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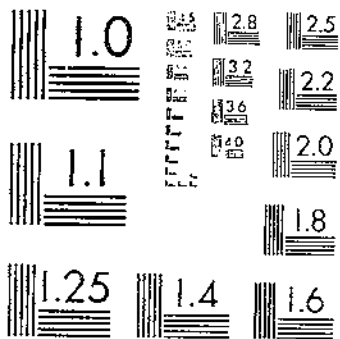
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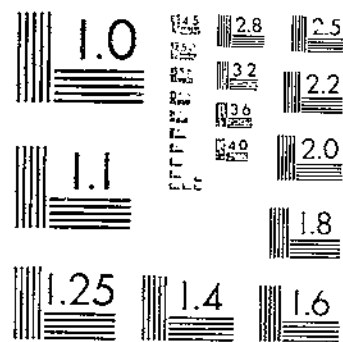
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DEPOSITORY

FOOD SUPPLY AND PELLAGRA INCIDENCE IN 73 SOUTH CAROLINA FARM FAMILIES

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In Cooperation With the South Carolina Extension Service and the
South Carolina State Board of Health

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INTRODUCTION

The food resources of the United States are capable of providing abundantly for the population, yet the diets of many families are inadequate for maintaining full physical well-being. Proper food can make the difference between average and better-than-average vigor. Dietary deficiencies lower the resistance of the body to disease, retard growth or permit imperfect development, impair health, and shorten the duration of the prime of life. When the diet is very inadequate, dietary deficiency diseases may appear.

Pellagra is one of these diseases. It occurs among both farming and wage-earning families who use a certain type of poorly balanced

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diet composed mainly of highly milled cereals, sweets, and lard or salt pork. Subsistence for several months or even for shorter periods on this one-sided diet leads to the development of pellagra. This disease occurs not because these foods are unwholesome in themselves but because, when they are eaten to the exclusion of all others, they form a diet which does not furnish the body with enough of certain necessary food factors. The pellagra-preventing factor is fairly abundant in milk, lean meat, and fish; sparingly present in most vegetables, and quite lacking in highly refined flour and cereals, in fats, and in sugar. Studies of the United States Public Health Service still in progress indicate not only the kinds of food which are pellagra preventing, but also the approximate amount of each needed to prevent the disease when the rest of the diet is very deficient in the pellagra-preventing vitamin. Rarely, however, are pellagra-producing family dietaries inadequate in the pellagra-preventing vitamin only; usually they are also very deficient in other vitamins, in iron, and in protein, especially protein from animal sources.

It has been estimated (19)² that about 200,000 persons in the United States had suffered from pellagra in 1929. These cases occurred mainly in the South, among low-income groups. In some instances ignorance of food values and faulty food habits were probably responsible for the condition, and in others an economic situation which put an adequate diet beyond reach. In addition to factors outside the control of the families affected, the difficulties of the situation were often intensified by the failure to use to advantage the money available for food, or to make wise use of the land available for home food production.

The situation calls for widespread educational work among such families. Improvement of their standard of living depends on knowledge on the part of the people themselves, and on their opportunity to obtain food which is not only pellagra preventing but adequate in all other respects.

In order to make recommendations as to diet for any community it is necessary to have definite information on the kind and quantity of food customarily used and on the prevailing practices in home food production and conservation. Under some circumstances it is also necessary to conduct a health survey. In 1929-30 the Bureau of Home Economics and the South Carolina Extension Service undertook studies to secure such information from farm families in a section of South Carolina where pellagra was prevalent.

SCOPE AND METHOD OF STUDY

The investigation included the collection of information regarding the food used by 73 farm families in Lee County, S. C.; the evaluation of the food supply in terms of its adequacy for good nutrition; periodic examinations of members of the cooperating families for symptoms of pellagra; and a study of the relation of the food supply to pellagra incidence.

The food habits of the families successful in warding off pellagra, as well as those of the families succumbing to the disease, were carefully observed, and nutrition demonstrations were conducted in which pellagra-preventing food materials were furnished to certain families.

² Italic numbers in parentheses refer to Literature Cited, p. 34.

The findings include facts regarding the character of the customary diets which were pellagra preventing, and regarding the effectiveness for health protection of adding definite quantities of selected pellagra-preventing food materials to the nonpellagra-preventing diets. This information affords a sound basis for dietary recommendations for families in Lee County and in other sections where similar conditions prevail.

CLASSIFICATION OF FAMILIES

The cooperation of the 73 farm families included in the study was secured by field agents who were local home demonstration agents engaged in the Cooperative Extension Service of South Carolina and of the United States Department of Agriculture. The families were divided by the field agents into two groups: (1) Families in a very unsatisfactory economic situation, members of which were suffering from pellagra at the time, or whose health history and estimated food supply were such that it seemed likely they would succumb to pellagra during the late spring. This group consisted of 44 families. To each of these families some one kind of pellagra-preventing food material was furnished in definite quantities for known periods previous to May or June. The food materials provided were dry skim milk, evaporated milk, wheat germ, cured lean pork, canned tomatoes, and pure dry yeast; (2) families whose economic condition indicated that without aid they could probably furnish themselves with some of the pellagra-preventing foods, and thus maintain a better state of nutrition than their neighbors could if unaided. Twenty-nine families composed this group. Throughout the period of observation these families depended solely on their own resources for their food supply. Subsequent records showed, however, that the field agents had overestimated the importance of the food resources of some of these families. In 15 of them some one or more members incurred pellagra during the late spring.

Twenty-six families, of which 19 received aid in the form of food, cooperated in this investigation during the spring of 1929; the remaining 47, of which 25 received such aid, cooperated during the fall and winter of 1929 and the spring of 1930.

The number and size of all of the families cooperating in this investigation are shown in Tables 1 and 14. Those receiving aid are classified according to the kind of food which they received; and those not receiving aid, according to the pellagra-preventing character of their food as judged by the incidence of pellagra among them in the late spring of the year of the study. The groups of families were, on the average, similar in family size and composition.

TABLE 1.—Average size and composition, by age groups, of families depending on their own resources for food, classified by type of diet used throughout the year, and of aided families classified by the kind of supplementary food received

Classification	Families cooperating	Family size	Members of family in age group of—		
			18 years and over	11 to 17 years	Under 11 years
	Number	Persons	Persons	Persons	Persons
Unaided families whose food supply was—					
Pellagra preventing throughout the year.....	14	6.64	2.50	1.53	2.64
Not pellagra preventing throughout the year.....	15	6.33	2.60	1.60	2.18
Total or average.....	20	6.48	2.55	1.55	2.38
Aided families whose food supply was supplemented with—					
Dry skim milk.....	13	6.53	2.23	1.38	2.92
Evaporated milk.....	14	6.21	2.36	1.21	2.64
Wheat germ.....	7	7.28	2.57	2.00	2.71
Lean cured pork.....	6	3.34	2.00	.67	.67
Canned tomatoes.....	2	7.00	2.50	1.00	3.50
Yeast.....	2	8.00	2.50	3.00	2.50
Total or average.....	44	6.21	2.32	1.39	2.50

Tables 2, 3, and 14 give some facts regarding the health history, the type of land tenure, and the food resources of all cooperating families. About two-thirds of the unaided families and four-fifths of the aided families reported a history of pellagra. About half of the unaided families were farm owners; most of the aided families were tenants. Although pellagra has often been associated with the tenant type of agriculture, the type of land tenure seems to have had little relation to the reported history of the occurrence of pellagra in so far as this study is concerned. The disease had previously occurred in 13 of the 18 farm-owning families and in 43 of 55 tenant families.

TABLE 2.—Type of land tenure and reported family history of pellagra of all cooperating families

Classification	Families cooperating			Families reporting history of pellagra		
	Total	Farm owners	Tenants, croppers, hired men	Total	Farm owners	Tenants, croppers, hired men
	Number	Number	Number	Number	Number	Number
Unaided families whose food supply was—						
Pellagra preventing throughout the year.....	14	9	5	6	5	1
Not pellagra preventing throughout the year.....	15	5	10	12	5	7
Total.....	29	14	15	18	10	8
Aided families whose food supply was supplemented with—						
Dry skim milk.....	13	1	12	12	1	11
Evaporated milk.....	14	0	14	13	—	13
Wheat germ.....	7	3	4	5	2	3
Cured lean pork.....	6	0	6	6	—	6
Canned tomatoes.....	2	0	2	1	—	1
Pure dry yeast.....	2	0	2	1	—	1
Total.....	44	4	40	38	3	35

TABLE 3.—Food resources of all cooperating families reported for winter, 1928-29 or 1929-30

Classification	Families cooperating	Families reporting possession of—					
		Cows	Hogs	Poultry flock		Vegetable garden	Dried beans or peas for winter use
				For meat	For eggs		
Unaided families whose food supply was—	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Pellagra preventing throughout the year	14	11	10	7	10	11	0
Not pellagra preventing throughout the year	15	3	10	8	8	10	10
Total	29	14	20	15	18	21	10
Aided families whose food supply was supplemented with—							
Dry skim milk	13	3	6	10	8	7	11
Evaporated milk	14	1	9	6	6	5	4
Wheat germ	7	2	3	5	3	4	3
Cured lean pork	6	3	0	3	5	3	0
Canned tomatoes	2	1	2	0	2	0	2
Pure dry yeast	2	0	2	1	1	1	0
Total	44	10	22	25	25	20	20

The use made of the land rather than the type of land tenure is the important matter. Eleven of the 14 families which had a pellagra-preventing diet while depending on their own resources for food secured it by devoting part of their land to the support of milk cows, swine, poultry, and gardens. Aside from the milk supply, however, the food resources of the unaided group during the study were not very different from those of other cooperating families. The aided families, on the whole, reported food resources somewhat less abundant than those of the unaided families whose food was found to be not pellagra preventive. Pellagra incidence during the period of the study among the various aided groups may, therefore, be contrasted with that among the unaided families whose food was not pellagra preventive, in order to determine the effect of the supplementary food.

PHYSICAL EXAMINATIONS

Data were obtained on pellagra incidence during this study by means of physical examinations made of the members of each family in the presence of the field workers. These examinations were made by county health doctors cooperating with the South Carolina State Board of Health. Usually the same physician examined the same families at each successive examination. Unfortunately, from the standpoint of this investigation, every member of each household could not be present for each examination; therefore only the records of those individuals examined periodically are included in this report.

The condition diagnosed as pellagra by the cooperating physicians was that described by Goldberger (3). Loss of strength with indigestion or nervousness, or both, appearing or increasing in the late winter or spring, and lessening or disappearing in the fall, weariness, dizziness or vertigo, discomfort or pain in the pit of the stomach, headache, wakefulness, and frequently also sluggish bowel action are common early symptoms of the disease. Such symptoms may of

course be due also to causes other than pellagra. A burning of the mouth, reddened tongue, and burning of the hands and feet may be characteristics of later stages of pellagra, and their presence justified a suspicion of the disease, especially if the individual was known to use a diet low in milk, meat, vegetables, and fruit. The most definite and distinctive signs of the disease are skin lesions, more or less bilaterally symmetrical, appearing at first like sunburn, then turning a dirty brown color with parchmentlike texture; later the skin becomes rough and scaly and even cracks and peels. The eruption appears most frequently on the backs of the hands, on the feet, forearms, legs, neck, and back. In children, such symptoms as listlessness and fretfulness, loss of activity, and loss of weight may be detected early, but these preliminary indications often escape notice until the appearance of the characteristic eruption.

