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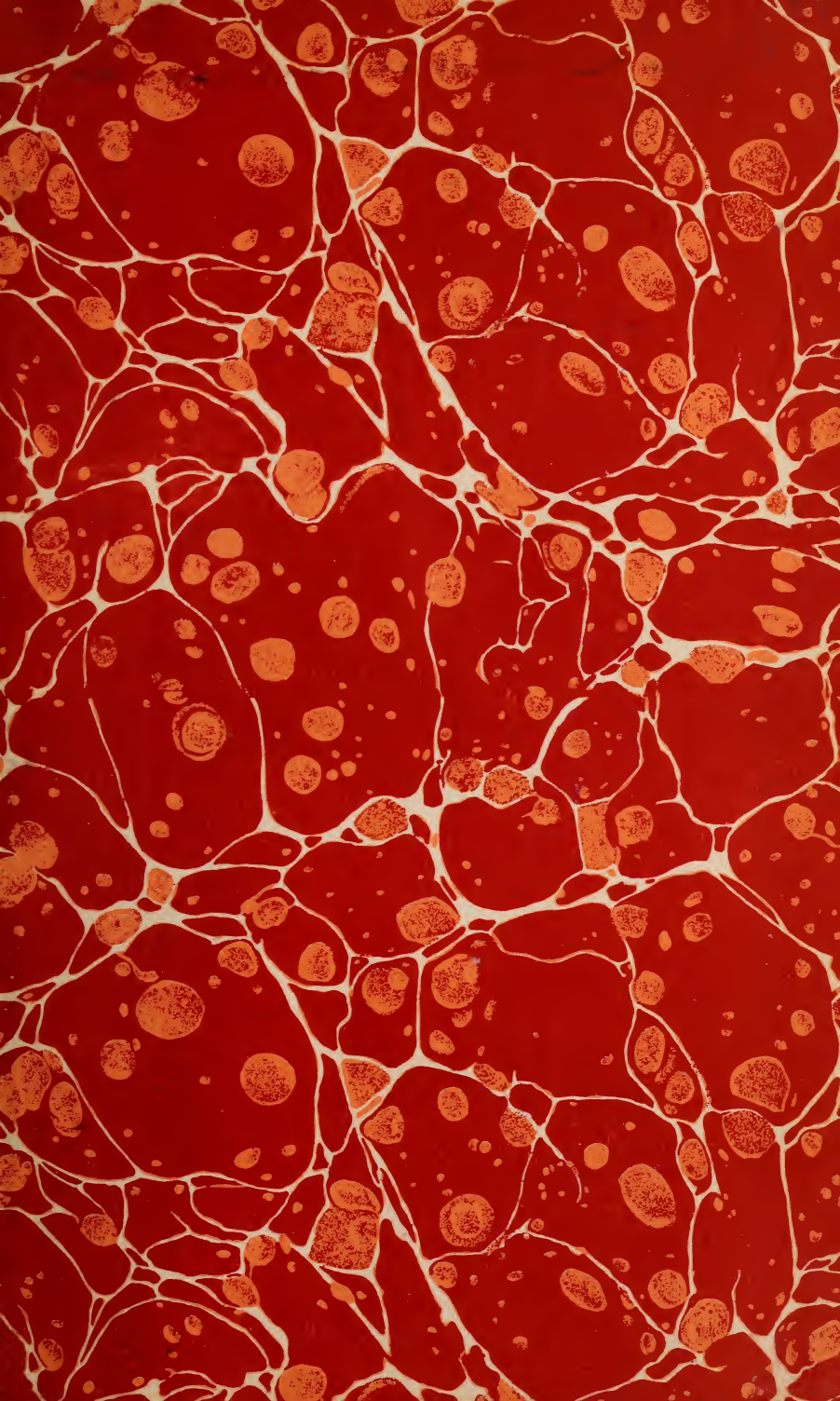
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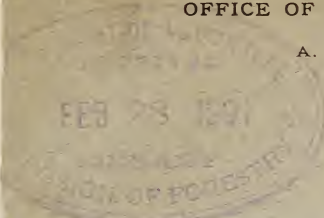
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U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,

A. C. TRUE, Director.

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NUTRITION INVESTIGATIONS

AT THE

UNIVERSITY OF ILLINOIS, NORTH DAKOTA AGRICULTURAL
COLLEGE, AND LAKE ERIE COLLEGE, OHIO,

1896 TO 1900.

BY

H. S. GRINDLEY and J. L. SAMMIS, E. F. LADD, and ISABEL BEVIER
and ELIZABETH C. SPRAGUE.



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1900.

LIST OF PUBLICATIONS OF THE OFFICE OF EXPERIMENT STATIONS ON THE FOOD AND NUTRITION OF MAN.

NOTE.—For those publications to which a price is affixed application should be made to the Superintendent of Documents, Union Building, Washington, D. C., the officer designated by law to sell Government publications.

- Charts. Food and Diet. By W. O. Atwater. (Four charts, 26 by 40 inches.) Price per set, unmounted, 75 cents.
- Bul. 21. Methods and Results of Investigations on the Chemistry and Economy of Food. By W. O. Atwater. Pp. 222. Price, 15 cents.
- Bul. 28. (Revised edition.) The Chemical Composition of American Food Materials. By W. O. Atwater and A. P. Bryant. Pp. 87. Price, 5 cents.
- Bul. 29. Dietary Studies at the University of Tennessee in 1895. By C. E. Wait, with comments by W. O. Atwater and C. D. Woods. Pp. 45. Price, 5 cents.
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- Bul. 45. A Digest of Metabolism Experiments in which the Balance of Income and Outgo was Determined. By W. O. Atwater and C. F. Langworthy. Pp. 434. Price, 25 cents.
- Bul. 46. Dietary Studies in New York City in 1895 and 1896. By W. O. Atwater and C. D. Woods. Pp. 117. Price, 10 cents.
- Bul. 52. Nutrition Investigations in Pittsburg, Pa., 1894-1896. By Isabel Bevier. Pp. 48. Price, 5 cents.
- Bul. 53. Nutrition Investigations at the University of Tennessee in 1896 and 1897. By C. E. Wait. Pp. 46. Price, 5 cents.
- Bul. 54. Nutrition Investigations in New Mexico in 1897. By A. Goss. Pp. 20. Price, 5 cents.

[Continued on third page of cover.]

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
A. C. TRUE, Director.

NUTRITION INVESTIGATIONS

AT THE

UNIVERSITY OF ILLINOIS, NORTH DAKOTA AGRICULTURAL
COLLEGE, AND LAKE ERIE COLLEGE, OHIO,

1896 TO 1900.

BY

H. S. GRINDLEY and J. L. SAMMIS, E. F. LADD, and ISABEL BEVIER
and ELIZABETH C. SPRAGUE.



U. S. Department of Agriculture,
Washington, D. C.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1900.



LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
Washington, D. C., December 3, 1900.

SIR: I have the honor to transmit herewith a report on dietary studies made at the University of Illinois by Prof. H. S. Grindley, at the North Dakota Agricultural College by Prof. E. F. Ladd, and at Lake Erie College, Ohio, by Prof. Isabel Bevier (now professor of Household Science, University of Illinois) and Elizabeth C. Sprague.

These studies were made under the direction of Prof. W. O. Atwater, special agent in charge of nutrition investigations, in accordance with instructions given by the Director of this Office. In conducting his investigations Professor Grindley was assisted by J. L. Sammis and E. A. Paul, of the department of chemistry of the University of Illinois. In connection with the investigation at the North Dakota Agricultural College, especial mention should be made of the cooperation and assistance of Miss Marie B. Senn, of the department of domestic science. In the work at Lake Erie College mention should be made of the assistance of President Mary Evans and Dean Luette P. Bentley, who did much to insure the success of the undertaking. The especial object in Professor Grindley's investigation was to learn something of the food habits of professional men and men at rather severe muscular labor in the region studied, while Professor Ladd and Miss Bevier and Miss Sprague studied especially the diet of women students' clubs in their respective institutions. Many dietary studies have been made in the past, in this and other countries, with clubs of men and with families composed of men and women. Comparatively few such studies, however, have been made with clubs or other groups composed entirely of women.

These studies constitute a part of the nutrition investigations in charge of this Office. The results obtained are believed to be interesting and valuable in themselves and useful for purposes of comparison.

The report is submitted with the request that it be published as Bulletin No. 91 of this Office.

Respectfully,

A. C. TRUE,
Director.

Hon. JAMES WILSON,
Secretary of Agriculture.



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NUTRITION INVESTIGATIONS IN ILLINOIS, NORTH DAKOTA, AND OHIO, 1896-1900.

DIETARY STUDIES AT THE UNIVERSITY OF ILLINOIS.

By H. S. GRINDLEY,
Assistant Professor of Chemistry, University of Illinois,

AND

J. L. SAMMIS,
Assistant in Chemistry, University of Illinois.

INTRODUCTION.

Two dietary studies were made in cooperation with the Office of Experiment Stations at the University of Illinois, at Urbana—one with the family of an instructor and the other with a club of workingmen. In connection with the studies a number of food materials were analyzed. The dietaries form part of a series conducted under the auspices of the U. S. Department of Agriculture for the purpose of obtaining information concerning the food habits and food consumption of persons in different regions of the United States.

The methods employed were essentially those explained in a previous publication of this Office.¹ Briefly stated, they are as follows: At the beginning of each dietary study a careful inventory by weight was taken of all the food materials in the house. During the fourteen days which each study covered the kinds and weights of all food purchased were recorded in the same way, and all table and kitchen waste was carefully collected, weighed, and properly prepared for analysis. At the close of the experimental period a second inventory of all the food materials on hand was taken.

The amounts of different foods on hand at the beginning, plus those received during the study, less the amounts remaining at the end gave the amount of each kind of food actually used.

