

T H E S I S

on

CONSUMPTION AND COST OF FOOD FOR COLLEGE WOMEN AT

OREGON STATE COLLEGE

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Submitted to the

OREGON STATE AGRICULTURAL COLLEGE

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In partial fulfillment of  
the requirements for the  
Degree of

MASTER OF SCIENCE

by

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May 10, 1929.

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# CONSUMPTION AND COST OF FOOD FOR COLLEGE WOMEN AT OREGON STATE COLLEGE.

## PURPOSE OF THIS STUDY.

A wide variation in the amount of money spent for food in sorority houses on this campus brought up the question of adequate nutrition in the houses in which the food budgets were low. This study was undertaken to determine the difference in the food nutrients furnished by the various houses. Another purpose of this study was a comparison of the food consumption and cost on this campus with that reported in recent studies of other college groups.

## REVIEW OF OTHER STUDIES.

Somewhat similar studies have been made from time to time. At Montana State College (7) in 1916 an extensive study of the costs and diets for college groups was made over a period of seven months. Expenses of operating, including upkeep and repair, were reported as well as the cost of food per capita per month and per day. The food served for eight days was analyzed for calorie values, protein, calcium, phosphorus and iron.

In 1917 a very detailed and accurate study extending over a period of two weeks was made in a women's dormitory at Vassar. (6). The outstanding characteristic of

this study was a very careful analysis of the quantity and kinds of food wasted. It was reported that the total waste represented 26 per cent of all food purchased. Ten and six tenths per cent of the waste was edible. The sample menu given shows that the meals characteristic of that time and place supplied more meat and fewer green leafy vegetables and fresh fruits than the meals served here in 1928. Eggs for breakfast and meat at the other two meals gives a much heavier protein diet than is considered necessary or desirable today.

In 1919 a similar study of food consumed by 300 people in seven days was made at the University of Illinois. (5). The amount of protein, carbohydrate, and fat was determined as well as the calories supplied. The cost per person per day, the cost of waste and the cost of calories supplied by food eaten at other times than regular meals was reported.

"Food Selection and Expenditure in a College Community" (8) is the title of the report of a study made at Kansas Agricultural College in 1925. Records for one month were kept in several sororities and fraternities and boarding houses for men. In addition to repeating much of the work of earlier studies a more careful analysis of the minerals supplied by the diet was reported. Vitamins were also discussed.

At the University of Washington (9) in January and February, 1926, another study of eleven sororities and one women's dormitory added more data to that already reported. Again a study was made of the minerals supplied. In neither the Kansas nor the Washington study was waste taken into account. In the Washington study each house made its own inventory. There is a greater possibility of error under these conditions than in the study made at O. S. C. in which the person making the study took the inventories in each house.

#### METHODS OF OBTAINING DATA

In this study at Oregon State College the winter month of January was chosen as the best time to make the study because of the relative scarcity of fresh fruit and vegetables. If the diet was ever low in minerals and vitamins it would be during the winter months.

Using the cost figures for the previous year, three sororities in each of the low, medium, and high cost groups, in which the costs ranged from \$72.00 to \$110.00 per person per year, were selected and their cooperation obtained.

The figures were obtained from a study made by the inventory method in nine sorority houses, two home management houses, and one women's dormitory over a period of one week. A complete inventory was made by the investigator by weighing all food on hand at the beginning and

at the end of the week.

The bills for all food purchased during the week were furnished by all the houses, except the dormitory, and were used in calculating the actual amount of food consumed. Records of food used in the dormitory were obtained from their card file of purchases and from calculations made from recipes used during the week.

Classification of Food.

All food was classified as follows:

Dairy products (except butter) i.e. milk, cream, cheese, and ice cream.

Eggs.

Fats, i.e. bacon, butter, cooking fat, salad oil, and drippings.

Fruits, fresh, canned, dried.

Grain products, i.e. bread, rolls, crackers, breakfast cereals, flours, cornstarch, macaroni, rice and tapioca.

Meat, fish, and poultry.

Nuts.

Sweets, i.e. honey, molasses, sugar, syrup, candy, preserves, and jelly.

Vegetables, fresh, canned, dried.

Miscellaneous, chocolate, cocoa, gelatine, catsup, coffee, tea, spices, flavoring, baking powder, soda, salt, etc.



### Cooperation of House Managers.

The splendid cooperation of the food managers in the various houses made it possible to obtain other necessary data. Each manager reported the brands of food used, the amount of canned goods, the cuts of meat, the number of people served each meal, the menus for the week, and approximate table waste. Each girl in all the houses except the dormitory reported her height, weight, and age, and all food eaten which was not furnished by the house.

### Training of the Food Managers.

In all of the sorority houses, except one, the manager had completed the required food courses in Home Economics. Four of the managers had also completed two terms of nutrition. In one instance the house mother helped plan the meals. The managers in the home management houses had finished the five terms of foods and nutrition. Menus for the dormitory were made out by a member of the faculty in Institution Economics.