The members of families cooperating in the part of the study made in the spring of 1929 were given two physical examinations, one in April (Apr. 12 to 14) and the other after the middle of June (June 22 to 25). May and June are months in which the incidence of pellagra approaches a peak. The first examination of the families cooperating the following fall and spring was made during the latter part of November, 1929, at which time information was secured regarding the history of pellagra in the family. The second examination of this group was made in February, 1930, and a third during the last 10 days in May. A final examination was given certain families in the fall of 1930, at which time inquiry was made as to attacks of pellagra beginning after the May examination.

FOOD-CONSUMPTION DATA COLLECTED

Three types of information on the food supply were obtained from every family. These included (1) statements of the provision made for the winter food, (2) complete records of the kinds and quantities of food used over short periods, and (3) records of the use of specified foods over relatively long periods in the spring.

The information as to the provision made by each family for a winter food supply of milk, pork, poultry, eggs, and dried peas was obtained by the investigators in order to help decide which families most needed supplementary food and which kind should be given.

To secure complete data on the type of food customarily used by the cooperating families, records of total food consumption for one week were obtained in April from families who cooperated in the spring of 1929. Similar records of the food used in one week during the latter part of November, 1929, and again in two weeks during April or the early part of May, 1930, were secured from families cooperating in the fall of 1929 and in the spring of 1930. The records consisted of inventories, taken with the help of the investigators, of the food on hand at the beginning and at the end of these periods, of records kept by the housewife of food purchased in the meantime or brought in from the farm, and of records of the edible food given to animals or pets, or used for purposes other than family consumption. Data on the number and ages of the persons nourished by this food were also obtained.

Since the keeping of dietary records is exacting, it was found impossible to secure them from all of the cooperating families. Only a small number kept them for both fall and spring periods. Some of

the records which were secured bore internal evidence of inaccuracy, and all such data have been excluded from this report. Records which could be used were obtained from 7 families in April, 1929, from 18 families in November, 1930, and from 15 of the latter group and from 4 additional families in April or early May, 1930. These 44 records were all received from the 29 families which did not receive aid.

The onset of pellagra may not occur until a diet deficient in pellagra-preventive food materials has been used for several weeks or even several months. Hence it seemed important to accumulate information on the quality of the diet of the cooperating families over a long period in the late winter and early spring, this being a time when farm diets are likely to be restricted in variety and perhaps also in quantity. With the limited amount of time at the disposal of the investigators, it was impossible to obtain complete records of all the food used over a period of several months. Records were therefore made by the housewife and collected every two weeks by the investigators to show the quantities of dairy products, lean meat, fruits, and vegetables used daily to supplement the flour or meal, fats, and sweets which form the bulk of the customary diets.

METHODS OF EVALUATING FOOD-CONSUMPTION DATA

The data obtained regarding the total food used by the cooperating families over the short periods have been analyzed (1) in terms of the quantities of the various articles of food used, (2) in terms of the fuel value and the quantities of certain nutrients obtained from the food, and (3) in terms of the percentage of calories derived from specified types of food.

The records of the use of certain specified food materials over long periods in the spring have been analyzed only in terms of quantities used per person per day.

FOOD COMPOSITION

The nutritive value of the food supply has been calculated in terms of calories, grams of protein, calcium, phosphorus and iron, and units of certain vitamins. Figures on the average nutritive values of common food materials were compiled from various sources, but mainly from Atwater and Bryant (1), from Rose (18), and from Sherman (20). Calculated values of 0.327 per cent of calcium and 0.555 per cent of phosphorus were used in estimating these elements in the self-rising white flour. Figures for vitamins A and C were taken from tables issued by the New York Association for Improving the Condition of the Poor (16) and those for the pellagra-preventing factor were calculated from data given in publications of the United States Public Health Service (5, 6, 8, 9, 10, 11, 12, 13, 23). A value of unity was assigned to that quantity of each food material which Goldberger and his collaborators found to be preventive of pellagra in man when given in addition to diets lacking pellagra-preventing value.

FAMILY EQUIVALENTS

. When dealing with groups which are nonhomogeneous so far as nutritional needs are concerned, it is obviously incorrect to compare directly the total value of the food used by individual families or

groups of families, or to compare even per capita figures. Not only do family groups differ in the number of members, but the members differ from each other in age, size, and activity. Some device must be employed to weight the relative nutritional needs of persons of varying age, size, and activity so that the relative needs of various family groups may be reduced to common terms. In this study the relative needs of each individual for energy (calories), protein, calcium, phosphorus, and iron have been expressed in terms of the allowances made for an adult man at moderate muscular work, i. e., 3,000 calories, 67 grams of protein, 0.68 gram of calcium, 1.32 grams of phosphorus, and 0.015 gram of iron. Table 4 indicates the factors by which these standard allowances can be converted into allowances for persons of various ages and activities.

TABLE 4.—Factors expressing the relative allowance of calories and nutrients for individuals, by age, sex, and activity groups

[Unity represents 3,000 calories, 67 grams of protein, 0.68 gram of calcium, 1.32 grams of phosphorus, and 0.015 gram of iron]

Group, by sex, age, and muscular activity	Factors expressing relative allowances of—				
	Calo-ries	Pro-tein	Cal-cium	Phos-phorus	Iron
Male, 18 to 60 years, moderately active.....	1.0	1.0	1.0	1.0	1.0
Child:					
Under 4 years.....	.4	.7	1.5	.7	.4
4 to 8 years.....	.6	.9	1.5	.9	.6
9 to 11 years.....	.7	1.1	1.5	.9	.8
12 to 15 years.....	.9	1.2	1.4	1.0	1.0
Male:					
16 to 17 years.....	1.1	1.3	1.2	1.0	1.0
18 to 60 years, active.....	1.2	1.1	1.0	1.0	1.0
18 to 60 years, moderately active.....	1.0	1.0			
18 to 60 years, sedentary.....	.9	1.0			
60 years and over, moderately active.....	.9	.9			
60 years and over, sedentary.....	.8	.9			
Female:					
16 to 17 years.....	.8	.9	1.2	1.0	1.0
18 to 60 years, active.....	.9	.9	1.0	1.0	1.0
18 to 60 years, moderately active.....	.9	.8			
18 to 60 years, sedentary.....	.7	.8			
60 years and over, moderately active.....	.7	.7			
60 years and over, sedentary.....	.6	.7			

By the use of the factors given in Table 4, five sets of "adult units" can be calculated for each family, one for each food essential for which dietary standards have there been assigned. The calculated nutritive values of any dietary expressed in terms of chemical composition on an adult-unit basis may then be compared with the standards cited for the adult.

STANDARDS OF DIETARY ADEQUACY

Unity in Table 4 represents the standard allowances for an adult man weighing 154 pounds and engaged in moderately active work (20). These allowances for protein and the specified mineral elements are each 50 per cent higher than the average minimum requirements for the maintenance of nutritional equilibrium.

These standards and factors indicating equivalency do not interpret the relative need of the various members of the family for all of the food substances necessary for normal nutrition. They include only

those for which there is knowledge of the approximate quantities needed by the body, and of the approximate quantities furnished by common American food materials, and of which some American dietaries contain less than would appear to constitute a wise margin of safety.

In calculating the number of adult units in the farm families included in this study, a factor of 1.2 has been used as the energy equivalent for the men and 0.9 for the women from 18 to 60 years of age, because these members of the family were engaged in work which required more than moderate muscular activity for its performance. The use of factors greater than unity for any nutrient has the advantage of permitting direct comparison of the data with the standards set for a man at moderate muscular work, but it has the disadvantage of permitting the less critical reader to underestimate the total amount of any nutrient used by the family group. The finding that a family has used 3,300 calories per adult unit per day, for example, means that the standard of 3,000 calories was exceeded by 10 per cent, and that enough food was reported as used to furnish the active adult man (factor for energy, 1.2) with 3,960 calories; the active adult woman (factor for energy, 0.9) with 2,970 calories; and other members of the family group with 10 per cent more than the allowances indicated by Table 4.

It is recognized that food may not be distributed at the family table among individuals in the proportions indicated by the factors of Table 4. These factors are based on average values and merely indicate the trend which can be observed with a large number of families over considerable periods of time. Food consumption over short periods depends upon appetite and habit as well as upon activity. Muscular activity is variable from day to day, and perhaps from season to season, among both adults and children. Detailed information must be had regarding age, weight, height, build, and activity from hour to hour, if accurate estimates of the food needs of any individual are to be made.

OTHER CRITERIA FOR EVALUATING THE ADEQUACY OF DIETARIES

All of the requirements for an adequate diet can not yet be expressed quantitatively in chemical terms. The presentation of the actual quantities of various food materials used by the families studied will permit further calculations to be made as research on food values and nutritional requirements afford further quantitative data. These figures are also of interest in indicating the extent to which various commodities enter the dietary of a particular group of the population.

All organic foods are sources of energy to the body, but certain types of food materials make distinctive contributions to the diet in addition to energy. Hence, the percentage of calories derived from specified types of food is an indication of the adequacy of the diet. Refined grain products are important sources of protein as well as of energy, but are poor sources of minerals and vitamins. The biological value of their proteins is much enhanced when used in combination with milk and certain other foods. Milk is particularly important for its proteins of excellent quality, for calcium, for vitamin A, and for the pellagra-preventing factor, and in all of these respects effectively supplements the cereal products. Vegetables and fruits, while

varying widely in their energy values, are important carriers of minerals and vitamins. Citrus fruits, tomatoes, and vegetables of green and yellow color are particularly important for their vitamin C and vitamin A content. Green-colored vegetables are also valuable for iron. Most fats and sweets furnish energy only. Eggs, lean meat, and fish are sources of proteins of excellent quality, the pellagra-preventing factor, and in the case of eggs and liver, of iron and vitamin A. Family dietaries furnishing enough energy for the group nourished by them are usually found to be also otherwise adequate for good nutrition if the percentage of calories derived from these various types of food fall within the range indicated in Table 5. However, the selection of food materials within the types must be so made as to safeguard the supply of vitamins A and C, and iron.

TABLE 5.—Percentage of calories derived from specified types of food in adequate family dietaries of low, moderate, and high cost (17)

Type of food	Money value level		
	Low cost	Moderate cost	High cost
Bread, flour, cereals.....	30-40	25-30	20
Milk and cheese.....	20-25	25	20-25
Vegetables and fruits.....	12-15	15-20	18-24
Fats and oils.....	10-12	10-20	18-20
Sugars.....	10-12	10-12	10-12
Lean meat, fish, eggs.....	5-10	5-15	10-15

METHOD OF CALCULATING THE MONEY VALUE OF THE FOOD USED

Not all the food used by the families cooperating in this study was purchased; part of it was produced on the farm. Therefore, this report presents the money value of food rather than the cost. In general, the calculations of money value have been made on the basis of local retail prices. Table 17 gives the range of prices reported by the cooperating families for purchased commodities and the price reported most frequently. Retail prices as reported by some one or more of the cooperating families have been assigned to most home-grown products. For a few items used by some families but not purchased by any family, estimated prices of inexpensive forms, varieties, or grades were used. The money value of the food materials listed in Tables 6 and 18 have been calculated on the basis of the prices described.