Samples for analysis were taken in nearly all cases where the amount of any given food material used was large, or where its composition could not be safely assumed. In all other cases the composition was assumed from the averages of analyses of similar materials.²

¹ U. S. Dept. Agr., Office of Experiment Stations Bul. 21.

² These averages were taken from U. S. Dept. Agr., Office of Experiment Stations Bul. 28 (revised), or from an earlier unpublished revision.

From the amounts of the different kinds of food actually used and the composition of each food as shown by analysis or as assumed from the average of analyses of similar materials the total amounts of nutritive ingredients used during the study were determined. From these the amounts of nutrients in the waste were deducted, and thus the quantities of nutrients actually eaten were ascertained.

The customary factors were used for reducing the result to terms of per man per day.¹

COMPOSITION OF FOOD MATERIALS.

A description of the food materials which were analyzed (by usual methods²) in connection with the dietary studies is given below.

DESCRIPTION OF SAMPLES.

Beef and veal.—All the samples were from cattle raised in the central part of eastern Illinois and slaughtered in Urbana for the local market.

Pork and bacon.—All the samples of pork and bacon were from native hogs slaughtered in Urbana, except No. 9 (sugar-cured ham), which was from Chicago.

No. 149. Spring chicken.—These were very small, the live weight being only about 2 pounds. Price, 25 cents each.

Nos. 133, 215. Cisco fish, entrails removed.—Purchased in Urbana, probably shipped from Chicago.

No. 28. Lake trout.—From Lake Michigan, purchased in Urbana.

No. 56. Brook trout, canned.—This was canned cooked fish.

No. 245. Dried salt cod.—The usual commercial product.

Nos. 48, 98, 234. Eggs.—Purchased in Urbana at 10 cents per dozen.

Butter.—All the samples, except No. 22, represent country butter. No. 22 was bought in Champaign, Ill., as good creamery butter.

Nos. 76, 197. Whole-milk cheese.—Of average quality.

Milk.—All the samples of milk were from a single cow, which furnished all the milk used in dietary No. 275. The protein content is noticeably low.

No. 238. Condensed milk.—A well-known commercial brand.

Nos. 43, 206. Wheat flour.—This was a patent roller-process Minnesota flour.

No. 16. Corn meal, bolted.—Ground in mills at Urbana from home-grown corn.

Baker's bread, white and graham.—All of the samples of bread were obtained from the same baker. The average weight of a loaf was 13 ounces; the usual price 5 cents per loaf, or 3 loaves for 10 cents. The price to boarding clubs was 40 loaves for \$1.

Vegetables, fresh.—All vegetables analyzed were grown in the immediate neighborhood of Urbana. They represent ordinary varieties which have been grown under usual conditions.

Fruits.—The lemons, bananas, oranges, and peaches were brought from a distance and it is not known where they were grown. All the other fruits were grown in the neighborhood of Urbana.

The results of the analyses are given in the tables which follow. Table 1 shows the composition of the food materials as purchased in the market, including both the edible portion and the refuse. Table 2 shows the composition of the edible portion.

¹ U. S. Dept. Agr., Office of Experiment Stations Bul. 55.

² U. S. Dept. Agr., Division of Chemistry Bul. 46 (revised), and Office of Experiment Stations Bul. 29; also Connecticut Storrs Station Rpt. 1891.

TABLE 1.—Percentage composition of food materials as purchased, including refuse, analyzed in connection with dietary studies in Illinois.

Laboratory No.	Description of food material.	Refuse.	Water.	Nutrients.			
				Protein.	Fat.	Carbo- hydrates.	Ash.
	ANIMAL FOOD.						
	Beef:	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
24	Loin, sirloin steak, medium fat...	20.38	50.27	14.86	13.67		0.77
11	Loin, sirloin steak, very fat.....	13.68	40.42	16.35	29.14		.80
	Average, 2 samples.....	17.03	45.35	15.61	21.41		.79
191	Ribs, roast, very fat.....	6.40	42.94	13.69	36.23		.60
167	Round, roast, lean.....	2.79	68.31	21.07	7.29		1.03
226	Round, roast, medium fat.....	10.04	58.01	16.67	15.02		.85
106	Round, roast, very fat.....	16.42	45.90	14.35	23.19		.61
	Average, 4 samples.....	8.91	53.79	16.45	20.43		.77
138	Round steak, lean.....	4.64	66.45	20.57	7.64		.93
190	Do.....	9.11	62.91	18.05	8.87		.93
213	Do.....	4.86	62.61	22.94	8.81		1.06
248	Do.....	4.69	63.20	21.45	9.41		1.02
	Average, 4 samples.....	5.83	63.79	20.75	8.68		.99
113	Round steak, medium fat.....	6.01	56.16	18.84	18.49		.82
	Average, 5 samples.....	5.86	62.27	20.37	10.64		.95
200	Rump, lean.....		64.91	17.51	16.45		.87
114	Rump, medium fat.....	12.49	52.80	15.28	18.01		.85
	Average, 2 samples.....	6.25	58.86	16.40	17.23		.86
175	Liver.....	7.28	65.63	20.21	3.11	2.45	1.32
141	Tongue.....	9.22	69.18	20.18	.76		.99
214	Corned.....		45.00	13.28	32.69		9.99
	Veal:						
130	Leg, roast, lean.....	25.49	53.27	16.62	3.51		.95
90	Leg, roast, medium fat.....	8.15	64.04	18.15	8.06		1.02
224	Do.....	19.23	55.73	14.64	9.34		.87
140	Ribs, roast, very fat.....	25.43	37.38	12.08	23.46		.64
	Average, 4 samples.....	19.58	52.61	15.37	11.09		.87
124	Leg, steak, medium fat.....	6.86	64.36	16.97	10.91		.94
161	Ribs, steak, very lean.....	12.69	64.52	17.33	4.87		1.05
	Average, 2 samples.....	9.78	64.44	17.15	7.89		1.00
34	Loin cutlets.....	12.24	59.61	16.04	11.39		.88
	Pork:						
84	Ham, roast, medium fat.....		55.58	30.23	13.03		1.57
251	Do.....	1.79	63.27	19.44	15.48		.94
177	Do.....	8.53	54.72	17.12	19.40		.97
	Average, 3 samples.....	3.44	57.86	22.26	15.97		1.16
65	Ham, roast, fat.....	4.61	45.79	15.77	33.73		.62
	Average, 4 samples.....	3.73	54.84	20.64	20.41		1.03
128	Shoulder steak, fat.....	10.93	48.68	14.46	26.40		.73
199	Do.....	3.94	56.02	16.33	23.11		.86
86	Do.....	5.05	54.40	15.65	24.20		.78
	Average, 3 samples.....	6.64	53.03	15.48	24.57		.79
9	Ham, sugar-cured.....	4.46	33.18	21.91	33.31		5.60
101	Bacon.....	7.59	15.29	6.19	68.07		2.97
165	Do.....	5.82	23.36	8.73	57.93		4.46
174	Do.....	6.51	24.34	8.60	57.41		3.64
253	Do.....	4.81	20.67	8.55	61.96		4.03
	Average, 4 samples.....	6.18	20.92	8.02	61.34		3.78
82	Lard.....				99.95		.05
149	Poultry: Chicken, spring, live, small.	55.11	34.10	8.53	1.82		.47
	Fish:						
133	Cisco, entrails removed.....	13.71	62.38	15.31	7.95		.77
215	Do.....	6.50	68.84	17.22	7.19		.97
	Average, 2 samples.....	10.11	65.61	16.27	7.57		.87
245	Cod.....	1.61	54.83	27.72	.31		14.67
56	Trout, brook, canned.....	3.47	66.06	21.54	5.92		3.60
28	Trout, lake.....	40.73	43.18	10.59	4.82		.57
	Eggs:						
48	Hens'.....	11.85	65.27	12.43	9.44		1.01
98	Do.....	13.18	65.37	11.72	8.84		.89
234	Do.....	11.88	66.32	12.48	8.87		.95
	Average, 3 samples.....	12.14	65.65	12.21	9.05		.95
	Dairy products:						
68	Butter.....		11.22	1.37	81.75		5.66
69	Do.....		13.19	1.07	83.42		2.32
121	Do.....		17.65	1.26	77.07		4.02
182	Do.....		13.87	.93	81.87		3.33
223	Do.....		14.96	1.38	80.34		3.32
235	Do.....		19.92	1.32	77.50		1.31
241	Do.....		11.11	1.23	84.32		3.34
	Average, 7 samples.....		14.56	1.22	80.90		3.33
22	Butter, creamery.....		9.52	.72	86.57		3.19
76	Cheese, whole milk.....		35.60	22.88	36.41	2.30	2.81
197	Do.....		35.78	26.19	32.58	3.68	1.77
	Average, 2 samples.....		35.69	24.54	34.50	2.99	2.29

TABLE 1.—Percentage composition of food materials, etc.—Continued.

