CIRCULAR No. 89 OCTOBER, 1929

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

NUTRITIVE VALUE AND COST OF FOOD SERVED TO COLLEGE STUDENTS

By Edith Hawley, *Senior Food Economist, Economics Division, Bureau of Home Economics*

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INTRODUCTION

Almost 1,000,000 boys and girls leave their homes every fall to go to college or university. To meet the physical needs of such a host of young people some provision must be made by either the institution of learning or the townspeople. Up to the time they leave home most of them have been accustomed to considerable parental care and supervision, and in many cases this means that these boys and girls have done little thinking or choosing for themselves. Their food has been planned and set before them with frequent admonitions as to what they should or should not eat. Their clothes were planned for them, and their shelter was determined by the parents' standards of housing and decoration.

When the break comes and close supervision disappears, the young person feels a sense of freedom in making these momentous decisions for himself. The vegetables that he has never liked, for instance, he will give up, and he will specialize in pies and doughnuts of which he never before had all he wanted. He will choose his own clothes, and his room will reflect his own tastes. In the matter of clothes and interior decoration, as a rule, no permanent harm is done by a sudden burst of this kind into freedom. In the matter of food, however, a strong and healthy constitution may be completely undermined by an uncurbed indulgence in taste.

In order to prevent some of these tendencies from going too far, many colleges and universities provide dormitories under skilled management and with a dietitian in charge of the food. Here supervision of some kind is maintained over the students. Other colleges and universities leave the matter almost entirely to sororities

and fraternities. Here the person in charge is chosen largely for her social assets, and the diet that is furnished is determined for the most part by the tastes and financial status of the students. The opinion is oftentimes expressed that the food supplied in the sororities and fraternities is not adequate to meet the students' needs.

Since the information available for students' diets was scattered and of an individual nature, the present study was undertaken to get a more comprehensive view of the situation. Data for 250 institutions in colleges and universities are presented and compared with the results from 12 published studies made in 93 institutions. Records from both supervised and unsupervised dining halls are included. The nutritive value of the food actually consumed by students is compared with their estimated nutritive needs, and the analysis of cost is made by comparing the food expenditures of the various institutions in toto and for the various foodstuffs.

SOURCES OF DATA ON FOOD HABITS OF COLLEGE STUDENTS

The first careful investigation of the American diet was made under the direction of W. O. Atwater (*1, 2, 3, 4, 10, 11, 15, 17, 18, 21, 26, 29, 30*).[1] In 1875 he began an investigation of food habits in Massachusetts; and after becoming associated with the United States Department of Agriculture, he directed the collection of dietaries from all parts of the United States.

Two other studies, one by Richards and Talbot (*23*) in Chicago and the other by Bailey (*5*) in Kansas, were made about the same time. Interest in this type of investigation then abated and does not become apparent again until 1914–15, when Gephart (*9*) studied the diet at St. Paul's School. During the 14 years that have elapsed since that time considerable data have accumulated. Seven other investigators have collected information pertaining to dietaries of college students from 49 institutions.

The 11 investigations that have been briefly mentioned here furnish data on the nutritive value and costs of the food consumed, and are brought together in the various tables for comparison with the studies reported in this circular. In addition to the 11 studies of nutritive value and cost of food, Gross (*12*) reports the distribution of expenditure among the various food groups in the practice house at the Michigan State College of Agriculture, but no discussion of the total cost of the diet is given.

Though St. Paul's School, studied by Gephart in 1914–15, is a boys' preparatory school and the students are somewhat younger than those included in the college and university studies, because of the wide use that has been made of this study the results are given here for comparison. The writer made a similar study of the diet at this school during 1926–27, which is as yet unpublished, but figures from it are quoted here for comparison.

General information about these studies is summarized in Table 1.

[1] Reference is made by italic numbers in parentheses to "Literature cited," p. 19.

TABLE 1.—*Sources of published data on the food habits of students in colleges, universities, and a preparatory school, arranged chronologically*

Investigator	Date of study	College or university	Location	Institution		
				Number covered by study	Average size	
					Persons	Adult male units
	Year				*Number*	*Number*
Atwater and others [1]	1886–1905		In 9 States	39		75
Richards and Talbot (*23*).	1893–94	University of Chicago.[4]	Chicago, Ill	1	106	85
Bailey (*5*)	1900–1902	University of Kansas	Lawrence, Kans	1	34	
Gephart (*9*)	1914–15	St. Paul's School	Concord, N. H	3	165	
Feeney (*8*)	1916	Miami University	Oxford, Ohio	3	128	
Macleod and Griggs (*20*).	1917	Vassar College [4]	Poughkeepsie, N. Y.	1	115	92
Borthwick (*7*)	[3] 1917	Montana State College of Agriculture.	Bozeman, Mont	1		
Bevier (*6*)	[3] 1920	University of Illinois [5]	Urbana, Ill	9		
Kramer and Grundmeier (*19*).	[3] 1926	Kansas State Agricultural College.	Manhattan, Kans	20	23	
Raitt (*22*)	1926	University of Washington.[4]	Seattle, Wash	12	32	26
Hawley [2]	1926–27	St. Paul's School	Concord, N. H	3	185	
Gross (*12*)	[3] 1928	Michigan State College of Agriculture.	East Lansing, Mich	9		7

[1] See references listed on page 2.
[2] Unpublished.
[3] Date of publication.
[4] Mostly women in the institutions.
[5] Probably about 25 persons to the institution.

When the United States entered the World War in 1917, the importance of food in achieving a successful outcome was emphasized. Because so little was known about the food habits of the American people, and because it was impossible to make adequate plans for the efficient use of the foods produced in the United States without such knowledge, investigations were undertaken by a number of organizations and Government bureaus to gather information that would throw light on this subject.

Among the Government agencies interested in such studies was the former Office of Home Economics of the United States Department of Agriculture. Through the home economics teachers of the country, it collected by the so-called inventory method food-consumption records for one week from 1,195 families and 465 institutions. Inventories were taken of the food on hand at the beginning and at the end of the week, and careful records were kept of the food purchased during the period. The difference between the second inventory and the sum of the first inventory and the food purchased gave the food supplied for consumption. To find the food actually consumed it was necessary to deduct the amount recorded as wasted.

