Average	4.2	47.35	0.76	1.35	82.55		64.71	1.11

* No allowance was made for adults in families containing children.

**These values were not included in computing the number of pints of milk per child per day.

per cent. The average deficiency for the 10 families was 14.4 per cent.

Although 90 per cent of the families were below the standard for iron (15 milligrams), the average deficiency amounted to only 4 milligrams or 26.7 per cent. The extent of deficiency in the nine diets ranged from 73.3 to 6.7 per cent. Two were 40 per cent below the standard. The relatively meagre consumption of eggs, meat, and vegetables no doubt accounted for the low iron intake in the three families lowest in the scale. Family No. IX, whose dietary varied only 2 milligrams from the standard for iron, used an unusually large amount of wild greens.

The diets of all the families were inadequate as to vitamins except No. V, whose vitamin C intake exceeded the standard by 33 per cent. However, the tables (10) used in calculating the vitamin content of the dietaries were rather incomplete so that if more data were at hand, the diets of families V, VI, and VII would probably have been adequate as to vitamins A and G. The deficiency of vitamin C is traceable mainly to the failure to use a sufficient quantity of fresh fruits and vegetables. However, vegetables furnished 61.2 per cent of the vitamin C in the diets (table 6), fruits 18.1 per cent, and dairy products 20.8 per cent. Family No. II, with a 51 per cent deficiency

Table 6. **AVERAGE PERCENTAGE DISTRIBUTION OF NUTRIENTS IN DIETS OF TEN LOW-INCOME FAMILIES.**

Food Group	Calories	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Vitamins A	Vitamins G	Vitamins C
		grams	grams	grams	grams	grams	grams	units	units	units
Dairy products	13.76	24.63	25.97	6.30	72.28	35.99	14.28	63.14	57.54	20.77
Fats	11.38	0.30	41.33							
Fruits	3.89	0.96	0.75	6.13	2.25	1.89	6.66	4.61	3.78	18.06
Grain products	35.01	35.80	6.85	48.25	9.43	23.93	24.51	0.64		
Meats	8.23	21.13	19.20	0.02	1.59	14.01	16.85	7.52	21.41	
Sugars	14.20	0.11	0.37	22.91	0.22	0.19	0.18			
Vegetables	10.89	14.05	1.94	14.52	13.01	20.31	34.14	23.36	16.36	61.18
Food adjuncts	1.66	1.06	1.20	1.77	0.62	2.20	2.42			
Nuts	0.95	1.32	2.26	0.19	0.59	1.45	0.84			
Miscellaneous	0.03	0.04	0.06	0.02			0.14	0.73	0.92	

of vitamin C, complained of sore gums about midway in the record period. They were advised to buy some canned tomatoes, and as a result of their use the condition disappeared. The father in another family (IV) had a bad case of pyorrhea. His jaws and head were so swollen for one week that he could eat little more than soup and had to stay home from work.

Dairy products furnished the bulk of the vitamin G in the diets (57.5 per cent). The low meat and egg consumption was doubtless partly responsible for the deficiency of this vitamin in the diets as well as the restricted use of vegetables.

The deficiency in vitamin intake differs radically from the findings in the California study of Okey and Smythe (8) who reported that half of the families included in their study received amounts which were "probably satisfactory" and that three were adequately fed in respect to vitamin A. In regard to vitamin C, 17 of their 25 families received at least a satisfactory quantity, only three being below standard. The same was true of vitamin G.

Compared with the restricted diet for emergency use of Stiebeling and Ward (11), four families of the present study would have diets adequate as to vitamin A, two as to vitamin C, and three as to vitamin G.

In comparison with the standard of Okey and Smythe (8) for phosphorus and iron of 1.2 grams and .013 gram, respectively (the criteria adopted for a minimum dietary), the diets of four of the 10 families studied would be adequate as to phosphorus and five as to iron. Using their 60-gram standard for protein, seven families would have a satisfactory protein intake as compared with four under the Sherman standard.

The yield of 2792 Calories per adult male per day was practically the same as that found for relief families by Wiehl (12).