### Method of Calculating Waste.

Calculations for refuse were made by using the figures given in Rose's Laboratory Handbook for Dietetics (2) supplemented by determinations made for refuse in certain foods as purchased here. An additional ten per cent of the total edible portion was allowed for waste. Thus all of the figures in this study represent more nearly

the actual amount of food consumed, than the amount purchased.

#### Methods of Purchasing.

Among the houses studied, three different methods of purchasing food were used. The sorority and fraternity houses have a manager's cooperative association and store through which they make their purchases. The dormitories buy wholesale. The home management houses patronize a small neighborhood grocery and market.

#### Methods of Calculating Nutritive Value.

The nutritive value of all food consumed was calculated in shares of energy, protein, calcium, phosphorus, and iron, according to the tables given in Rose's "Foundations of Nutrition." (1). Supplementary figures were obtained from Rose's "Laboratory Handbook for Dietetics" (2), Sherman's "Food Products" (4), and U. S. D. A. Bulletin 28, "The Chemical Composition of American Food Materials." (10) The composition of ice cream and cottage cheese was obtained from local factories. The proportions of sugar and fresh fruit used in canning were furnished by the Horticultural Department of the college.

Since the plan used by Dr. Rose (1) for expressing nutritive values in shares instead of calories and grams has not been used in other studies, an explanation of this method may well be made here. A table converting calories and grams to shares is needed to compare the figures of

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this study with those of other studies. For some time the energy value of food has been expressed in 100 calorie portions since many average servings of common foods yield 100 calories of energy. The usual figure taken to express the energy allowance of the average man, who weighs 154 pounds and is engaged in moderate activity, is 3000 calories for one day. Other daily allowances for the average man are,

protein, 10 per cent of the total calories or:

75 grams

calcium, 0.67 grams

phosphorus, 1.32 grams

iron, 0.015 grams

Each 100 calorie portion,  $1/30$ th of the day's allowance of energy for the average man, represents one share of energy. One-thirtieth of the allowance for protein, calcium, phosphorus, and iron represents a share of each respectively. The total allowance for the day for the average man, then, is 30 shares of each of these nutrients. The following table gives the value of one share of each nutrient.

1 share of energy = 100 calories or  $1/30$  of 3000 calories

1 share of protein = 2.5 grams or  $1/30$  of 75 grams

1 share of calcium = 0.023 grams or  $1/30$  of 0.67 grams

1 share of phosphorus = 0.044 grams or  $1/30$  of 1.32 grams

1 share of iron = 0.0005 grams or  $1/30$  of 0.015 grams.

Vitamins have not been included in the share tables as yet. Recently the vitamin content of some foods has been expressed in units. (3). One unit of vitamin A is the amount required to induce an average gain of 3 grams per week in a standard rat over a period of eight weeks.

One unit of vitamin B is the amount required to maintain constant weight in a standard rat over a period of eight weeks.

One unit of vitamin C is the amount necessary to protect a standard guinea pig (weight 300 grams) from scurvy over a period of ninety days.

The estimated requirements in vitamins for the average man per day may be expressed according to Rose <sup>1</sup>. as not less than

3000 units of vitamin A

900-1000 units of vitamin B

15 units of vitamin C, a fair allowance.

However, the supply of vitamins necessary for protection from disease may not be enough for the very best health as is suggested in the following statement. "Enough is an ambiguous term as applied to our vitamin intake because the optimum for the greatest advantage to health is apparently many times what is needed to protect us from deficiency disease." (11)

<sup>1</sup>. Rose, M. S. -- Personal Communication.

Since too few foods have been evaluated in terms of units of each vitamin, it was impossible to express quantitatively the vitamin consumption in this study.

#### ANALYSIS OF DATA.

##### Average Energy Value of Food Consumed.

The average energy value of the food consumed in the sorority houses was 24 shares per person per day.<sup>2</sup> In the home management houses and the dormitory 26 shares per person per day were furnished. In order to compare these figures with those obtained from other studies it is necessary to express them in calories per kilogram of body weight. Expressed thus they are 42 calories per kilogram per day for the sorority women and 43 calories per kilogram per day for the women of the home management houses. Since the women in the dormitory were not asked to report their weights, similar figures could not be obtained from them.

##### Average Daily Energy Expenditure.

From a study of the daily energy expenditure of several hundred women students at Columbia University, a prediction of a daily energy requirement of 33 calories per kilogram of body weight was made for the least active students. The most active ones required from 42 to 45 calories per kilogram per day. (1). A study of the daily

energy expenditure of a number of women on the Oregon State College campus gave an average daily requirement of 38 calories per kilogram per day. The house providing the least number of energy shares supplied 38 calories per kilogram per day.

