A STUDY OF THE NUTRITIVE VALUE OF THE FOOD CONSUMED BY A COOPERATIVE GROUP OF COLLEGE WOMEN LIVING IN A RESIDENCE HALL

by

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B. S., Kansas State Teachers College, Emporia, 1926

A THESIS

submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

KANSAS STATE COLLEGE

OF AGRICULTURE AND APPLIED SCIENCE

1936

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INTRODUCTION

It appears desirable to check diets occasionally to determine their adequacy. This need has been recognized by those responsible for feeding the groups on the campus of the Kansas State College. In 1931, the diet at the women's residence hall was so checked by Ryder (28) and Littleford (24). The study here reported was made to determine the adequacy of the food served in this same residence hall at the present time under a cooperative plan now in effect. It was also desired to compare these findings with those of the previous study and with accepted standards.

The women's residence hall accommodates 129 young women, and the foods unit is under the direction of the Department of Institutional Economics of the Division of Home Economics. The personnel includes a social director, a dietitian who is also an Assistant Professor of Institutional Economics, an assistant who relieves the dietitian about four hours daily, and three men students who assist with the heavier work. All the remaining duties are carried by resident students under supervision. The cooperative plan is

optional. Those participating work approximately one hour a day, with the exception of students majoring in Institutional Economics, who average from two to five hours each. The latter are required to spend one semester in residence and, during this time, serve in the capacity of supervisors.

A six-week period is divided into units of one week each: breakfast, office, lunch, housekeeping, dinner, and rest. An institutional major acts as supervisor for each of the work groups, and the number of cooperating students is divided so as to allow them to serve on one of these groups each week. The supervisors are responsible for the planning of menus under the direction of the dietitian, the making out of work schedules, and supervising the groups.

Menus are planned one week in advance and each set represents the work of three students. Dinners are planned first by one student, then lunches by another, and last, breakfast by the third student. To meet the food requirements of the group, and as a working basis, each day's menus are expected to include 1 pint of milk to be used in cooking or as a beverage, 2 or more fruits, 2 vegetables besides potatoes, cereal, 1 serving of whole grain bread,

1 serving of meat, and 1.14 ounces of butter per person per day. The menus are also planned to supply variety in flavor, color, texture, and consistency.

REVIEW OF LITERATURE

Dietary studies have long been used as a means of judging the adequacy of diets. Voit, of Germany, was one of the early workers in this field and also one of the most influential. As a result of his studies, he recommended 118 grams of protein, 56 grams of fat, and approximately 3000 calories per day for a man at moderate muscular work.

The earliest quantitative American dietary studies were made by or in conjunction with Atwater (1) a former pupil of Voit. Atwater (1886-1905), as special agent in charge of the Office of Experiment Stations stimulated investigations throughout the United States pertaining to food habits of various groups living in different localities. As a result of these investigations, Atwater believed that Americans were more active than Europeans and consumed more food. He therefore recommended a modification of Voit's standards allowing for a man of moderate

activity 110 to 120 grams of protein and 3000 to 3400 Calories daily.

Another study made in 1901-1902 was that of Bailey (2) at the University of Kansas. He based his determinations upon estimations of food as purchased which allowed for inedible refuse. The average consumption per person per day was 3923 Calories even though there were twice as many women as men in the group studies. Bailey concluded that the Kansas student followed the southern tendency to eat too much fat, starch, and sugar, and too little lean meat. He suggested the use of less pork and cornmeal, and more lean beef, oatmeal, peas, and beans.

Cameron (7) studied the diet at five residence halls for students in Edinburgh (1905-1906). Using the method adopted by Atwater and his colleagues, and basing some of her analyses upon Atwater's, she found the average per capita food consumption to be 143 grams of protein, 511 grams of carbohydrate, 138 grams of fat, and 3979 Calories per day. The protein intake was high in all of her studies with the animal protein amounting to 63 per cent of the total. The edible waste contained 5.8 per cent of the protein, 7.9 per cent of the fat, 4 per cent of the carbohydrate, and 5.6 per cent of the calories. As the waste was

only about half that of American studies of college residence halls, she concluded that housekeepers in Edinburgh were more economical than housekeepers in college residence halls in America.

In 1915, Gephart (15) at the request of St. Paul's School in New Hampshire, studied the food served in that institution in order to determine its adequacy and cost. He found that the 4000 Calories consumed per student per day more than met the energy requirements, and that the food presented was adequate and in good proportions. Edible waste amounted to 15 per cent of the calories, and 18 per cent of the total food purchased.

Sherman and Gillett (30) collected records of the amount and cost of food consumed by 102 families for a period of one week during 1914-1915. These records were analyzed for calcium, phosphorus, and iron as well as protein and total energy. This was an advance beyond the early dietary studies which included only the intake of protein, fat, and carbohydrate, expressed at first in these terms, but later as protein and energy. Analyses showed that these family dietaries were often low in energy and calcium, and sometimes low in iron and phosphorus.

An attempt to standardize food conditions in college

halls for women was made by Borthwick (6) in 1917. She first sent questionnaires to various institutions, but receiving only a single reply containing any information, she then made an eight-day dietary study of a women's residence hall at Montana State College using the inventory method. The daily food was found to supply 2549 Calories per capita. The protein, calcium, and phosphorus were adequate for the needs of the group studied, but iron was below the accepted standards.

Macleod and Griggs (25), in 1917 made a weighed inventory study at Vassar College which included a record of inedible as well as edible waste. The group under observation numbered 115, of whom 91 were students whose average age was 19.4 years; height, 5 feet 4 inches; and weight, 123.9 pounds. A total of 3927 meals was served during the study with an average daily fuel value of 2698 Calories per person. Waste amounted to 26 per cent of the food as purchased; 10.6 per cent being edible, and 15.6 per cent inedible.

Two years later, Bevier (5) made a careful dietary study of 12 groups of women students at the University of Illinois. Her survey covered a period of seven days and the calculations obtained from 9 of the 12 groups showed

an average individual consumption of 2419 Calories, and 69.5 grams of protein. Less than a pint of milk was consumed per capita per day and only 75 per cent of the group ate breakfast.

Kramer and Grundmeir (23), in 1924, studied the food records for one month of 60 organized groups at Kansas State College. Of these records, 20 were analyzed for calories, protein, calcium, phosphorus, and iron, and sources of vitamins were also considered. These workers found that the individuals were receiving an average of 2889 Calories daily which they believed was sufficient, but they suggested that the kind of food used might be improved. In these studies, an average of 10 per cent of the total calories was supplied by protein, calcium was adequate for only 4 groups, phosphorus for 14, and iron for 8 groups. The vitamin content was proportional to the amount spent for protective foods.

A check on the food served to students at St. Paul's School was made upon request by Edith Hawley (19) from the Bureau of Home Economics in 1926-1927. Her findings agreed quite closely with the earlier ones of Gephart. In her study the average daily consumption per boy was 3940 Calories, 111 grams of protein, 1.09 grams of calcium,

1.75 grams of phosphorus, and 0.018 grams of iron. Edible waste amounted to 30 per cent of the energy, and 23 per cent of the protein of the food served. She suggested an increase in the amounts of vegetables, fruits, and whole grain cereals used, with a reduction in protein foods.