The average amount of Calories, protein, and minerals was higher in every respect than the averages of the diets of 233 families in Alameda County, California, reported by Okey and Luck (7); but it is lower than the averages for the white rural families in the study of Moser (5).

Distribution of Nutrients in the Diets

As shown in the accompanying table (table 6) an average of slightly more than one-third of the Calories was derived from grain products, the percentage for individual families ranging from 25.1 to 41.2. The lowest value is that of the family (VII) whose food supply was adequate in all nutrients except iron and vitamins. Stiebeling and Ward (11) state that in a diet in which grain products furnish more than 45 per cent of the Calories, other essential foods are likely to be displaced. Two of the families, (III and VIII) closely approximated this percentage. Their diets bore out the truth of the above statement since both were inadequate in respect to all the nutrients. The 35.0 per cent average for the 10 families varies but slightly from the percentage of Calories from grain products suggested by Stiebeling and Ward for the adequate diet at minimum cost.

They recommended also that milk should furnish 25 per cent of the Calories in adequate diets at any cost level for a family with three children. The milk consumption of the 10 families in the present study averaged only 13.8 per cent which is little more than half of the desired quantity. The family with the lowest percentage (7.1) had the greatest deficiency in calcium and, with one exception, the greatest deficiency in phosphorus. It is interesting to note that the family most nearly approximating the 25 per cent, viz., family No. VII with a percentage of 21.3, was one whose dietary was deficient only in iron and vitamins. Only four families exceeded the 15 per cent proportion of Calories to be derived from milk products suggested for the restricted diet for emergency use.

The average proportion of Calories derived from vegetables and fruits and from meat products almost coincides with the proportion suggested for the adequate diet at minimum cost (table 7). However, the fats were somewhat lower than the amounts specified for the diet, and the sugars twice as high.

The protein derived from animal sources amounted to from one-fourth to two-thirds of the total protein in the diets planned for the moderately active man and from 40 to 80 per cent of those for the children. The average for the diets of the 10 families was 45.8 per cent with a range of 25.0 to 60.0 per cent. More than one-third of the protein was provided by grain products, the diets of only three families furnishing less than that amount.

Dairy products supplied 72.3 per cent of the calcium, 36 per cent of the phosphorus, and 14.3 per cent of the iron. In one family (VII) dairy products furnished as high as 85.5 per cent of the calcium and 51.6 per cent of the phosphorus; but in another (X), the percentage dropped to 50.5 and 17.2 per cent, respectively. Vegetables furnished from 4.9 to 29.7 per cent of the calcium in the diets, 10.6 to 40.7 per cent of the phosphorus, and 23.3 to 51.4 per cent of the iron; the averages for the 10 diets being respectively, 13.0, 20.3, and 34.1 per cent.

Grain products furnished almost one-fourth of the phosphorus and of the iron. The ratio of calcium to phosphorus in the diets was 1:1.6, and of calcium to protein, 1:99. Sherman (10) maintains that the food supply should contain at least one hundredth as much calcium as protein in order to furnish these nutrients in the proportions corresponding to the needs of the body.

Dairy products furnished 63.1 per cent of the vitamin A in the diets, 20.8 per cent of the vitamin C, and 57.5 per cent of vitamin G. In one family's diet (VII), dairy products furnished 43.0 per cent of the vitamin C, but the proportion was as low as 6.2 per cent in the diet of family No. V. The difference was due mainly to the higher proportion of fruits and vegetables in the latter dietary and the extensive use of evaporated milk. Vegetables furnished an average of 61.2 per cent of the Vitamin C. The percentage of vitamin G supplied by dairy products ranged from 34.5 to 75.0. In the diet with the smallest percentage from dairy products, meats furnished 45.1 per cent of the vitamin G, the average from this source for the 10 diets being 21.4 per cent.

Food Costs

The size of the income seemed to have little relation

Table 7. COMPARISON OF PERCENTAGE DISTRIBUTION OF CALORIES IN DIETS.