#### Summary of Food Consumption and Cost.

A summary of the food consumption and cost obtained from the entire study is given in Table I in which cost and nutritive values are expressed as cost and shares per person per day. The figures are arranged in the ascending order of the cost.

(See page 11 for Table I.)

With the exception of house No. 2, the assumed standard for women at O. S. C., that is, 22 shares of energy or 2200 calories per person per day was supplied by each house. The sorority house that spent the most money for food supplied the largest number of energy shares. (27.7).

The protein shares supplied were all above the assumed standard of 22 shares. All of the houses except No. 2 and both home management houses furnished more than 30 shares of protein. House No. 6 used the largest quantity of protein, 37 shares.

The intake of calcium was adequate except at one home management house. The dormitory supplied the most calcium i.e., 46.9 shares per person per day. More than 33 shares of calcium were furnished by each of ten houses.

TABLE I.

Summary of all Figures.

Cost and Shares per person per day.

S H A R E S									
	No. of house	Cost	Energy	Protein	Calcium	Phos-phorus	Iron	Average weight of women	No. of persons served each meal
Sororities	1	.340	22.0	30.4	34.4	29.7	25.0	124.6	25.3
	2	.370	21.6	23.1	29.2	23.1	18.3	124.0	27.3
	3	.380	22.9	31.5	33.5	29.6	27.5	126.5	21.3
	4	.400	26.7	35.8	42.3	33.9	27.0	128.0	24.2
	5	.410	22.4	35.5	39.5	33.4	31.5	126.6	22.5
	6	.420	25.9	37.0	35.5	33.0	26.4	126.0	20.2
	7	.420	22.8	33.2	35.9	31.4	26.4	121.5	24.8
	8	.430	24.5	31.6	36.4	27.8	28.5	120.2	24.4
	9	.490	27.7	32.5	37.7	31.9	31.5	122.0	22.0
Ave. age		.407	24.1	32.3	36.0	30.4	27.0	124.4	23.5
Home Mgt. Houses	1	.480	25.8	29.0	36.6	29.5	27.2	128.0	8.0
	2	.490	25.4	27.2	24.8	25.4	23.1	134.0	8.0
Average		.485	25.6	28.1	30.7	27.4	25.1	131.0	8.0
Dormitory		.410	25.5	36.5	46.9	35.8	30.1		124.6
Assumed standard for women at O.S.C..			22.0	22.0	22.0	22.0	30.0		

The supply of iron was below the standard allowance of 50 shares per person per day in all except three houses, No. 5, No. 9 and the dormitory. House No. 2 which was lowest in every item except cost supplied only 0.6 of the iron allowance.

The phosphorus intake was somewhat lower than that of either protein or calcium. The largest amount, 35.8 shares, was furnished by the dormitory. House No. 2 supplied the least, 23 shares.

The fact that House No. 2 was lowest in every item except cost may be partially explained by the fact that a tea was given to a large number of people during the week of inventory. This raised the average number of persons served at each meal to 27 instead of the regular number, 22. Reducing the nutrients supplied to the per person per day basis would necessarily make the supply for this house low.

#### Relation of Cost to Energy Value.

The energy value of the food consumed in the sorority houses seemed to bear a rather close relationship to the cost. In general the sorority houses having the lowest costs supplied the fewest energy shares.

The relation between cost and calories in each of the houses studied is shown in Table II.



TABLE II.

Sorority House	Cost	Energy shares
1	\$.34	22.0
2	.37	21.6
3	.38	22.9
4	.40	26.7
5	.41	22.4
6	.42	25.9
7	.42	22.8
8	.43	24.5
9	.49	27.7
Home Management House		
1	.48	25.8
2	.49	25.4
Dormitory	.41	25.5

Cost According to Method of Purchase.

Different methods of buying make it impossible to compare the cost and energy value of food consumed in the sorority houses with that of the home management houses and dormitory. Purchases from the wholesale house, from the cooperative association or from the retail merchant showed quite a variation in the cost of some staples.

The difference in the cost of some common foods when purchased according to the above methods is shown in Table III.

(See page 14 for Table III)

The home management houses, buying at retail, furnish the same number of energy shares per person per day as the dormitory, buying at wholesale, with a difference in cost

TABLE III.

Costs According to Method of Purchase.

	Wholesale	Cooperative Assn.	Retail
Bread (24 oz. loaf)	\$.090	\$.09 <sup>1</sup> / <sub>2</sub>	\$.100
Eggs (per dozen)	.320	.3700	.400
Flour	.034	.0370	.055
Sugar	.059	.0650	.100
Lettuce (per head)	.090	.1000	.100
Potatoes	.020	.0175	.025
Cabbage (per lb.)	.030	.0400	.050
Butter 1.	.470	.5000	.500
Milk (per gallon) <sup>1</sup> .	.350	.3000	.400

<sup>1</sup>. Milk and butter for the dormitories are supplied by the O. S. C. dairy.

of 7 and 8 cents per person per day. A part of that difference comes from the number of persons served, for the greater the number of persons fed the less the cost per person. At the home management houses 8 persons were served at each meal while at the dormitory 125 persons were served.