FOOD SUPPLY OF UNAIDED FAMILIES

The supplies of food used by individual unaided families have been classified into two groups: (1) Those which were apparently pellagra preventing as shown by the freedom of the families from symptoms of pellagra in the late spring, and (2) those which were not pellagra preventing as evidenced by the fact that one or more members of each family succumbed to pellagra in the late spring. Two individuals in families whose food supply was classified as pellagra preventing did incur pellagra in the late spring, but in each case the individual reported a refusal to use milk, the food which

was the main source of the pellagra-preventing factor in the family dietary.

Each type of food supply has been analyzed in terms of the kinds and amounts of food materials composing it, and has been evaluated in terms of chemical composition. The results are summarized in Tables 6, 7, 9, and 10, and presented in detail in Tables 15 and 16.

COMPLETE DIETARY RECORDS OVER SHORT PERIODS

QUANTITIES OF FOOD MATERIALS USED

Satisfactory dietary records for 1 or 2 week periods in November, April, or early May, were obtained from each of the 29 unaided families, 15 supplying records for both seasons. It is significant that the families whose food supply was pellagra preventing were using not only more food, but much more milk, lean meat, fish, and eggs and somewhat more vegetables and fruit than were the families in which one or more members succumbed to the disease in the late spring. (Table 6.) The articles of food mentioned are of chief practical importance in pellagra prevention, and the extent of their use undoubtedly accounts for the difference between the two groups of families in their resistance to pellagra, and for the difference in the susceptibility of the second group at different seasons. However, since the body can store some of the surplus of pellagra-preventing factors from times of dietary plenty for use in times of dietary deficiency, the nature of the food used over a short period can not always be correlated with presence or absence of symptoms of pellagra. During the period of observation both groups were using much larger quantities of foods derived from the grain products, and of fats and oils, than is suggested by this bureau even for low-cost adequate diets (21), or than is estimated by the United States Department of Commerce (15) to be the per capita consumption for the United States, but neither group was using as much of milk, vegetables, fruit, lean meat, fish, or eggs.

TABLE 6.—Food supply of unaided families: Average quantity and money value of food materials used per adult energy unit per day by two groups at each of two seasons, compared with a low-cost adequate dietary (21) and with food apparently utilized in the United States (15)

Classification	Families cooperating	Average size of family	Bread, flour, and cereals	Milk and cheese	Vegetables and fruit	Fats and oils	Sugars	Lean meat, fish, and eggs	Money value
November data for families whose food supply was—		<i>Adult energy units</i>							
Pellagra preventing throughout the year...	Number 6	4.7	Pounds 1.63	Pounds 1.02	Pounds 1.20	Pound 0.25	Pound 0.30	Pound 0.23	Cents 25
Not pellagra preventing throughout the year...	12	5.0	1.15	.69	.93	.28	.14	.10	15
April or May data for families whose food supply was—									
Pellagra preventing throughout the year...	13	4.7	1.14	1.29	.49	.29	.10	.23	22
Not pellagra preventing throughout the year...	13	5.7	1.07	.93	.47	.27	.10	.09	12
Suggested low-cost adequate dietary (pellagra preventing) (21).....		5.5	.68	1.70	1.28	.10	.23	.26	20
Apparent utilization of food in the United States (15).....			.58	1.38	1.57	.14	.31	.54	-----

NUTRITIVE VALUE OF THE FOOD USED

ENERGY

The food supply used over the two brief periods in November and in April or May, by families successful in warding off pellagra, furnished at each season more energy (calories) and more of each nutrient for which calculations were made, than did the food supply used by the families which incurred pellagra in the late spring. The food used in the fall by each group was more abundant than that used in the spring, as shown in Table 7. On the average, the families seemed to have food furnishing sufficient calories. Individual families varied considerably from the average, however, and, as shown in Tables 8 and 16, a number of the families whose food supply was not pellagra preventing throughout the year seemed to be underfed as well as misfed.

TABLE 7.—Food supply of unaided families: Average nutritive value of food supply used per adult unit per day by two groups at each of two seasons, and of a suggested low-cost adequate dietary (21)

Classification	Families	Energy	Protein	Calcium	Phosphorus	Iron	Vitamin A	Vitamin C	Pellagra-preventing factor
November data for families whose food supply was—									
Pellagra preventing throughout the year...	Number 6	Calories 4,855	Grams 100	Grams 1.19	Grams 2.90	Gram 0.0160	Units 5,200	Units 160	Units 2.2
Not pellagra preventing throughout the year...	12	3,541	62	.76	1.99	.0093	3,600	100	1.1
April or May data for families whose food supply was—									
Pellagra preventing throughout the year...	13	3,900	75	1.13	2.31	.0127	4,100	99	1.6
Not pellagra preventing throughout the year...	13	3,035	51	.77	1.63	.0086	700	95	0.6
Suggested low-cost adequate diet (pellagra preventing) (21).....		3,000	70	.75	1.41	.0162	6,300	170	1.5

TABLE 8.—Food supply of unaided families: Number of families in each of two groups using food which furnished specified number of calories per adult energy unit per day at each of two seasons

Classification	Families cooperating	Families whose food supply furnished per adult energy unit per day—						
		Under 2,100 calories	2,100-2,699 calories	2,700-3,299 calories	3,300-3,899 calories	3,900-4,499 calories	4,500-5,099 calories	5,100 calories and over
November data for families whose food supply was—								
Pellagra preventing throughout the year.....	Number 6					Number 2	Number 3	Number 1
Not pellagra preventing throughout the year.....	12	3	3	1	4		1	
April or May data for families whose food supply was—								
Pellagra preventing throughout the year.....	13			3	5	1	3	1
Not pellagra preventing throughout the year.....	13	2	3	3	4	1		

PROTEIN

At both seasons the families in each of which some cases of pellagra developed in the late spring used food which furnished, on the average, less than 68 grams of protein per adult unit per day. This is less than is usually considered a safe allowance over the average minimum requirement. Much of it was derived from grain products whose proteins are of lower biological value than those from milk, eggs, or lean meat.

MINERALS

The estimated amounts of calcium and phosphorus in the food of both groups were larger than would be expected from a consideration of the items of food used, because the flour generally used was a self-rising variety containing added calcium phosphate. All but two of the families who had pellagra-preventing food all the year had more than 0.68 gram of calcium per adult unit, and 1.32 grams of phosphorus in their food. Even with the extra calcium in the flour, the food supply furnished less calcium than is considered a satisfactory allowance in the case of 6 of the 13 unaided families among whom cases of pellagra occurred in the late spring. Indeed, in the case of four families the estimated amount was less than 0.45 gram, the average minimum quantity required for maintaining calcium equilibrium in the adult man. Only for 3 of 13 families whose food was pellagra preventing throughout the year, and only for 1 of 13 families in each of which some members succumbed to the disease in the late spring, did the food used in April or early May furnish an ample allowance of iron, i. e., 0.0150 gram or more per adult unit. (Table 16.)

VITAMINS

In the fall the food of each group of families furnished enough of the pellagra-preventing factors to keep the members free from the disease. In the spring the food of those incurring pellagra included very meager amounts. Each group used green vegetables more liberally in the fall than in the spring. This increased the vitamin A value of their diets at that season. The use of whole milk at both seasons by the families which were not subject to pellagra, further enriched their diets in vitamin A. The fall diets of each group furnished more vitamin C than did the spring diets, but for all families, and at both seasons, the quantities were probably less than is desirable. (Table 7.)

It is interesting to consider whether the more liberal intake of protein, minerals, and vitamins on the part of families successful in warding off pellagra was due merely to the use of larger quantities of all food materials or to the use of food of a different character. That the latter is the case is shown by Tables 9 and 10. Table 9 shows the quantities of the various nutrients per 3,000 calories of the food as reported by each group of families in November, and in April or May. On this basis the differences in the food supply of the two groups appear less pronounced, but are still large enough to justify the statement that the food of the two groups was decidedly different in character. Table 10 shows that the chief difference in the two types of food supply lay in the extent to which milk and cheese were used. Compared with the adequate low-cost dietary suggested by this

bureau (21) the food supply of both groups at both seasons was lower than is desirable in milk, in vegetables and fruits, and in lean meat, fish, and eggs, and correspondingly higher than seems desirable in foods derived from the cereal grains and in fats and oils.

TABLE 9.—*Food supply of unaided families: Nutritive value per 3,000 calories of the food used by two groups of unaided families at each of two seasons, compared with a low-cost adequate dietary (21)*

Classification	Families cooperating	Protein	Calcium	Phosphorus	Iron	Vitamin A	Vitamin C	Pellagra-preventing factor
November data for families whose food supply was—								
Pellagra preventing throughout the year.....	Number 6	Grams 62	Gram 0.74	Grams 1.79	Gram 0.0099	Units 3,200	Units 100	Units 1.4
Not pellagra preventing throughout the year.....	12	62	.64	1.68	.0079	3,050	85	.9
April or May data for families whose food supply was—								
Pellagra preventing throughout the year.....	13	58	.87	1.78	.0098	3,150	75	1.2
Not pellagra preventing throughout the year.....	13	50	.78	1.91	.0085	700	95	.6
Suggested low-cost adequate diet (pellagra preventing) (21).....		70	.75	1.41	.0162	6,800	170	1.8

TABLE 10.—*Food supply of unaided families: Percentage of calories derived from specified types of food materials, as used by two groups at each of two seasons, compared with a low-cost adequate dietary (21) and with food apparently utilized in the United States (12)*

Classification	Families cooperating	Average energy value per adult unit	Calories derived from--					
			Bread, flour, and cereals	Milk and cheese	Vegetables and fruit	Fats and oils	Sugars	Lean meat, fish, and eggs
November data for families whose food supply was—								
Pellagra preventing throughout the year.....	Number 6	Calories 4,855	Per cent 49	Per cent 7	Per cent 8	Per cent 25	Per cent 9	Per cent 2
Not pellagra preventing throughout the year.....	12	3,541	50	1	9	30	7	3
April or May data for families whose food supply was—								
Pellagra preventing throughout the year.....	13	3,900	45	11	3	28	8	5
Not pellagra preventing throughout the year.....	13	3,035	54	1	3	34	6	2
Suggested low-cost adequate dietary (pellagra preventing) (21).....		3,000	36	18	13	13	12	8
Food apparently utilized in the United States (12).....		3,850	27	14	13	14	15	17

¹ Per capita.