Laboratory No.	Description of food material.	Refuse.	Water.	Nutrients.			
				Protein.	Fat.	Carbo-hydrates.	Ash.
ANIMAL FOOD—continued.							
Dairy products—Continued.							
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
148	Cheese, cottage		77.01	16.13	1.59	3.65	1.62
181	Do		67.04	25.70	.41	4.87	1.98
	Average, 2 samples		72.03	20.92	1.00	4.26	1.80
262	Milk		89.15	2.18	4.15	3.90	.62
263	Do		88.16	2.59	4.00	4.58	.67
264	Do		88.26	2.64	3.70	4.68	.72
265	Do		87.52	2.63	4.20	4.99	.66
266	Do		88.54	2.74	3.20	4.90	.62
267	Do		87.87	2.75	4.10	4.55	.73
268	Do		88.09	2.78	3.50	4.87	.76
269	Do		88.27	2.63	3.80	4.62	.68
	Average, 8 samples		88.23	2.62	3.83	4.64	.68
258	Milk, condensed		28.20	7.78	9.00	53.32	1.70
VEGETABLE FOOD.							
Cereals:							
16	Corn meal, bolted		9.58	9.44	3.95	75.54	1.49
64	Rolled oats		10.09	15.31	7.84	64.82	1.94
51	Rice		12.96	11.25	.13	75.44	.22
17	Cracked wheat		8.93	12.38	1.67	75.40	1.62
19	Wheat flour (high patent spring)		8.77	12.75	1.13	76.93	.42
43	Wheat flour, roller process (medium patent winter)		12.35	13.63	1.19	72.36	.47
206	Do		11.75	13.69	1.01	73.08	.47
	Average, 2 samples		12.05	13.66	1.10	72.72	.47
18	Wheat flour, graham		10.63	13.56	1.80	71.90	2.11
14	Macaroni		11.10	15.94	.30	71.73	.93
85	Wheat bread, graham		32.87	10.92	.64	53.63	1.94
96	Do		37.01	10.68	.50	50.19	1.62
	Average, 2 samples		34.94	10.80	.57	51.91	1.78
83	Wheat bread, white		37.71	9.95	.78	50.43	1.13
95	Do		38.34	10.08	.46	49.95	1.17
109	Do		39.67	10.18	.28	48.63	1.24
122	Do		38.86	10.40	.39	49.08	1.27
135	Do		40.26	10.02	.63	47.82	1.27
	Average, 5 samples		38.97	10.13	.51	49.18	1.22
45	Crackers		9.62	12.19	11.08	64.24	2.87
20	Crackers, oyster		4.60	17.25	11.35	65.26	1.54
75	Cake, homemade		23.70	5.11	11.71	58.42	1.06
243	Cake, white with frosting		21.81	6.58	8.05	62.50	1.04
244	Cake, chocolate layer		20.50	6.22	8.10	64.06	1.12
7	Cake, fig, homemade		33.15	5.31	6.67	53.67	1.17
186	Cake, white, sugar icing		24.34	6.03	7.50	61.08	1.04
222	Cookies		5.52	7.88	16.67	69.16	.77
126	Cookies, candy		11.40	6.70	10.43	70.57	.90
134	Cookies, lemon snaps		11.10	8.25	17.05	62.94	.66
Sugars:							
10	Granulated sugar					100.00	
72	Brown sugar		5.43	2.38		88.44	3.75
44	C sugar		1.23	.25		98.24	.28
42	Granulated sugar .....		.22			99.68	.10
Vegetables:							
250	Beans, canned		69.16	6.71	2.30	20.05	1.78
12	Beans, navy white		10.33	22.19	1.66	62.27	3.55
146	Beans, string		91.67	2.16	.18	5.24	.75
236	Do		91.42	2.47	.19	5.16	.76
	Average, 2 samples		91.55	2.32	.19	5.20	.76
81	Beans, string, cooked		95.29	.81	1.13	1.92	.85
143	Beets, including tops	39.77	56.52	.80	.03	2.15	.73
233	Beets, without tops		94.05	1.10	.09	3.81	.94
257	Beets, cooked		88.63	2.28	.11	7.35	1.63
93	Cabbage	16.04	76.61	1.57	.13	4.93	.71
231	Do	16.73	77.63	1.08	.09	3.89	.57
	Average, 2 samples	16.39	77.12	1.33	.11	4.41	.64
103	Cabbage, edible portion		92.47	1.40	.20	5.28	.65
104	Celery	43.87	53.33	.55	.05	1.67	.53
142	Do	50.00	47.49	.51	.04	1.51	.45
227	Do	49.00	48.44	.54	.06	1.42	.54
	Average, 3 samples	47.62	49.75	.53	.05	1.53	.51
131	Corn, green (sweet)	65.91	29.34	1.00	.18	3.35	.21
216	Do	70.22	24.86	.88	.16	3.70	.19
	Average, 2 samples	68.07	27.10	.94	.17	3.53	.20
78	Onions, raw	8.65	78.62	1.69	.11	10.42	.51
152	Do	5.32	90.13	.39	.04	3.96	.16
203	Do	10.44	77.95	1.07	.06	10.04	.43
	Average, 3 samples	8.14	82.23	1.05	.07	8.14	.37

TABLE 1.—Percentage composition of food materials, etc.—Continued.

Laboratory No.	Description of food material.	Refuse.	Water.	Nutrients.			
				Protein.	Fat.	Carbohy- drates.	Ash.
	VEGETABLE FOOD—continued.						
	Vegetables—Continued.		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
119	Peas, green	49.58	39.11	3.64	0.32	6.74	0.61
180	Do	50.00	36.60	4.01	.32	8.58	.49
	Average, 2 samples	49.79	37.86	3.83	.32	7.66	.55
94	Pickles, cucumbers, spiced		77.12	.41	.02	20.68	1.77
108	Pickles, cucumbers, sour		95.51	.39	.06	1.35	2.69
66	Potatoes, new, raw	25.04	63.02	1.09	.03	10.11	.71
107	Do	21.30	64.04	1.53	.04	12.36	.73
116	Do	21.21	64.66	1.34	.06	12.03	.70
188	Do	18.90	67.73	1.50	.03	11.15	.69
	Average, 4 samples	21.61	64.86	1.37	.04	11.41	.71
256	Potatoes, boiled		81.03	1.75	.15	16.07	1.00
15	Potatoes	33.32	54.18	1.29	.02	10.67	.50
46	Tomatoes, fresh		95.21	1.00	.21	3.09	.49
204	Do		94.13	1.02	.23	4.18	.50
	Average, 2 samples		94.67	1.01	.22	3.64	.50
21	Tomatoes, canned		94.33	.78	.13	4.25	.51
	Fruits, preserves, etc.:						
155	Apples	33.94	59.89	.18	.05	5.81	.14
178	Do	33.93	60.09	.17	.04	5.58	.19
209	Do	30.74	61.13	.25	.03	7.68	.17
210	Do	35.84	56.85	.24	.07	6.85	.16
	Average, 4 samples	33.61	59.49	.21	.05	6.48	.17
33	Bananas	37.79	46.15	.81	.41	14.21	.63
91	Blackberries		87.31	1.14	1.04	10.01	.50
159	Do		87.36	1.30	.64	10.20	.50
179	Do		87.45	1.23	.63	10.25	.43
192	Do		87.01	1.49	.56	10.45	.49
201	Do		87.28	1.41	.65	10.26	.40
237	Do		86.47	1.14	.74	11.14	.51
	Average, 6 samples		87.15	1.29	.71	10.39	.47
77	Blueberries, canned		89.07	.35	.31	10.02	.25
29	Cherries, canned		77.18	1.13	.05	21.09	.55
238	Huckleberries		81.95	.59	.59	16.60	.27
153	Lemons	36.94	56.35	.63	.10	5.66	.32
32	Oranges	35.77	56.41	.72		6.77	.31
97	Peaches	14.00	76.82	.76	.11	7.94	.37
171	Pears	10.60	75.77	.57	.11	12.56	.39
92	Raspberries, black		83.50	1.57	1.69	12.64	.60
125	Do		82.22	2.08	1.46	13.56	.68
	Average, 2 samples		82.86	1.83	1.58	13.10	.64
30	Tomato preserves		40.95	.69	.06	57.62	.68

TABLE 2.—Percentage composition of fresh, edible portion of food materials and of waste analyzed in connection with dietary studies in Illinois.

Laboratory No.	Description of food material.	Water.	Nutrients.				
			Protein.	Fat.	Carbohy- drates.	Ash.	
	ANIMAL FOOD.						
	Beef:		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
24	Loin, sirloin steak, medium fat	63.14	18.66	17.17		0.96	
11	Loin, sirloin steak, very fat	46.84	18.94	33.75		.92	
	Average, 2 samples	54.99	18.80	25.41		.94	
191	Ribs, roast, very fat	45.87	14.62	38.71		.64	
167	Round, roast, lean	70.27	21.68	7.50		1.06	
226	Round, roast, medium fat	64.49	18.53	16.70		.94	
106	Round, roast, very fat	54.91	17.17	27.74		.74	
	Average, 4 samples	58.89	18.00	22.66		.85	
138	Round steak, lean	69.68	21.57	8.01		.98	
190	Do	69.22	19.85	9.77		1.02	
213	Do	65.81	24.11	9.27		1.12	
248	Do	66.31	22.50	9.88		1.06	
	Average, 4 samples	67.76	22.01	9.23		1.05	
113	Round steak, medium fat	59.75	20.05	19.67		.83	
	Average, 5 samples	66.15	21.62	11.32		1.01	
200	Rump, lean	64.91	17.51	16.45		.87	
114	Rump, medium fat	60.34	17.46	20.58		.97	
	Average, 2 samples	62.63	17.49	18.52		.92	

TABLE 2.—Percentage composition of fresh, edible portion of food materials, etc.—Cont'd.