A comparison of the cost and energy shares for houses No. 4 and No. 7, both of which served 24 people, shows that the same amount of money may buy a different number of energy shares. House No. 4, which supplied 26.7 energy shares for \$.40, used a greater proportion of sweet fruit, cooking fat and salad oil, and meat, than house No. 7, which supplied only 22.8 energy shares for \$.42. The greater cost for fewer energy shares at House No. 7 came from the purchase of more fresh fruit and lettuce. It was unfortunate in this case that the money spent for lettuce was practically all wasted for a large part of it was used as a foundation for salads and was thrown into the garbage.

#### Percentage Distribution of the Food Dollar.

From a study of 224 American dietaries, Dr. Sherman (3) was led to make certain suggestions and recommendations for improving the nutritive value of the dietary without increasing the cost. A study of the amount of money spent for each type of food gives a good foundation

for such recommendations. Dr. Sherman's food budget for his own family is used as a standard for comparison in this study at O. S. C. in Table IV.

TABLE IV.  
Percentage Distribution of the Food Dollar.

	House No.	Cereals	Milk and Ice Cream	Fruit and Vegetables	Fats	Sugars	Meat and other protein	Misc.
Sororities	1	10	10	24	15	4	34	3
	2	7	22	24	12	4	24	7
	3	8	8	29	15	5	27	8
	4	6	9	23	15	5	35	7
	5	9	13	24	16	8	31	4
	6	9	10	23	11	4	34	7
	7	8	9	35	11	4	29	4
	8	7	10	35	13	5	26	4
	9	8	11	26	16	5	27	7
Home Mgt. Houses.	1	4	11	35	18	4	24	4
Dormitory	2	13	11	30	15	6	22	3
		6	14	26	16	5	28	5
Shorman's family budget		12-15	25-30	15-18	10-12	3	17-25	

In studying this table, the fact that Dr. Sherman's figures are for a family group in which there are several children must be taken into consideration. The supply of milk would necessarily be higher in proportion to other foods for a group including children than in a dietary for a group of adults. In the houses studied, the proportion spent for milk and cereals was low. In nearly

all the houses the percentage spent for fats, sugar, and food accessories was high. If economy as well as better nutrition is a goal the supply of milk and whole grain cereals might well be increased and fats, sugar, and accessories decreased. The proportion of money spent for meat and other protein foods was higher than Sherman's highest figures in all houses except No. 2 and both home management houses. This may be partly due to the fact that the price of beef was extremely high at the time this study was made. The percentage spent for fruit and vegetables was very high.

#### Percentage Distribution of the Food Calorie.

Dr. Rose (1) says, "A good diet at moderate cost can be readily constructed, using the following plan for the general distribution of calories:

I. Foods from the cereal grains	30%
II. Milk	13%
III. Vegetables and fruits of at least three kinds	15%
IV. Fats and oils	17%
V. Sugars and foods very rich in sugar	10%
VI. Eggs, cheese, meat and other flesh foods	<u>15%</u>
Total	100% "

In order to compare the diets at the various houses included in this study with the above plan the percentage distribution of the food calorie was determined. The

results of this study are recorded in Table V.

TABLE V.

Percentage Distribution of the Food Calorie.