Of the 465 institutions covered by this war-time survey, 192 records of food consumed by college students were analyzed to determine their adequacy to meet estimated nutritive needs and to find the cost of the diet. Institutions from colleges and universities in all parts of the United States, serving on the average 78 adult-male units daily, which is the equivalent of 78 moderately active men, or 97.5 women of similar activity, are represented. The results of this study are here published for the first time.

In 1925 the Bureau of Home Economics asked the departments of home economics in the various State colleges to cooperate in a study

of food consumption in students' residence halls, especially those maintained by sororities and fraternities. In response to this request records suitable for use were collected from 35 institutions by the inventory method already described. Seventeen were from sororities and fraternities, and 18 from dormitories and practice houses.

In addition to the data from the dietary studies conducted by the former Office and the present Bureau of Home Economics, results are available from a study of food consumption made by Leila W. Hunt in 23 residence halls at the State College of Washington during 1926–27. It also was made by the inventory method and includes 7 studies from the dining halls under the supervision of the home economics department and 16 studies from the sororities, fraternities, and clubs at the college.

FOOD FACTORS INCLUDED IN THE ANALYSIS

The analysis of a diet to ascertain its adequacy commonly consists of three steps: (1) The calculation of nutrients present in the food; (2) an estimate of the nutritive needs of the group under consideration; and (3) the comparison of the nutrients available for consumption with a standard of good nutrition to see if the food is sufficient to meet the needs of the group. This method of analysis was used in the present study.

Although food is known to supply the body with 20 or more food constituents in the form of 10 ash constituents, 6 unidentified substances called vitamins, and water, protein, fat, and carbohydrate, the analysis of a diet usually includes only those factors which can be measured quantitatively and which are known to be oftentimes furnished in insufficient amounts. In this study only the total energy furnished by the protein, fat, and carbohydrate consumed, and the amount of protein, calcium, phosphorus, and iron yielded by the diet were studied. In making these calculations the short method which has been worked out in the Bureau of Home Economics was used (*14*).

The nutritive needs of the various individuals included in the investigations were determined by the use of Hawley's double scale for calculating dietary requirements (*13*). Since they consisted almost entirely of adults, it was necessary chiefly to make adjustment for the lower nutritive need of women on the assumption that their nutritive requirements are 0.8 as great as those of a moderately active man weighing 70 kilograms, or 154 pounds. The results given by this calculation show the number of adult-male units maintained by the diet. The amount of nutrients available for each individual is found by dividing the total nutrients yielded by the food by the total number of adult-male units.

Figures thus obtained should be compared with a standard of good nutrition to judge of the adequacy of the diet. In this study comparison was made with Sherman's nutritive standard (*25, p. 541–542*), which may be stated as 3,000 calories, 67 grams of protein, 0.68 gram of calcium, 1.32 grams of phosphorus, and 0.015 gram of iron per man per day. The protein, calcium, and phosphorus figures are derived largely from metabolism experiments in which the individuals used in the experiments maintained protein, calcium, or phosphorus balance on a minimum of the nutrient under consideration. In setting

a nutritive standard with a margin for safety Sherman added 50 per cent to the average minimum quantity of the various factors needed to maintain equilibrium. The standards for energy and iron are in line with the other three.

Sherman's standard is sometimes criticized as being too low in certain nutrients. But in making such a criticism one is likely to lose sight of the two functions of such a standard. (1) It may be used in measuring the adequacy of a customary diet. Here the standard should indicate a safe minimum. (2) A nutritive standard has value in educating people in good food habits. Here it should indicate an optimum value for the best growth and development. Since such a standard at the present time must be based largely on opinions with possible bias, and since this study was undertaken for the purpose of finding out whether the diet consumed by college students was adequate to meet their needs, it seems best to use a standard which is known to indicate a safe minimum.

In two of the investigations reported here, those of the Office of Home Economics and of L. W. Hunt, considerable analysis is made of the cost of the diet. The study of 35 institutions made by the Bureau of Home Economics in 1926–27 does not include this factor, however, because it was not reported in sufficient detail by the cooperating institutions.

NUTRITIVE VALUE OF THE AVERAGE DIET OF COLLEGE STUDENTS

As already pointed out, the analysis of the food consumed by college students includes the five factors, total energy, protein, calcium, phosphorus, and iron. In Table 2 arithmetic means are given for the five food factors, together with certain statistical measurements of their reliability. Here the data are divided according to the dates of study, 1918 and 1926. Under the date 1926 are included the 35 institutions studied by the Bureau of Home Economics and the 23 institutions studied by L. W. Hunt at the State College of Washington.

TABLE 2.—*Nutritive value and cost of the average food consumed in 192 institutions for college students in 1918, and in 58 institutions in 1926,*[1] *together with measurements of the variability and reliability of the data*

Factors studied	Per adult-male unit per day of—										
	Energy		Protein		Calcium		Phosphorus		Iron		Cost
	1918	1926	1918	1926	1918	1926	1918	1926	1918	1926	1918
	Calories	*Calories*	*Grams*	*Grams*	*Gram*	*Gram*	*Grams*	*Grams*	*Gram*	*Gram*	*Cents*
Arithmetic mean	3,180	3,070	97	89	0.86	0.85	1.59	1.46	0.017	0.016	45.1
Standard deviation	601	615	19	21	.29	.23	.39	.41	.004	.005	14.3
Standard error of mean	43	81	1	3	.02	.04	.03	.05	.0003	.0007	1.0
3×standard error of mean	129	243	4	8	.06	.11	.09	.15	.0009	.002	3.0
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Coefficient of variation	19	20	20	24	34	33	25	28	24	31	32

[1] The figures given for 1926 include the 35 institutions studied by the Bureau of Home Economics, and the 23 dietary studies made by L. W. Hunt at the State College of Washington.

The similarity between the investigations made in the two periods is striking. In the 1918 study 192 institutions were included, and in that of 1926 there were 58 institutions, or nearly one-third as many. The average food consumption in terms of energy and nutrients, however, is close. In 1918 the average diet yielded 3,180 calories, and in 1926 it yielded 3,070 calories. The standard deviation is almost identical in the two studies, 601 calories in 1918 and 615 calories in 1926. This means that in both investigations, approximately two-thirds of the diets studied showed an energy value within 600 calories of the arithmetic mean. In other words, two-thirds of the diets had an energy value of 2,500 to 3,700 calories per man per day.