In order to obtain a more comprehensive view of students' diets, Hawley (20) in 1928, collected data for 250 institutions in colleges and universities and compared her results with those of 12 published studies in 93 similar institutions. Her data showed that the average diet of college students yielded slightly more energy and from 33 to 45 per cent more protein than students of that age probably need. The results also indicated that the diets consumed by these college students yielded, 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 amounts customarily used as standards.

In 1929, Benedict and Farr (3) made a study of the energy and protein content of individual foods and mixed meals. The energy values were obtained with an oxy-calorimeter and nitrogen by the Kjeldahl method. They also studied meals served at the home economics practice house and found them to average 2450 Calories and 61 grams of protein per capita per day.

In the same year, Grace (17) at Oregon State College, investigated the amount of food consumed in 9 sorority houses, 1 home management house, and 1 women's dormitory. Data were obtained by the inventory method over a period of one week in January. Calculations were expressed in shares according to Rose (26). Grace found that the Oregon women consumed daily 2156 to 2765 Calories per person. Protein yielded more than 10 per cent of the total calories, calcium was adequate in all but 1 group, phosphorus was above standard in all cases, while iron was low in 3 of the groups studied. Only 6 of the groups averaged a pint of milk per person per day, all the others used less. Grace concluded that the large percentage of vegetables and fruits consumed indicated an adequate supply of vitamins.

Benedict and Farr (4) in 1931, determined edible waste by analyses of sample meals obtained from 1 fraternity and 2 sororities. The edible waste per meal at the fraternity was found to be 112 Calories and 3.18 grams of protein, or 11 and 10 per cent respectively of the energy and protein served. Data obtained from waste studies at the sororities showed that it averaged from 12 to 27 per cent of the total food energy. The large amount of waste

was evidently due to a high consumption of "extra foods" which amounted to 13 to 29 per cent of the total energy intake per day.

In 1931, Ryder (28) and Littleford (24) in a weighed inventory study made at the women's residence hall at Kansas State College before it became a cooperative group, found the average daily per capita consumption to be 1821 Calories, 56.1 grams of protein, 0.792 grams of calcium, 1.197 grams of phosphorus, and 0.023 grams of iron. An analysis of edible waste showed a loss of 25 per cent of the energy and 19 per cent of the protein.

At the women's dormitory of the University of California at Los Angeles, Goddard et al (16) in 1934, made a similar dietary study basing their findings upon the food as purchased and the weight of the total food waste. The average weight of the women in the groups was 126.5 pounds and their ages ranged from 17 to 25 years. The nutritive needs of the group were determined on six representative women by estimating the time spent in various activities. The diet was considered adequate in all respects except for iron. More calories were furnished by fruits and vegetables than by meat and eggs. Edible waste amounted to 12 per cent of the food as purchased.

In 1933-1934, 28 Vassar students, selected from 76 applicants faced with the necessity of earning part of their expenses or discontinuing their college course, undertook cooperative housekeeping. The duties included planning of meals, ordering of food, cooking, cleaning, and detailed recording of purchases. As all the work was done by students it necessitated the purchasing of easily prepared foods which increased the cost to some degree. Food waste was reduced to a minimum by economical table service, daily purchasing, and careful use of left overs. Wheeler and Mallay (32) analyzed the records and found that these young women ate very little meat and only a moderate amount of milk, but much fruit. The per capita average for each day was 0.5 of an egg, 1 pint of milk, 1.44 ounces of butter, and more than 7 ounces of orange juice. The food provided daily for each person 2397 Calories, 70 grams of protein, 0.92 grams of calcium, 1.32 grams of phosphorus, 11.8 mgs. of iron, 6616 units of vitamin A and 227 units of vitamin C.

PROCEDURE

Those participating in the study were acquainted with

the plans at a dinner meeting and their cooperation obtained. A one-day preliminary period insured the proper collection of data and familiarized those concerned with the procedure. Height, weight, and age records (form 1) were made for all residents of the hall. Heights and weights were taken with heavy clothing and shoes removed. To obtain an indication of foods eaten between meals, record sheets (form 2) were given each person at the beginning of a week. These were to be filled out each day and returned at the end of the week.

The study covered a fourteen-day period beginning with breakfast, December 2, and ending with tea, December 15, 1935. The group observed consisted of 133 persons. Of these 129 were students, (126 women and 3 men). In addition, there were 1 social director, 1 food director, and the 2 investigators, one of whom was the assistant dietitian. A record (form 3) was kept of all meals served during the period.

A weighed inventory (form 4) was made of all the food on hand at the beginning of the study. A Fairbanks counter scale, which was checked for accuracy before and during the study, was used for weighing large quantities and a torsion balance for smaller amounts. A daily inventory (form 5)

Form 1. Weight-height-age record.

	Weight pounds	Height[1] inches	Age[2] years
Jennie Smith	115.0	63.5	20

[1] Shoes and heavy clothing removed

[2] Age to nearest birthday

Form 2. Record of foods eaten between meals.

	Kind	Amt.	Time of eating	Cost	Reasons for eating: Accessibility	hunger	sociability	habit
Monday	candy bar	1	4:00 p. m.	$0.05				
Tuesday								
Wednesday								
Thursday								
Friday								
Saturday								
Sunday								

Form 3. Daily record of meals served.

Week of _____ 1935

Breakfast

No. meals served:	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total
Residents served:								
Paying guests								
Free guests								
Employees								
Staff								
Total no. served:								

Lunch

No. meals served:	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total
Residents served:								
Paying guests								
Free guests								
Employees								
Staff								
Total No. served:								

Dinner

No. meals served:	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total
Residents served:								
Paying guests								
Free guests								
Employees								
Staff								
Total no. served:								

Total meals served during the week

Total meals less employees

Form 4. Inventory of staples on hand December 2, 1935.

Food	Brand	Cases or bags	Unit: what	Unit: size	Unit: wt.	Number: in case or bag	Number: total units	Amount: On hand wt.	Amount: Purchased unit	Amount: Purchased wt.	Amount: Total unit	Amount: Total wt.	Amount: Remaining unit	Amount: Remaining wt.	Amount: Used unit	Amount: Used wt.	Cost: Unit	Cost: Total for food used
					lb			lb		lb.		lb.		lb.		lb.		
Corn	Smith	3.5	11	2.5	1.2	24	141	176.25			141	176.25	109	136.25	32	40	$0.06	$2.37

Form 5. Record of daily food purchases.

Food	Date	On hand lb.	Received lb.	Total lb.	Remaining lb.	Used lb.	Cost per unit $	Total cost $
Dairy Products								
Milk	Dec. 2, 1935	185.75	190.00	375.75	42.50	333.25	0.03	9.99
Cream								

was made of food purchased during the period and the amount added to that of the first inventory. At the end of the study another inventory was taken of all food on hand and these amounts were subtracted from the sum of the first two. The difference represented the amount of food used.