Laboratory No.	Description of food material.	Water.	Nutrients.			
			Protein.	Fat.	Carbohydrates.	Ash.
ANIMAL FOOD—continued.						
Beef—Continued.						
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
175	Liver	70.78	21.80	3.35	2.64	1.43
141	Tongue	76.21	22.21	.84		1.08
214	Corned	45.00	13.28	32.69		9.99
Veal:						
130	Leg, roast, lean	71.49	22.30	4.72		1.28
90	Leg, roast, medium fat	69.72	19.76	8.78		1.11
224	Do	69.00	18.13	11.56		1.08
140	Ribs, roast, very fat	50.12	16.21	31.47		.86
	Average, 4 samples	65.08	19.10	14.13		1.08
124	Leg, steak, medium fat	69.10	18.22	11.71		1.01
161	Ribs, steak, very lean	73.90	19.84	5.58		1.20
	Average, 2 samples	71.50	19.08	8.15		1.11
34	Loin, cutlets	67.92	18.28	12.98		1.01
Pork:						
84	Ham, roast, medium fat	55.58	30.23	13.03		1.57
251	Do	64.42	19.80	15.76		.95
177	Do	59.82	18.72	21.21		1.06
	Average, 3 samples	59.94	22.92	16.67		1.19
65	Ham, roast, fat	48.00	16.54	35.36		.65
	Average, 4 samples	56.96	21.32	21.34		1.06
128	Shoulder steak, fat	54.65	16.24	29.64		.82
199	Do	58.31	17.00	24.06		.90
86	Do	57.94	16.47	25.48		.83
	Average, 3 samples	56.97	16.57	26.39		.85
9	Ham, sugar cured	34.72	22.93	34.87		5.86
101	Bacon	16.55	6.69	73.66		3.21
165	Do	24.80	9.42	61.51		4.74
174	Do	26.03	9.20	61.40		3.90
253	Do	21.72	8.98	65.09		4.23
	Average, 4 samples	22.28	8.57	65.42		4.02
82	Lard			99.95		.05
149	Poultry: Chicken, spring, live, small	75.96	19.01	4.05		1.05
Fish:						
133	Cisco, entrails removed	72.27	17.74	9.21		.89
215	Do	73.63	18.42	7.69		1.04
	Average, 2 samples	72.95	18.08	8.45		.97
245	Cod	55.73	28.18	.31		14.91
56	Trout, brook, canned	68.43	22.32	6.13		3.73
28	Trout, lake	72.86	17.87	8.14		.97
Eggs:						
48	Hens'	74.04	14.10	10.72		1.14
98	Do	75.29	13.50	10.18		1.03
234	Do	74.83	14.08	10.01		1.07
	Average, 3 samples	74.72	13.89	10.30		1.08
Dairy products:						
68	Butter	11.22	1.37	81.75		5.66
69	Do	13.19	1.07	83.42		2.32
121	Do	17.65	1.26	77.07		4.02
182	Do	13.87	.93	81.87		3.33
223	Do	14.96	1.38	80.34		3.32
235	Do	19.92	1.32	77.45		1.31
241	Do	11.11	1.23	84.32		3.34
	Average, 7 samples	14.56	1.22	80.90		3.33
22	Butter, creamery	9.52	.72	86.57		3.19
76	Cheese, whole milk	35.60	22.88	36.44	2.30	2.81
197	Do	35.78	26.19	32.58	3.68	1.77
	Average, 2 samples	35.69	24.54	34.50	2.99	2.29
148	Cheese, cottage	77.01	16.13	1.59	3.65	1.62
181	Do	67.04	25.70	.41	4.87	1.98
	Average, 2 samples	72.03	20.92	1.00	4.26	1.80
262	Milk	89.15	2.18	4.15	3.90	.62
263	Do	88.16	2.59	4.00	4.58	.67
264	Do	88.26	2.64	3.70	4.68	.72
265	Do	87.52	2.63	4.20	4.99	.66
266	Do	88.54	2.74	3.20	4.90	.62
267	Do	87.87	2.75	4.10	4.55	.73
268	Do	88.09	2.78	3.50	4.87	.76
269	Do	88.27	2.63	3.80	4.62	.68
	Average, 8 samples	88.23	2.62	3.83	4.64	.68
258	Milk, condensed	28.20	7.78	9.00	58.32	1.70
VEGETABLE FOOD.						
Cereals:						
16	Corn meal, bolted	9.58	9.44	3.95	75.54	1.49
64	Rolled oats	10.09	15.31	7.84	64.82	1.94
51	Rice	12.96	11.25	.13	75.44	.22

TABLE 2.—Percentage composition of fresh, edible portion of food materials, etc.—Cont'd.

Laboratory No.	Description of food material.	Water.	Nutrients.			
			Protein.	Fat.	Carbohydrates.	Ash.
VEGETABLE FOOD—continued.						
Cereals—Continued.						
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
17	Cracked wheat.....	8.93	12.38	1.67	75.40	1.62
19	Wheat flour (high patent, spring).....	8.77	12.75	1.13	76.93	.42
43	Wheat flour, roller process (medium patent, winter).....	12.35	13.63	1.19	72.36	.47
206	Do.....	11.75	13.69	1.01	73.08	.47
	Average, 2 samples.....	12.05	13.66	1.10	72.72	.47
18	Wheat flour, graham.....	10.63	13.56	1.80	71.90	2.11
14	Macaroni.....	11.10	15.94	.30	71.73	.93
85	Wheat bread, graham.....	32.87	10.92	.64	53.63	1.94
96	Do.....	37.01	10.68	.50	50.19	1.62
	Average, 2 samples.....	34.94	10.80	.57	51.91	1.78
83	Wheat bread, white.....	37.71	9.95	.78	50.43	1.13
95	Do.....	38.34	10.08	.46	49.95	1.17
109	Do.....	39.67	10.18	.28	48.63	1.24
122	Do.....	38.86	10.40	.39	49.08	1.27
135	Do.....	40.26	10.02	.63	47.82	1.27
	Average, 5 samples.....	38.97	10.13	.51	49.18	1.22
45	Crackers.....	9.62	12.19	11.08	64.24	2.87
20	Crackers, oyster.....	4.60	17.25	11.35	65.26	1.54
75	Cake, homemade.....	23.70	5.11	11.71	58.42	1.06
243	Cake, white, with frosting.....	21.81	6.58	8.05	62.50	1.04
244	Cake, chocolate layer.....	20.50	6.22	8.10	64.06	1.12
7	Cake, fig, homemade.....	33.18	5.31	6.67	53.67	1.17
186	Cake, white, sugar icing.....	24.34	6.03	7.50	61.08	1.04
222	Cookies.....	5.52	7.88	16.67	69.16	.77
126	Cookies, candy.....	11.40	6.70	10.43	70.57	.90
134	Cookies, lemon snaps.....	11.10	8.25	17.05	62.94	.66
Sugars:						
10	Granulated sugar.....				100.00	
72	Brown sugar.....	5.43	2.38		88.44	3.75
44	C sugar.....	1.23	.25		98.24	.28
42	Granulated sugar.....	.22			99.68	.10
Vegetables:						
250	Beans, canned.....	69.16	6.71	2.30	20.05	1.78
12	Beans, navy white.....	10.33	22.19	1.66	62.27	3.55
146	Beans, string.....	91.67	2.16	.18	5.24	.75
236	Do.....	91.42	2.47	.19	5.16	.76
	Average, 2 samples.....	91.55	2.32	.19	5.20	.76
81	Beans, string, cooked.....	95.29	.81	1.13	1.92	.85
143	Beets, including tops.....	93.84	1.34	.05	3.56	1.21
233	Beets, without tops.....	94.05	1.11	.09	3.81	.94
257	Beets, cooked.....	88.63	2.28	.11	7.35	1.63
93	Cabbage.....	91.24	1.87	.16	5.88	.85
231	Do.....	93.23	1.30	.11	4.67	.69
	Average, 2 samples.....	92.24	1.59	.14	5.28	.77
103	Cabbage, edible portion.....	92.47	1.40	.20	5.28	.65
104	Celery.....	95.01	.99	.08	2.98	.94
142	Do.....	94.97	1.02	.08	3.02	.91
227	Do.....	94.98	1.06	.11	2.78	1.07
	Average, 3 samples.....	94.99	1.02	.09	2.93	.97
131	Corn, green (sweet).....	86.08	2.94	.53	9.83	.62
216	Do.....	83.47	2.95	.55	12.41	.63
	Average, 2 samples.....	84.78	2.95	.54	11.12	.63
78	Onions, raw.....	86.06	1.85	.12	11.41	.56
152	Do.....	95.20	.41	.04	4.18	.17
203	Do.....	87.04	1.20	.07	11.22	.48
	Average, 3 samples.....	89.43	1.19	.08	8.94	.40
119	Peas, green.....	77.57	7.23	.64	13.36	1.20
180	Do.....	73.19	8.02	.63	17.17	.99
	Average, 2 samples.....	75.38	7.63	.64	15.27	1.10
94	Pickles, cucumber, spiced.....	77.12	.41	.02	20.68	1.77
108	Pickles, cucumber, sour.....	95.51	.39	.06	1.35	2.69
66	Potatoes, new, raw.....	84.06	1.46	.03	13.50	.95
107	Do.....	81.37	1.95	.05	15.70	.93
116	Do.....	82.07	1.70	.08	15.27	.88
188	Do.....	83.51	1.85	.04	13.75	.85
	Average, 4 samples.....	82.75	1.74	.05	14.56	.90
256	Potatoes, boiled.....	81.03	1.75	.15	16.07	1.00
15	Potatoes.....	81.29	1.94	.02	16.01	.75
46	Tomatoes, fresh.....	95.21	1.00	.21	3.09	.49
204	Do.....	94.13	1.02	.23	4.18	.50
	Average, 2 samples.....	94.67	1.01	.22	3.64	.50
21	Tomatoes, canned.....	94.33	.78	.13	4.25	.51
Fruits, preserves, etc.:						
155	Apples.....	90.65	.27	.07	8.79	.22
178	Do.....	90.95	.25	.06	8.45	.29

TABLE 2.—Percentage composition of fresh, edible portion of food materials, etc.—Cont'd.