The results for calcium in the two investigations are also close. In 1918 the average diet contained 0.86 gram with a standard deviation of 0.29 gram, and in 1926 it contained 0.85 gram with a standard deviation of 0.28 gram. This means that the diet of college students contained in two-thirds of the institutions from 0.57 gram of calcium to 1.15 grams per man per day.

Results for the other three nutrients do not agree quite so closely as do those for energy and calcium. The average diet in 1918 yielded 97 grams of protein with a standard deviation of 19 grams, and in 1926 it yielded 89 grams of protein with a slightly larger standard deviation, or 21 grams. The figures for phosphorus were 1.59 grams with a standard deviation of 0.39 in 1918, and 1.46 grams with a standard deviation of 0.41 in 1926; and for iron the figures were 0.017 gram in 1918, standard deviation 0.004, and 0.016 gram in 1926, standard deviation 0.005. For these three nutrients the mean intake was smaller in 1926, and in each case the standard deviation was larger.

Because of differences in units for measuring the food constituents and in their relative size, the coefficient of variation is more illuminating than the standard deviation. It is obtained by dividing each standard deviation by its mean and multiplying by 100. The coefficients of variation given in Table 2 for the two investigations agree in showing that the energy of the diet, which in two-thirds of the institutions was consumed in amounts within 19 to 20 per cent of the mean, is the least variable factor; whereas calcium, with a coefficient of 33 to 34 per cent, is the most variable factor of the diet. This factor is influenced largely by the use that is made of milk. It is very easy to change the calcium content of the diet by increasing or decreasing the consumption of milk.

The variability of protein, phosphorus, and iron is intermediate between the other two factors. The 1918 study indicated that protein is similar to energy in its variability. The 1926 study indicates a wider variation, two-thirds of the cases giving protein values within 24 per cent of its mean. For phosphorus two-thirds of the diets were within 25 to 28 per cent of the means, and for iron they were within 24 to 31 per cent of the means.

It is interesting to note how closely these figures agree with those obtained by Sherman when studying metabolism data for the purpose of setting nutritive standards for protein, calcium, and phosphorus (*24, p. 25*). In 109 experiments in protein he found a mean of 44.4 grams with a coefficient of variation of 21 per cent. The present findings from institutional dietaries with a mean of 89 to 97 grams

show a similar coefficient—20 to 24 per cent. In 95 experiments in phosphorus Sherman found a mean of 0.88 gram with a coefficient of variation of 17; whereas the institutional dietaries show a mean of 1.46 to 1.59 grams with a coefficient of variation somewhat higher than Sherman's—25 to 28 per cent. The mean of 98 experiments in calcium tabulated by Sherman is 0.45 gram with a coefficient of variation of 27 per cent; whereas the mean of the institutional dietaries reported in this circular is 0.85 to 0.86 gram of calcium with a coefficient slightly higher than Sherman's—33 to 34 per cent. In other words, the variation from the average value of the nutritive factors in the freely chosen diets studied here is only slightly greater than that of individuals in closely controlled laboratory experiments in nutrition.

In studies of this kind the tendency is to ask how valuable these averages are for generalization. Some of the institutions are in all probability not representative of the group. How great are the errors introduced into the averages by such samples? The standard errors of the mean are included in Table 2 to show the reliability of the various means. They are obtained by dividing the standard deviation in each case by the square root of the number of institutions studied. Because three times as many cases were included in the study made in 1918, the means in that study have smaller standard errors than do the means of the 1926 study. Basing conclusions on the assumption that three times the standard error of the mean indicates the limits that might be expected from other studies of this same kind, another study of 192 average diets of college students picked in the same way as these would probably result as follows: The average for energy would be within 3,050 to 3,310 calories per man per day; for protein it would be from 93 to 101 grams; for calcium, 0.80 to 0.92 gram; for phosphorus, 1.50 to 1.68 grams; and for iron, 0.016 to 0.018 gram. In a smaller study greater variation would be expected.

Sherman's standard of nutrition, given as 3,000 calories, 67 grams of protein, 0.68 gram of calcium, 1.32 grams of phosphorus, and 0.015 gram of iron, is shown in Table 3. Comparison of the figures given above with this standard indicates that the average college student probably gets an adequate diet. The analysis indicates, however, that the factors which approach most nearly to the minimum standard are energy and iron.

COMPARISON OF RESULTS FROM ALL STUDIES OF COLLEGE DIETS

The nutritive value of the average food consumed by college students, according to the studies made in 1918 and in 1926, is compared in Table 3 with results obtained in other investigations of the college students' diet. Since various dietary scales were used by these investigators, adjustments were made so that the results of all are expressed on the same base, namely, Hawley's double scale (*13, p. 20, 28*). Some of the investigators also used the old Rubner factors in calculating the energy of the food consumed. Corrections were made for this difference, and all results for energy are based on the values, 4 calories per gram for carbohydrate and protein and 9 calories per gram for fat. Two averages are given in Table 3, one in which the results reported in the two surveys of St. Paul's School are included with the college studies, and the other based only on the diets of college students.

TABLE 3.—*Nutritive value of the food consumed by college students as shown by studies made in 1918 and in 1926, compared with a standard of good nutrition and with averages from results obtained in other investigations*

Investigator	Dietaries studied	Nutritive value per man per day of—									
		Energy		Protein		Calcium		Phosphorus		Iron	
		Amount	Percentage of standard	Amount	Percentage of standard	Amount	Percentage of standard	Amount	Percentage of standard	Amount	Percentage of standard
	Number	*Calories*	*Per cent*	*Grams*	*Per cent*	*Grams*	*Per cent*	*Grams*	*Per cent*	*Grams*	*Per cent*
Standard (Sherman) for safety		3,000	100	67	100	0.68	100	1.32	100	0.015	100
Office of Home Economics (1918)	192	3,180	106	97	145	0.86	126	1.59	120	.017	113
Bureau of Home Economics (1926) [1]	58	3,070	102	89	133	0.85	125	1.46	111	.016	107
Average [2] 11 investigations		3,470	116	106	158	0.93	137	1.60	121	.018	120
Average [2] 9 investigations, not including St. Paul's School		3,380	113	105	157	0.90	132	1.57	119	.018	120
Atwater and others [3]	39	3,420	114	114	170						
Richards and Talbot [3,4,5]	1	3,690	123	135	201	1.10	162	2.12	161	.023	153
Bailey [3]	2	3,570	119	99	148						
Feeney [6]	3	3,300	110	90	134	1.06	156	1.31	99	.016	107
Macleod and Griggs [4,5]	1	3,840	128	141	210	1.11	163	1.95	148	.021	140
Borthwick [5]	1	3,190	106	91	136	0.70	103	1.28	97	.019	127
Bevier [5]	9	3,140	105	87	130						
Kramer and Grundmeier	20	2,890	96	82	122	0.58	85	1.24	94	.014	93
Raitt [5]	12	3,340	111	102	152	0.86	126	1.52	115	.016	107
St. Paul's School:											
Gephart [3,5]	3	4,000	133	112	167						
Hawley	3	3,940	131	111	166	1.09	160	1.75	133	.018	120

