DETERMINED ENERGY VALUE OF DORMITORY MEALS

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THESIS

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INTRODUCTION

To save the time and expense required in chemical analysis, studies of the food consumption of large groups of college women of northern states by the inventory method have proved effective. According to Coons and Schiefelbusch[1] the habitual food consumption of present-day college women is lower than it was a generation ago and lower among Oklahoma women than among women whose intake was reported in other sections of the United States. Their conclusion was that prolonged under-nutrition is a factor in low metabolism. It is significant that the Oklahoma women had similar diets in caloric content to an underweight group of college women whose intake was studied at the University of Chicago by Blunt and Bauer[2] and that the Oklahoma women consumed 19 per cent less calories than did the Chicago women.

Calorimetric determinations on food consumed by college women of the South and Southwest, where little research has been done in the energy value of dormitory meals and where the semi-tropical climate prevails, is clearly needed.

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[1]C. M. Coons and A. T. Schiefelbusch, "The Diets of College Women in Relation to Their Basal Metabolism," Journal of Nutrition, V (1932), 456.

[2]H. Blunt and M. Bauer, Journal of Home Economics, XIV (1922), 226.

The present study was planned to determine the energy value of food served to a group of 220 women attending a small sectarian college at Belton, Texas.

PROCEDURE

To determine the caloric content of food served at Mary Hardin-Baylor College dormitory, samples of food and plate waste were collected for seven days' meals during the spring of 1956. Family-style service of meals, which is the custom of the college, permitted a free selection of the food offered. Although the food was placed in platters and bowls, the number of portions provided were sufficient to serve a similar size portion to each girl at the table. However, second servings were usually available. Both milk and coffee were served in winter and milk and iced tea in summer, so that two beverages were available to those desiring two. Oleomargarine and white and whole wheat bread were available for extra servings. Food portions identical to those served to each girl at the table were collected after each meal. Moisture determinations were made by weighing the composite food of each meal before it was ground, blended in a Waring Blendor, and dried in a gas oven at a temperature below 200° F. Plate waste was collected in a weighed container at the end of each meal and the total contents weighed. A sample of plate waste from each meal was ground, blended, and dried. The caloric value of bread alone, sliced bread and hot bread, was determined by obtaining and drying samples in like manner.

After all food and plate waste samples were dried, they were burned in a Parr Oxygen Bomb Calorimeter and their caloric value calculated.

DISCUSSION

The menus of the seven days on which food was collected for determination followed the usually accepted pattern of most southern homes. It may be seen in Table I that breakfast consisted of fruit or fruit juice, assorted cereal, eggs, bacon or sausage, with hot biscuits or muffins served with toast and jelly. Both milk and coffee were served at breakfast, and some of the girls drank both, while some drank only fruit juice. Each breakfast menu contains an adequate amount of animal protein, even when fluid milk was not chosen as the breakfast beverage. As in many small institutions, scrambled eggs appeared most frequently because they can be kept warm more easily and are well accepted. All breakfast menus except one contained some type of dry cereal with half a cup of whole milk.

The noon meal pattern consisted of meat, two vegetables, corn bread, salad, dessert, and a choice of beverages. The ever-present and popular hot corn bread with fresh vegetables, and home-made cake and pastries cooked in the college kitchen made the noon meal the one usually eaten by all the girls. It is interesting to note that liver, which appeared twice in the seven-day collections, was not a usual weekly plan of the dining-room service. This happened because the seven days'

TABLE I

MENUS SERVED DURING THE DAYS FOOD WAS COLLECTED FOR CALORIE DETERMINATION

Meal	Day 1	Day 2	Day 3
Breakfast	Tomato Juice Pep ½ cup Milk Bacon Fig & Jelly Biscuit--Toast Milk--Coffee	Tomato Juice Puffed Wheat ½ cup Milk Sausage Jelly--Peach Preserves Biscuit--Toast Milk--Coffee	Grapefruit Raisin Bran ½ cup Milk Scrambled Eggs Cherry Preserves Biscuit--Toast Milk--Coffee
Noon Meal	Barbecued Beef Pinto Beans Vegetable Salad Corn Bread Blueberry Cobbler Milk--Tea	Smothered Liver Broccoli Potatoes Vegetable Salad Corn Bread Doughnuts Milk--Tea	Fried Steak--Gravy Carrots Lima Beans Vegetable Salad Corn Bread Cherry Pie Milk--Tea
Supper	Luncheon Meat Fried Potatoes Sliced Tomatoes W.W.--Bread Ice Cream Milk--Tea	Hamburger Steak Corn Green Beans Peach Pickle W.W.--Bread Ice Cream Milk--Tea	Beef Stew Turnip Greens Pickled Beets W.W.--Bread Fruit Cup Milk--Tea