Type of diet	Calories derived from-- Bread flour cereals	Milk, cheese	Vegetables fruits	Fats	Sugars	Meats, fish, eggs
Restricted diet for emergency use*	42	15	13	16	9	5
Adequate diet at minimum cost*	32	24	14	15	7	8
Diet, this study	35	13.8	14.8	11.4	14.2	8.2**

*Table from Stiebeling and Ward (11) with addition of data from present study.
**Eggs are included in dairy products.

to adequacy of diet as the two families with the highest income (table 8) had inadequate diets, and the family with the lowest income had the most nearly adequate one. The percentages of the incomes spent for food seemed to be no better criteria, since the two ranking third and fifth highest were those of the two families whose dietaries showed the greatest deficiencies. However, the size of family in one of these cases and the low income of the other account for this inconsistency.

On the basis of amount spent per day per adult male unit, the correlation is somewhat closer, although the cost of the diet most closely approaching adequacy was exceeded by four others. However, the diet with the highest cost ranked second as to adequacy, and the one next highest ranked fourth. The two diets for which the least was expended were the most deficient. The expenditure per adult male unit per day ranged from $0.078 to $0.415. The average cost for the 10 dietaries was $0.169.

The money value of the diets bore a much closer relation to adequacy, the scale of values closely approximating the ranking as to extent of deficiency (table 9). Family No. III whose diet should have ranked eighth as to cost, considering its degree of adequacy, devoted a large percentage of the money expended for food to grain products

Table 8. SUMMARY OF FOOD COSTS.

Family	Adult male units (energy)	Income per month	Total amount spent for food	Percent of income spent for food	Actual expenditure: Per period per adult male unit	Actual expenditure: Per day per adult male unit	Money value of food obtained from other sources	Money value: Total	Money value: Per period per adult male unit	Money value: Per day per adult male unit
I	3.7	$28	$ 8.11	29.0	$ 2.19	$0.078	$10.73	$19.44	$ 5.25	$0.187
II	7.3	35	20.06	57.3	2.75	0.098	5.41	23.84	3.27	0.116
III	4.2	52	23.85	45.9	5.68	0.203	5.60	30.20	7.19	0.257
IV	5.1	43	36.60	85.1	7.18	0.249	2.40	40.67	7.97	0.279
V	1.6	15	9.84	65.6	6.15	0.159	8.77	19.99	12.49	0.323
VI	3.8	35	33.06	94.5	8.70	0.334	5.15	40.07	10.54	0.415
VII	4.8	30	16.74	55.8	3.48	0.125	14.65	31.63	6.58	0.236
VIII	4.8	52	23.70	45.6	4.94	0.189	5.85	28.88	6.02	0.231
IX	2.8	35	10.30	29.4	3.68	0.104	3.57	18.96	6.77	0.189
X	4.6	20	15.41	77.1	3.35	0.144	0.34	15.45	3.36	0.144
Total	42.5	345	197.67	585.3	48.98	1.685	62.47	269.13	71.23	2.379
Average	4.25	34.50	19.77	58.5	4.90	0.169	6.25	26.91	7.12	0.238

Table 9. RELATIONSHIP BETWEEN ADEQUACY AND MONEY VALUE OF DIETS.

Money value of diets per adult male unit per day	Rank of families as to money value of diets per adult male unit	Rank of families as to adequacy of diets
$0.415	VI	V
0.323	V	VI
0.277	IV	VII
0.257	III	IV
0.236	VII	VIII
0.231	VIII	IX
0.189	IX	I
0.187	I	III
0.144	X	X
0.116	II	II

(table 10). They purchased all their bread, using only $4\frac{1}{2}$ pounds of flour during the period, and spent an undue proportion for sweet rolls. They used almost 3 pounds of oleo per week. If the amount spent for rolls and part of that spent for fats had been used to purchase vegetables and fruits, the nutritive value of the diet would have been higher in relation to the money value.