USE OF SPECIFIED FOOD MATERIALS IN RELATION TO THE INCIDENCE OF PELLAGRA

How long a person can live on an inadequate diet without incurring pellagra depends both upon the degree of the inadequacy of the diet and upon the bodily store of the pellagra-preventing factor which the person has acquired during times of a dietary surplus.

During a 2 to 6 month period previous to the last physical examinations made of the cooperating families (the last 10 days of May or

after the middle of June); each family kept a record of the quantities of milk, lean meat, fish, eggs, fruits, and vegetables used.

It was found that the 14 unaided families whose food supply was pellagra preventing throughout the year used, on the average, 2¼ cups of milk per person per day, about 3 ounces of fruit and succulent vegetables, and about 3 ounces of lean meat. (Table 11.) From these families, 7 men, 14 women, and 42 children were periodically examined for pellagra. Only two persons were suffering from the disease in the late spring, an adult woman who would not drink milk and a 10-year-old girl who was reported as having a very poor and "finicky" appetite. The family dietaries were undoubtedly pellagra preventive, and these two persons were the victims of their own faulty food habits. No further cases of pellagra developed later in the summer in any of these families.

TABLE 11.—*Food supply in relation to pellagra incidence among unaided families: Average reported use of pellagra-preventing food materials in the late winter and spring, history of pellagra among individuals periodically examined, and pellagra incidence in the late spring*

Classification	Families co-operating	Reported use per capita per day of—			Period covered by report on food	Individuals given periodic physical examinations		
		Milk	Vegetables and fruit	Lean meat, fish, and eggs		Total	With history of pellagra	In whom pellagra was observed in late spring
Families whose food supply was—								
Pellagra preventing throughout the year.....	Number 14	Cups 2.20	Pound 0.22	Pound 0.16	Weeks 4-16	Number 63	Number 11	Number 12
Not pellagra preventing throughout the year.....	15	1.15	.15	.13	4-13	81	22	31

¹ These individuals refused to drink milk.

² Averages based on data from 13 families.

Over parallel periods in the late winter and early spring the 15 unaided families in each of which one or more persons incurred pellagra in the late spring used, on the average, less than one-fifth cup of milk, less than 3 ounces of vegetables and fruit, and less than 3 ounces of lean meat, fish, and eggs per person per day. From these families 11 men, 21 women, and 49 children were examined; of these, 4 men, 12 women, and 6 children reported a history of pellagra. Before the end of the summer 1 or more members of each family, altogether 4 men, 13 women, and 14 children, had incurred pellagra.

Even on these very restricted diets not every member in each family succumbed to pellagra. The normal seasonal changes in diet may cut short some cases before they reach a diagnosable stage. Probably the different members of a family group seldom eat the same proportions of the food available at any one time. When there is a shortage of certain food materials some members may be favored with a larger share of the scarce and, therefore, the choice foods; when all kinds of food are plentiful, individual food preferences will determine choice. Apparently some members of each family group are more successful in fortifying themselves against a future shortage of pellagra-preventing foods than are others.

It is of interest to compare the diets of these unaided families and of the subjects of Goldberger's experiment in the fall of 1915, when pellagra was first experimentally induced in man by dietary means (7). In consideration of pardon, 11 convicts in a State penitentiary volunteered to subsist for six months on a 1-sided diet consisting of highly milled wheat flour, bolted maize meal, grits, cornstarch, white rice, cane sugar, homemade cane sirup, sweetpotatoes, pork fat, cabbage, collards, turnip greens, and coffee. During the first three months some buttermilk was used in making the wheat biscuits. The average energy intake of the volunteers was from 2,500 to 3,500 calories, including 41 to 54 grams of protein, 80 to 90 per cent of which was from cereal sources. About 51 per cent of the calories were derived from grain products, 6 per cent from vegetables, 12 per cent from sugar and sirup, and 31 per cent from fat. This diet was, therefore, not only practically devoid of the pellagra-preventing factor, but was low in mineral elements and vitamins A, B, and C, as well as deficient in certain amino acids.

Only men of good health and with no previous history of pellagra were accepted as volunteers. But during the second month after beginning to use this restricted ration, they all began to suffer from weakness, abdominal pain or discomfort, and headache, and before the six months were over, 6 of the 11 men had developed a well-marked eruption of the skin, the earliest beginning about the end of the fifth month of the diet. All of the subjects lost weight, particularly during the last month, and even those who did not incur skin lesions developed the symptoms frequently encountered in pellagrous communities, i. e., loss in weight, exhaustion, dizziness, nervousness, headache, insomnia, burning and redness of the tongue, and cramps. Hence their condition was diagnosed as "pellagra sine pellagra", i. e., not definitely diagnosed as having pellagra, but were classed as suspects, who, it was felt, would have developed the confirmatory skin lesions had the test been permitted to run longer.

The chief difference between the diets of these subjects in Goldberger's experiment and the diets used in April or early May by the farm families among whom pellagra was prevalent in late spring lies in the amounts of lean meat and milk used by the farm families. The volunteering convicts received practically no milk and no lean meat; whereas, on the average, the unaided families among whom pellagra occurred used about one-fifth cup of milk and from 2 to 3 ounces of lean meat, fish, or eggs per person per day. On this small per capita allowance of pellagra-preventing foods some members in each family kept free from outward manifestation of the disease while others succumbed.

In general, the results on the relation of the food supply to pellagra incidence among these farm families are in harmony with the findings secured in a study conducted by Goldberger and his colleagues (14) covering a village population of about 23,000 mill operatives in South Carolina over a period of five years.

FOOD SELECTION IN RELATION TO MONEY VALUE OF DIETS

A shortage of home-produced foods and of ready cash makes evident the nature of the competition between foods that satisfy the appetite and foods that are also otherwise necessary for an adequate

diet. Some families in which one or more members were suffering from pellagra in the late spring had a scanty food supply in the early spring, as judged from records of their total consumption for a week in April or early May. In three of the families in which children as well as adults suffered from pellagra (families Nos. 16, 28, and 29) there seemed to be a real food shortage, as shown in Table 16 of the appendix. The food furnished 1,833, 1,974, and 2,953 calories per adult energy unit per day, respectively, as compared with a standard of 3,000 calories; 0.46, 0.42, and 0.99 gram of calcium as compared with a standard of 0.68 gram per adult unit; 1.06, 1.20, and 2.73 grams of phosphorus as compared with a standard of 1.32 grams; 0.0042, 0.0034, and 0.0078 gram of iron as compared with a standard of 0.0150 gram; and 0.4, 0.1, and 0.5 unit of pellagra-preventing food material as compared with a standard of 1 unit. The relatively high figures for calcium and phosphorus in the case of family No. 29 are due not to the use of milk, which is usually the most important natural food source of these elements, but to the calcium phosphate in the self-rising flour. No milk or cheese was used by any of these three families; only family No. 29, which used some fish and beef, had foods furnishing proteins from animal sources. Family No. 16 used some cabbage, peas, and other vegetables; family No. 28 used no vegetables; and family No. 29, a few sweetpotatoes, tomatoes, and legumes. In these three families from 91 to 97 per cent of the calories were derived from white flour, corn meal, rice, granulated sugar, and lard.

The foods used by these three families consisted of the cheapest food sources of energy, and had a calculated money value of 9, 7, and 13 cents, respectively, per adult energy unit per day. Adequate diets could not have been secured for this money allowance even with wiser spending.

In still another family (No. 21) in which children and adults were suffering from pellagra at the last physical examination in the late spring, the food used in May furnished 4,794 calories per adult energy unit per day. Ninety-seven per cent of the calories were derived from grain products, fats, and sugar, for a money value of about one-third cent per 100 calories. Calculated on the same price basis, a low-cost adequate diet (21) has a value of approximately 1 cent per 100 calories. Obviously this family could not have secured a fully balanced diet for the same money even by reducing the total calories by one-third or one-half. A marked improvement in the quality of the diet could have been made, however, had the family used smaller quantities of the staple foods and included some milk and lean meat, and more vegetables in its diet.

The food of the unaided families among whom pellagra did not occur in the late spring furnished, on the average, 3,900 calories per adult energy unit per day, at a (calculated) money value of 0.56 cent per 100 calories. It was pellagra preventing but would have been better balanced in other respects had it included more vegetables, milk, eggs, and lean meat. Without increasing the money value assigned to food, these families could not have secured the complete low-cost diet suggested by this department (21), but they would have had money for a larger proportion of the protective foods had they been willing to eat somewhat less and reduce their total food intake to the standard of 3,000 calories per adult energy unit per day.

From observations made by Benedict and his coworkers (2), it would appear that in case of serious food shortage, a considerable reduction in diet can be safely undertaken by adults over a period of several months, provided the diet is well balanced. The body seems to adjust itself quite satisfactorily to a lower plane of nutrition. It is not known, however, what effects, if any, more serious than the temporary stunting of growth would occur in children.

USE OF SUPPLEMENTARY FOODS IN RELATION TO INCIDENCE OF PELLAGRA AMONG AIDED FAMILIES

In Lee County there were many families whose food resources and whose economic condition indicated that they would probably succumb to pellagra in the late spring if not given aid during the winter and spring. To 44 of these families certain pellagra-preventing food materials were furnished in definite quantities for known periods previous to the final physical examinations in the late spring. Table 20 gives detailed information on the supply of protective foods in relation to the incidence of pellagra in each of these families, and Table 12 gives the summary for each group receiving definite quantities of each food.

TABLE 12.—*Food supply in relation to pellagra incidence among aided families: Quantity of pellagra-preventing food material furnished per capita per day for specified periods previous to physical examination in late spring, history of pellagra among individuals periodically examined, and pellagra incidence in late spring*

Supplementary food furnished			Individuals given periodic physical examinations		
Kind	Quantity furnished per capita per day	Period previous to last examination	Total	With history of pellagra	In whom pellagra was observed in late spring
		Weeks	Number	Number	Number
Dry skim milk.....	2 ounces.....	8-18	54	35	6
Do.....	4 ounces.....	8	9	3	0
Evaporated milk.....	1 pound.....	9-24	71	38	7
Wheat germ.....	1 ounce.....	16-18	22	8	2
Do.....	2 ounces.....	8	16	4	2
Cured lean pork.....	8 ounces.....	8-20	15	12	4
Canned tomatoes.....	1½ pints.....	8	13	1	0
Pure dry yeast.....	1 ounce.....	8	13	3	0

DRY SKIM MILK

From a group of 10 families receiving 2 ounces of dry skim milk per person per day for 8 to 18 weeks, 54 persons, including 1 man, 16 women, 18 boys, and 19 girls, were periodically examined for pellagra. Of these, the man, 15 women, and 19 children had suffered from pellagra previously. By May and June, after receiving milk for 16 weeks or more, 1 girl and 5 women showed symptoms of the disease. The child, who was then suffering from a mild attack, reported no history of pellagra. The women had all suffered from pellagra before but reported that their cases this year were less severe than formerly.

From three families receiving 4 ounces of dry skim milk per person per day for 8 weeks, 9 persons, including 1 man, 4 women, 3 boys, and 1 girl, were under observation. Three of the women reported a his-

tory of pellagra. None of the persons observed showed symptoms of the disease when the final examinations were made.