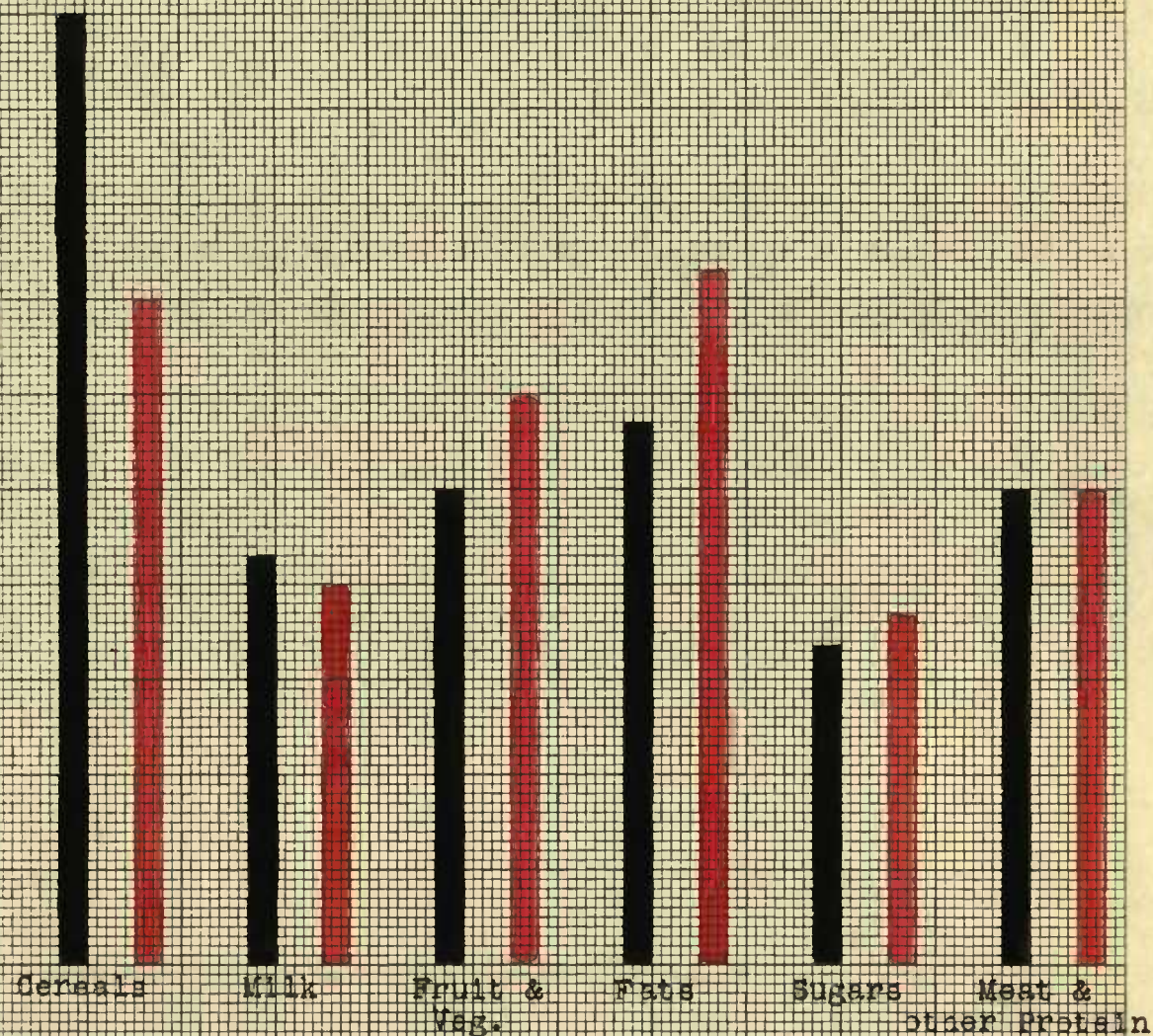
	House No.	Cereals.	Milk	Fruit and Vegetables.	Fats.	Sugars	Meat and other prot.	Misc.
Sororities	1	22.9	12.9	17.7	17.7	10.9	17.5	0.5
	2	19.6	16.6	14.3	23.5	12.4	13.0	0.7
	3	23.3	10.5	19.8	17.4	11.7	16.3	1.0
	4	17.3	11.2	16.0	22.9	11.3	19.3	2.0
	5	18.8	14.9	15.4	25.5	8.2	15.6	1.7
	6	24.7	11.4	13.7	24.6	9.8	14.7	1.2
	7	21.8	12.3	19.9	17.1	11.0	17.3	0.7
	8	19.6	10.6	19.8	21.9	11.7	15.7	0.7
	9	23.3	9.3	17.9	21.9	12.1	14.6	1.0
Home Mgt. Houses	1	12.9	11.5	21.6	26.0	14.3	12.3	1.4
	2	30.0	7.2	16.4	24.9	11.1	9.8	0.6
Dormitory		20.2	12.8	17.2	21.2	11.0	16.8	0.8
Dr. Rose's standard		30.0	13.0	15.0	17.0	10.0	15.0	

Compared with the standard for a moderate cost dietary only one house provided the required number of calories from cereals. Houses No. 2 and No. 5 supplied a larger proportion of calories from milk than the standard. At house No. 2 this may be accounted for by the ice cream which was served at their Founder's Day Tea. The percentage of calories supplied from milk by the other houses ranged from 7.2 to 12.9 per cent, only two of the houses falling below 10 per cent. The proportion of calor-

ies supplied by fruits and vegetables ranged from 13.7 to 21.6 per cent. Houses No. 2 and No. 6 fell below the standard of 15 per cent. In nine of the houses the proportion of calories from fat is high. At house No. 5 and home management house No. 1 it was one and one-half times the standard. The percentage of calories from sugar were a trifle higher than the standard except in houses No. 5 and No. 6. The least sugar was used by the sorority using the most fat. Very little preserved fruit but next the highest amount of butter was used at that house. Three houses (No. 2 and both home management houses) supplied a smaller proportion of calories from protein foods than the standard recommends. Only house No. 4 was very much higher in protein foods, i.e. one and one-third times the standard. This would seem to bear out the statement that the large proportion of money spent for meat and other protein foods was due to the high cost of beef at that time.