[1] Includes records from 35 institutions collected by Bureau of Home Economics and from 23 institutions studied by L. W. Hunt.
[2] Unweighted.
[3] The old energy values—4.1 calories per gram of protein and carbohydrate, and 9.3 calories per gram of fat—were used by the investigators. Corrections were made for this factor so that all results are on the same base.
[4] Mineral values were calculated in the Bureau of Home Economics.
[5] The results given in terms of persons were changed to figures for adult-male units.
[6] Not clear whether results were given in terms of adult-male unit or of person.

Comparison of the figures reported in this circular with those from other studies shows that the food consumed by college students yielded somewhat less energy, protein, calcium, and iron than there reported. According to the figures presented the average diet of college students yields slightly more energy and from 33 to 45 per cent more protein than students of that age probably need. The 11 reports previously made indicate that students consume, on the average, 16 per cent more energy and 58 per cent more protein than they need. When the results for St. Paul's School, a preparatory school for boys, are left out of the calculation, the food constituents are slightly reduced. The data from all of these studies indicate that the diets consumed by college students yield, on the average, from 25 to 37 per cent more calcium, 11 to 21 per cent more phosphorus, and 7 to 20 per cent more iron than the nutritive standard indicates that they need.

The question as to what foods are responsible for these variations in nutrients naturally arises. This is brought out by a study of the distribution of energy among the food groups. (Table 4.) A suggested distribution of energy for a well-balanced diet, based on C. L. Hunt's work (*16*), is given for comparison with the results found in six of these investigations.

TABLE 4.—*Comparison of the distribution of energy among the various food groups consumed by college students with a standard of good nutrition and with results from similar studies*

Study	Percentage of total calories supplied by—				
	Meat,[1] fish, and eggs	Milk, cream, and cheese	Fatty foods and sweets	Cereals	Fruits and vegetables
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Standard (C. L. Hunt)	15–16	14–15	25–24	28–25	18–20
Office of Home Economics (1918))	17	12	29	29	14
Bureau of Home Economics (1926)	16	13	34	24	13
Richards and Talbot	27	14	22	24	13
Macleod and Griggs	31	16	21	21	11
Raitt	16	8	39	22	15
St. Paul's School (Hawley)	21	18	29	19	13

[1] Bacon and salt pork are included with meat.

According to C. L. Hunt's calculations, if the total energy need is met the other factors are probably adequate when 15 to 16 per cent of the energy is derived from meat, fish, and eggs; 14 to 15 per cent from milk, cream, and cheese; 24 to 25 per cent from the fatty foods and sweets; 25 to 28 per cent from cereals; and 18 to 20 per cent from fruits and vegetables. When the results of the various studies are compared with this as a standard, it appears that in spite of deviations the students, on the whole, followed this distribution of energy.

For meat, fish, and eggs the results from only three studies deviate to any extent from this standard. The girls studied by Macleod and Griggs (*20*) derived 31 per cent of their energy from this source, those studied by Richards and Talbot (*23*) 27 per cent, and the boys at St. Paul's School according to Hawley's study 21 per cent. The students included in the food surveys made at Vassar College by Macleod and Griggs and at St. Paul's School by Hawley consumed

relatively more milk, cream, and cheese than were needed for a well-balanced diet according to C. L. Hunt's standard; whereas those studied by Raitt (*22*) at the University of Washington derived considerably less energy from these foods than is desirable. The institutions studied by the Office and the Bureau of Home Economics also used them less freely than the standard suggests as desirable.

Fruits and vegetables are another important food group which should be used freely in the diet because of mineral and vitamin yield. The standard suggests that 18 to 20 per cent of the total energy be drawn from this source. In the various institutions, however, the foods furnished only 11 to 15 per cent of the total energy. There is no way of measuring quantitatively the vitamins of the diet, but when the use of milk, fruit, and vegetables is low, as in some of the studies, the danger of a deficiency of these factors is greatly increased.

Fatty foods, sweets, and cereals, especially those which are highly refined, are important chiefly for their energy value. The students in four of the investigations derived 58 to 60 per cent of their energy from these sources, as the standard suggests. In the diets studied by Richards and Talbot (*23*), Macleod and Griggs (*20*), and Hawley, however, only 46, 42, and 48 per cent of the energy, respectively, was supplied by these foods.

From the investigation of the nutritive value of the food consumed in these institutions the conclusion is probably justified that the students were, on the whole, well nourished. Kramer and Grundmeier (*19*), however, indicate that the students included in their study were in all probability receiving a diet inadequate in certain foods constituents.

Large variations in food constituents are shown in the different investigations. The smallest food intake is found in Kramer and Grundmeier's study, in which the average diet yielded 4 per cent less energy and 22 per cent more protein than is considered necessary to meet the students' needs. The greatest excess of energy is found in the diets studied at St. Paul's School, where the boys consumed 32 per cent more energy than was estimated as needed. The study made by Macleod and Griggs gives results which approximate those of St. Paul's School and indicates that Vassar College students were consuming food which yielded 28 per cent more energy than they needed. The greatest excess of protein in the diet is shown in the studies made by Richards and Talbot and by Macleod and Griggs, which report the use of more than twice as much protein as was actually needed.

In only five of the investigations previously reported were the mineral values calculated. Since Macleod and Griggs and Richards and Talbot, however, reported consumption figures for each foodstuff in great detail, it was possible to calculate the mineral values of these diets and to compare them with the other studies. The results are shown in Table 3. According to the figures given there, the average diet studied by Kramer and Grundmeier was inadequate in calcium, phosphorus, and iron, the greatest deficiency being in calcium. The diet yielded only 85 per cent as much calcium as the students probably needed, whereas 94 per cent of their phosphorus need and 93 per cent of their iron need were met. Minerals in the greatest excess were yielded by the diets reported by Macleod and Griggs, Richards and Talbot, and Hawley for St. Paul's School. In

all three cases 60 to 63 per cent more calcium, 33 to 61 per cent more phosphorus, and 20 to 53 per cent more iron were consumed than were actually needed according to the nutritive standard.