EVAPORATED MILK

From 14 families receiving a pound of evaporated milk per person per day for 8 to 24 weeks, 71 individuals were regularly examined. These included 8 men, 16 women, 25 boys, and 22 girls. Six of the men, 13 women, and 19 children had previously suffered from pellagra; 2 men and 4 women, although they had been furnished the milk for 16 weeks or more, had the disease in the late spring, but in milder form than before. One child was suffering from pellagra when the supplementary feeding was begun. His condition was improved, but not cured, by the use of 1 pound of the milk daily for 8 weeks; 4 other persons, however, were cured after receiving the milk for this period.

WHEAT GERM

In a group of 4 families receiving an ounce of wheat germ per person per day for approximately 4 months, 24 individuals, including 3 men, 4 women, 10 boys, and 7 girls were under observation. One man, 2 women, and 5 children reported a history of pellagra. By the end of the period one man and one woman showed symptoms of the disease. The man reported a negative pellagra history but was suffering with a mild case when last examined. The woman had suffered from the disease before.

From 3 families receiving 2 ounces of wheat germ per person per day for 8 weeks, 16 individuals, including 1 man, 6 women, 3 boys, and 6 girls were examined periodically. The man and three women were suffering from pellagra in April when the supplementary feeding was begun. By the middle of June, symptoms of sore mouth and burning skin still persisted in two of the women; the others were apparently free from the disease.

CURED LEAN PORK

From 3 families receiving one-half pound cured lean pork per person per day for approximately 5 months, 7 persons were examined at regular intervals, including 1 man, 4 women, and 2 children. All but one woman had reported a history of pellagra. When the last physical examinations were given the last week in May, three weeks after the supply of meat had been exhausted, three women were suffering from pellagra. In 3 other families 2 men, 3 women, and 3 children were examined in April for the first time. All but one man were found to be suffering from pellagra. These families were given cured lean pork, one-half pound per person per day. After eight weeks, the interval between the first and last examinations, the symptoms of pellagra had completely disappeared from all but one woman, and her condition was improved.

CANNED TOMATOES

Two families in which there were 2 men, 3 women, and 8 children were given 1½ pints of canned tomatoes per person per day for 8 weeks. One person in one family was suffering from pellagra when the supplementary feeding was begun; otherwise both families reported a

negative pellagra history. Two months later when the pellagrin was again examined, he was free from all symptoms of the disease. The second family owned a cow, and used about 2 quarts of milk daily. This increased, of course, the pellagra-preventing value of their diet. No symptoms of pellagra were observed in either family at the last physical examination in June.

PURE DRIED YEAST

In 2 families in which 2 men, 1 woman, and 10 children were examined in April, 1 boy and 2 girls were suffering from pellagra. One ounce of pure dried yeast was furnished each individual daily for the next two months. No symptoms of the disease were observed in any members of either household at the end of that period.

GENERAL OBSERVATIONS

In some cases the quantities of supplementary foods furnished per person per day in this investigation were smaller than have been reported by the Public Health Service (5, 6, 8, 9, 10, 11, 23) to be pellagra preventing when used in addition to a constant basal ration very deficient in pellagra-preventing factors. The food supply that the aided families furnished for themselves was probably not pellagra preventing, as it was very similar to that used in the early spring by the unaided families in each of which one or more members succumbed to pellagra late in the same spring. Probably it contained as much of the protective factor as the experimental basal ration used by the Public Health Service, and possibly more. However, only one family (No. 72) reported the continued and liberal use of a markedly protective food other than that furnished. There is every reason to believe that the furnished foods provided the major share of the pellagra-preventing food used by the aided families and that the lessened incidence, or the moderation in the severity of the cases which did occur, can be attributed chiefly to the supplementary foods in the quantities given.

From the data on health history and food resources given in Tables 15 and 19 it seems likely that had the families which were supplied with pellagra-preventing food continued without aid, the incidence of pellagra among them would have been as high during the period of observation as it had been in their past, or as high as in the current year among those unaided families whose food supply was not pellagra preventing. The use of the supplementary foods unquestionably reduced the incidence of the disease in the aided families.

That no group of families receiving supplementary food was entirely free from the disease may be due to the fact that the quantities furnished were insufficient for the needs of a given individual, or it may be due to the failure of the individuals incurring the disease to use their full share of the furnished food. While it is not suggested that the quantities of supplementary food furnished in this demonstration provided the most suitable per capita allowance, it is clear that when used to supplement a family diet, these food materials are efficacious in greatly reducing the incidence of the disease.

INCIDENCE OF PELLAGRA IN RELATION TO SEX AND AGE

The incidence of pellagra among the cooperating families both in the past and during the year of the study appeared to be higher among the adult women than among the men and children. This is shown in Table 13. Inasmuch as the supplementary pellagra-preventing food was furnished to aided families in definite quantities per person, and as the families made an effort to distribute it equally among their members, the relatively high incidence of pellagra among adult women (usually mothers of families) indicates that they may need more of the pellagra-preventing factor than do men and children, or habitually eat relatively less, especially in case of restricted quantities.

TABLE 13.—Incidence of pellagra in relation to sex and age: Average for all cooperating families

Classification	Individuals examined periodically	Individuals with history of pellagra		Individuals discovered with pellagra at last examination	
		Number	Per cent	Number	Per cent
Unaided families whose food supply was:					
Pellagra preventing throughout the year—					
Male, 18 years and over.....	7	4	57	0	0
Female, 18 years and over.....	14	4	29	1	17
Male, under 18 years.....	20	2	10	0	0
Female, under 18 years.....	22	1	5	1	15
Not pellagra preventing throughout the year—					
Male, 18 years and over.....	11	4	36	4	36
Female, 18 years and over.....	21	12	57	13	62
Male, under 18 years.....	29	3	10	9	31
Female, under 18 years.....	20	3	15	5	25
All aided families whose food supply was supplemented by pellagra-preventing foods:					
Male, 18 years and over.....	21	12	57	3	14
Female, 18 years and over.....	57	42	74	16	28
Male, under 18 years.....	71	24	34	1	1
Female, under 18 years.....	60	27	41	1	1

¹ Would not drink milk.

SUGGESTIONS FOR IMPROVING DIETS

The prevalence of pellagra among the unaided families during this investigation appeared to be related to their supply of home-produced food. Of the 14 unaided families among whom pellagra was not observed, 8 families owned cows, raised hogs for food, and had vegetable gardens; only 1 unaided family reporting an equal provision for its food supply incurred pellagra while under observation. Milk appears to be a food of prime importance in the diet of these farm families. It can easily be used in the quantities necessary for pellagra prevention, and is of great value in reinforcing the diet in many other respects. Other foods furnished by the farm for home use are also of value in pellagra prevention, and should be included in the diet, but in addition to, not as a substitute for, milk.

Of the 59 other families included in this study only one-fourth had cows; about one-half had swine; three-fourths had poultry; and about one-half had gardens. About two-thirds of them were tenant farmers on small farms. The number of persons in each household was large, averaging six to seven persons. It may be of interest to compare these figures with statistics for Lee County as a whole. According to the

United States Census of Agriculture for 1925, (22), 78 per cent of the farmers were tenants and 80 per cent of all the farms were less than 50 acres in size. The average value per acre for land and buildings was \$64.55, and the average value of crops raised in 1924 was approximately \$31 per acre. The average value of the livestock, including approximately three swine per farm, was about \$250. One cow was milked for every two or three farms. The poultry and eggs produced in 1924 had a value of approximately \$30 per farm. Such facts show that the cash incomes and the food resources for farm families in Lee County as a whole are very low, and the families face a very difficult problem in the matter of securing an adequate diet.

Extension workers have amply demonstrated that the acre used for the home garden can be the most profitable acre on the farm. It is also well known that the milk cow and swine provide foods from animal sources most economically. Public-health agencies (4) have pointed out that most rural families must keep well-managed and productive vegetable gardens, poultry flocks, milk cows, and pigs, if they are to have the food materials needed for normal nutrition not only readily available, but available at a relatively low cost. A program for the home production and conservation of food should be undertaken which will make available for every week in the year at least the minimum quantities of protective foods. These quantities are summarized in Table 18 for a family of 7 with 2 adults and 5 children, the average family size among the cooperating families. For families of this size a food supply including these food materials would have a money value of \$575 to \$600 per year if calculated at the retail prices current in Lee County when this study was made (1929-30). The families cooperating in this study could afford such diets only if they produced a large share of the food on their own farms. This has been found expedient by most successful farm families.

SUMMARY AND CONCLUSIONS

The food supply of 73 farm families of Lee County, S. C., has been studied in its relation to the incidence of pellagra. In April or early May the diets of the families in which one or more members showed symptoms of the disease in the late spring were found to consist largely of breadstuffs, sweets, and fats. These foods may be satisfying to the palate and furnish energy very cheaply, but they are inadequate in protein, minerals, and vitamins. In many cases the amounts of calcium and iron were lower than dietary standards for good nutrition recommend, and the diets were poor in vitamins A and C as well as grossly deficient in the pellagra-preventing factor. The families successful in warding off pellagra used diets more abundant in every respect, and containing a much higher proportion of milk than those used by families in each of which one or more members incurred pellagra in the late spring.

The investigators supplied definite quantities of one of six pellagra-preventing food materials to 44 families whose health history and economic resources indicated that without aid they would be unsuccessful in warding off pellagra in the late spring. The articles of food furnished were dry skim milk, evaporated milk, cured lean pork, wheat germ, canned tomatoes, and pure dry yeast. Periodic examinations for pellagra revealed that the incidence and severity of the

disease among these aided families was less than they had experienced in former years and much less than unaided families of similar resources experienced during the period under observation.

Exact knowledge of the food intake of each individual for the entire period of the investigation could not be secured with the supervision available. Hence it can not be affirmed that the supplementary food materials in the quantities used were the sole source of the pellagra-preventing factor; nor is any claim made that the food even of those who did not incur pellagra contained all the pellagra-preventive factor desirable for an individual. However this study does afford a practical demonstration that the addition of 2 to 4 ounces of dry skim milk or 1 pound of evaporated milk, or 1 to 2 ounces of wheat germ, or 1½ pints of canned tomatoes, or one-half pound of cured lean pork, or 1 ounce of pure dry yeast per person per day to the food supply customarily used in winter and early spring suffices to reduce greatly the incidence of pellagra among families which in times of stress subsist on a very monotonous and 1-sided diet containing very little milk, lean meat, fish, or eggs.

The diets of the farm families cooperating in this study would also be much improved in other respects if a larger proportion of their food consisted of dairy products, fruits, vegetables, lean meat, fish, and eggs. For most farm families the most economical means of providing these important foods is through a carefully planned program of home food production and conservation.

APPENDIX

Detailed data on food supply and pellagra incidence among 73 farm families in Lee County, S. C., are given in Tables 14 to 20.