TABLE I--Continued

Day 4	Day 5	Day 6	Day 7
Grape Juice	Orange Juice	Whole Orange	Apple Juice
	Grape Nuts	Rice Crispies	Shredded Wheat
	½ cup Milk	½ cup Milk	½ cup Milk
Scrambled Eggs	Scrambled Eggs	Scrambled Eggs	2 sl. Bacon
Peach Preserves	Fig Preserves	Jelly	Grape Jelly
Muffin--Toast	Biscuit--Toast	Muffin--Toast	Muffin--Toast
Milk--Coffee	Milk--Coffee	Milk--Coffee	Milk--Coffee
Steak--Gravy	Roast--Gravy	Liver and Onions	Roast Beef
Potatoes	Squash	Broccoli	Turnips and Greens
Green Beans	Green Beans	Corn	Radish and Onion
Fruit Salad	Beet Salad	Spiced Peaches	Corn Bread
Corn Bread	Corn Bread	Corn Bread	Peach Cobbler
Chocolate Pie	Cocoanut Pie	Chocolate Pie	Milk--Tea
Milk--Tea	Milk--Tea	Milk--Tea	
Chicken Noodles	Salmon Croquettes	Pimiento Cheese	Tuna Salad
English Peas	Brussels Sprouts	Fried Potatoes	Potato Chips
Peach Pickle	Peach & Cheese Salad	Tomatoes and Lettuce	Tomatoes and Lettuce
W.W.--Bread	W.W.--Bread	W.W.--Bread	W.W.--Bread
Ice Cream	Sherbet	Ice Cream	Apple Cake
Milk--Tea	Milk--Tea	Milk--Tea	Milk--Tea

food represented here was collected a day at a time during the spring semester. Fish at the noon meal is not shown for the seven days, Table I, but generally appeared on the weekly menu plans.

Supper, a better-attended meal than breakfast, is not as popular as the noon meal. Because of a greatly reduced kitchen staff in the evening, the food served at supper was usually of a kind that could be previously prepared or prepared in a short time by fewer people. Picnic-style food was often served during the warm weather with foods that lent themselves to the making of light salad accompaniments. Ice cream was on the evening menu many times because of the fact that no preparation was required. It appears in Table I on five of the seven menus.

Determined fuel values, which may be seen in Table II, show a range of 370 to 911, with an average of 640 for the breakfast composites. The low values were made on days when crisp bacon took the place of scrambled eggs, which contain much fat as prepared in the institutional kitchen. On Day 4 a very generous serving of country sausage brought the energy value to its peak of all breakfasts, namely 911 calories. Hot biscuits and muffins with jellies, which are found on each of the breakfast menus, made for additional calories. If an eight-ounce serving of whole milk was consumed by each girl, the value of the composite was raised by 166 calories to an average of 792 calories. In Table II

TABLE II

CALORIC VALUES OF MEALS SERVED

Meal	Composite	Composite + Milk*	Composite + Bread
Breakfast			
Day 1	458	624	535
Day 2	911	1077	988
Day 3	740	906	817
Day 4	690	861	772
Day 5	550	716	627
Day 6	761	827	838
Day 7	370	536	447
Total	4480	5547	5024
Average	640	792	718
Noon Meal			
Day 1	1050	1216	1127
Day 2	722	888	799
Day 3	1003	1169	1080
Day 4	743	909	820
Day 5	920	1086	997
Day 6	849	1015	926
Day 7	760	926	837
Total	6047	7209	6586
Average	864	1029	941
Supper			
Day 1	720	886	797
Day 2	786	952	863
Day 3	804	970	881
Day 4	662	828	739
Day 5	973	1139	1050
Day 6	945	1111	1022
Day 7	606	772	683
Total	5496	6658	6035
Average	785	951	862

*Caloric value of milk calculated from published tables.