One, and usually both of the investigators, was present during the entire time of the preparation of food and collection of waste in order to be sure that no errors were made. Students were trained to assist in the actual collection of waste, direction sheets having been prepared in advance for their use. Rubber scrapers and, in some cases, very small but known amounts of distilled water were used to remove all food left on the plates. The silver was rinsed in a small amount of hot, distilled water to dislodge food clinging to it. Any water so used was added to the liquid waste and the weight of this added water was later subtracted from the total liquid waste. Milk glasses were turned upside down to drain in order to collect any material clinging to them. Cocoa and coffee cups were rinsed to remove any sugar and other nutrients. Skins of baked potatoes, prune pits, and like materials were scraped to remove all edible parts. Juice left in oranges and grapefruit was extracted, strained to separate solids

from liquids, and then added to the edible waste.

Utensils used in food preparation were scraped, and, if that did not remove all the food, distilled water was used as necessary. Egg whites clinging to the insides of shells, fat removed from meat before cooking, spilled particles, spoiled food, and any other waste that had been edible were added to the edible waste.

One day's collection included waste from dinner, breakfast, and lunch with the exception of the first and last days. These were divided into breakfast and lunch on the first day; and dinner, breakfast, lunch, and tea on the last day. This was done so that the grinding and sampling of waste could be done in the afternoon when it was most convenient. The waste, with the exception of the fat, was also weighed at this time. The solids were then placed in a large cloth bag[1] and allowed to drain overnight in a room 35° to 50° F.

The following afternoon, approximately 24 hours after collecting, the drained solids were weighed, ground twice in an electric food chopper, and then thoroughly mixed by hand to secure a uniform mass. A two per cent sample was

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[1] One square yard of closely woven cheesecloth was used for each bag. These were rectangular in shape, but triangular ones would have insured better drainage.

then weighed out to be used for chemical analysis. The collected and drained liquids were also weighed again at this time and any loss by evaporation was replaced with distilled water to bring the weight back to the original, which simplified calculations and was more convenient for sampling. These two liquids were combined and stirred until well mixed, then a two per cent sample was also taken of these and thoroughly combined with the sample of solids previously obtained. A trip balance was used for the weighing. A drop of formaldehyde was added to the mixed sample to preserve it during the drying period. The samples were dried in granite pans in air at about 60° C. until they were of approximately constant weight. They were then stored in tight jars until analyzed.

The fat waste, which was comparatively small in amount, was combined for the entire period, stored in a cool place, and weighed at the end of the study. The fat mixture was calculated as half butter and half 100 per cent fat. The values for this fat and the other edible waste as obtained by analysis, were subtracted from the total food served. The remainder represented the food actually used by the group. This was divided by the number of meals served and then multiplied by three to give the daily per

capita intake.

The Hawley short method of calculating (18) was used to determine the energy, protein, calcium, phosphorus, and iron content of the foods used. Hawley divides the foods into 10 groups as follows: "(1) Foods that are relatively better sources of calcium than of protein, phosphorus, and iron; (2) foods in which all of the nutrients are of about the same relative importance; (3) foods in which iron is of relatively more importance than the other three nutrients; (4) foods in which calcium is relatively low and the other three nutrients high; (5) foods that are lacking or practically lacking in the four nutrients; (6) animal foods in which calcium is relatively low, protein high, and phosphorus and iron intermediate; (7) foods in which calcium is relatively high, iron low, and protein and phosphorus intermediate; (8) foods in which protein and phosphorus are relatively high and calcium and iron low; (9) vegetable foods in which calcium is relatively low, protein high, and phosphorus and iron intermediate; (10) foods in which protein is relatively higher than the other three nutrients."

As canned fruits and vegetables are not included as such in the short method it was necessary to first convert

them to "as purchased" terms, and then reduce them to fresh food values. This was done by using the waste figures for fruits and vegetable from the Proximate Composition of Fresh Fruits (10) and Vegetables (9), and then taking 60 per cent of the canned weight as recommended by Hawley (18) who suggests that 60 per cent of canned goods may be considered as solids and 40 per cent as liquids.

Saccharimeter readings were made of the sirups of all canned fruits used. From the specific gravity thus obtained the amount of sugar in the sirup was determined according to tables given by Cruess (13). The weight of this sugar was added to that of the inventory, and the fruits and vegetables were included in their respective groups.

Recipes for practically all prepared foods not included in the short method were secured and the foods used in their preparation were added to their respective groups. Most of the foods not included in the short method groups by Hawley were computed item by item using Rose's (26) tables on food composition. Breakfast food calculations were based upon figures obtained from Kellogg's Laboratories; pickles and tomato catsup from the Heinz Co., pineapple juice from Libby, McNeill, and Libby, and vitamin content from Sherman (27).

RESULTS AND DISCUSSION

The standards used to determine the adequacy of the food served were, for the most part, based on those set by Sherman (29) for a moderately active man weighing 70 kilograms, i. e., a daily intake of 3000 Calories, 70 grams of protein, 0.68 grams of calcium, 1.32 grams of phosphorus, and 0.015 grams of iron. The vitamin standards suggested by Steibling and Ward (31), consisting of 3990 units of vitamin A, 100 units of vitamin C, and 750 units of vitamin G were used. These standards were adapted to women on the commonly used basis of weight with the exception of iron. The latter was not so scaled because it is believed that women have relatively greater needs for iron than men.

The women in this study ranged in weight from 41.8 to 81.1 kilograms and averaged 60.5 kilograms. The average age was 20.5 years and the average height was 63.2 inches. Considering the average individual in the study as $\frac{60.5}{70.0}$ of the Sherman and Steibling and Ward standards, she was calculated to have a daily food requirement of 2549 Calories, 60.5 grams of protein, 0.59 grams of calcium, 1.14 grams of phosphorus, 0.015 grams of iron, 3449 units of vit-

amin A, 87 units of vitamin C, and 648 units of vitamin G.

The actual food consumed at the table by the group studied averaged per capita 2088 Calories, 65 grams of protein, 0.75 grams of calcium, 1.13 grams of phosphorus, 0.0095 grams of iron, 7548 units of vitamin A, 105 units of vitamin C, and 603 units of vitamin G for each of the 14 days covered by the study (table 3). This does not include any extra foods eaten elsewhere.

A comparison of the standard and the actual food consumed showed the latter to be low in calories and iron, approximately adequate in phosphorus, and above standard in protein and calcium. The number of measurable vitamins are shown in table 4. Vitamin A was 3956 units, and vitamin C 18 units above the suggested standard, while vitamin G was 47 units below. However, in this connection, it is necessary to note that complete data were not available for calculating the vitamin content of all the foods served so doubtless the diet was actually higher in vitamins than these figures indicated. In view of our present knowledge of the instability of vitamin C, especially when food is prepared and allowed to stand as is necessary in institutions feeding large groups, it would seem probable that vitamin C might also be insufficient.