TABLE 14.—Family size, land tenure, and reported food resources of individual families, classified by the type of diet used throughout the year or by kind of supplementary food given

UNAIDED FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Family size by age groups			Land tenure		Report on possession of—					
	18 years and over	11 to 17 years	Under 11 years	Type	Occupancy of present farm	Cows	Hogs	Poultry flock		Vegetable garden	Dried peas or beans for winter use
								For meat	For eggs		
	Number	Number	Number		Years						
1	6	0	2	Hired man	1	Yes	No	No	Yes	No	No
2	2	0	2	Owner	11	No	Yes	Yes	Yes	Yes	Yes
3	2	1	3	do	3	Yes	Yes	Yes	Yes	Yes	Yes
4	2	2	7	do	21	Yes	Yes	Yes	No	Yes	Yes
5	2	0	0	do	15	No	No	No	No	No	No
6	5	1	1	do	30	Yes	Yes	Yes	No	Yes	Yes
7	2	1	2	do	6	Yes	Yes	Yes	Yes	Yes	Yes
8	2	1	1	Tenant	18	Yes	Yes	Yes	Yes	Yes	Yes
9	2	3	5	Owner	3	Yes	Yes	Yes	Yes	Yes	No
10	2	3	3	Tenant	18	Yes	No	No	Yes	Yes	Yes
11	3	3	2	do	5	Yes	No	No	No	Yes	(?)
12	2	3	4	do	10	Yes	No	No	Yes	Yes	Yes
13	2	3	2	Owner	18	Yes	No	No	Yes	Yes	Yes
14	2	0	3	do	3	No	Yes	No	Yes	No	No

TABLE 14.—Family size, land tenure, and reported food resources of individual families, classified by the type of diet used throughout the year or by kind of supplementary food given—Continued

UNAIDED FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Family size by age groups			Land tenure		Report on possession of—					
	18 years and over	11 to 17 years	Under 11 years	Type	Occupancy of present farm	Cows	Hogs	Poultry flock		Vegetable garden	Dried peas or beans for winter use
								For meat	For eggs		
Number	Number	Number		Years							
15.....	2	0	3	Owner.....	1	No.	Yes.	Yes.	Yes.	Yes.	No.
16.....	2	4	2	Tenant.....	5	No.	Yes.	No.	No.	No.	No.
17.....	2	0	0	do.....	2	No.	Yes.	No.	Yes.	Yes.	Yes.
18.....	2	3	1	do.....	10	No.	Yes.	No.	Yes.	Yes.	Yes.
19.....	2	2	2	do.....	5	No.	No.	Yes.	No.	Yes.	Yes.
20.....	5	1	3	Owner.....	50	No.	Yes.	Yes.	No.	Yes.	Yes.
21.....	2	0	2	Hired man.....	0	No.	Yes.	No.	Yes.	No.	No.
22.....	2	0	0	Owner.....	6	Yes.	No.	Yes.	Yes.	Yes.	Yes.
23.....	2	1	4	Hired man.....	10	No.	Yes.	Yes.	Yes.	Yes.	Yes.
24.....	2	2	4	do.....	1	No.	No.	No.	No.	No.	Yes.
25.....	3	3	0	Owner.....	13	Yes.	Yes.	Yes.	Yes.	No.	Yes.
26.....	4	0	1	do.....	40	No.	Yes.	Yes.	Yes.	Yes.	No.
27.....	5	3	2	Tenant.....	6	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
28.....	2	2	5	do.....	3	No.	No.	No.	No.	No.	No.
29.....	2	3	3	do.....	1	No.	No.	No.	No.	No.	Yes.

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH DRY SKIM MILK

30.....	2	1	5	Tenant.....	1	No.	No.	Yes.	Yes.	Yes.	Yes.
31.....	5	0	0	do.....	34	No.	Yes.	No.	No.	No.	Yes.
32.....	2	0	4	Overseer.....	1	No.	Yes.	No.	Yes.	Yes.	No.
33.....	3	2	2	Owner.....	17	No.	No.	Yes.	No.	No.	No.
34.....	2	2	1	Tenant.....	1	No.	No.	Yes.	Yes.	Yes.	Yes.
35.....	2	2	5	do.....	3	No.	Yes.	Yes.	Yes.	Yes.	Yes.
36.....	2	4	5	do.....	3	No.	Yes.	Yes.	Yes.	Yes.	Yes.
37.....	2	2	1	Hired man.....	1	No.	No.	No.	No.	No.	Yes.
38.....	2	0	5	Cropper.....	1	No.	No.	Yes.	Yes.	No.	Yes.
39.....	2	4	5	Tenant.....	3	Yes.	Yes.	Yes.	No.	Yes.	Yes.
40.....	1	0	3	do.....	10	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
41.....	2	0	2	(?)	(?)	No.	No.	Yes.	No.	No.	Yes.
42.....	2	1	0	(?)	9	Yes.	No.	Yes.	Yes.	No.	Yes.

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH EVAPORATED MILK

43.....	2	0	5	Hired man.....	3	No.	No.	No.	No.	Yes.	No.
44.....	3	4	4	Tenant.....	2	No.	No.	Yes.	Yes.	No.	No.
45.....	2	0	0	Hired man.....	14	No.	Yes.	No.	No.	Yes.	Yes.
46.....	4	3	4	Tenant.....	10	No.	Yes.	No.	No.	No.	No.
47.....	2	1	2	do.....	15	No.	No.	Yes.	Yes.	No.	No.
48.....	4	0	1	do.....	3	No.	No.	No.	No.	Yes.	No.
49.....	2	0	1	Hired man.....	15	No.	Yes.	No.	Yes.	No.	No.
50.....	2	0	3	Tenant.....	1	No.	Yes.	Yes.	No.	No.	No.
51.....	3	3	2	do.....	4	No.	Yes.	Yes.	No.	Yes.	Yes.
52.....	2	1	4	do.....	2	No.	Yes.	No.	No.	Yes.	No.
53.....	1	0	1	do.....	14	Yes.	Yes.	Yes.	Yes.	No.	Yes.
54.....	2	1	2	(?)	14	(?)	(?)	(?)	(?)	(?)	(?)
55.....	2	3	4	Tenant.....	8	No.	Yes.	No.	Yes.	No.	No.
56.....	2	1	4	do.....	4	No.	Yes.	Yes.	Yes.	No.	Yes.

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH WHEAT GERM

57.....	3	3	2	Tenant.....	2	No.	Yes.	Yes.	No.	Yes.	No.
58.....	2	2	1	Owner.....	9	Yes.	No.	Yes.	Yes.	Yes.	No.
59.....	2	3	5	do.....	24	No.	Yes.	Yes.	No.	Yes.	Yes.
60.....	3	2	2	Tenant.....	34	No.	No.	Yes.	Yes.	Yes.	Yes.
61.....	3	1	3	do.....	16	Yes.	No.	No.	No.	No.	No.
62.....	2	3	5	Owner.....	6	(?)	Yes.	Yes.	Yes.	No.	Yes.
63.....	5	0	1	Tenant.....	14	No.	No.	No.	(?)	No.	No.

TABLE 14.—Family size, land tenure, and reported food resources of individual families, classified by the type of diet used throughout the year or by kind of supplementary food given—Continued

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH LEAN CURED PORK

Family No.	Family size by age groups			Land tenure		Report on possession of—					
	18 years and over	11 to 17 years	Under 11 years	Type	Occu-pancy of present farm	Cows	Hogs	Poultry flock		Vegetable garden	Dried peas or beans for winter use
								For meat	For eggs		
	Number	Number	Number		Years						
64.....	2	1	1	Tenant.....	4	No..	No..	Yes..	Yes..	Yes..	No.
65.....	1	1	1	do.....	1	No..	No..	Yes..	Yes..	Yes..	No.
66.....	3	0	0	Hired man.....	3	Yes..	No..	Yes..	Yes..	Yes..	No.
67.....	2	1	1	Tenant.....	3	Yes..	No..	No..	Yes..	No..	No.
68.....	2	1	1	Hired man.....	3	No..	No..	No..	No..	No..	No.
69.....	2	0	0	do.....	2	Yes..	No..	No..	Yes..	No..	No.

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH CANNED TOMATOES

70.....	2	0	4	Tenant.....	3	No..	Yes..	No..	Yes..	No..	Yes.
71.....	3	2	3	do.....	3	Yes..	Yes..	No..	Yes..	No..	Yes.

AIDED FAMILIES WHOSE FOOD SUPPLY WAS SUPPLEMENTED WITH PURE DRY YEAST

72.....	2	4	2	Tenant.....	3	No..	Yes..	Yes..	Yes..	Yes..	No.
73.....	3	2	3	do.....	3	No..	Yes..	No..	No..	No..	No.

TABLE 15.—Food supply of unaided families: Quantity, in pounds, of food materials used per adult energy unit at each of two seasons by individual families with two types of diets

NOVEMBER DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Family size in adult energy units	Grain products					Milk and cheese		Vegetables and fruit										Fats and oils			Sugars			Lean meat, fish, and eggs							
		Flour	Corn meal	Oats	Rice	Bread and other cereal	Milk	Cheese	Potatoes	Sweet potatoes	Cabbage	Collards	Other greens	Peas	Tomatoes	Other vegetables	Legumes	Berries	Other fruit	Salt pork and bacon	Lard	Butter	Sugar	Molasses and sirup	Preserves and jelly	Poultry	Fresh pork and other meat	Ham	Beef	Fish	Eggs	
1	5.0	0.34	0.44	0.34	0.20		0.00	0.03		2.10				0.38	0.14				0.11	0.17		0.25	0.34		0.17		0.08		0.25			
2	1.38	0.27	0.13	0.12					0.52		0.17		0.52	0.10	0.12				0.09	0.09		0.26	0.19	0.06	0.09						0.01	
3	1.66	0.60	0.61	0.61			2.62						1.17	0.09	0.02	0.01			0.15	0.09		0.06	0.15	0.06								
4	1.71	0.56	0.46	0.30	0.13		3.43						1.17	0.08			0.05		0.17	0.07		0.18	0.11		0.45					0.26		
5	2.2	0.39	2.13						0.13				0.22			0.03			0.18													
6	2.4	0.63	0.53		0.10				0.36				0.11		0.11	0.13			0.24	0.21		0.10										