The accompanying chart represents the average number of calories supplied by the different types of food consumed in the various houses compared with Dr. Rose's standard for a moderate priced dietary. In studying this chart the following differences were noted. Only  $\frac{2}{3}$  of the amount of cereal recommended was used. The amount of milk supplied was slightly lower than the standard. The fruits and vegetables were  $\frac{1}{6}$  higher, the fats be-





#### PERCENTAGE DISTRIBUTION OF THE FOOD CALORIE

Black Represents Dr. Rose's Standard for a Moderate Priced Dietary

Red Represents the Averages of this Study



tween 1/5 and 1/4 higher, and the sugars only slightly higher than Dr. Rose's recommendations. Meats and other proteins just equalled the standard.

Average Percentage Distribution of Cost and Nutrients.

The average percentage distribution of cost and nutrients among the different types of food was worked out in order to show how a variation in the expenditures for the different types of food will affect the nutrients supplied. For example, a larger proportion of money spent for milk would materially increase all nutrients except iron. The calcium supply would be very much increased. A larger proportion spent for fats would increase calories only, unless the fat was butter which is an important source of vitamin A. A study of Table VI will illustrate this point still further.

TABLE VI.

Average Percentage Distribution of Cost and Nutrients.

Type of Food	Relative Cost	Calories	Prot- ein	Calcium	Phos- phorus	Iron
Cereals	8.0	21	21.00	8.00	17.00	16.0
Milk & Ice Cream	11.5	12	16.00	57.00	27.00	7.0
Fruit & vegetables	28.0	18	12.00	19.00	21.00	43.0
Butter & other fats	14.0	22	0.60	0.60	0.50	0.8
Sugars	4.5	11	0.14	0.48	0.23	0.9
Meat & other prot.	28.6	15	47.00	14.00	33.00	33.0
Miscellaneous	5.0	1	1.50	0.40	1.40	0.6

One of the important things to note in Table VI is the fact that a good supply of all the nutrients except calcium came from cereals. The cost of the nutrients

supplied by cereals was less than the cost of those supplied by any other type of food. When milk was added to cereals the deficiency in calcium was made up and the other items were materially increased with the exception of iron. Milk supplied 57 per cent of the calcium but only 7 per cent of the iron. A large proportion of all money spent for food was used for fruit and vegetables and for meat and other protein foods. The proportions spent for these two items were nearly equal. The outstanding nutrient supplied by fruits and vegetables was iron. More calories were supplied by fruits and vegetables than by meat and other protein foods. The latter supplied 47 per cent of the protein and 33 per cent of the phosphorus and of the iron respectively. Although fats and sugars contributed nothing but calories, the proportion of money spent for fats was one-half of that spent for fruits and vegetables or for meat and other protein foods. The large amount spent for fats may be due to a more general use of salads accompanied by an oil dressing.

#### Vitamins.

Since the vitamin content of foods has not been determined quantitatively a definite statement as to the adequacy of the supply cannot be made. However, a comparison of the amounts of certain foods known to be good sources which were supplied by the houses may be made.

Vitamin B is found in many different foods and is

not greatly affected by the ordinary processes of cooking. For these reasons very few diets of adults would be deficient in this element.

The most important sources of vitamin A are milk, butter, and eggs. The number of pounds of these foods as well as of other types of food necessary to an adequate dietary which were consumed in the various houses is given in Table VII. These figures represent the edible portion only.

(See page 23 for Table VII.)

Six of the houses furnished the minimum standard for milk for adults, one pint (approximately 1 lb.) per person per day; (4). All others except one home management house furnished three-fourths of a pint or more. The lowest figure is .446 pounds, less than one-half pint per person per day. The butter supply ranged from .068 to .110 pounds per person per day except at house number 6 where oleomargarine was used almost entirely. The number of eggs used varied from one-third to one egg per person per day. Only three houses furnished less than one-half an egg.

Vitamin C is so easily destroyed by heat and oxidation that its chief sources are certain raw fruits and vegetables, especially citrus fruits and cabbage. Tomatoes are an outstanding exception to the statement made above for they are a good source after being canned.

TABLE VII.

Consumption of certain classes of food in pounds per  
person per day.