TABLE II--Continued

Composite + Milk & Bread	Composite - Plate Waste	Composite + Milk - Plate Waste	Composite + Bread - Plate Waste	Composite + Bread + Milk - Plate Waste
701	280	446	357	842
1154	799	965	876	1095
983	586	742	653	969
938	649	815	626	878
793	482	648	559	717
1004	631	697	708	910
613	285	451	362	528
6186	3712	4764	4141	5939
884	530	680	591	848
1293	801	867	878	1044
965	612	778	689	855
1146	871	1035	948	1014
986	726	892	803	969
1163	882	1048	859	1125
1092	749	915	826	992
1003	644	810	721	887
7648	5285	6345	5724	6886
1092	755	906	818	984
963	685	851	762	928
1029	727	893	804	970
1047	790	956	867	1033
905	602	768	679	845
1216	897	1063	974	1140
1188	851	1017	928	1094
849	Not	Available	Not	Available
7197	4552	5548	5014	6010
1028	759	924	836	1001

there may also be seen the increase in caloric value, to 718 calories, if a serving of bread, 77 calories, is added to the breakfast composite. Even when corrections were made for plate waste, the caloric averages provided are 530 for composite food only, with milk 680, and with extra bread, 591 calories. The maximum caloric value provided by breakfast is shown when the individual consumes both a glass of milk and a serving of bread--884 calories without plate waste and 848 with plate waste.

Young and Storvick,[1] in their study of food consumed by college women, found that the weekly intake of students missing breakfast showed that a direct parallel exists between the adequacy of breakfast and that of the diet as a whole. Omission of breakfast is frowned on by all nutritionists who have learned, as stated by Bogart,[2] that food is needed to supply energy and prevent fatigue during the morning hours. Also, if breakfast is omitted or is too light a meal, it is difficult to make sure that the other meals will furnish the daily quota of all nutrients.

It is evident in Table II that a patron of Mary Hardin-Baylor dining-room could consume at the noon meal a range of 722 to 1050 calories (from composites), with an average of

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[1]C. B. Young and G. A. Storvick, "Food Habits of College Freshmen at Oregon State College," Journal of the American Dietetic Association, XXV (1949), 2.

[2]Jean Bogart, Nutrition and Physical Fitness (Philadelphia, 1955), pp. 355-361.

864 per noon meal. When corrections were made for plate waste, the range was 644 to 882, with an average of 755 calories. The maximum provided by the noon meals, 965 to 1293, with an average of 1092, is shown when the girl consumes a slice of bread in addition to the corn bread in the composite and an eight-ounce serving of whole milk. With plate waste deduction, this becomes a range of 855 to 1125, with an average of 984 calories.

The supper composite ran lower in caloric values than did the noon meals, the range being 606 to 973, with an average of 785 calories. As in the case of other meals, a girl could increase her caloric intake with the addition of a glass of milk and a slice of bread, which would bring the energy value to a range of 849 to 1216, with an average of 1028, whereas with the plate waste corrections the range was 845 to 1094, with an average of 1001 calories. The menu for Day 7 was found to have the least fuel value, 606 calories. Tuna fish salad as the main dish of the meal was composed of tuna fish and fresh chopped vegetables, which were not high in calories. A plain apple sauce "cake" muffin which was served for dessert is lower in calories than a serving of ice cream. The supper of Day 5, which gives the highest caloric value of the seven days, included deep fat fried salmon croquettes, a starchy vegetable, hominy, and cheddar cheese used in the salad.

It may be seen from Table III that the breakfast plate waste ranged from 46 to 178 calories, with an average of 111. The smallest amount of plate waste, 46 calories, occurred on Day 4 when no cereal was served, indicating that the extra bulk may cause a girl to leave more of the food uneaten. However, the highest plate waste, 178 calories, occurred on Day 1 when the composite meal was lowest in caloric content. The next highest plate waste appeared on Day 3. The high plate waste for these two breakfasts may be due to the same type of bran cereal being served on these days, since this type of cereal was not served at any of the other breakfasts at which less plate waste occurred.

TABLE III

AVERAGE CALORIC VALUE OF PLATE WASTE FOR EACH OF THE SEVEN DAYS' MEALS

Day	Breakfast	Noon	Supper	Total
Day 1	178	249	35	462
Day 2	112	110	59	281
Day 3	164	132	14	310
Day 4	46	17	60	123
Day 5	68	38	76	182
Day 6	130	100	94	324
Day 7	85	116	X	201
Total	783	762	338	1883
Average	111	109	56*	269

X - unavailable
*Obtained by dividing total by six days.