Table 1. Nutritive value of diet according to food groups.

Food groups	Factors		Quantity Consumed pounds	Equivalent weight	
	Calories	Protein-mineral		Calorie-pounds	Protein-mineral-pounds
Group 1					
Grapefruit	0.5	0.6	65.00	32.50	39.00
Carrots	0.5	1.0	122.04	70.02	122.04
Lettuce	0.2	1.0	132.71	26.54	132.71
Celery	0.2	0.6	74.95	14.99	74.95
Oranges	0.5	2.0	168.15	84.08	100.89
Olives, green	3.0	0.6	11.72	35.16	23.44
Lemons	0.5	1.0	5.43	2.70	32.58
Total				257.10	496.29
Group 2					
Apples	1.0	0.4	192.35	192.35	76.94
Apricots, dried	6.5	4.0	3.35	21.78	13.40
Beets	1.0	1.0	11.20	11.20	11.20
Cherries, sour	1.7	0.8	12.43	21.13	9.94
Cherries, sweet	1.7	0.8	19.34	32.88	15.48
Grapes	1.7	0.6	27.75	47.18	16.65
Onions	1.0	1.2	35.36	35.36	42.43
Pears	1.3	0.8	43.13	56.07	34.51
Peaches	1.0	0.6	26.98	26.98	16.19
Potatoes, sweet	2.0	1.0	127.59	255.18	127.59
Pepper	0.5	0.1	1.31	0.65	0.13
Tomatoes, fresh	0.5	0.8	20.27	10.14	16.22
Tomatoes, canned	0.5	0.8	1.31	0.65	0.13
Total				756.80	454.09

Table 1 (continued).

Food groups	Factors: Calories	Factors: Protein-mineral	Quantity Consumed: pounds	Equivalent weight: Calorie-pounds	Equivalent weight: Protein-mineral-pounds
Group 3					
Prunes	1.0	1.0	17.50	17.50	17.50
Raisins	1.0	1.0	10.52	10.52	10.52
Dates	1.0	1.0	13.95	13.95	13.95
Tapico	1.0	0.6	2.25	2.25	1.35
Honey	1.0	0.2	9.81	9.81	1.96
Potatoes, Irish	0.3	0.5	615.25	184.58	307.63
Bananas	0.3	0.2	110.05	33.02	22.01
Oysters	0.2	1.5	21.25	4.25	31.88
Beans, string	0.1	1.0	83.85	8.39	83.85
Cabbage	0.1	0.6	55.50	5.55	33.30
Asparagus	0.1	0.6	35.30	3.53	21.18
Spinach	0.1	1.5	31.95	3.20	47.93
Pineapple	0.1	0.4	52.17	5.22	20.87
Cranberries	1.0	0.2	20.00	2.00	4.00
Total				303.57	617.73
Group 4					
Beans, navy	1.0	2.0	10.00	10.00	20.00
Eggs	0.4	0.9	148.47	59.39	133.63
Peas	0.2	0.3	121.64	24.33	36.49
Corn	0.1	0.1	63.16	6.32	6.32
Total				100.04	196.44
Group 5					
Butter	1.0	1.0	131.70	131.70	131.70
Jelly	0.5	1.0	6.70	3.35	6.70
Lard, compound	1.2	0.0	27.01	32.41	
Mazola	1.2	0.0	23.75	28.50	

Table 1 (continued).

Food groups	Factors: Calories	Factors: Protein-mineral	Quantity Consumed: pounds	Equivalent weight: Calorie-pounds	Equivalent weight: Protein-mineral-pounds
Preserves	0.5	1.0	24.20	12.10	24.20
Sugar, gran.	0.5	0.0	158.69	79.34	
Sugar, cube	0.5	0.0	1.10	0.55	
Sugar, powdered	0.5	0.0	1.10	0.55	
Sugar, Red hots	0.5	0.0	0.28	.14	
Vream	1.2	0.0	30.28	36.34	
Total				324.98	162.60
Group 6					
Bacon	2.6	0.6	15.25	39.65	9.15
Beef, clod	0.9	1.0	36.18	32.56	36.18
Beef, dried	0.7	1.7	8.18	5.73	13.91
Beef, ground	0.9	1.0	14.68	13.21	14.68
Beef, round	0.9	1.0	36.90	33.21	36.90
Beef, shank EP	0.9	1.3	3.76	3.38	4.89
Beef, stew	0.9	1.0	14.84	13.36	14.84
Fowl	0.7	0.9	44.90	31.43	40.41
Ham	1.6	0.9	36.43	58.29	32.79
Lamb	1.0	0.8	36.93	36.93	29.54
Liver	0.5	1.3	22.50	11.25	29.25
Pork, cutlets	1.2	0.8	27.00	32.40	21.60
Pork, shoulder (salt)	1.6	0.9	16.00	25.60	14.40
Pork, fresh	1.2	0.8	9.26	11.11	7.41
Pork, sausage	2.0	0.8	17.43	34.86	13.94
Veal, cutlets	0.5	1.0	26.19	13.10	26.19
Total				396.07	346.08
Group 7					
Cheese, American	6.0	7.0	13.95	83.70	97.65

Table 1 (continued).

Food groups	Factors: Calories	Factors: Protein-mineral	Quantity Consumed: pounds	Equivalent weight: Calorie-pounds	Equivalent weight: Protein-mineral-pounds
Cream, 20	3.0	0.8	7.35	22.05	5.88
Cream, 40	6.0	0.8	12.50	75.00	10.00
Milk	1.0	1.0	1587.55	1587.55	1587.55
Total				1768.30	1701.08
Group 8					
Cheese, cottage	1.0	2.0	24.00	24.00	48.00
Walnuts, English	1.7	0.4	0.25	.43	0.10
Haddock	0.4	0.4	34.56	13.82	13.82
Salmon	1.0	0.4	11.00	11.00	4.40
Shrimp	0.4	0.4	1.56	0.62	0.62
Tuna	1.0	0.4	11.50	11.50	4.60
Total				61.37	71.54
Group 9					
Cocoa	1.5	1.7	7.74	11.61	13.15
Chocolate	1.5	1.0	1.25	1.88	1.25
Cracked wheat	0.7	0.6	54.87	38.41	32.92
Oatmeal	1.0	1.0	3.00	3.00	3.00
Flour,whole wheat	1.0	0.6	19.75	19.75	11.85
Bread,whole wheat	0.7	0.6	38.14	26.70	22.86
Rolls,whole wheat	0.7	0.6	45.00	31.50	27.00
Total				132.85	112.03

Table 1 (continued).

Food groups	Factors: Calories	Factors: Protein-mineral	Quantity Consumed: pounds	Equivalent weight: Calorie-pounds	Equivalent weight: Protein-mineral-pounds
Group 10					
Bread, white	0.7	0.9	118.01	82.61	106.21
Rolls, white	0.7	0.9	13.25	9.28	11.93
Bread, raisin	0.7	0.9	7.76	5.43	6.98
Crackers	1.0	1.0	24.24	24.24	24.24
Flour, white	1.0	1.0	133.82	133.82	133.82
Macaroni	1.0	1.2	6.00	6.00	7.20
Rice	1.0	0.9	15.69	15.69	14.12
Total				277.07	304.50

Table 2. Nutritive value of extra foods.