Laboratory No.	Description of food material.	Water.	Nutrients.			
			Protein.	Fat.	Carbohydrates.	Ash.
	VEGETABLE FOOD—continued.					
	Fruits, preserves, etc.—Continued.	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per ct.</i>
209	Apples	88.26	0.36	0.04	11.09	0.25
210	Do	88.61	.88	.10	10.67	.24
	Average, 4 samples	89.62	.32	.07	9.75	.25
33	Bananas	74.19	1.31	.66	22.83	1.01
91	Blackberries	87.31	1.14	1.04	10.01	.50
159	Do	87.36	1.30	.64	10.20	.50
179	Do	87.45	1.23	.63	10.25	.43
192	Do	87.01	1.49	.56	10.45	.49
201	Do	87.28	1.41	.65	10.26	.40
237	Do	86.47	1.14	.74	11.14	.51
	Average, 6 samples	87.15	1.29	.71	10.39	.47
77	Blueberries, canned	89.07	.35	.31	10.02	.25
29	Cherries, canned	77.18	1.13	.05	21.09	.55
238	Huckleberries	81.95	.59	.59	16.60	.27
153	Lemons	89.36	.99	.16	8.98	.51
32	Oranges	87.84	1.12	.....	10.54	.50
97	Peaches	89.33	.88	.13	9.23	.43
171	Pears	84.75	.63	.13	14.05	.43
92	Raspberries, black	83.50	1.57	1.69	12.64	.60
125	Do	82.22	2.08	1.46	13.56	.68
	Average, 2 samples	82.86	1.83	1.58	13.13	.64
30	Tomato preserves	40.95	.69	.06	57.62	.68
	WASTE.					
	Animal food:					
164	Meat waste	46.92	15.60	33.58	1.54	2.36
261	Do	39.39	17.07	37.08	3.79	2.67
232	Do	40.03	21.58	35.68	.....	3.03
71	Fat waste .....	.....	.....	100.00	.....	.....
27	Animal waste	39.78	18.47	32.40	7.41	1.93
36	Do	47.78	18.26	26.63	4.84	2.49
37	Do	24.04	24.56	40.59	6.15	4.66
38	Do	41.09	17.86	28.87	9.13	3.05
31	Pure dry fat .....	.....	.....	100.00	.....	.....
	Vegetable food:					
158	Bread waste	64.16	5.36	10.31	17.35	2.82
259	Do	54.37	7.42	5.13	31.66	1.41
41	Do	17.85	9.59	10.33	60.36	1.86
40	Do	64.16	5.10	8.77	19.72	2.25
260	Vegetable waste	72.94	5.19	7.44	12.16	2.28
169	Do	75.23	3.39	7.33	12.02	1.83
25	Do	67.54	3.78	4.94	21.09	2.65
26	Do	70.03	2.33	6.95	18.59	2.10
35	Do	70.49	3.39	4.05	19.73	2.33
39	Do	68.98	4.56	6.02	18.62	1.82

DETAILS OF THE DIETARY STUDIES.

The results of the dietary study are shown in Tables 3 and 4. These tables give the total amount and cost of the food consumed by the family during the entire time of the study and the computed cost and quantities of the different kind of nutrients per man per day. The fuel value in the daily diet is also computed. The figures in parentheses following the total weight of each food material consumed during the study refer to corresponding reference numbers in Table 13 in the Appendix (p. 39), which gives the values for percentage composition used in calculating the results of the study. As most of the food materials were sampled and analyzed, the figures are largely taken from Tables 1 and 2. There are, however, apparent discrepancies between some of the figures in the Appendix table and the correspond-

ing averages in Tables 1 and 2. Thus in dietary study No. 275 the reference No. 76 is given to the item wheat flour. This shows (see Table 13 in Appendix) that in calculating the results the composition of the flour was taken as 13.6 per cent protein, 1.2 per cent fat, and 72.5 per cent carbohydrates. Two kinds of flour were used, Nos. 43 and 206. The average of the analyses of these samples as given in Table 2 is protein, 13.4; fat, 1.1; and carbohydrates, 72.7 per cent. But during the study over 9,000 grams of flour No. 43 and only about 3,000 grams of sample No. 206 were used. The average composition of the total amount of flour consumed was, therefore, estimated by taking into account both the figures for analysis and the quantity of flour used. They are accordingly believed to be more accurate than the average of the analyses would be. This same statement will serve to explain all other apparent discrepancies between the figures in the table in the Appendix and averages in Tables 1 and 2.

DIETARY STUDY OF A TEACHER'S FAMILY (NO. 274).

The study began March 21, 1897, and continued 14 days.

The family consisted of a man and his wife. The man was an assistant professor having quite active work. Both persons were healthy, active, with good appetite. They used during the study no stimulants, narcotics, or medicines. Their weights were about 175 and 110 pounds, respectively. The number of meals taken was as follows:

	Meals.
Man, 32 years old	42
Woman, 27 years old (42 meals \times 0.8 meal of man).....	34
Total number of meals taken equivalent to.....	76

Equivalent to 1 man for 25 days.

The details of the dietary study follow:

TABLE 3.—Weights of foods and nutrients consumed in dietary study of a teacher's family at Urbana, Ill. (No. 274).

[For explanation of numbers in parentheses, see Appendix, p. 39.]

Kinds and total amounts of food consumed during the study (14 days).	Cost, composition, and fuel value of food per man per day.				
	Cost.	Protein.	Fat.	Carbohydrates.	Fuel value.
<i>Food purchased.</i>					
ANIMAL FOOD.					
Beef: Sirloin steak, 1.2 lbs., 16 cts. (7); sirloin steak (fat), 3.3 lbs., 41 cts. (8). Veal: Cutlets, 2 lbs., 25 cts. (18).....					
Pork: Ham, 3.9 lbs., 49 cts. (28); lard, 1.7 lbs., 13 cts. (34).....	3	19	24	.....	301
Chicken: 4.1 lbs., 50 cts. (36).....	3	18	52	.....	557
Fish: Lake trout, 3.3 lbs., 33 cts. (43).....	2	11	1	.....	54
Eggs: 4.1 lbs., 30 cts. (46).....	1	6	3	.....	53
Butter: 2.7 lbs., 68 cts. (50).....	1	10	7	.....	106
Milk: 15.4 lbs., 45 cts. (58).....	3	.....	42	.....	391
Cheese: 1.2 lbs., 22 cts. (54).....	2	9	11	14	197
	1	6	8	2	107
Total animal food	16	79	148	16	1,766

TABLE 3.—Weights of foods and nutrients consumed in dietary study, etc.—Continued.

Kinds and total amounts of food consumed during the study (14 days).	Cost, composition, and fuel value of food per man per day.				
	Cost.	Protein.	Fat.	Carbohydrates.	Fuel value.
<i>Food purchased—Continued.</i>					
VEGETABLE FOOD.					
Cereals: Cracked wheat, 9 lbs., 5 cts. (85); corn meal, 0.8 lb., 1 ct., (66); wheat flour, 8.3 lbs., 21 cts. (75); Graham flour, 2.1 lbs., 8 cts. (81); macaroni, 0.9 lb., 15 cts. (86); oyster crackers, 1.4 lbs., 12 cts. (91); fig cake, 1.1 lbs., 18 cts. (96)	3	36	7	205	1,053
Sugars, starches, etc.: Sugar, 8.3 lbs., 37 cts. (99); molasses, 1 lb., 5 cts. (108)	2	.....	.....	162	664
Vegetables: Beans (dried), 1.1 lbs., 5 cts. (117); potatoes, 18.6 lbs., 11 cts. (139); tomatoes (canned), 8.2 lbs., 33 cts. (145)	2	10	.....	55	276
Fruits: Bananas, 9.1 lbs., 42 cts. (154); cherries (canned), 1.7 lbs., 19 cts. (157); oranges, 2.8 lbs., 22 cts. (169); tomatoes (preserved), 2 lbs., 45 cts. (179)	5	2	1	54	239
Total vegetable food	12	48	8	476	2,222
Total food	28	127	156	492	3,988
<i>Waste.</i>					
ANIMAL FOOD.					
Meat, 1 lb. (192); meat, 0.9 lb. (193); meat, 1.1 lbs. (194); meat, 1.2 lbs. (195); fat, 0.6 lb. (197) .....	.....	14	(a)	6	407
VEGETABLE FOOD.					
Bread, 1.2 lbs. (203); bread, 1.7 lbs. (204); vegetables, 0.7 lb. (211); vegetables, 0.9 lb. (212); vegetables, 1.5 lbs. (213); vegetables, 2.1 lbs. (214) .....	.....	7	(a)	41	290
Total waste .....	.....	21	45	47	697
<i>Food eaten.</i>					
Animal food .....	.....	65	(a)	10	1,858
Vegetable food .....	.....	41	(a)	435	1,932
Total food .....	.....	106	111	445	3,290

a The fat in the waste can not be classified according to its animal or vegetable derivation, owing to the use of a considerable amount of animal fats such as lard, butter, and suet in the preparation of such vegetable foods as bread, pastries, cooked vegetables, etc. Thus in this instance the total fat as found by analysis of the vegetable foods wasted was in excess of the actual amount present in the raw food materials.

DIETARY STUDY OF A BOARDING CLUB OF MECHANICS (NO. 275).

The study began June 12, 1897, and continued 14 days. The men included in this study were all employed by a railroad company. Some worked in the machine shops located in Urbana, and others were railroad engineers. These men were not engaged in what would be called particularly severe labor, but were performing the usual amount which their occupation required and which is ordinarily called moderately severe muscular labor. The woman who kept the boarding house did the cooking and other work of the house.

The members of the boarding club and the number of meals taken were as follows:

	Meals.
13 men, average age 33 years, average weight 152 pounds.....	455
1 woman, 32 years old (42 meals \times 0.8 meal of man).....	34
1 boy, 13 years old (42 meals \times 0.6 meal of man).....	25
1 girl, 9 years old (42 meals \times 0.5 meal of man).....	21

Total number of meals taken equivalent to..... 535

Equivalent to 1 man for 178 days.

The results of the dietary study are shown in the table which follows:

TABLE 4.—Weights of foods and nutrients consumed in dietary study of a club of mechanics at Urbana, Ill. (No. 275).

[For explanation of numbers in parentheses, see Appendix, p. 39.]