The average retail money value of the diets (tables 8, 11) was $26.91 per family for the four week period or $6.73 per week. The lowest was $15.45 and the highest $40.67. The average value per adult male unit per day of $0.238 was lower than that of the families studied by Okey, their cost per day averaging $0.33 per adult male. These values are not directly comparable because of the probable variation in price levels due to the difference in locality and the period in which the studies were made.

The distribution of the money value of the diets among the food groups as compared with that recommended by Stiebeling and Ward (11) for the restricted diet for emergency use and the adequate diet at minimum cost is shown in table 12. The percentage distribution of expenditures in the ten diets apparently conforms most closely to that of the restricted diet. In comparison with the adequate diet at minimum cost, the percentage of the money

Table 10. PERCENTAGE DISTRIBUTION OF MONEY VALUE AMONG THE VARIOUS FOOD GROUPS.

Family	Dairy products*	Fruits and vegetables	Meats	Grain products	Fats, sugars and food adjuncts
I	27.3	33.8	11.6	13.2	14.1
II	25.5	30.8	8.1	16.1	19.6
III	25.6	9.2	15.3	31.0	19.0
IV	12.6	19.8	27.1	25.0	15.5
V	18.8	33.4	6.9	24.8	16.1
VI	21.7	26.0	19.1	13.3	19.8
VII	39.5	15.7	8.3	13.9	22.7
VIII	15.4	31.7	10.9	24.9	17.2
IX	22.3	29.3	8.4	15.8	24.3
X	16.6	24.9	13.2	16.2	29.1
Average	22.5	25.5	12.9	19.4	19.7

*Includes eggs.

Table 11. FOOD COSTS OF THE DIETS OF TEN LOW-INCOME FAMILIES.

Food group	I		II		III		IV		V		VI	
	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value
Dairy products	$0.57	$5.30	$5.73	$6.08	$1.92	$7.72	$4.89	$5.14	$1.95	$3.76	$7.61	$8.71
Fats	0.42	0.58	1.77	1.69	2.99	2.91	2.02	2.30	1.02	1.21	2.93	3.06
Fruits	0.20	4.00	2.04	2.48	0.70	0.70	1.83	1.83	0.00	3.34	1.08	1.71
Grain products	2.25	2.57	2.53	3.83	9.30	9.36	9.69	10.18	4.10	4.96	5.01	5.34
Meats	0.85	2.25	0.99	1.92	4.35	4.62	9.53	11.00	0.50	1.37	6.90	7.65
Sugars	0.95	1.47	1.11	1.11	0.75	1.03	1.55	1.43	0.53	0.45	1.74	2.18
Vegetables	2.17	2.57	4.13	4.87	1.90	2.07	5.07	6.22	0.41	3.34	5.18	8.72
Food adjuncts	0.55	0.58	1.46	1.52	1.50	1.35	1.42	1.97	1.33	1.56	2.61	2.65
Nuts			0.18	0.18	0.10	0.10	0.60	0.60				
Miscellaneous	0.15	0.12	0.12	0.16	0.34	0.34						
Total	8.11	19.44	20.06	23.84	23.85	30.20	36.30	40.67	9.84	19.99	33.06	40.07

Food group	VII		VIII		IX		X		Average	
	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value	Actual expenditure	Money value	Total expenditure	Money value
Dairy products	$2.16	$12.50	$0.56	$4.44	$3.26	$4.22	$2.67	$2.56	$3.13	$6.04
Fats	2.20	1.85	1.70	1.55	0.45	0.74	1.40	1.28	1.69	1.72
Fruits	1.39	2.16	3.06	3.22	0.30	0.54	0.65	0.61	1.13	2.06
Grain products	4.41	4.39	7.10	7.18	1.89	2.99	2.61	2.50	4.89	5.33
Meats	0.00	2.62	3.21	3.16	1.25	1.59	2.04	2.04	2.96	3.82
Sugars	2.71	3.30	1.59	1.46	1.45	3.24	1.14	1.08	1.35	1.68
Vegetables	2.38	2.79	5.04	5.93	1.60	5.01	3.37	3.24	3.13	4.48
Food adjuncts	0.76	1.26	1.40	1.90	0.10	0.63	1.12	1.73	1.23	1.52
Nuts	0.63	0.63					0.25	0.25	1.76	0.19
Miscellaneous	0.10	0.13	0.04	0.04			0.16	0.16	0.09	0.10
Total	16.74	31.63	23.70	28.88	10.30	18.96	15.41	15.45	19.77	26.91

Table 12. COMPARISON WITH STANDARD BUDGETS OF THE PERCENTAGE DISTRIBUTION OF EXPENDITURES AMONG THE FOOD GROUPS.