APRIL OR MAY DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

2	2.2	0.56	0.28				0.33		0.47			0.07	0.04	0.04	0.07			0.15	0.31		0.22	0.11								0.27	0.08
3	4.6	0.15	0.40	0.05	0.02	0.04	2.81		0.02	0.24	0.14	0.06	0.04	0.04	0.03	0.02	0.16		0.03	0.12		0.08	0.04		0.04		0.15		0.11	0.04	
4	7.7	0.65	0.35		0.03		1.71		0.51		0.08	0.11	0.08	0.03	0.13				0.17	0.09		0.08	0.22		0.03				0.22	0.06	
5	2.2	0.48	0.99			0.04		0.08				0.40		0.16					0.36	0.16	0.08								0.08		
6	2.4	0.52	0.55		0.02		0.04		0.06		0.15		0.04		0.01		0.23		0.22	0.08		0.06	0.01						0.06	0.02	
7	2.0	0.44	0.23	0.07	0.07		2.26					0.07			0.02	0.01	0.35		0.22	0.09		0.18	0.01			0.10		0.04	0.08		
8	2.0	0.60	0.64	0.26	0.21		3.14				0.05				0.01				0.22	0.09						0.10		0.09	0.15	0.11	
9	2.3	0.44	0.37	0.18	0.08		2.62				0.01				0.02	0.03	0.03	0.03	0.20	0.16									0.06	0.06	
10	6.3	0.68	0.23	0.18	0.12		1.05				0.23			0.03	0.03	0.03	0.03		0.09	0.11		0.24					0.10	0.09	0.18	0.02	0.03
11	6.9	0.58	0.52		0.04		1.14						0.08		0.03	0.03	0.03		0.18	0.10	0.04	0.10	0.06					0.10	0.06	0.03	
12	1.48	0.51	0.06	0.04			1.88		0.10				0.05		0.03	0.03			0.18	0.10	0.04	0.10	0.06					0.08	0.02	0.11	
13	5.7	0.31	0.30	0.18							0.05		0.05			0.10	0.06		0.13	0.08		0.15	0.15	0.05				0.08	0.02	0.11	
14	2.7	0.61	0.63	0.30	0.09				0.15	0.05	0.10			0.14					0.10	0.30		0.20	0.15	0.05				0.10	0.10	0.23	

NOVEMBER DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

15	4.1	0.56	0.08	0.26	0.23																																	
16	6.9	.46			.04					0.23	0.43		0.04	0.10																								
17	3.2	.80	.84		.18						.56	.13		0.05																								
18	6.5	.53	.27		.05						.92																											0.01
19	5.3	.67	.36	.38	.07						.70																											
20	6.3	.50	.08		.19						.11	.21		.16	.05																							
21	3.0	.76	.52								1.50	.23		.07	.11	.28																						
22	2.2	.32	.41		.06	0.06		0.06			.08		.31																								.06	
23	4.8	.89	.36	.12							.62	.06		.13	.24																						.05	
24	6.5	.57	.27	.26	.03			.04	.06		.24			.38	.08	.07	.18		.13	.15	.27	.18														.02		
25	5.9	.58	.30		.06						.10			.11	.07																						.04	
26	4.6	.62	.78	.06	.03	.09					.21					.05	.20	.08			.12	.06	.05	.07			0.06								.09	.05	.06	.08

APRIL OR MAY DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

15	4.1	0.47		0.24	0.44																																	
16	6.9	.41			.07								0.22																									
17	3.2	1.07		.07	.04			0.10			.37																											
18	6.5	.18	0.31		.02		0.38				.17			0.03	.04	0.09																						0.01
20	6.8	.67	.26								.14	.50			.01	.04				0.03	0.40	.27	.15	.08				.05							0.02	0.10	.02	
21	3.0	.86	1.04	.19							.25	.21				.06																						.03
23	4.8	.96	.28	.12	.05						.10	.09																										
24	6.5	.69	.31		.08		.05																															.09
25	5.9	.45			.07						.17	.45			.09	.03						.15	.29	.15	.10				.05							.02	.02	
26	4.6	.57	.01	.26	.01						.08		.15							.04	.08	.19	.12	.21	.12	.06									.04	.04	.03	
27	8.8	.78	.40	.06	.07						.11	.02			.04	.21					.08	.19	.14	.03	.19	.01	.02			0.06					.08	.08	.02	
28	6.4	.54	.07		.04						.17											.18	.14	.10	.26											.12	.02	
29	6.6	1.04	.10		.08					0.10						.08		.07					.18	.11	.26										.09	.13		

TABLE 16.—Food supply of unaided families: Nutritive value of food used at each of two seasons by individual families with two types of diets

NOVEMBER DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Nutritive value per adult unit per day in terms of—						Calories derived from—					
	Energy	Protein	Calcium	Phosphorus	Iron	Pellagra-prevent-ing factor	Bread, flour, and cereal	Milk and cheese	Vegetables and fruit	Fat and oils	Sugars	Lean meat, poultry, fish, and eggs
	Calor-ies	Grams	Grams	Grams	Gram	Units	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
1.....	5,624	116	6.99	2.30	0.0233	3.3	37	2	19	19	17	6
2.....	4,645	99	1.57	3.87	0.0180	1.3	40	6	41	11	11	2
3.....	4,218	82	1.53	2.82	0.0144	2.5	47	20	22	9	9	5
4.....	5,740	84	1.47	3.02	0.0152	3.5	43	20	11	17	9	5
5.....	5,057	160	.75	3.17	0.0154	2.0	79	3	13	13	13	5
6.....	4,236	61	.94	2.23	0.0078	.6	48	7	40	5	5	5

NOVEMBER DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

15.....	2,549	42	0.55	1.54	0.0077	0.5	73	3	22	13	2	2
16.....	2,137	27	.53	.88	.0069	.8	35	13	38	13	1	1
17.....	5,466	89	1.08	2.87	.0102	1.0	52	5	38	4	1	1
18.....	3,379	58	.71	1.84	.0070	1.5	42	13	27	7	11	11
19.....	4,135	70	.78	2.37	.0101	1.8	50	10	19	5	4	4
20.....	2,711	70	.65	1.50	.0099	.7	41	5	33	14	1	1
21.....	4,323	68	.82	2.37	.0102	1.8	46	18	34	4	2	2
22.....	3,103	59	.88	1.54	.0111	.9	43	4	2	6	1	1
23.....	4,481	52	.73	2.23	.0077	.9	47	9	36	7	1	1
24.....	3,981	62	.75	2.01	.0132	1.2	47	2	9	26	14	2
25.....	2,532	49	.75	1.84	.0072	1.0	58	2	27	10	3	3
26.....	3,797	94	.90	2.87	.0094	1.6	56	9	19	3	3	3

APRIL OR MAY DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

2.....	3,501	62	0.82	1.96	0.0121	1.4	36	3	8	33	18	10
3.....	3,463	79	1.18	2.60	0.0126	3.2	35	20	5	18	6	5
4.....	3,025	75	1.16	2.50	0.0200	2.2	40	14	6	25	11	4
5.....	4,868	89	1.35	2.27	0.0145	1.0	49	3	2	45	1	1
6.....	3,157	01	.94	2.66	.0078	.8	55	2	3	35	4	1
7.....	3,637	66	1.25	2.21	0.0106	2.3	35	10	2	31	10	3
8.....	5,430	142	2.46	4.24	0.0158	4.0	52	18	2	12	10	6
9.....	3,221	68	1.25	2.31	0.0079	2.5	45	27	1	21	6	6
10.....	4,528	78	1.10	2.73	0.0107	1.2	47	7	3	32	6	5
11.....	3,186	56	.86	1.91	0.0139	.3	59	1	1	23	10	6
12.....	3,771	59	1.02	2.13	0.0113	1.0	45	13	2	32	7	1
13.....	3,434	60	.80	1.20	0.0152	.7	37	8	7	27	16	5
14.....	4,461	84	.66	2.40	0.0125	.5	57	2	27	8	6	6

APRIL OR MAY DATA FOR FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

15.....	2,863	41	0.46	1.40	0.0061	0.3	67	4	29	8	1	1
16.....	1,833	22	.46	1.06	0.0142	.4	41	5	46	5	5	5
17.....	3,791	60	1.37	2.83	0.0134	.8	43	4	4	42	4	4
18.....	2,381	33	.43	1.05	0.0056	1.0	48	5	4	35	4	4
20.....	2,800	59	.87	2.02	0.0101	.9	50	5	5	33	8	4
21.....	4,794	80	.85	2.80	0.0100	.4	60	2	2	24	6	6
23.....	3,479	53	.74	2.26	0.0078	.3	63	1	2	34	3	2
24.....	2,786	41	.61	1.71	0.0051	.4	50	1	2	33	1	1
25.....	2,686	32	.65	1.33	0.0084	.0	30	7	7	49	11	3
26.....	3,645	72	.90	2.15	0.0118	.5	63	1	1	30	1	5
27.....	3,723	74	1.07	2.50	0.0106	.6	55	2	2	27	14	2
28.....	1,974	23	.42	1.20	0.0034	.1	50	3	3	37	10	10
29.....	3,053	63	.90	2.73	0.0078	.5	63	3	3	24	4	6

TABLE 17.—Retail price of food materials in Lee County, S. C., November, 1929, May, 1930, as reported by cooperating families¹

Food material	Price most frequently paid		Reported price range	
	Per pound	Other unit	Per pound	Other unit
Grain products:	<i>Cents</i>		<i>Cents</i>	
Bread.....	8.6	10 cents per loaf.....		
Flour.....	4.2	\$1 per 24 pounds.....	4.2-4.6	\$1-\$1.10 for 24 pounds.
Corn meal.....	2	25 cents per package.....		20-50 cents per package.
Grits.....	2.5	6 cents per quart.....		
Hominy.....	2.5	do.....		
Macaroni.....		10 cents per package.....		
Oatmeal.....	5			
Rice.....	5.5			10-15 cents per quart.
Dairy products:				
Milk, fluid whole.....		10 cents per quart.....		
Milk, dry skim.....	25			
Cheese.....	35			
Vegetables, fruits:				
Potatoes.....	3.3			
Sweet potatoes.....	3			
Beans, dried.....	15			
Tomatoes.....		10-15 cents per can.....		
Beans, green string.....	20			20-32 cents per pound.
Peas.....	15.6	12.5 cents per quart.....		12.5-20 cents per quart.
Cabbage, collards, greens, onions, turnips.....	(5)			
Corn.....		10 cents per can.....		
Vegetable soup.....	(10)			
Berries.....		15 cents per quart.....		
Fruit, fresh.....	(8)			
Fats, oils:				
Butter.....	40		40-50	
Lard.....	12.5		12.5-20	
Bacon fat.....	(20)			
Pork, salt.....	12.5		8-17	
Sugars:				
Sugar.....	7		5-10	
Honey.....	(20)			
Jelly.....		(20 cents per pint).....		
Sirup.....	6.4			65-85 cents per gallon.
Lean meats, fish, eggs:				
Beef, fresh.....	15		12.5-25	
Beef, chipped.....	25			
Beef, corned.....	25		20-30	
Beefsteak.....	35			
Pork.....	30			
Sausage.....	25		25-30	
Poultry.....	30			
Fish.....	17		14-20	
Salt fish.....	8.3			
Salmon.....	26		10-20	
Eggs.....		20 cents per dozen.....		

¹ Parenthesis indicates price used in calculating the money value of home-produced articles of food used by some families but not purchased by any during the period of the study. The figures used for these four items were for the summer of 1930, Washington, D. C., retail price for inexpensive grades, forms, or varieties.