Kinds and total amounts of food consumed during the study (14 days).	Cost, composition, and fuel value of food per man per day.				
	Cost.	Protein.	Fat.	Carbohydrates.	Fuel value.
<i>Food purchased.</i>					
ANIMAL FOOD.					
Beef: Steak, 19.3 lbs., \$1.59 (5); roast, 20.4 lbs., \$1.83 (1); rump, 12.1 lbs., \$1.08 (4); tongue, 3.2 lbs., 29 cts. (12); liver, 4.2 lbs., 7 cts. (11); corned, 4.4 lbs., 40 cts. (14); smoked, 1.3 lbs., 29 cts. (16). Veal: Roast, 22.4 lbs., \$1.99 (19); steak, 8 lbs., 69 cts. (20)..	4.6	42	32	.....	470
Pork: Roast, 15.7 lbs., \$1.67 (25); steak, 10 lbs., 94 cts. (26); bacon, 16.4 lbs., \$1.38 (31); lard, 4.6 lbs., 37 cts. (34).....	2.5	14	54	.....	559
Chicken, 7.5 lbs., 75 cts. (37).....	.4	2	.....	.....	8
Fish: Cisco, 7.8 lbs., 83 cts. (38); brook trout (canned), 1.8 lbs., 30 cts. (42); cod, 2.5 lbs., 35 cts. (40); fish (kind not given), 1.4 lbs., 14 cts. (41).....	.9	6	2	.....	43
Eggs, 24 lbs., \$1.44 (47).....	.8	8	6	.....	89
Butter, 27.6 lbs., \$5.50 (51).....	3.1	1	57	.....	534
Cheese: Full cream, 2.4 lbs., 33 cts. (55); cottage, 5.5 lbs., 27 cts. (56).....	.3	4	2	1	39
Milk: Whole, 90.8 lbs., \$2 (59); condensed, 0.9 lb., 20 cts. (60); buttermilk, 6 lbs., 5 cts. (61).....	1.3	7	9	13	166
Total animal food.....	13.9	84	162	14	1,908
VEGETABLE FOOD.					
Cereals: Flour, 267 lbs., 53 cts. (76); rolled oats, 2.8 lbs., 18 cts. (69); rice, 0.8 lb., 7 cts. (72); crackers, 1.8 lbs., 15 cts. (93); white bread, 59.4 lbs., \$1.85 (87); brown bread, 9.9 lbs., 31 cts. (89); cake, 7.2 lbs., \$1.19 (97); cookies, 5.7 lbs., 61 cts. (98).....	2.8	32	7	168	885
Sugar: Granulated, 33.1 lbs., \$2.01 (101); brown, 3.3 lbs., 13 cts. (102); C sugar, 13.1 lbs., 69 cts. (103).....	1.6	.....	.....	124	508
Vegetables: Potatoes, 182.5 lbs., \$2.31 (140); tomatoes, 6.6 lbs., 32 cts. (146); cabbage, 27.8 lbs., 15 cts. (124); celery, 8.2 lbs., 49 cts. (125); cucumber pickles, 4.3 lbs., 45 cts. (136); cucumbers, 1.8 lbs., 8 cts. (128); onions (raw), 3 lbs., 12 cts. (130); string beans (cooked), 3.4 lbs., 6 cts. (120); string beans, 6.4 lbs., 13 cts. (119); canned beans, 2.6 lbs., 10 cts. (115); peas, 11.7 lbs., 35 cts. (134); corn (roasted), 21.5 lbs., 38 cts. (126); beets and tops, 7.5 lbs., 8 cts. (122).....	2.8	10	1	67	325
Fruits: Canned blueberries, 2.5 lbs., 17 cts. (156); huckleberries, 0.6 lb., 5 cts. (164); blackberries, 29.8 lbs., \$1.39 (155); raspberries, 5.3 lbs., 50 cts. (177); peaches, 10.3 lbs., 52 cts. (170); pears, 3.1 lbs., 22 cts. (171); lemons, 0.8 lb., 10 cts. (167); apples, 28.1 lbs., 44 cts. (149).....	1.9	2	.....	18	82
Total vegetable food.....	9.1	44	8	377	1,800
Total food.....	23.0	128	170	391	3,708

TABLE 4.—Weights of foods and nutrients consumed in dietary study, etc.—Continued.

Kinds and total amounts of food consumed during the study (14 days).	Cost, composition, and fuel value of food per man per day.				
	Cost.	Protein.	Fat.	Carbohy- drates.	Fuel value.
<i>Waste.</i>					
ANIMAL FOOD.					
Meat, 13.8 lbs. (191); lard, 2.2 lbs. (196); milk, whole, 10.7 lbs. (59)	<i>Cents.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Calories.</i>
.....		7	19	2	213
VEGETABLE FOOD.					
Bread, 4.8 lbs. (205); vegetables, 27.2 lbs. (216)		3	6	11	113
Total waste		10	25	13	326
<i>Food eaten.</i>					
Animal food		77	143	12	1,695
Vegetable food		41	2	366	1,687
Total food		118	145	378	3,382

DISCUSSION OF RESULTS.

For purposes of comparison the results of the dietary studies reported above are given in Table 5, together with the results of similar studies made in other regions of the United States and commonly accepted dietary standards.¹

TABLE 5.—Cost, nutrients, and fuel value of food per man per day in dietary studies in Urbana and elsewhere.

	Cost of food.	Protein.	Fat.	Carbo- hydrates.	Fuel value.	Nutritive ratio.
Teacher's family, Illinois:	<i>Cents.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Calories.</i>	
Food purchased	27.0	124	158	487	3,975	.....
Food wasted		23	45	46	700	.....
Food eaten		101	113	441	3,275	1:6.9
Professional men, Connecticut, average of 9 dietaries:						
Food purchased	25.0	110	136	442	3,530	.....
Food wasted		3	7	5	100	.....
Food eaten		107	129	437	3,430	1:6.8
Professional man's family, Pennsylvania:						
Food purchased	22.3	98	155	396	3,465	.....
Food wasted		7	10	16	185	.....
Food eaten		91	145	380	3,280	1:7.8
Teacher's family, Indiana:						
Food purchased	18.0	111	110	349	2,910	.....
Food wasted		5	8	9	130	.....
Food eaten		106	102	340	2,780	1:5.4
Proposed standard for man with little muscular work (Atwater)		112	.....	.....	3,000	1:5.5
Mechanics' boarding club, Illinois:						
Food purchased	23.0	128	171	392	3,720	.....
Food wasted		11	25	13	330	.....
Food eaten		117	146	379	3,390	1:6.1
Mechanics' families, Connecticut, average of 9 dietaries:						
Food purchased		113	153	420	3,605	.....
Food wasted		7	11	14	185	.....
Food eaten		106	142	406	3,420	1:6.9
Mechanic's family, Indiana:						
Food purchased	26.0	106	157	475	3,840	.....
Food wasted		16	23	67	555	.....
Food eaten		90	134	408	3,285	1:7.9

¹ U. S. Dept. Agr., Office of Experiment Stations Bul. 21, p. 213.

TABLE 5.—*Cost, nutrients, and fuel value of food per man per day, etc.—Continued.*

	Cost of food.	Protein.	Fat.	Carbohydrates.	Fuel value.	Nutritive ratio.
	<i>Cents.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Calories.</i>	
Mechanic's family, Tennessee:						
Food purchased.....	16.0	119	224	455	4,435	.....
Food wasted.....		9	14	43	345	.....
Food eaten.....		110	210	412	4,090	1:8.1
Mechanic's family, New Jersey:						
Food purchased.....	28.0	103	144	431	3,530	.....
Food wasted.....		3	6	6	95	.....
Food eaten.....		100	138	425	3,435	1:7.4
Proposed dietary standard for man with moderate work (Atwater).....		125	.....	.....	3,500	1:6.8

It will be noticed that the quantity of nutrients and the potential energy of the food purchased in dietary study No. 275 were considerably larger than were found in similar dietary studies of families of professional men summarized in the above table. The amount of table and kitchen waste is also unusually large in the Urbana dietary, 18.5 per cent of the protein, 28.5 per cent of the fat, and 9.5 per cent of the carbohydrates of the food purchased being wasted.

In nine dietaries of professional men reported by Atwater and associates the average waste was only 2.7 per cent of the protein, 5.2 per cent of the fat, and 1.1 per cent of the carbohydrates. Although the amount of waste is large as compared with that found in studies of professional men it is no larger than has been found often in studies of wage-earners with as large incomes. Further, it is evident that the percentage of waste in so small a family (two persons) may often, though not necessarily, be greater than in a larger family.

The fuel value of the food eaten is somewhat larger than the tentative standard for a man with light muscular work calls for, while the amount of protein is somewhat smaller. It will be noticed that in the dietary the nutritive ratio is larger than that suggested by the standard for a man at light muscular work.

The cost of the dietary of the Illinois professional man's family was somewhat greater than the average quoted for similar families in Connecticut and Pennsylvania. It is, however, more than probable that if the study had been continued or had been made at a different season of the year the cost would have varied somewhat. Therefore any conclusion regarding the difference noted is manifestly unwarranted. The professional men in Illinois, Connecticut, and Pennsylvania paid considerably more for their daily food than the teacher's family in Indiana. It should be said that in the Indiana study the cost is considered to be unusually low.

Considering the results of the study with the club of workingmen, it will be seen that the amount of protein purchased and also the amount eaten was larger than in any of the averages of dietaries quoted, while the quantity of carbohydrates in the food purchased and eaten was smaller and the amount of fat about the same as the

average. The fuel value of the food eaten corresponds very closely to that observed in studies quoted above, except in the case of the mechanic's family of Tennessee. The so-called nutritive ratio, i. e., the ratio of the energy furnished by the protein to that furnished by the fats and carbohydrates taken together is narrower in the dietary of the Urbana mechanics than in the averages of other dietaries quoted. It is but slightly above that suggested by the commonly accepted American standard for a man at moderate muscular work. The protein and energy found in the dietary also agree quite closely with the dietary standard.

The mechanic's family in Illinois paid a little less on an average for their daily food than the mechanic's family in New Jersey and considerably more than the mechanic's family in Tennessee, but more data are needed before sweeping conclusions can be drawn regarding the points suggested by these figures.

DIETARY STUDY OF A CLUB OF WOMEN STUDENTS AT NORTH DAKOTA AGRICULTURAL COLLEGE.