COST OF THE STUDENTS' FOOD

Evaluation of food costs is more difficult than that of the nutritive value of food, because it is not possible to set up standards of expenditure in the same sense that nutritive standards can be determined. The best way to evaluate food costs is to compare what one group gets in return for the money expended with that of other groups. Analysis of the cost of food here is based on returns from 192 institutions collected by the Office of Home Economics in 1918 and from 23 institutions studied by L. W. Hunt in 1926. Table 5 shows the average amount expended by the institutions for food and the way the expenditures were distributed among five food groups. Eleven investigations covering a period of 41 years, 1886 to 1927, are also given for comparison with the results obtained in these two investigations, but it is possible to show the distribution of expenditure in only 8 of these 11 studies. Because of the changing price level during the 41 years covered, it was necessary for comparative purposes to reduce all figures for cost to a common base. The 1926 price level was chosen, and adjustment was made by the use of the retail food-index numbers published by the United States Bureau of Labor Statistics (*28, p. 6, 34, 35*).

TABLE 5.—*Comparison of the average cost of the food consumed by college students, based on 1926 prices, and of the distribution of expenditure among the various food groups as shown by various investigators*

Study	Year	Location	Cost per adult-male unit per day	Distribution of expenditures for—				
				Meat, fish, and eggs	Milk, cream, and cheese	Fatty foods, sweets, and miscellaneous	Cereals	Fruits and vegetables
			Cents	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Office of Home Economics.	1918	United States	45	29	15	18	13	26
L. W. Hunt	1926	Pullman, Wash	40	22	9	28	10	31
Average, including St. Paul's School.		Concord, N. H	63	34	12	21	10	23
Average, not including St. Paul's School.			55	34	11	22	11	22
Atwater and others	1886–1906	In 9 States	59					
Richards and Talbot	1893–94	Chicago, Ill	77	36	17	19	13	15
Bailey	1900–1902	Lawrence, Kans	44					
Feeney	1916–17	Oxford, Ohio	61	31	7	23	13	26
Macleod and Griggs	1917	Poughkeepsie, N. Y	59	51	12	15	7	15
Borthwick	1917	Bozeman, Mont	48	38	8	27	5	21
Bevier	1919	Urbana, Ill	56					
Kramer and Grundmeier.	1924	Manhattan, Kans	34	26	12	25	13	24
Raitt	1926	Seattle, Wash	54	28	9	29	9	25
Gross	1927	East Lansing, Mich	26	11	16	16	16	31
St. Paul's School:								
Gephart	1914–15	Concord, N. H	93					
Hawley	1926–27	do	111	36	21	12	5	26

On the basis of 1926 prices, the food in the institutions covered by the Office of Home Economics and by L. W. Hunt cost on an average from 40 to 45 cents per man per day. The investigation of 192 institutions in 1918 shows a standard deviation of 14 cents, and a coefficient of variation of 32 per cent. (Table 2.) The data from L. W. Hunt's study were not adequate for the calculation of variation.

The expenditures from these two groups of institutions are 10 to 15 cents less than the average for the colleges and universities studied by other investigators. If the expenditures at St. Paul's School are included in the average the differences are greatly increased, for the other institutions spent only about two-thirds as much. In fact, with the exception of the Chicago institution studied by Richards and Talbot in 1893–94, none of the investigators report an expenditure as high as this average—63 cents. Only the institutions in Manhattan, Kans., studied by Kramer and Grundmeier, show an average expenditure lower than those reported in this circular. Bailey, of the University of Kansas, reported about the same expenditure as the 192 institutions studied by the Office of Home Economics in 1918.

The question is naturally asked: What did the various institutions get in return for their money? Comparison of the cost figures with the nutritive values given in Table 3 shows that, in return for the 40 to 45 cents per man per day spent by the institutions reported here, the students received a liberal diet. With an average expenditure of 55 cents per man per day the amount of energy, protein, calcium, and iron consumed was increased somewhat. When the food expenditures at St. Paul's School are included in the average, however, food costs are increased 14 per cent, but the amount of nutrients yielded by the food is only slightly increased.

The expenditures shown in Table 5 are for food as purchased; whereas the nutritive value of the diet given in Table 3 is based on the food actually consumed. Some of the differences in expenditure are therefore probably caused by differences in waste. Such waste figures as are available show considerable variation. In the institutions studied by Atwater and by Richards and Talbot, 13 per cent of the energy and 14 per cent of the protein of the purchased food were wasted. In the study made by Macleod and Griggs 12 per cent of each was wasted. At the time Gephart studied the food consumed at St. Paul's School, the waste included 15 per cent of the energy and 18 per cent of the protein that was purchased, and in the recent study made by Hawley the waste of energy at the school had more than doubled and that of protein had increased about 27 per cent. Other factors usually involved in variations in expenditure are quality of goods purchased, services demanded in the way of credit and delivery, and the size of the order. The studies that have been made, however, throw no light on these problems.

Although no satisfactory standard for the distribution of expenditure among the various food groups can be stated because of the many factors that enter in to influence the prices that are paid for food, yet it was suggested in one of the Government thrift publications issued soon after the war (*27*) that about one-fifth of the food budget be spent on each of the five groups: Meat, fish, and eggs; milk, cream, and cheese; fatty foods, sweets, and miscellaneous foods; cereals; and fruits and vegetables. It is interesting to see how widely these studies vary from that standard. The institutions at Washington

State College spent 22 per cent of their food costs for meat, fish, and eggs; whereas Macleod and Griggs (*20*) report an expenditure of 51 per cent at Vassar College. The other institutions are between these two extremes. None of them spent less than 20 per cent on this group of foods. Only one school, St. Paul's School for boys, during 1926–27 spent as much as 20 per cent on milk, cream, and cheese; yet Table 3 shows that calcium deficiency was reported in only one investigation, that of Kramer and Grundmeier. On the average about 21 per cent of the total food expenditure went for fatty foods, sweets, and miscellaneous foods, and 23 per cent for fruits and vegetables, but the expenditures for cereals and for milk, cream, and cheese averaged only about 10 per cent. The proportion spent for meat, fish, and eggs was much higher than for the other food groups. The figures show considerable deviation, not only from the suggested standard but among themselves.