Extra	Pounds	Calories	Protein grams	Calcium grams	Phosphorus grams	Iron grams
All Bran[1]	1.69	2630	97.35	0.74	10.24	0.127
Blueberries	19.32	5178	52.55	1.40	0.57	0.062
Catsup	19.94	10788	226.80	1.51	3.83	0.109
Celery Cabbage[2]	24.00	1566	132.60			
Cheese, Phil. cream	4.00	6404	127.00	0.14	0.17	
Corn flakes[1]	1.96	3389	65.79	0.07	0.50	0.023
Cornstarch	2.31	3776				
Crackers, graham[3]	8.82	16793	400.08	0.96	8.12	0.072
Egg yolk	0.62	1019	44.16	0.37	0.12	0.023
Gelatine	0.18	299	74.63			
Grapefruit juice[6]	29.25	5558	53.07			
Grapenuts	2.76	4645	143.96			
Grits	2.58	4283	128.73	0.26	1.50	0.009
Ice cream	86.06	80661	1894.80	16.46	14.35	0.056
Jello[7]	3.62	7164	199.62			
Karo[3]	.24	327				
Marshmallows	11.42	17094			0.13	
Mustard	0.17			0.08	0.13	
Paprika	1.57			1.63	2.43	
Parsley[3]	0.32	77	5.37			0.458
Pecans[5]	6.87	22981	342.53	2.77	10.43	0.803
Pepper, black	0.70			1.40	0.60	
Pepper, white	0.25			0.48	0.26	
Pickles, sweet[4]	14.75	14724		0.67	0.60	0.127
Pineapple juice[5]	13.50	3246	244.94			
Relish[4]	7.25	5017		0.30	0.26	0.039
Rice Crispies[1]	2.73	4709	7.43	0.14	1.24	0.033
Sherbert	27.00	32317	4029.82			
Sorghum	20.87	27152	227.07	20.09	4.07	0.692
Sugar, brown	19.19	33084				
Vinegar	19.72			1.43	1.16	0.027
Wheat, cracked	1.59	2609	80.04	0.34	3.08	0.037
Wheat, flakes[1]	1.68	2851	92.97	0.33	2.85	0.048
	362.99	315823	8721.20	51.49	66.96	2.745

[1]Data from Kelloggs' cereals
[2]Data from Proximate Composition of Vegetables
[3]Data from Chaney and Ahlborn
[4]Data from Heinz Company
[5]Data from Libby, McNeill, and Libby
[6]Data from Proximate Composition of Fruits
[7]Data from General Foods

Table 3. Nutritive value of diet.

Group	Equivalent-weight calorie-pounds	Energy calories	Equivalent-weight protein-mineral pounds	Protein grams	Calcium grams	Phosphorus grams	Iron grams	Vitamin A units	Vitamin C units	Vitamin G units
1	257.01	77103	496.29	1985.16	99.258	79.41	0.9926	1995458	68649	104637
2	756.80	151360	454.09	2497.50	34.056	72.65	0.8628	537906	48173	42090
3	303.57	303570	617.73	9265.95	61.773	247.09	5.5596	1323060	80989	120615
4	100.04	160064	196.44	11786.40	58.932	157.15	2.7502	1649529	22620	95968
5	324.98	1137430	162.60	731.70	11.382	11.38	0.1626	2950080		
6	396.07	396070	346.08	24225.60	14.189	259.56	3.8068	1035514		155443
7	1768.30	530490	1701.08	25516.20	935.594	714.45	1.7010	1894652	23813	414065
8	61.37	30685	71.54	6438.60	14.308	72.97	0.3577	15120		
9	132.85	212560	112.03	6721.80	33.609	190.45	1.9045	13852		
10	277.07	443312	304.50	15529.50	30.450	127.89	1.3702			
Extras		315823		8721.20	51.490	66.96	2.7450	266784	77	647
Total		3758467		113419.61	1345.04	2000.46	22.2130	11681954	244321	933465
Waste, edible		526561		12789.73	184.29	248.79	7.3700			
Total consumption		3231906		100629.88	1160.75	1751.67	14.8430	11681954	244321	933465
Av. per person per day		2088		65.01	0.75	1.13	0.0096	7548	105	603
Standard, adult male		3000		70.00		1.32	0.0150	3990	100	750
Standard, this study		2549		60.50		1.14	0.0150	3592	87	648

Table 4. Vitamin content of diet.

Food	Pounds	Vitamins[1] A units	C units	G units
Apples	192.35	46164	9618	19631
Asparagus	35.30	19768		
Bacon	15.25	1220		2248
Bananas	110.05	176080	8804	17472
Beans, nary	10.00	2400		
Beans, string	83.85	201240	6708	
Beef, av. fat	69.46			26783
Beef, round steak	36.90			16738
Beets	11.20	896		2540
Bread	277.03	13852		
Butter	131.70	2950080		
Cabbage	55.50	8880	17760	18881
Carrots	122.04	1835482	3661	34598
Celery	74.95		3784	
Cheese, American	13.75	154000		
Cheese, cottage	24.00	11500		
Cheese, cream	4.00	89600		
Corn	63.16		3158	
Dates	13.95	18972		
Eggs	148.47	1306536		95968
Egg yolk	.62			647
Fish, fat	22.50	3600		
Grapefruit	65.00		15600	
Grapes	27.75	8880	833	
Ice cream	11.91	266784		
Lemons	5.43		1303	
Lettuce	132.71	106168	3981	37623
Liver	22.50	1008000		91854
Meat	328.68	26294		
Milk	1587.55	1651052	23813	414065
Onions	35.36		1768	2005
Oranges	168.15	53808	40356	32416
Parsley	0.32		77	
Pears	43.13			9782
Peaches	26.98		2158	
Peas	121.64	340592	19462	
Peppers	1.31	3668	524	
Pineapple	52.17		4174	
Potatoes, Irish	615.25	98440	30763	59769
Potatoes, sweet	127.59	173522	6380	
Prunes	17.50	84000		
Spinach	31.95	715680	12780	14493
Tomatoes	112.05	304776	26892	8132
Veal	26.19			17820
Totals		11681954	244321	933465
Av. per person per day		7548	105	603

[1]Average values.

Table 5. Comparison of nutritive value of food served to college groups.