The high plate waste of the noon meal on Day 1 (249 calories) may be accounted for by the fat and bone from the barbecued beef found in the garbage can after that meal. Day 4 had the least plate waste, for a noon meal, 17 calories, and it is interesting to note (Table I) that more popular foods were served at that meal. The plate waste for the noon meals ranged from 17 to 249, with an average of 109 calories (Table III).

It is evident from the same table that less food energy value was wasted from the supper meals. The range of 14 to 94 showed less overall variation in plate waste, with an average of 56 calories. On Day 3 only 14 calories were lost in plate waste when vegetable stew was served, while the highest plate waste occurred on Day 6 when pimiento cheese and fried potatoes were served.

In Table IV the total daily caloric value of seven days' composite foods are shown. The total calories from seven breakfasts was 4485, with an average of 640. Composites for the seven noon meals totaled 6047 calories, with an average of 864. The seven suppers provided 5496 calories, with an average of 785. When the totals were added and the average obtained, it was found that a Mary Hardin-Baylor girl could get a range of 1736 to 2555, and an average of 2260, for composite foods alone. When corrections were made for plate waste, the range for composite foods was found to be 1535 to 2200, with an average of 1977.

TABLE IV

TOTAL DAILY CALORIC VALUE OF SEVEN DAYS' COMPOSITE FOOD

Day	Breakfast	Noon	Supper	Total	Total Average Plate Waste
Day 1	458	1050	720	2228	1766
Day 2	911	722	786	2419	2138
Day 3	740	1003	804	2547	2134
Day 4	695	743	662	2100	1936
Day 5	550	920	973	2443	2200
Day 6	761	849	945	2555	2133
Day 7	370	760	606	1736	1535
Total	4485	6047	5496	16,028	13,842
Average	641	864	785	2,290	1,977

The National Research Council[3] recommends 2400 calories for girls of 16-20 and 2300 calories for girls over 20. The young women of this study were 17-22 years of age. A 5 per cent reduction for the warmer climate gives 2280 calories for those under 20 and 2180 calories for the girls over 20. The average daily caloric food composite provided a plus or minus 10 per cent of these recommended allowances. Thus if the individual had the average plate waste determined for all of the meals, this would not be true. Neither of these averages takes into consideration that each girl was permitted more of the composite foods, as well as a glass of

[3]National Research Council, Recommended Dietary Allowances, revised ed. (Washington, D. C., 1953).

milk and additional bread at each of these meals. Furthermore, other foods eaten between meals, such as candy, carbonated drinks, and other snacks would bring the total day's intake to a level exceeding the recommendations.

At Cornell University eight women, ages 22-36, were the subjects of a study by Frank and Johnston[4] in which they were predicted to need an average of 2270 calories per day. This prediction was made by the use of a system recommended by the National Research Council for women of moderate activity with adjustment for age, mean external temperature, and weight. It was found that the prediction was similar to the energy needs of these young women. The girls in the warmer climate of the present study had an average of 2260 calories provided as composite food alone. This suggests that if the food served is eaten, the recommended daily caloric requirement of the average college girl would be met without fluid milk or additional breadstuff.

It is not enough to provide the food. It must be eaten in order that each individual obtain an adequate diet. Nygreen[5] emphasizes this point in a study of the food served in the women's residence halls of the University of Washington

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[4]R. M. Frank and F. A. Johnston, "Total Energy Needs of Women of 22 to 36 Years of Age," Journal of the American Dietetic Association, XXXI (October, 1955), 1007-1009.

[5]M. S. Nygreen, "Foods Eaten by College Students: Acceptability, Adequacy, and Cost," Journal of the American Dietetic Association, XXX (October, 1954), 359-362.

State: that although a diet was planned which met the daily recommended allowance by the National Research Council in nutrients, the patrons who missed meals or refused portions failed to receive full value for money spent.

SUMMARY

This study was made to determine the energy value of food served family style to 220 young women at Mary Hardin-Baylor College, Belton, Texas. Identical samples of food served on seven days, in addition to a sample of plate waste from each meal, were collected, weighed, dried, and their energy value computed by burning in a Parr Oxygen Bomb Calorimeter.

The breakfast composites provided 370 to 911 calories, with an average of 640.

The noon meal composites provided 722 to 1050 calories, with an average of 864.

The supper meal composites provided 606 to 973 calories, with an average of 785.

The daily total composite food ranged from 1736 to 2555 calories, with an average of 2260.

Additional calories were available at each meal from second servings of the composite foods, fluid milk, and second servings of breadstuff.

The daily total calories from plate waste ranged from 123 to 462, with an average of 269 calories.

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