Class of food	Restricted diet*	Adequate diet at minimum cost*	Food administration budget**	This study	
				Money value	Actual Expenditure
Milk and cheese	20-30	30-35	20	22.5	16.4
Fruits and vegetables	25-30	25-20	20	25.5	21.4
Meats, eggs, and fish	10	15	20	12.9	12.5
Grain products	20	15	20	19.4	25.4
Fats, sugars, and food adjuncts	20	15	20	19.7	24.3

* Diets at Four Levels of Nutritive Content and Cost. Stiebeling and Ward.

**Issued by the United States Food Administration during the World War as part of its educational program.

value devoted to vegetables was slightly higher than the maximum allowed. The percentages for dairy products were low, and for grain products, fats, and sugars, correspondingly high.

The percentage distribution of the money value of the five food groups for the individual families is shown in table 10. The percentage for dairy products ranged from 39.5 to 12.6; for fruits and vegetables, 33.8 to 9.2; for meats and fish, 27.1 to 6.9; for grain products, 31.0 to 13.2; and for fats and sugars, 29.1 to 14.1.

The average percentages of actual expenditure for the five food groups varied considerably from those of the money value of these food classes. The percentage for meat and fish was practically the same, but the percentages for dairy products and for fruits and vegetables dropped, with a corresponding rise in those for grain products and for fats and sugars. This variation was due to the value of the food obtained from sources other than by purchase (table 14), the largest proportion of which consisted of dairy products, especially milk, and of fruits and vegetables. The average money value per family of dairy products thus obtained was $2.86 for the period. Four families (I, III, VII, VIII) relied almost wholly, or altogether upon outside sources for their milk supply. The money value of fruits

Table 13. PERCENTAGE DISTRIBUTION OF ACTUAL EXPENDITURE AMONG THE VARIOUS FOOD GROUPS.

Family	Dairy products*	Fruits and vegetables	Meats	Grain products	Fats, sugars and food adjuncts
I	7.0	29.2	10.5	27.7	25.5
II	28.6	30.8	4.9	12.6	23.1
III	8.1	10.9	18.2	39.0	23.8
IV	13.4	18.9	26.0	26.5	15.3
V	19.8	4.2	5.1	41.7	29.3
VI	23.0	18.9	20.9	15.2	22.0
VII	12.9	22.5	0.0	26.3	38.2
VIII	2.4	34.2	13.5	30.0	20.0
IX	31.7	18.4	12.1	18.4	19.4
X	17.3	26.1	13.2	16.9	26.4
Average	16.4	21.4	12.5	25.4	24.3

*Includes eggs.

Table 14. MONEY VALUE OF FOOD OBTAINED OTHER THAN BY PURCHASE.

Food Group	Families										Average
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Dairy products	$ 4.86	$0.10	$5.60	$0.30	$1.88	$1.39	$9.76	$3.92	$0.75	$	$2.86
Fats											
Fruits	3.76	0.55			3.12	0.80	0.84	0.25			0.93
Grain products	0.23	0.45		1.20	0.60	0.21	1.01	0.12			0.28
Meats	0.70	2.45		1.15	0.98	1.00	1.54	0.10	0.34		0.83
Sugars	0.48	0.54				0.26	0.52	0.10			0.19
Vegetables	0.70	1.07		.75	2.19	1.31	0.81	1.36	2.33	0.34	1.09
Food adjuncts		0.25				0.18	0.08		0.15		0.07
Nuts							.00				
Miscellaneous							0.09				0.01
Total	$10.73	$5.41	$5.60	$2.40	$8.77	$5.15	$14.65	$5.85	$3.57	$0.34	$6.25
Percentage of total money value of diets	55.2	22.7	18.5	5.9	43.9	1.29	46.3	20.3	18.8	2.2	23.2

obtained from other sources averaged $0.93 per family; of vegetables, $1.09; of meats, $0.83; of grain products $0.28; and of sugars and food adjuncts, $0.27.