Study	Year	Institution	Location	Av. wt. subjects kg.	Energy calories	Protein gm	Calcium gm.	Phosphorus gm.	Iron gm.	Edible waste included
Borthwick	1917	Women's res. hall	Bozeman, Mont.		2549					yes
Macleod & Griggs	1917	Women's res. hall Vassar	Poughkeepsie New York	56.3	2698	99.5				no
Bevier	1920	Women's organizations	Urbana, Ill.		2419	69.5				
Grace	1929	Women's organizations Oregon State College	Corvallis Oregon		2765					
Ryder & Littleford	1931	Women's res. hall Kansas State College	Manhattan Kansas	58.2	1821	56.1	0.61[1]	0.98[1]	0.0042[1]	no
Shirley	1932	Sororities (av.)	Manhattan Kansas		2822	86.4	0.78	1.38	0.0160	yes
Fowler	1933	Fraternity, K.S.C.	Manhattan Kansas	65.3	2915	82.8	0.65	1.29	0.0070	no
Conard	1934	Sorority, K.S.C.	Manhattan Kansas	55.7	2055	58.1	0.50	0.92	0.0080	no
Davis	1934	Cooperative group, K. S. C.[2]	Manhattan Kansas	67.3	3415	94.8	1.41	2.04	0.0159	no
Goddard, et al	1934	Women's res. hall U. of Calif. at L.A.	Los Angeles Calif.	57.1	2600	83.0	0.63	1.24	0.0130	no
Jackson	1934	Sorority, K.S.C.	Manhattan Kansas	53.3	2338	63.3	0.53	0.98	0.0069	no
Wheeler & Mallay	1934	Cooperative group Vassar	Poughkeepsie New York	56.6	2397	70.0	0.92	1.32	0.0018	yes
Present	1935	Women's res. hall K. S. C.	Manhattan Kansas	60.5	2088	65.0	0.75	1.13	0.0950	no
Sherman's standard				70.0	3000	70.0	0.68	1.32	0.015	no

[1] Calculated by investigator

[2] Mostly men

A comparison of the results of the present study with those of similar studies (table 5) shows that the caloric consumption of this group, while higher than that of Ryder's and Littleford's, was still low. This is in accord with the prevalent idea that college women of today have a lower caloric intake than those of a few years ago as summarized by Coons and Schiefelbush (12). Perhaps the seemingly low caloric intake can be explained in this case by the amount and character of the food eaten between meals. While these reports were disappointingly few in number due to a misunderstanding in regard to their collection, and they were too inaccurate to permit calculation of them, they are suggestive of the relative importance of this source of food. The reports varied greatly from that of one student who ate 10 chocolate creams in one week to that of another who ate 5 cookies, 4 pieces of bread and jam, 1 piece of cake, and "lots" of candy in a single day. Another, who ate neither breakfast nor lunch, reported eating 2 pears, 3 cookies, 2 sandwiches, 2 pieces of cake, and 1 apple during the day and gave as her reason "accessibility". Table 6 summarizes the results of the between-meal records.

Table 6. Between-meal eating.

Total no. reporting	Per cent reporting	Av. no. times per week per person	Reasons in order of frequency	Types of food selected in order of preferences
75	30	8	Accessibility Sociability Hunger Habit	Candy & candy bars, cake, cookies, cokes, apples, nuts, sandwiches, ice cream, doughnuts, popcorn, crackers, and dates.

The daily protein intake, averaging 65.0 grams per capita, was somewhat above the standard set by Sherman, which allows an average of one gram per kilogram. The quality of the protein, on the whole, was good; animal foods furnished 59.3 per cent; grain products, 16.5 per cent; and vegetables, 11.9 per cent of the total. Although milk was always offered as a beverage for breakfast and lunch, the average daily consumption was only 0.86 of a pint. The average number of eggs consumed was 0.8 per person per day.

The daily per capita calcium intake averaged 0.75 gram, which was 0.16 gram above the Sherman standard for a woman of 60.5 kilograms. The dairy products, milk, cheese,

cream, and ice cream furnished 69.1 per cent of the total calcium, although they represented only 17.1 per cent of the cost of the diet.

Phosphorus consumption was probably adequate being 1.13 grams as compared with the standard of 1.14 grams per person per day. As was true with calcium, the largest percentage of phosphorus also came from dairy products. Ranking next as sources of phosphorus were vegetables, grain products, and meat and fish in the order given.

Iron was decidedly low in this dietary with an average intake of 0.0095 grams per person per day. Vegetables furnished 33.6 per cent and grain products 15.3 per cent of the total iron in the diet. No doubt the figures on iron waste were high as no attempt was made to protect the samples from contamination, but, in any case, it would have been impossible to meet the standard of 0.015 grams per person per day as the amount of iron calculated to be present in the food as served was only 0.014 grams per capita. While some recent publications suggest that the standard used in this study may be unnecessarily high for iron, the evidence to this effect is insufficient to warrant a lowered level of intake at the present time.

In order to obtain a well-balanced diet, Gillett rec-

ommended an average expenditure of money for food as follows: One-fifth, more or less, for vegetables and fruits; one-fifth, or more, for milk and cheese; one-fifth, or less, for meat, fish, and eggs; one-fifth, or more, for bread and cereals; one-fifth, or less, for fats, sugar, and other groceries and food adjuncts. According to Hunt (21) if the total energy need is met the other factors are probably adequate when 18 to 20 per cent of the calories are furnished by fruit and vegetables; 14 to 15 per cent by milk and cheese; 15 to 16 per cent by meat, fish, and eggs; 25 to 28 per cent by cereals and bread; 24 to 25 per cent by fats, sugar, etc. In the present study, 28.3 per cent was spent for meat, fish, and poultry, 17.9 per cent for dairy products (exclusive of butter), 28.1 per cent for fruits and vegetables, 7.7 per cent for bread and cereals, 17.9 per cent for fats, sugars, etc. Table 7 shows the percentage distribution of cost and nutrients in the present study.

The proportion spent for meat, fish, poultry, and eggs may appear high, but the study was made when these foods were selling at relatively high prices. The use of many fresh fruits and vegetables out of season during this study raised the amounts spent for these foods, but the increased palatability insured better consumption and ap-

Table 7. Average precentage distribution of cost and nutrients in food served.

Type of food	Relative cost	Calories	Protein	Calcium	Phosphorus	Iron
Meat and fish	22.31	11.32	24.84	1.89	14.65	17.23
Eggs	5.99	2.40	7.34	2.87	5.68	8.29
Milk, cheese, cream & ice cream	17.91	16.74	27.13	69.12	38.03	7.93
Butter and other fats	11.63	21.22	0.55	0.66	0.47	0.62
Grain products	7.69	16.53	20.47	4.50	16.82	15.29
Sugar and other sweets	3.65	11.11	0.35	1.60	0.33	3.26
Vegetables	15.65	10.38	11.87	12.50	17.38	33.61
Fruits	12.43	6.83	2.16	5.56	4.84	8.71
Nuts	0.35	0.76	0.44	0.25	0.58	3.09
Other foods and food adjuncts	2.35	2.71	4.85	1.04	1.22	1.97

parently justified the greater expenditure. No doubt the increased use of whole grain products would have raised the mineral content of the diet, especially phosphorus and iron.