COMPARISON OF DIETS PLANNED BY DIETITIANS WITH THOSE PLANNED BY PERSONS UNTRAINED IN FOOD VALUES

The need of a dietitian in feeding the sick is commonly recognized but the question is oftentimes asked whether it pays to have a dietitian in charge of normal diets. This study was undertaken partly for the purpose of determining whether the fraternities and sororities which are depended on in many colleges and universities to provide housing and food for the students were meeting their responsibilities. The food served there is seldom under the supervision of persons trained in food values. Since the figures that have been used in this circular are derived from both types of institutions, it is possible to compare the results directly. This is done in Table 6, which shows the figures obtained in the study of 35 institutions made in the Bureau of Home Economics, and in the 23 institutions reported by L. W. Hunt at the State College of Washington.

TABLE 6.—*Comparison of the average diet planned by dietitians with that planned by persons untrained in food values*

Factor studied	Unit of study	Bureau of Home Economics, 1926		L. W. Hunt, 1926		Standard of good nutrition
		Dietitian	No dietitian	Dietitian	No dietitian	
Energy	Calories	3,426	3,241	3,197	2,648	3,000
Protein	Grams	110	90	97	77	67
Calcium	do	1.31	0.72	0.94	0.71	0.68
Phosphorus	do	1.93	1.34	1.74	1.20	1.3
Iron	do	.02	0.016	0.019	0.014	0.015
Cost	Cents			44.5	38.4	
Meat, fish, eggs	Percentage of total calories			15	11	15–16
Do	Percentage of total cost			25	21	20 or less.
Milk, cream, cheese	Percentage of total calories			9	8	14–15
Do	Percentage of total cost			9	9	20 or more.
Fatty foods, sweets, miscellaneous.	Percentage of total calories			39	41	24–25
Do	Percentage of total cost			27	27	20 or less.
Cereals	Percentage of total calories			18	23	25–23
Do	Percentage of total cost			8	12	20 or more.
Fruits, vegetables	Percentage of total calories			19	17	18–20
Do	Percentage of total cost			31	31	20 more or less.

In both investigations diets planned by persons trained in food values furnished more energy and nutrients than did those supervised by untrained persons. According to L. W. Hunt the sororities and fraternities studied at the State College of Washington did not supply enough food to furnish the energy, phosphorus, and iron needed by the students. The calcium requirement was only slightly above the standard, not only in these sororities and fraternities but in those studied in the Bureau of Home Economics. These boarding houses may have been trying to save money on their food. In the State College of Washington they spent 38.4 cents per man per day; whereas the halls under skilled management spent 44.5 cents. Low food costs are also shown in Kramer and Grundmeier's study of sororities and fraternities in Manhattan, Kans. (*19*), where the houses were spending 34 cents per man per day for food inadequate in energy, calcium, phosphorus, and iron.

The distribution of energy among the various food groups is in harmony with the above findings. The dietitian at Washington State College supplied more energy in the form of meat, fish, eggs, milk, cream, cheese, fruits, and vegetables; whereas the meals planned by a person untrained in food values drew more largely on cereals, fatty foods, sweets, and miscellaneous foods—foods important chiefly for their energy value. The distribution of cost shows, on the whole, a similar tendency.

Figures such as these lead to the conclusion that a college boarding house under the supervision of a person untrained in food values is rather likely to serve an inadequate diet. This is especially true when a person of that kind tries to save money on the food bills. Such a person usually mistakes apparent for real economy, not knowing that foods which seem cheaper are oftentimes much dearer. Milk, for instance, is one of the cheapest sources of calcium. But when compared, pound for pound, with white bread, it seems much dearer. One would, however, have to eat more than four times as much bread as milk to get the same amount of calcium. The energy need may therefore be more than met by such a food, while the requirement for minerals and vitamins is not supplied.

QUANTITY OF FOOD PURCHASED AND AMOUNT PAID PER POUND

Five of the investigations discussed here were reported in sufficient detail to show the average quantity of the various foodstuffs purchased during one month. Four studies show the amount paid per pound. L. W. Hunt, in addition, reports the amount that she has found suitable to allow for each adult-male unit in marketing. These figures, given in Tables 7 and 8, should be of value in planning menus and in purchasing food for a large group.

TABLE 7.—*Food consumed per adult-male unit per month according to five investigations and suggested average serving per adult-male unit*