TABLE 18.—Food supply of unaided families: Average quantity and money value of food materials used per adult energy unit per day by two groups at two seasons compared with suggested low-cost adequate dietary (21)

Food material	November data for families whose food supply was—				April or May data for families whose food supply was—				Suggested low-cost adequate dietary (21)	
	Pellagra preventing throughout the year ¹		Not pellagra preventing throughout the year ²		Pellagra preventing throughout the year ³		Not pellagra preventing throughout the year ³			
	Quantity	Money value	Quantity	Money value	Quantity	Money value	Quantity	Money value	Quantity suggested	Money value
Grain products:										
Flour.....	0.65	2.73	0.60	2.52	0.48	2.02	0.67	2.81	0.32	1.36
Corn meal.....	.75	1.50	.36	.72	.47	.94	.20	.52	.22	.39
Grits.....	.14	.35	.09	.22	.11	.28	.07	.18	.08	.43
Rice.....	.09	.50	.09	.50	.07	.38	.07	.38		
Bread, other cereal.....			.01	.07	.01	.07			.06	.30
Total.....	1.63	5.08	1.15	4.03	1.14	3.80	1.07	3.89	.68	2.48
Dairy products:										
Milk.....	1.02	4.74			1.29	6.00	.03	.14	1.70	7.51
Cheese.....	.01	.18	.01	.35	.01	.21				
Total.....	1.03	4.92	.01	.35	1.30	6.21	.03	.14	1.70	7.51
Vegetables, fruits:										
Potatoes.....			.02	.07	.09	.30	.09	.30	.16	.34
Sweetpotatoes.....	.71	2.13	.53	1.59	.01	.18	.01	.30	.42	1.25
Cabbage.....					.07	.35	.20	1.00	.08	.42
Collards.....	.09	.45	.07	.35						
Other greens.....	.01	.08	.03	.15	.06	.30	.01	.05	.04	.21
Peas.....	.23	.46	.08	.16	.01	.02	.04	.08		
Tomatoes.....	.04	.33	.03	.25	.03	.25	.02	.17	.23	1.91
Other vegetables.....	.08	.40	.09	.45	.05	.25	.05	.25	.19	1.01
Legumes.....	.03	.15	.03	.15	.04	.05	.01	.05	.03	.39
Berries.....	.01	.10			.07	.70	.02	.20		
Other fruit.....			.05	.40	.04	.32	.02	.16	.19	1.54
Total.....	1.20	4.07	.03	3.57	.40	2.72	.47	2.29	1.28	8.00
Fats, oils:										
Salt pork, bacon.....	.16	2.00	.17	2.12	.14	1.75	.14	1.75	.05	.78
Lard.....	.09	1.12	.11	1.35	.13	1.62	.13	1.62	.02	.32
Butter.....					.02	.80			.04	1.04
Total.....	.25	3.12	.28	3.50	.29	4.17	.27	3.37	.10	2.14
Sugars:										
Sugar.....	.15	1.65	.10	.70	.12	.84	.04	.42	.08	.55
Molasses, sirup.....	.13	.82	.03	.19	.06	.38	.04	.25	.11	.88
Preserves, jellies.....	.02	.13	.01	.03	.01	.03			.04	
Total.....	.30	2.00	.14	.92	.19	1.25	.10	.67	.23	1.43
Lean meats, fish, eggs:										
Poultry.....	.12	3.60	.02	.60	.01	.15			.05	1.50
Beef.....	.02	.30	.02	.30	.03	.45	.02	.30	.03	.39
Ham.....	.01	.30			.03	.90				
Fresh pork, other meat.....			.02	.60	.01	.30	.01	.24	.13	3.00
Fish.....	.08	1.36	.03	.51	.08	1.36	.04	.68	.03	.52
Eggs.....			.01	.13	.07	.93	.02	.27	.05	.69
Total.....	.23	5.59	.10	2.14	.23	4.09	.09	1.49	.29	7.06
Grand total.....	4.64	24.78	2.61	14.51	3.64	22.13	2.63	11.85	4.28	28.62

¹ Average for 6 families.

² Average for 12 families.

³ Average for 13 families.

TABLE 19.—Food supply of unaided families in relation to pellagra incidence: Reported use by individual families of pellagra-preventing food materials in the late winter and spring; with history of pellagra, and pellagra incidence by sex and age groups in the late spring

FAMILIES WHOSE FOOD SUPPLY WAS PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Reported use per capita per day of—			Period covered by report on use of food previous to last physical examination	Individuals given physical examinations periodically												
	Milk	Vegetables, and fruit	Lean meat, fish, and eggs		Total				With history of pellagra				In whom pellagra was observed in late spring				
					Men	Women	Boys	Girls	Men	Women	Boys	Girls	Men	Women	Boys	Girls	
	Cups	Pound	Pound	Weeks	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
1.....	3.3	0.23	0.08	14			2	2									
2.....	1	.18	.30	4	1	1	2		1	2				1	1		
3.....	2.1	.15	.22	12	1	2	1	3	1								
4.....	3.9	.20	.11	14		1	3	0		1	1						1
5.....	2	.14	.42	12	1	1											
6.....	.6	.11	.12	16	1	2	2		1								
7.....	3.1	.21	.24	12		1	1	2		1	1						
8.....	4.0	.10	.20	10													
9.....	4.1	.18	.13	12	1	1	1	3									
10.....	2.0	.18	.07	4				3									
11.....	4.0	.15	.15	6		1											
12.....	2.2	.35	.01	4													
13.....	2.1	.20	.10	4			3	2									
14.....	0	.20	.04	4	1		2										
Average of total.....	2.20	.22	.16		7	14	20	22	4	4	2	1		1			1

* Did not drink milk.

TABLE 19.—Food supply of unaided families in relation to pellagra incidence: Reported use by individual families of pellagra-preventing food materials in the late winter and spring; with history of pellagra, and pellagra incidence by sex and age groups in the late spring—Continued

FAMILIES WHOSE FOOD SUPPLY WAS NOT PELLAGRA PREVENTING THROUGHOUT THE YEAR

Family No.	Reported use per capita per day of—			Period covered by report on use of food previous to last physical examination	Individuals given physical examinations periodically											
	Milk	Vegetables, and fruit	Lean meat, fish, and eggs		Total				With history of pellagra				In whom pellagra was observed in late spring			
					Men	Women	Boys	Girls	Men	Women	Boys	Girls	Men	Women	Boys	Girls
					Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
15	Cups 0	Pound 0.13	Pound 0.03	Weeks 6	1	1	4	1	1				1			
16	.02	.07	.07	18	1	1	5	1					1		3	1
17	.02	.09	.04	16	1	2								1		
18	.57	.07	.03	16			2	1								
19	.20	.07	.06	14	1	1		4								1
20	.14	.09	.09	15	1	3	2	1		2		1				
21	.07	.04	.06	14	1	1	1	1			1				1	
22	.65	.30	.20	18												
23	(?)	.07	.08	14			3	2			2					
24	.03	.05	.05	14			1	3								
25	.08	.15	.15	18	1	2		1		2		1				
26	.46	.32	.19	18	1	2		1								
27	(?)	.27	.32	12	1	2		1		1						
28	0	.25	.30	4	1	1	5	2	1			1	1		3	1
29	0	.27	.10	4	1	1	3	2	1	1			1	1	2	2
Average or total	1.18	.15	.14		11	21	29	20	4	12	3	3	4	13	9	5

† Data questioned; therefore omitted.

‡ Average for 13 families.

TABLE 20.—Food supply of aided families in relation to pellagra incidence: Kind and quantity of pellagra-preventing food materials given to individual families, history of pellagra among individuals periodically examined, and pellagra incidence, by age and sex groups, in the late spring

FAMILIES GIVEN DRY SKIM MILK: 2 OUNCES PER PERSON PER DAY

Family No.	Period of aid previous to late spring physical examination	Individuals given periodic physical examinations											
		Total				With history of pellagra				In whom pellagra was observed in late spring			
		Men	Women	Boys	Girls	Men	Women	Boys	Girls	Men	Women	Boys	Girls
	Weeks	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
30	10		1	4	1								1
31	18		2										
32	15	1	1	1	3	1	1	1	3				
33	12		3	4									
34	18		3	1	1				3			1	
35	16		1	5	2			4	2				
36	16		1	2	5			2	3			1	
37	18		2	1	1			2	1				
38	8		1	3	2			2	2				
39	8		1	1	1			2	1				
Total		1	16	18	19	1	15	8	11		5		1

FAMILIES GIVEN DRY SKIM MILK: 4 OUNCES PER PERSON PER DAY

40	8		1	2	1								
41	8	1	1	1									
42	8		2										
Total		1	4	3	1		3						

FAMILIES GIVEN EVAPORATED MILK: 1 POUND PER PERSON PER DAY

43	16	1	2	1	3	1				1			
44	16	1	1	4	4	1	1	2	2		1		
45	22	1	1			1	1						
46	16	1	1	3	4	1		1	2	1	1		
47	24		1	3			1						
48	10		1		1					1		1	
49	18		3	1			3						
50	20	1	1	1	2		1	1					
51	22			3	2	1		1	2				
52	22	1	1	4	1	1		4	1		1		
53	8		1	1			1	2				1	
54	8		1				1						
55	8	1	1	3	4								
56	8		1	1	1		2	2					
Total		8	16	25	23	6	13	11	8	2	4	1	

FAMILIES GIVEN WHEAT GERM: 1 OUNCE PER PERSON PER DAY

57	10	1	1	3	2					1			
58	16	1	1	2	1		1	2	1				
59	18		1	3	2								
60	16	1	1	2	2	1	1	1	1		1		
Total		3	4	10	7	1	2	3	2	1	1		

FAMILIES GIVEN WHEAT GERM: 2 OUNCES PER PERSON PER DAY

61	8	1	2	1	2	1	1						
62	8		1	2	4				1				
63	8		3				2				2		
Total		1	6	3	6	1	3		1		2		

¹ Woman pregnant.

² Active pellagra in April when supplementary feeding was begun.

TABLE 20.—Food supply of aided families in relation to pellagra incidence: Kind and quantity of pellagra-preventing food materials given to individual families, history of pellagra among individuals periodically examined, and pellagra incidence, by age and sex groups, in the late spring—Continued

FAMILIES GIVEN CURED LEAN PORK: ¼ POUND PER PERSON PER DAY

Family No.	Period of aid previous to late spring physical examination	Individuals given periodic physical examinations											
		Total				With history of pellagra				In whom pellagra was observed in late spring			
		Men	Women	Boys	Girls	Men	Women	Boys	Girls	Men	Women	Boys	Girls
	Weeks	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
64	20	1	1	1		1	1	1					
65	20				1								
66	20		2					1					
67	8	1	1	1		1	1						
68	8		1		2				2				
69	8	1	1						2				
Total		3	7	2	3	2	6	1	3		4		

FAMILIES GIVEN CANNED TOMATOES: ¼ PINTS PER PERSON PER DAY

70	5	1	1	1	3	1							
71	8	1	2	3	1								
Total		2	3	4	4	1							

FAMILIES GIVEN PURE DRY YEAST: 1 OUNCE PER PERSON PER DAY

72	8	1	1	4	2								
73	8	1		2	2		1	2					
Total		2	1	6	4		1	2					

¹ Active pellagra in April when supplementary feeding was begun.

² Much improved.

³ Family also used 2 quarts of milk daily.

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