	No. of House	Milk	Butter	Eggs	Cereal	Fruit	Vegetables	Meat
Sororities.	1	1.000	.085	.066	.450	.287	.950	.277
	2	.776	.068	.037	.279	.250	.760	.200
	3	.797	.074	.080	.434	.573	.839	.280
	4	1.050	.077	.053	.365	.224	.965	.360
	5	1.140	.096	.090	.451	.189	1.177	.369
	6	1.040	.014	.063	.515	.266	.968	.407
	7	1.025	.069	.080	.446	.628	1.268	.311
	8	.840	.053	.060	.395	.588	1.016	.312
	9	.770	.104	.065	.506	.637	1.120	.300
Home Mgt.	1	.920	.113	.083	.240	.647	.985	.260
Houses	2	.446	.095	.125	.584	.509	.768	.157
Dormitory		1.040	.109	.046	.434	.555	.913	.333

Potatoes which are cooked only fifteen minutes still retain a fair amount of vitamin C. (1). Since they are eaten more generally and in larger quantities than most other vegetables they are a very valuable source of the vitamin. Quick cooking and prompt service are necessary to retain an appreciable amount of the vitamin however. The amount of potatoes served at the various houses ranged from 0.8 to 2.0 medium potatoes per person per day. The total amount of vegetables eaten varied from  $\frac{3}{4}$  of a pound to  $1\frac{1}{4}$  pounds per person per day. The variation in the consumption of fruit was from  $\frac{1}{5}$  of a pound to  $\frac{5}{8}$  of a pound per person per day.

More consideration of the vitamin content of foods when the menus are planned would result in more interesting meals as well as a better supply of vitamins. Special attention should be given to the supply of vitamin C which is the one most often found wanting in the winter menus.

#### Study of Menus.

A group of dinner menus served on January 28, 1928 are given in Table VIII to show the general plan used by the majority of sorority houses on this campus. They illustrate also certain tendencies in choices of food common to these groups.

The type of meat most commonly used is the cheaper cut of beef, such as round steak, hamburger, a cut for stew, or pot roast.

# TABLE VIII.

Dinner Menus, January 28, 1928.

1. Shad Loaf Escalloped potatoes String Beans Bread and Butter Pickles Lemon Pudding	2. Macaroni and Meat Cabbage Salad Graham and white bread sandwiches Tapioca Pudding Coffee	3. Smothered Steak Mashed Potatoes Buttered Beets Bread and butter Caramel Nut Pudding Whipped Cream
4. Tamale Pie Fried Parsnips Cottage Cheese Salad Bread and butter Gooseberry pie	5. Hamburger Baked Potatoes Buttered Beets Bread and butter Pineapple jello	6. Swiss Steak Mashed Potatoes Peas Bread and butter
7. Meat Balls Mashed Potatoes Brown Gravy Stewed Tomatoes Bread and Butter Fruit Cup	8. Farmer's Steak Gravy Squash Spinach Bread and butter Cream Puffs Coffee	9. Eggs in Bacon Rings Baked Potatoes Stewed Tomatoes Cole Slaw Bread and butter Fruit Cup
10. Breaded Veal Boiled Potatoes Creamed Cabbage Tomato Aspic Orange Shortcake Bread and Butter	11. Sausage Mashed Potatoes Parsnips String Bean Salad Bread and butter Cocoanut pie	12. Roast Beef Escalloped Potatoes Stewed Tomatoes Sweet Mixed Pickles Bread and butter Steamed Date Pudding

Potatoes are usually served for dinner. Either another cooked vegetable or a salad or both accompany the potatoes and meat in the main course. More often the salad is a luncheon dish and is omitted at dinner. Too frequently the salad served is not made of raw fruit or vegetables, but of cottage cheese, fish, eggs, canned fruits, or vegetables.

Puddings are the type of dessert most frequently used.

Milk is usually provided as a beverage at breakfast and lunch but not at dinner.

Menu No. 6 is lacking in interest and appears unsatisfying. The vitamin C content of menus 3 and 4 is very low.

(See page 25 for Table VIII)

Food Eaten Which was not furnished by the Houses,

Part of the social life in college groups consists of visits to the lunch counter and of "feeds" whenever a package arrives from home. Because of this fact it seemed important to make a survey of the food which the girls in the various houses ate in addition to that furnished by the house. This food was not accounted for in the study of nutritive values nor in the cost. The following list of foods which were eaten but were not furnished by the houses is arranged in the descending order of the frequency of their use.

Coffee  
Candy  
Ice Cream  
Cake  
Sandwiches  
Pie  
Fruit  
Cookies  
Sweet breads (snails, maple squares, fig rolls, etc)  
Coca Cola  
Milk shakes and milk  
Popcorn  
Peanuts  
Toast  
Hot Chocolate  
Salad  
Waffles  
Tea  
Raw Vegetables  
Soup  
Pickles

Coffee and candy were used nearly twice as many times as ice cream and cake during the week of this study. Coffee, the first on the list, was ordered 171 times. Very often a cup of coffee was drunk for sociability at the Electric



Lunch where the college crowd gathers. In the house ordering coffee most frequently a number of girls did not eat breakfast at home but had it later at the Electric Lunch. An excellent chocolate cake a la mode is one of the specials at this same lunch room, which probably accounts for the frequency of the third and fourth articles. Candy often came from home or was a gift. Soup and pickles, the last two on the list, were ordered only three times. Breakfast was the meal most commonly missed in all the houses. Maple squares, or toast, or waffles with coffee were eaten at the lunch counter instead.