Food	Office of Home Economics (191 colleges), 1918	Bureau of Home Economics (44 colleges), 1926	St. Paul's School, 1926–27	Macleod and Griggs, 1917	Richards and Talbot, 1893–94	L. W. Hunt, average serving per adult-male unit
Meat, fish, and eggs:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Beef	7.6	6.9	11.6	9.1	16.6	0.33
Lamb	.6	----	4.2	4.8	7.0	.33
Pork	2.0	1.8	1.3	7.2	1.7	.25
Poultry	1.3	----	4.6	7.3	4.0	.50
Veal	.9	1.6	3.6	----	3.1	.33
Fish	2.4	1.2	2.4	4.1	2.0	.33
Eggs	2.0	2.6	7.4	3.1	1.5	.33
Other meat	.5	.8	3.4	----	----	.20
Milk, cream, and cheese:						
Whole milk	29.3	28.1	61.9	43.2	46.6	1.20
Other milk	2.3	.8	.5	----	----	.33
Cream	1.0	2.9	5.2	7.7	4.6	.12
Cheese	.4	.6	.3	.2	.2	.03
Ice cream	.7	.3	.1	----	----	.24
Fatty foods:						
Bacon and salt pork	.4	.4	2.0	1.2	.6	.200
Butter	3.0	3.6	5.7	3.5	4.0	.025
Table oil	.3	2.1	.4	.2	.1	.013
Lard and other cooking fats	.9	----	1.6	1.4	----	.026
Sugar and sirups:						
Honey	.1	.2	----	----	----	.02
Maple sirup	.1	----	.1	.5	.3	.04
Molasses	.4	.2	.3	.3	.4	.02
Corn sirup	.9	.2	.1	----	----	----
Sugar	4.6	5.0	9.9	4.7	5.2	.45
Jams and jellies	.4	.5	2.0	1.0	1.5	----
Cereals:						
Bread, white	3.2	5.0	2.9	9.6	13.8	----
Bread, graham	2.8	1.3	----	2.3	1.1	----
Other baked goods	1.5	.2	.7	.4	.6	----
Corn meal	1.8	.4	.2	----	1.6	----
Cornstarch	.1	.1	.1	----	----	.027
Flour, white	5.7	6.2	11.4	3.7	1.7	.50
Flour, graham	1.1	.2	.2	----	3.1	.25
Other flour	.7	----	----	.1	----	.25
Hominy	.4	.1	.1	.1	----	----
Macaroni	.3	.5	.3	.1	.2	.02
Rice	.6	.4	.5	.2	.4	.02
Rolled oats	.6	.3	----	.1	1.1	.10
Tapioca	.1	----	----	.1	.1	.02
Wheat cereal	.6	1.1	2.4	.4	----	.10
Other cereals	----	.1	.4	.3	----	.024
Fruits, fresh:						
Apples	4.9	1.4	5.8	2.6	5.9	.50
Bananas	1.7	1.4	.9	3.1	3.1	.25
Cherries	----	.7	----	----	----	----
Grapes	----	.1	----	----	3.7	.25
Melons	.1	----	.1	----	.2	.75
Oranges, lemons, and grapefruit	2.5	4.8	7.5	5.0	.4	.20
Peaches	.1	.6	----	----	.1	----
Pears	----	.5	.2	----	----	----
Rhubarb	.1	----	.6	----	----	----
Other	.4	.6	----	.4	.4	----
Fruits, canned	3.1	2.1	8.1	1.2	.5	.26
Fruits, dried:						
Raisins	.1	.2	.3	.1	.3	----
Prunes	.6	----	----	.4	.5	.13
Apricots	.1	----	----	----	.5	.13
Other	.3	.7	.2	----	.6	----
Vegetables, fresh:						
Beets	.6	.6	.7	1.4	1.1	.33
Cabbage and cauliflower	1.4	1.3	1.3	.5	1.3	.25
Carrots	.4	2.0	1.2	.4	.1	.33
Celery	.3	1.0	.5	.4	.4	.20
Corn	.2	.9	.2	----	----	----
Cucumbers	.1	----	----	----	----	.05
Lettuce and greens	.4	2.5	2.5	.6	.4	.15
Onions	.6	.5	1.3	1.4	.3	.25
Peas	----	.5	----	----	.2	.33
Potatoes	17.9	16.6	47.6	18.4	23.0	.50
Sweet potatoes	.7	1.5	1.6	----	3.3	.50
Squash and pumpkin	.1	.3	1.1	----	.5	.50
Tomatoes	.5	1.1	.2	----	----	.33
Turnips	.7	.2	1.0	1.3	1.3	.25
Other	1.2	.2	.2	1.7	----	----

TABLE 7.—*Food consumed per adult-male unit per month according to five investigations and suggested average serving per adult-male unit*—Continued

Food	Office of Home Economics (191 colleges), 1918	Bureau of Home Economics (44 colleges), 1926	St. Paul's School, 1926–27	Macleod and Griggs, 1917	Richards and Talbot, 1893–94	L. W. Hunt, average serving per adult-male unit
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Vegetables, canned	6.3	0.9	7.1	3.0	2.3	0.25
Vegetables, dried	.8	1.8	.7	.1	.6	.25
Miscellaneous:						
Chocolate and cocoa	.1	.2	.2	.2	.2	.004
Coffee, coffee substitutes, and tea			.7			.13
Gelatin		.1				.00074
Olives and pickles	.2	.1	.2	1.0		.01
Nuts	.1	.2		.1	.2	.04
Salt						.01
Leavening agents			.1			.0005
Vinegar			.2			
Other foods	.1		.5	.9		

None of the diets can be considered really well-balanced, but with some slight adjustments the figures reported in the 1918 and 1926 studies of the Office and the Bureau of Home Economics would furnish the best guides for checking up on purchases. In both cases, however, the allowance of milk, cream, cheese, fruits, and vegetables should be increased and that of fatty foods and sweets decreased.

Two methods were used in adjusting the figures in Table 8 to the 1926 price level. Since 1917 the United States Bureau of Labor Statistics has published index numbers for 20 or more individual foods, and they were used in adjusting the foods so marked to the 1926 price level. For all of the foods the general food index of retail prices published by the same bureau was also used (*28*). Results obtained by the two methods are, on the whole, similar, but a few foods reflect a strongly fluctuating price level. Sugar, for instance, was, relative to the general food-price level, higher in 1917 and 1918 than in 1926. The two adjusted sugar prices for these years point to this difference. The differences for lard, flour, corn meal, and navy beans are similar. Most of the meats were, on the other hand, relatively lower in 1917 and 1918 than they were in 1926. Two sets of figures given in Table 8 probably picture the type of prices paid in the various institutions fairly well and they are stated in such a way that they may be directly compared.

TABLE 8.—*Average prices per pound paid for the foods reported in four institutional studies, adjusted to the 1926 price level by individual and by all-food index numbers*