The menus used during the period (table 8) contained a liberal supply of fresh fruits and vegetables. Milk was freely offered at breakfast and, with one exception, for lunch and then cocoa milk was served. Second helpings of bread and of all foods prepared in excess of the first serving were given when desired. Cereals, either cooked or ready-to-eat, were always served for breakfast.

A total of 4643 meals was served at a cost of $0.106 per meal or $0.32 per day. The average percentage reporting for meals was: breakfast, 76.3 per cent; lunch, 80 per cent; and dinner, 90.0 per cent. The maximum number of times reported for between-meal eating by one person was 21 per week and the minimum 1, with an average of 7.8.

Waste is always a variable factor influenced by management, kind of food purchased, time of year, type of service, and the amount of money available for food. It may vary from practically nothing, in small carefully conducted groups, to very high proportions. The larger the group fed, the more difficult it is to use left-overs.

Table 8. Menus beginning December 2, 1935.

Monday		
Canned Pineapple	Cream of Corn Soup	Roast Beef - Gravy
Rolled Oats	Crackers Butter	Browned Potatoes
Pecan Rolls	Head Lettuce Salad	Cold Tomatoes
Butter	French Dressing	White Bread Butter
Coffee, Cocoa, Milk	Cherry Cobbler	Peppermint Stick Ice Cream
	Milk	
Tuesday		
Grapefruit	Baked Beans Catsup	Baked Ham
All Bran Cream	Cabbage Slaw	Candied Sweet Potatoes
Cinnamon Toast	Brown Bread Butter	Creamed Celery
Coffee, Cocoa, Milk	Baked Custard	Whole Wheat Rolls Butter
	Milk	Cranberry-Orange Salad
		Butterscotch Pie
Wednesday		
Tomato Juice	Scrambled-Eggs-Bacon	Fried Liver Onions
Wheat Grits Cream	Apple Celery Salad	Creamed Potatoes
Biscuit Butter	Whole Wheat Bread	Buttered Carrots
Pineapple-Orange-	Butter	Lettuce Salad Chiffonade Dr.
Jam	Spice Cup Cakes	White Bread Butter
Coffee, Cocoa, Milk	Milk	Chocolate Blanche Mange
		Whipped Cream
Thursday		
Bananas	Potato Salad	Pork Cutlets
Corn Flakes Cream	Buttered Green Beans	Steamed Potatoes
Coffee Cake Butter	Whole Wheat Muffins	Buttered Peas
Coffee, Cocoa, Milk	Butter	Mixed Pickles
	Fruit Cup Milk	Cracked Wheat Bread Butter
		Pineapple Delicious
		Coffee
Friday		
Grapes	Chinese Omelet	Baked Halibut-Tartar Sauce
Cracked Wheat Cream	Tomato Sauce	Parsley Buttered Potatoes
Toast	Ginger Bread	Celery Cabbage Salad
Butter Jelly	Hot Cocoa	Peas and Carrots
Coffee, Cocoa, Milk	White Bread Butter	White Bread Butter
		Date Ice Box Roll
		Whipped Cream

Table 8 (continued).

Saturday		
Oranges	Noodles and Meat	Sausage
Grape Nuts	Vegetable Salad	Escalloped Corn
Muffins Butter	White Bread	Fried Apples
Coffee, Cocoa	Butter	Olives-Pickles
Milk	Peaches-Oatmeal-Cookies	Cracked Wheat Bread Butter
	Milk	Chocolate Cake with Fruit Sauce
Sunday		
Grapefruit Juice	Chicken en Casserole	Shrimp Salad
Rice Crispies	Mashed Potatoes	Crackers
Cream	Buttered Asparagus	Olives
Buttered Toast	Orange-Date Salad	Fruit Jello
Poached Egg	Whole Wheat Rolls	Ice Box Cookies
Coffee, Cocoa	Butter	
Milk	Apricot Ice Cream	
	Coffee	

Menus beginning December 9, 1935.

Monday		
Oranges	Cheese Souffle	Meat Loaf
Puffed Wheat Cream	Celery Cabbage	Baked Potatoes
Buttered Toast	Butter	Wax Beans
Bacon	Whole Wheat Bread	Pickled Beets
Coffee, Cocoa,	Blueberry Cobbler	Bread Butter
Milk	Milk	Royal Anne Cherries
Tuesday		
Tomato Juice	Creamed Chipped Beef	Roast Shoulder of Lamb
Bacon Muffins	Baked Sweet Potato	Browned Potatoes
Krumbles Cream	Raisin Bread	Creamed Onions
Butter	Butter	Pear Salad
Coffee, Cocoa,	Apple Sauce	Cracked Wheat Bread Butter
Milk	Milk	Chip Chocolate Ice Cream

Table 8 (continued).

Wednesday		
Stewed Prunes	Hot Deviled Eggs	Baked Ham Croquettes
Rolled Oats Cream	Cabbage Slaw	Escalloped Potatoes
Cinnamon Toast	Whole Wheat Bread	Hot Tomatoes
Coffee, Cocoa, Milk	Butter	Celery Curls
	Vanilla Ice Cream Sandwich	White Bread Butter
	Milk	Cranberry Shortcake - Wh. Cream
Thursday		
Oranges	Vegetable Soup	Veal Cutlets
Rice Crispies	Crackers	Mashed Potatoes
Biscuits Butter	Butter	Buttered Peas
Honey	Fruit Salad	Lemon Ice
Coffee, Cocoa, Milk	Chocolate Milk	Whole Wheat Rolls Butter
		Prune-Apricot Upsidedown Cake
		Coffee
Friday		
Bananas	Macaroni and Cheese	Escalloped Oysters
Corn Flakes Cream	Lettuce Salad	Parsley Potatoes
Buttered Toast	Cracked Wheat Bread	Buttered Spinach
Scrambled Eggs	Butter	Carrot-Raisin Salad
Coffee, Cocoa, Milk	Chocolate Bread Pudding	White Bread Butter
	Lemon Sauce	Fruit Cup
Saturday		
Grapefruit	Spanish Rice	Swiss Steak
Wheat Grits	Cottage Salad	Candied Sweet Potato
Coffee Cake Butter	White Bread	Macedoine of Vegetable
Coffee, Cocoa, Milk	Butter	Cracked Wheat Bread Butter
	Baked Apple	Fruit Cup
	Milk	
Sunday		
Fruit Juices	Mock Drum Sticks	Nut Bread Sandwiches
Mixed Cereals	Mashed Potatoes	Parsley Sandwiches
Toast Preserves	Buttered Green Beans	Frozen Fruit Salad
Coffee, Cocoa, Milk	Sliced Tomatoes	Spiced Tea
	White Rolls Butter	Candy Canes
	Crackers Jam	
	Cheese	
	Coffee	

Even when there is careful planning of amounts prepared and wise use of left-overs some waste is inevitable. It may occur from spoilage, shrinkage, or failure of students to notify the management of their intended absence.