By E. F. LADD,

Professor of Chemistry, North Dakota Agricultural College.

INTRODUCTION.

The greater number of dietary studies carried on under the auspices of the Office of Experiment Stations of the U. S. Department of Agriculture in different parts of the United States have been made with men or with families or groups composed of men and women. Few have been undertaken with women alone. Such studies, however, should prove of considerable interest. It is generally assumed that women eat less than men, the commonly accepted dietary standards placing the amount at 0.8 of that required by man with the same relative amount of muscular activity. It is often said that women prefer different foods, being more fond of pastry and sweets and less fond of meat. A study was therefore undertaken in a college boarding house at Fargo, N. Dak., to determine the character, amount, and composition of the food consumed by the young women students in the agricultural college. It was believed the results would be interesting in themselves and useful for comparison with the results of similar studies made elsewhere. The club studied comprised nine students and a cook. The head of the department of domestic science, who was responsible for many of the details of the investigation, also lived at the boarding house during the study. The eleven young women under investigation ranged in age from 14 to 27 years, the average being 19 years. In weight they ranged from 100 to 145 pounds, the average being 126 pounds. They represented, as regards birthplace, widely different regions, three having been born in Norway, two in Ontario, two in Kansas, and one each in Iowa, Minnesota, Pennsylvania, and Vermont. However, the total number from any one region was not large enough to affect materially the dietary habits, so far as can be learned, nor was any tendency in this direction observed. The young women were living under uniform conditions, and in the author's opinion the group studied may be considered as fairly representative of similar groups at the educational institutions of the region.

The dietary study was conducted according to the methods described in a previous publication of the Office of Experiment Stations.¹

¹ U. S. Dept. Agr., Office of Experiment Stations Bul. 21.

Account was kept of the food on hand at the beginning and end of the study and of that purchased while it was in progress. From these data the total amounts of the different foods used were found. Their composition was determined from analyses made in connection with the study or from tables showing the average composition of similar materials.¹

Account was also kept of the number of meals eaten by the persons studied. Some of the students were absent from meals a few times and two meals were taken by visitors. From the recorded data the total number of meals eaten was calculated. This quantity divided by 3 gave the equivalent number of days for one woman.

CHARACTER AND COMPOSITION OF FOOD MATERIALS USED.

Analyses were made of many of the foods used during the dietary study. No special description of the samples analyzed is required, since they were the usual materials produced in the region or ordinarily found in the local market. The molasses used was made from sorghum. The bread was raised with yeast. The butter, milk, and cheese were products of local dairies. The composition of the materials analyzed is shown in the following tables. The composition assumed for those not analyzed is shown in the Appendix, p. 39.

TABLE 6.—Percentage composition of food materials as purchased, analyzed in connection with dietary study No. 153.

Reference No. a	Description of food material.	Refuse.	Edible portion.				
			Water.	Nutrients.			
				Protein.	Fat.	Carbohydrates.	Ash.
	ANIMAL FOOD.	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
33	Lard.....		0.3		98.1		
48	Butter.....		8.2	0.7	88.5		2.6
52	Cheese.....		30.2	28.3	35.5	1.8	4.2
57	Milk.....		87.2	3.2	4.1	4.8	.7
	VEGETABLE FOOD.						
65	Corn meal.....		11.9	10.4	2.0	74.8	.9
68	Oatmeal.....		8.0	17.7	7.4	65.3	1.6
71	Rice.....		12.4	7.4	.4	79.4	.4
74	Wheat flour.....		9.8	11.4	.5	77.9	.4
80	Wheat flour, Graham.....		10.2	12.7	2.6	72.8	1.7
88	Bread, wheat, yeast.....		32.3	8.8	1.7	56.3	.9
95	Cake, wheat.....		34.4	8.0	3.4	53.3	.9
92	Crackers, soda.....		4.4	10.7	10.0	73.0	1.9
	Honey.....		19.2			74.2	
107	Molasses.....		52.4			46.6	
100	Sugar, granulated.....		3.0			96.2	
114	Beans (navy).....		12.6	23.1	2.0	59.2	3.1
	Onions.....	9.0	79.7	1.3	.3	9.2	.5
	Parsnips.....	12.0	78.5	1.2	.2	7.5	.6
137	Pickles, mixed.....		93.8	1.1	.4	4.0	.7
166	Lemons.....	17.8	73.4	.8	.8	6.8	.4
152	Apricots, dried.....		5.1	6.5	1.0	81.0	6.4
159	Zante currants, dried.....		5.3	4.7	.4	85.3	4.3
160	Dates, dried.....	7.9	9.1	1.9	.6	79.5	1.0
163	Figs, dried.....		11.6	2.6	.3	83.1	2.4
172	Pears, dried.....		16.5	2.8	5.4	72.9	2.4
174	Prunes, dried.....	18.2	18.2	2.7	3.8	55.2	1.9
176	Raspberries, dried.....		8.1	7.3	1.8	80.2	2.6

a Numbers in this column refer to corresponding numbers in Table 13, Appendix.

¹ U. S. Dept. Agr., Office of Experiment Stations Bul. 28 (revised).

TABLE 7.—Percentage composition of fresh, edible portion of food materials analyzed in connection with dietary study No. 153.

Reference No. a	Description of food material.	Water.	Nutrients.			
			Protein.	Fat.	Carbohydrates.	Ash.
ANIMAL FOOD.						
33	Lard	0.3	.....	98.1	.....	.....
48	Butter	8.2	0.7	88.5	.....	2.6
52	Cheese	30.2	28.3	35.5	1.8	4.2
57	Milk	87.2	3.2	4.1	4.8	.7
VEGETABLE FOOD.						
65	Corn meal	11.9	10.4	2.0	74.8	.9
68	Oatmeal	8.0	17.7	7.4	65.3	1.6
71	Rice	12.4	7.4	.4	79.4	.4
74	Wheat flour.....	9.8	11.4	.5	77.9	.4
80	Wheat flour, Graham	10.2	12.7	2.6	72.8	1.7
88	Bread, wheat, yeast	32.3	8.8	1.7	56.3	.9
95	Cake, wheat	34.4	8.0	3.4	53.3	.9
92	Crackers	4.4	10.7	10.0	73.0	1.9
.....	Honey	19.2	.....	.....	74.2	.....
107	Molasses (sorghum)	52.4	.....	.....	46.6	.....
100	Sugar, granulated.....	3.0	.....	.....	96.2	.....
114	Beans, navy.....	12.6	23.1	2.0	59.2	3.1
.....	Onions	87.6	1.4	.3	10.1	.6
.....	Parsnips	89.2	1.4	.2	8.5	.7
137	Pickles, mixed.....	93.8	1.1	.4	4.0	.7
166	Lemons	89.3	1.0	.9	8.3	.5
152	Apricots, dried.....	5.1	6.5	1.0	81.0	6.4
159	Zante currants, dried	5.3	4.7	.4	85.3	4.3
160	Dates, dried.....	9.9	2.1	.6	86.3	1.1
163	Figs, dried.....	11.6	2.6	.3	83.1	2.4
172	Pears, dried.....	16.5	2.8	5.4	72.9	2.4
174	Prunes, dried.....	22.2	3.3	4.7	67.5	2.3
176	Raspberries, dried	8.1	7.3	1.8	80.2	2.6

a Numbers in this column refer to corresponding numbers in Table 13, Appendix.

DETAILS OF THE DIETARY STUDY.

The study began with supper March 7, 1896, and closed with dinner March 28, thus covering a period of twenty days. As previously stated, the club studied consisted of eleven young women, all but two being under 20 years of age. In addition to the food materials they used during the dietary study the following condiments and beverages: Black pepper, 1 ounce; mustard, 5 ounces; ginger, 0.5 ounce; vinegar, 2.44 pounds; tea, 0.72 pound; coffee, 2.69 pounds, and vanilla extract, 2.5 ounces. Salt was also used, but the amount was not recorded. The number of meals taken was as follows:

	Meals.
11 women	635
Woman (visitor)	2
Total	637

Equivalent to one woman 212 days.

The details of the dietary study follow.

TABLE 8.—*Weights of foods and nutrients consumed in dietary study of a club of women students at Fargo, N. Dak. (No. 153).*

[For explanation of numbers in parentheses, see Appendix, p. 39.]