Food	Office of Home Economics (191 colleges) 1918		St. Paul's School, 1926–27	Macleod and Griggs, 1917		Richards and Talbot, 1893–94	
	Individual food index	All-food index	As given	Individual food index	All-food index	Individual food index	All-food index
Meat, fish, and eggs:	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
Beef [1] [2]	17.4	20.1	39.2	26.8	23.7		17.4
Lamb [1]	31.7	27.1	33.8	28.6	22.3		13.4
Pork [1]	28.0	24.2	26.8	10.1	8.6	35.6	23.6
Poultry [1]	32.6	30.2	43.3	40.0	31.9	28.7	23.1
Veal		21.5	32.8				23.1
Fish		19.2	22.2		15.2		25.5
Eggs [1]	25.9	29.0	29.8	34.5	35.8	39.8	40.3
Milk, cream, and cheese:							
Whole milk [1]	5.1	4.9	7.3	3.4	3.0	4.7	5.3
Cream [3]		23.4	47.9		11.0		20.4
Cheese [1]	29.1	27.2	30.1	30.2	29.1		33.6
Ice cream		19.2	37.1				57.9
Fatty foods:							
Bacon and salt pork [1]	32.6	32.7	36.3	26.0	22.4	42.0	26.8
Butter [1]	38.0	39.5	50.6	45.2	45.9	54.1	64.1
Table oil		23.3	29.9		26.3		76.8
Lard [1]	16.3	23.7	15.9	12.5	17.2		
Sugar and sirups:							
Honey		18.5	38.6				
Maple sirup		14.5	16.3		10.3		30.5
Molasses		6.9	4.3		3.4		14.1
Corn sirup		7.8	12.7				
Sugar [1]	5.5	7.3	5.8	5.5	9.0	6.7	12.7
Jams and jellies		36.5	24.4		16.9		17.1
Cereals:							
Bread, white [1]	11.0	11.0	9.0	6.8	7.4		11.1
Bread, graham		7.0			5.6		10.6
Other baked goods		13.8	19.8		15.4		30.1
Corn meal [1]	4.0	5.2	2.8				4.9
Cornstarch		9.4	9.9				
Flour, white [1]	5.6	6.0	5.7	3.7	5.0	5.3	4.9
Flour, graham		5.6	4.0				6.5
Hominy		7.4	11.5		11.5		
Macaroni		13.0	13.6		14.8		24.8
Rice [1]	8.0	8.5	4.5	5.5	5.9		15.0
Rolled oats		6.9	6.3		6.3		6.9
Tapioca		13.5	30.0		12.0		10.4
Wheat cereal		10.6	12.9		13.4		10.0
Fruits, fresh:							
Apples		3.8	5.6		1.1		6.7
Bananas		5.6	12.0		6.9		7.2
Melons		1.9	13.0				5.8
Pears		5.2	19.5				
Rhubarb		5.1	11.7				
Fruits, canned		10.7	13.0		12.1		22.9
Fruits, dried:							
Raisins [1]	10.7	10.7	11.1	4.9	5.4		16.4
Prunes [1]	13.6	13.2		10.4	11.8		21.5
Apricots		18.0					29.9
Vegetables, fresh:							
Beets		2.2	5.3		3.5		1.6
Cabbage and cauliflower		4.8	9.6		2.7		4.2
Carrots		3.1	3.0		3.1		4.6
Celery		12.7	15.4		13.9		21.3
Corn		1.8	3.6				
Cucumbers		8.4					
Lettuce and greens		10.7	14.8		23.4		4.9
Onions [1]	4.7	3.5	4.4	5.5	7.8		3.2
Potatoes [1]	3.8	2.4	2.3	4.7	5.0	3.3	2.8
Sweet potatoes		3.8	3.0				5.1
Squash and pumpkin		4.4	3.8				6.5
Tomatoes		4.5	10.9				
Turnips		2.3	5.4		1.7		2.5
Vegetables, canned		9.9	12.9		10.9		9.7
Beans, dried	7.4	13.1	6.6				
Miscellaneous:							
Chocolate and cocoa		30.3	26.0		25.5		96.7
Olives and pickles		13.4	23.9		12.4		
Nuts		43.2	21.3		47.0		57.9
Gelatin		56.5	41.9		74.7		262.0

[1] Price was adjusted to the 1926 level by the use of the index numbers for individual foods published by the U. S. Bureau of Labor Statistics for the years 1917 to date.

[2] Most of the beef purchased at St. Paul's School was boned. At the other institutions beef figures included the refuse.

[3] At St. Paul's School cream of 40 per cent milk fat was purchased; whereas the other institutions bought cream of lower fat content.

The variations that occur in the prices of foods in Table 8 are in all probability caused largely by differences in the quality of food purchased, and in the service demanded in the way of delivery and credit. As noted in the table, much of the meat purchased at St. Paul's School was boned, and the figures given are for the edible portion of meat; whereas in the other institutions the figures are, on the whole, for meat as purchased and include the usual amount of refuse.

The number of persons served, the locality, and the competition between the markets in each locality are also factors contributing to prices. To determine the extent of their influence on the price paid would require a careful study of the methods of buying and of the markets patronized, an aspect of institutional feeding that was not included in this investigation.

SUMMARY AND CONCLUSIONS

This circular deals with the food habits of college students as they are revealed by dietary studies. The published results of 12 investigators are brought together for comparison with two studies including 227 institutions made by this department in 1918 and in 1926 and an investigation of 23 institutions made at the State College of Washington in 1926. These diets were analyzed to determine their adequacy in energy, protein, calcium, phosphorus, and iron, and the amount spent by the various institutions was examined.

As compared with Sherman's standard of nutrition, the diets reported here for the first time yielded slightly more energy, at least a third more protein, and from 7 to 26 per cent more calcium, phosphorus, and iron than were actually needed. Approximately two-thirds of the diets studied had an energy value within 19 to 20 per cent of the mean, a protein value within 20 to 24 per cent of the protein mean, and mineral values within 24 to 34 per cent of their means. The coefficients obtained on these freely chosen diets agree, on the whole, rather well with the following coefficients of variation found by Sherman in his metabolism experiments: Protein, 21 per cent; calcium, 27 per cent; and phosphorus, 17 per cent.

As compared with the diets reported by other investigators, the present studies show somewhat less energy, protein, calcium, and iron, and about the same amount of phosphorus. Examination of the distribution of energy among the various food groups indicates that, on the whole, meat, fish, eggs, fatty foods, and sweets are used in ample quantities for a well-balanced diet, whereas milk, cream, cheese, fruits, and vegetables play too small a part in the diet. The use of cereals was variable.

The economy practiced by the 250 institutions included in the present studies is to be commended. On the whole they furnished diets adequate in every respect on one-fourth to one-third less money than did the institutions previously reported. Only one of the previous studies shows a smaller average expenditure than those found by the present analysis, and the diet given there was inadequate in four essentials.

Comparison of the nutritive value of diets planned by dietitians with those by persons untrained in food values shows that the dietitians' diets were more nearly adequate in every respect. They used meat, fish, eggs, milk, cream, cheese, fruits, and vegetables more

freely, and cereals, fatty foods, sweets, and miscellaneous foods less freely, than the person untrained in food values.

From the new figures presented here, and those summarized from other sources, the conclusion seems warranted that college students are, on the whole, receiving diets which meet their needs. Iron is the factor in the greatest danger of being furnished in insufficient amounts. The cost is not excessive, averaging as it does from 40 to 45 cents per man per day on the 1926 prices level.

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