The calories contributed by this extra food were not estimated but it is evident that some of the women were getting many more calories than the house supplied.

#### COMPARISON WITH OTHER STUDIES

A comparison of the average percentage distribution of the food dollar at O. S. C. with the Kansas (8) and Washington (9) studies and also with Sherman's (3) distribution for a family group is shown in Table IX.

(See page 29 for Table IX)

The distribution of the food dollar for all these college groups is quite similar. The proportion of money spent for vegetables and fats is slightly higher at O.S.C. When compared with Sherman's record for a family group a wider variation appears. Children in the family would

TABLE IX.

Comparison With Other Studies of the Average  
Percentage Distribution of the Food Dollar.

	Cereals	Milk and ice cream	Fruit and vegetables	Fats	Sugars	Meat and other Protein	Miscellaneous
College Group							
Kansas	12.6	11.0	24.2	11.6	7.0	27.9	5.8
Washington	9.4	12.9	24.8	13.3	4.2	29.4	5.8
O. S. C.	8.0	11.5	26.0	14.0	4.5	28.6	5.0
Family group (Shorman)	12-15	25-30	15-18	10-12	3.0	17-25	

normally increase the amount for milk and decrease the amount spent for meat.

#### SUMMARY.

1. In a study of the food consumed by twelve groups of college women, the calories furnished by the various houses ranged from 2156 per person per day to 2765.

2. The protein supply was not less than 10 per cent of the total calories in any house. Approximately  $63\frac{1}{2}$  per cent of all the protein was obtained from animal sources. The largest proportion of all money spent was used to buy protein foods.

3. The calcium supply was adequate in all houses except one.

4. The phosphorus furnished was equal to or above the standard.

5. The supply of iron was sufficient in only three houses. All others furnished less than the standard of 30 shares per person per day, one furnishing only 18 shares.

6. The cost of food ranged from \$0.34 to \$0.49 per person per day.

#### RECOMMENDATIONS.

##### 1. Calories.

The number of calories supplied appears to be sufficient. It is doubtful that the intake of food is well

distributed through the day. The habit of omitting breakfast is a poor one from the standpoint of good nutrition. Midmeal lunches which furnish the calories breakfast should have supplied are principally sweets. Sweets supply calories but very few other nutrients. Three regular meals a day with very little eaten between meals would result in a much better state of nutrition.

## 2. Protein.

The large proportion of money spent for protein foods may be justified since they supplied 47 per cent of all protein and 33 per cent of phosphorus and iron respectively.

## 3. Minerals.

A moderate cost dietary must obtain a large proportion of its supply of iron from whole grain cereals, vegetables, and fruits rather than from meats. In this study the proportion of money spent for protein food and for fruit and vegetables was the same but protein foods supplied only 33 per cent of the iron while vegetables and fruits supplied 43 per cent. If the same amount of money had been spent for cereals they would have supplied 56 per cent of the iron.

In order to be sure of an adequate supply of calcium all houses should furnish the minimum allowance of milk for adults i.e. 1 pint per person per day. (4).

#### 4. Vitamins.

There is little danger of a real deficiency in vitamins if the distribution of nutrients is kept within our standard. At least one fresh fruit or vegetable served and eaten every day is a good rule to follow. To leave the lettuce on the salad plate is no longer considered a mark of culture but a waste of good food and money. Cabbage which is a good source of vitamin C is obtainable nearly all winter. Tomatoes, also, even when canned are a good source of vitamins, especially C. During the winter months when fresh vegetables are scarce a generous use of tomatoes is recommended.

#### 5. Cost.

To decrease cost reduce the amount of fat used other than butter and increase cereal foods. If the cereals used are whole grain the mineral supply will be increased also. With the exception of butter, fats yield only energy.

In general this study shows the dietary to be fairly satisfactory for the money spent. However, if the lowest cost, \$0.34, per person per day, were maintained throughout the year the meals might become monotonous and unsatisfactory from an esthetic point of view. Menus should be varied from week to week as well as from day to day. Monotonous meals dull the appetite and result

in lunching between meals or buying foods outside the house. The student pays for her meals at the house. She should not be obliged to buy her meals outside in order to be satisfied.

Food should be well cooked, properly seasoned, and attractively served. Many people refuse to eat vegetables because they have never tasted them when they were served at their very best. They should be cooked quickly, well seasoned, and served promptly so that they are hot. Nothing is more unappetizing than a poorly seasoned, lukewarm vegetable. Foods that are intended to be served hot should not come to the table lukewarm. The same thing is true of cold foods. Crisp lettuce, cabbage, and other vegetables served raw give a contrast in texture to the cooked foods and always make a meal more interesting.

#### CONCLUSION.

In this study, evidence is presented which shows that groups of college women can maintain a satisfactory standard of nutrition at a cost not exceeding \$0.49 per person per day provided the knowledge of nutritive values and wise buying methods are employed.

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