No attempt was made to separate kitchen and plate waste. Plate waste consisted to a great extent of lettuce used as a garnish, bread, butter, and unusual foods. The largest amount of plate waste occurred at dinner, December 5, due to excitement resulting from the fact that the hall had been quarantined for scarlet fever. Plate waste was at a minimum the next day because "extra food" was not available and, as there was no reason for hurrying, more of the food served at the table was eaten. The large amount of waste recorded, December 6, was due to loss of brown bread that had molded. The increased waste the last two days was the result of two factors: (1) The ice box was cleaned and all foods that could not be used were discarded; (2) the last day's waste, as previously noted, included four meals.

The edible waste in the present study (table 9) amounted to 10.6 per cent of the A. P. weight and represented 14.0 per cent of the energy, 11.3 per cent of the protein, 13.7 per cent of the calcium, 12.4 per cent of the

Table 9. Waste.

Date	Inedible	Edible									Sample	
		Fat	Solids		Liquid							
			Before draining	After draining	Loss	Drained	Collected	Total	HOH added	Total liquid	Solid	Liquid
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	gm.	gm.
Dec. 2	25.55		16.34	13.68	2.66	2.66	9.49	12.15	0.00	12.15	124.3	109.8[1]
Dec. 3	56.62		26.09	23.68	2.41	2.00	19.17	21.17	0.41	21.58	215.0	196.0
Dec. 4	54.93		17.93	17.81	0.12	0.12	8.62	8.74	0.00	8.74	163.3	77.1
Dec. 5	45.00		19.50	18.13	1.37	1.12	10.37	11.49	0.25	11.74	163.3	104.3
Dec. 6	29.25		43.84	41.56	2.28	2.00	16.62	18.62	0.28	18.90	376.5	172.4
Dec. 7	52.75		41.46	40.18	1.28	1.25	13.12	14.37	0.03	14.37	362.9	131.5
Dec. 8	32.30		29.34	27.43	1.91	1.74	8.00	9.74	0.17	9.91	249.5	90.7
Dec. 9	35.00		28.34	26.55	1.79	1.75	12.62	14.37	0.04	14.37	240.4	131.5
Dec. 10	32.25	0.50[3]	32.67	31.18	1.49	1.12	13.37	14.49	0.37	14.86	281.2	136.1
Dec. 11	27.50		29.24	26.68	2.56	2.12	17.50	19.62	0.44	20.06	240.4	181.4
Dec. 12	32.37		29.84	27.28	2.56	2.22	17.62	19.84	0.34	20.18	249.5	181.4
Dec. 13	30.25		50.34	45.68	4.66	3.75	15.55	19.30	0.91	20.21	412.8	181.5
Dec. 14	55.75		46.59	43.00	3.59	2.12	23.37	25.49	1.47	26.96	390.1	244.9
Dec. 15	15.24	25.68	72.34	69.46	2.88	1.87	43.42	45.29	1.01	46.30	630.5	421.8
Total	524.76	26.18	483.86	452.30	31.56	25.84	228.84	254.68	5.65	260.33[4]	4099.7	2360.4
Av. per day	37.48	1.87	34.56	32.30	2.25	1.84	16.34	18.19	.40	18.59	292.8	168.6

Edible waste 6.5 ounces per person per day.

[1] Ten per cent of the weight of the edible waste Dec. 2 and 3, later reduced to 2 per cent.

[2] Not added as amounts were negligible.

[3] Estimated loss when some was spilled.

[4]
Total weight of liquid . . .	260.33 pounds
Amount of distilled HOH added	109.77 pounds
Actual weight of liquid waste	150.56 pounds

phosphorus, and 32.7 per cent of the iron. A comparison of waste from a number of studies, including the present one, is shown in table 10. With the exception of Hawley's (19), the figures for waste in these studies were obtained by analyses.

Table 10. Comparison of waste in food served to different groups[1].

Study	Year	Institution	Location	Waste: Inedible	Waste: Edible: Total	Edible: Energy	Edible: Protein	Edible: Calcium	Edible: Phosphorus	Edible: Iron
				per cent	per cent	per cent	per cent	per cent	per cent	per cent
Atwater	1886-1906	Institutions and families:	9 states			13.0	14.0			
Cameron	1905	5 Res. halls	Edinburgh Scotland			6.1-22.2	3.5-8			
Gephart	1914-1915	St. Paul's School(boys)	Concord, N. H.			15.0	18.0			
Macleod & Griggs	1918	Res. Hall Vassar	Poughkeepsie N. Y.	15.6	10.6	12.0	12.0			
Hawley	1926-1927	St. Paul's School(boys)	Concord N. H.			30.0	23.0			
Benedict and Farr	1931	Sororities & Fraternities: U. of N. H.	Durham N. H.			10.0	11.0			
Ryder and Littleford:	1931	Women's Res. Hall, K. S.C:	Manhattan Kansas		23.0	25.1	19.1	27.2[2]	21.7[2]	68.6[2]
Conard	1933	Sorority K. S. C.	Manhattan Kansas			11.9	10.0	12.0	10.3	31.0
Davis	1934	Cooperative Group, K.S.C.:	Manhattan Kansas			9.0	9.0	8.0	8.0	20.0
Goddard et al	1934	Women's Res. Hall, U. of Calif. at L. A.	Los Angeles Calif.	13.6	12.0[3]					
Jackson	1934	Sorority K. S. C.	Manhattan Kansas			13.9	16.7	22.1	16.7	48.7
Present study	1935	Women's Res. Hall, K.S.C.	Manhattan Kansas	8.8	10.6	14.0	11.2	13.7	12.4	32.7

[1] A blank space means undetermined. [2] Calculated by investigator. [3] Average for 2 periods.

Table 11. Percentage composition of edible waste[1].

Protein	13.880
Fat	20.110
Fiber	1.150
Moisture	4.250
Ash	4.910
Carbohydrate	56.850
N-free extract (sugar, starch, etc.)	55.700
Calcium	0.200
Phosphorus	0.270
Iron	0.008
Total weight of dry matter	1842.9 grams

[1]Analyses by the Department of Chemistry, Kansas Agr. Exp. Station.

CONCLUSIONS

According to accepted standards, the food consumed appeared to be satisfactory for protein, calcium, phosphorus, and vitamins A and C but unsatisfactory for calories, iron, and vitamin G.

The present study confirms the growing belief that the college woman of today has a lower calorie and protein intake than one of a few years ago.

Before definite conclusions can be drawn concerning the adequacy of this diet, undoubtedly more information is necessary concerning the relation of the nutritional status of college women to their dietary habits.

The food intake during the present study was higher in all respects than that of the study of Ryder and Littleford in the same institution before the group was on a cooperative basis.

As edible waste was only about half that of the earlier study, it would indicate that cooperation in food preparation had developed an awareness of food values which resulted in an economic gain with no loss of adequacy of the food served.

ACKNOWLEDGMENT

Acknowledgment is due Dr. Martha S. Pittman and Mrs. Bessie Brooks West for their help during this study. The investigator also is particularly indebted to her major instructor, Dr. Martha S. Pittman, for assistance throughout the preparation of this manuscript.

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