The total value per family of food obtained from other sources ranged from $0.34 to $14.65, the average per family being $6.25. This represented 23.2 per cent of the average money value of the diets. This percentage, representing food obtained other than by purchase, varied from 2.2 to 55.2 for the 10 families. Thus it becomes evident that the diets of relief families, if this group may be considered truly representative, would doubtless be seriously deficient if they were not enriched by gifts from neighbors and relatives, commodities issued by the local relief agency, or home-produced foods.

In compiling the food records, several instances of unwise buying became evident. For instance, during the four weeks, one family bought 16 pounds of pressed ham which retailed at 30 cents per pound, 6 packages of bran flakes, and 10 packages of shredded wheat. They spent $11.00 for meat and only $5.14 for dairy products, $1.83 for fruits, and $6.22 for vegetables. The relative proportion of these expenditures differs radically from those suggested in Sherman's principles (10) that at least as much should be spent for dairy products as for meats and as much for fruits and vegetables as for meats. The same family bought and used 4 cans of sauerkraut in one week, serving it almost every day, and none during two of the other weeks.

One family bought too much bread and oleomargarine in proportion to other foods. A typical menu occurring almost once each day consisted of potatoes, gravy, bread, and "butter" (oleomargarine). Occasionally bacon or meat was included and sometimes milk. Another stock menu was soup, bread, "butter", coffee, and milk. Breakfast usually consisted of oatmeal or pancakes, bread, "butter", coffee, and milk. Very infrequently fruit appeared in the menu. Most of the meat purchased consisted of lunchmeat which was used mainly in the husband's lunch. This monotonous and inadequate diet ranked fourth as to money value.

In pleasing contrast are the menus used by family No.VI. The mother, a graduate of a city high school, was intelligent and a good housekeeper. Her standards were higher than those of any other family in the group studied and her food costs per adult male unit averaged highest. The greatest defect was the insufficient use of milk which was mainly due to the fact that her children did not like to drink it even as cocoa so that she had to use it in other foods. It is a difficult problem to provide a quart of milk per child when none is used as a beverage. She showed fairly good judgment in the expenditure of food money. However, she purchased 4-ounce portions of dried beef retailing at 60 cents per pound seven times during the period.

FINDINGS

Analysis of the diets of 10 low-income families of Manhattan, Kansas, indicated that at least 70 per cent were inadequate in most or all of the nutrients. All of the families were deficient in vitamins. The greatest deficiency in minerals was in iron. More were deficient in phoshorus than in calcium. There was an apparent correlation between deficiency in protein and minerals since the six diets deficient in protein were all deficient in minerals with but one exception.

All of the families failed to use sufficient milk, the average per child, without allowing any for adults being only 1.11 pints per day. Other common dietary errors were the use of too little fruit, especially of citrus fruits, and of vegetables, particularly fresh vegetables other than white potatoes.

The adequacy of the diets seemed to have a direct relation to the money value. The relationship between expenditure and adequacy was not close on account of differences in the size of families and in the amount of food obtained other than by purchase. It was evident that the incomes were too low, especially in the case of the large families, to permit them to provide adequate dietaries unless their knowledge of food were increased so that they would be able to make more careful selections.

The nutritive value of the diets could have been more nearly adequate if

1. The amount of whole grain cereals had been larger and less prepared cereals had been used.
2. More bread had been prepared at home.
3. The amount of dried beans used had been larger.
4. The amount of fresh whole milk and of fresh skim milk, especially, had been increased.
5. More fresh fruits and vegetables had been used.
6. More dried fruits had been purchased.
7. Less expensive cuts of meats had been purchased.
8. The amount spent for sugar had been decreased.

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