Kinds and total amounts of food.	Cost, composition, and fuel value of food per woman per day.				
	Cost.	Protein.	Fat.	Carbo- hydrates.	Fuel value.
	<i>Cents.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Calories.</i>
<i>Food purchased.</i>					
ANIMAL FOOD.					
Beef: Dried, 2 lbs., 25 cts. (16); roast, 11.7 lbs., \$1.53 (3); steak, 22.4 lbs., \$4.06 (6); stew, 3.2 lbs., 38 cts. (10).....	2.9	16	17	.....	225
Lamb: Leg, 8.5 lbs., \$1.01 (21).....	.5	4	3	.....	45
Pork: Chops, 6.2 lbs., 64 cts. (24); lard, 7 lbs., 70 cts. (33); salt, 2 lbs., 20 cts. (29); sausage, 2 lbs., 25 cts. (32).....	.8	3	24	.....	235
Poultry: Chicken, 7.7 lbs., \$1.29 (35).....	.6	3	3	.....	40
Eggs: 11.9 lbs., \$1.80 (45).....	.8	4	3	.....	45
Dairy products: Butter, 22.4 lbs., \$4.26 (48); cheese, 1 lb., 10 cts. (52); milk, 46.2 lbs., \$2.10 (57).....	3.1	4	47	5	475
Total animal food.....	8.7	34	97	5	1,065
VEGETABLE FOOD.					
Cereals: Corn meal, 3.8 lbs., 11 cts. (65); oatmeal, 10.1 lbs., 30 cts. (68); rice, 1.9 lbs., 16 cts. (71); graham flour, 6 lbs., 11 cts. (80); wheat flour, 70.6 lbs., \$1.06 (74); wheat bread, 4.7 lbs., 25 cts. (88); wheat cake, 0.8 lb., 20 cts. (95); soda crackers, 3.6 lbs., 36 cts. (92).....	1.2	26	4	163	810
Sugars, starches, etc.: Granulated sugar, 58.3 lbs., \$3.42 (100); sorghum molasses, 1.5 lbs., 10 cts. (107); cocoa, 0.3 lb., 13 cts. (112); chocolate, 0.4 lb., 11 cts. (113).....	1.8	.....	1	122	510
Vegetables: Beans, 4.2 lbs., 35 cts. (114); beets, 2.8 lbs., 2 cts. (121); cabbage, 14.7 lbs., 15 cts. (123); corn (canned), 1.2 lbs., 8 cts. (127); onions, 10.5 lbs., 12 cts. (129); parsnips, 1.8 lbs., 5 cts. (131); pickles, mixed, 5.2 lbs., 20 cts. (137); potatoes, 94.1 lbs., 19 cts. (138); tomatoes (canned), 6 lbs., 36 cts. (144).....	.7	8	1	49	245
Fruits: Apricots (dried), 5.6 lbs., 65 cts. (152); Zante currants (dried), 2.2 lbs., 18 cts. (159); dates (dried), 2.2 lbs., 22 cts. (160); figs (dried), 2 lbs., 29 cts. (163); lemons, 1.8 lbs., 40 cts. (166); pears (dried), 3.9 lbs., 39 cts. (172); prunes, 4.6 lbs., 58 cts. (174); raspberries, 1.2 lbs., 30 cts. (176).....	1.4	2	1	36	165
Total vegetable food ..	5.1	36	7	370	1,730
Total food.....	13.8	70	104	375	2,795
<i>Waste.</i>					
Animal food, 6.2 lbs. (198).....	.....	3	3	.....	40
Vegetable food:	.....	.....	.....	.....	.....
Cereals, 6.8 lbs. (202).....	.....	1	1	6	40
Vegetables and fruits, 21.2 lbs. (215).....	.....	2	1	9	55
Total vegetable food.....	.....	3	2	15	95
Total food.....	.....	6	5	15	135
<i>Food eaten.</i>					
Animal food.....	.....	31	94	5	1,025
Vegetable food.....	.....	33	5	355	1,635
Total food.....	.....	64	99	360	2,660

Several years ago a study of a woman student's club in Connecticut was reported by Atwater and associates.¹ A number of studies of men

¹Connecticut Storrs Station Rpt. 1894.

students¹ have also been reported. It is interesting to compare the results of the dietary study of the women's club in North Dakota with those of the similar study in Connecticut and with the average results of the students' clubs at a number of different institutions.

The foods selected in the North Dakota dietary study were varied in kind. These students ate such foods as are generally found on the table of families living in this region. Meat constituted 15.1 per cent of the total food. In the similar study made in Connecticut with women students it constituted 32.7 per cent, while the average amount found in eighteen studies of college clubs (sixteen being clubs of men, the others the two clubs of women just mentioned) was 10.5 per cent. The women students at Fargo, N. Dak., used about the same proportions of cereals, bread, etc., as was found in the study of the Connecticut club. They used, however, considerably more sugar, viz. some 12.5 per cent of the total weight of the food eaten as compared with 6.3 per cent in the Connecticut study. This was greater than the proportion found in the dietary studies of men students' clubs with the exception of a club at the University of Tennessee and a similar club at the University of Maine, the proportion in these two cases being about the same as at Fargo. A large variety of dried fruits was used in the North Dakota club, yet this class of foods constituted a somewhat smaller proportion of the total food material than similar foods in the dietary of the Connecticut women students. The former club used a somewhat larger percentage of vegetables than the latter.

The differences pointed out above are doubtless more or less accidental. Taken as a whole the results differ so little from the average results for students' clubs that the women students at Fargo can not be said to differ markedly, as regards foods selected, from the Connecticut women students or from the average of men students' clubs. The commonly accepted dietary standard for a woman at light muscular work calls for 90 grams of protein and 2,400 calories of energy. Judged by this standard the young women in the club studied at Fargo, were receiving too little protein. The fuel value of the diet was, however, higher than the standard calls for. The average amounts of nutrients per woman per day in the dietary of the women's club in Connecticut were 84 grams protein, 128 grams fat, and 264 grams carbohydrates. This would supply 3,015 calories. The amounts eaten in North Dakota were considerably less than in Connecticut. In both cases the young women seemed well nourished, and it would be unfair to assume from the limited data available that the North Dakota students were not receiving all the food that they needed. It is believed that an abundance of energy may make up for a deficiency of protein within certain limits, and, as pointed out above,

¹The details of these studies have been reported in the earlier bulletins of this office (see list on cover) and Connecticut Storrs Station Rpts., 1893-1896.

the amount of energy in the North Dakota dietary was greater than is called for by the commonly accepted dietary standard. Many dietary studies are on record in which persons have consumed much less food than these women students and yet have seemed to be in fairly good condition.

The total amount of waste in the North Dakota dietary is not unusually large. The fat in the vegetable waste probably came in large part from the butter and lard used in cooking the vegetables. It was of course impossible to separate this into animal and vegetable fat when the samples of waste were prepared for analyses. The cost of the food purchased (13.8 cents per day) was small.

DIETARY STUDY AT LAKE ERIE COLLEGE, PAINESVILLE, OHIO.

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INTRODUCTION.

At the request of the president and the dean of Lake Erie College, at Painesville, Ohio, a study was undertaken of some of the problems connected with the food supply of that institution. Lake Erie College is an institution for women, and, with few exceptions, the faculty and officers are also women. The students and faculty board together at the regular college commons. As it was felt that it might interfere with the success of the work if the students knew that they were the subject of experiment, they were not informed that a dietary study was being made. They would probably have been interested in the work rather than otherwise, but a knowledge that it was going on might have disturbed the ordinary routine, which it was desired to preserve. The diet at the institution has always received attention, as has, indeed, everything which bears on the health of the students, which is carefully guarded. While the conditions under which the study was made were not ideal, and the limitations imposed by college tradition and custom concerning the food supply and the restrictions of the local market were keenly appreciated, it was, nevertheless, a favorable opportunity for the study of some of the problems of the home. Perhaps the limitations but enhance the value of the study, as conditions are rarely ideal, and it is felt that this investigation may at least show to others some things to be avoided and possibly a few facts that will be helpful. In most of the dietary studies conducted under the auspices of this Department there has been no attempt to control in any way the food supply, but rather a careful avoidance of any such suggestion, in order that the facts concerning the usual living habits of the family or group studied might be obtained. In the study at Lake Erie College the object was twofold. It was, in fact, an attempt to apply the knowledge gained from other dietary studies and from a somewhat extended observation of the food habits of these students, and, in so far as practicable with the limitations named, in such a way as to provide an appetizing, nutritious diet at a cost not to exceed 25 cents per woman per day. The attempt was also made to supply the nutrients

in such proportion as to conform to dietary standards and at the same time satisfy the changing and somewhat capricious taste of such a large body of students. To this end the tastes of the student and the possibilities and limitations of the food supply were studied for some six weeks before the beginning of the dietary study proper. In this time certain facts were brought to light which may in part explain apparent inconsistencies in the diet. Thus it was found that if baked potatoes were served for breakfast, very few were eaten. If creamed potatoes were served, the quantity eaten was somewhat larger. But in either case there was a considerable loss of labor and material. Left over baked potatoes are not very easily utilized, while a quantity of uneaten creamed potatoes means a waste of butter and milk as well as of potatoes.

There was a strong preference expressed, equivalent to a demand, for fresh fruit for breakfast. While the fact was appreciated that this meant a considerable outlay of money with an apparently small return in nutritive value, it was felt that the real value of fruit in a diet can not be fully expressed in such terms. The fact was recognized that there is a tendency among women students to provide themselves with sweets, and it seemed not improbable that the acid in the fruit might help to prevent a craving for an excess of sugar in the diet. Therefore, fresh fruit was served almost every day for breakfast. The figures given later show that 14.8 per cent of the money expended for food went for fruit. This is a very large proportion, but it seems justifiable, because it added much to the attractiveness of the diet and satisfied an evident craving of the students. Observation showed that many of the students ate more of the regular breakfast when they had fruit than they did when no fruit was served. So, in a sense, it increased materially the amount of nutrients consumed.

The students of Lake Erie College at this time were chiefly from the middle West. They liked the foods to which they were accustomed at home, and were not especially fond of either beans or peas. These legumes are perhaps less used in this region than in New England and other regions of the United States. Therefore neither beans nor peas could be depended upon in any great degree to augment the protein of the diet. Milk was used freely as a beverage twice each day, being served with coffee for breakfast and with tea or cocoa at luncheon. It was observed that the quantity of milk drunk at the table varied considerable from day to day.

After such facts as the above had been carefully considered and estimates had been made which showed that the food habitually consumed provided a nutritious and inexpensive diet, which seemed satisfying and appetizing to the household, a dietary study was undertaken for ten days according to regulation methods under what seemed to be the normal conditions of the college life, care being taken to keep the cost under 25 cents per woman per day and to have the daily food corre-

spond in kind and amount to the requirements of the tentative dietary standards for women with a moderate amount of exercise.¹ As previously stated, at no time were the members of the group studied (with the exception of the president and dean) conscious that they were the subjects of an experiment.

Owing to the cooperative system which prevails at the college, the life is very much like that of a large family in which each individual has some responsibility for the comfort of the household, and it seemed that a dietary study could be made under more normal conditions than where regular institutional life prevailed. In the original plan of the investigation this study was to provide a basis for comparison and at the same time show how closely the dietary standards could be attained by estimates of the amount of food materials required. The authors were confident that the supply of protein provided by the diet evidently desired by the students would be somewhat lower than the amount required by the commonly accepted dietary standard. Yet the students were in excellent health and the diet apparently satisfied their needs. It is a matter of much regret that circumstances prevented the making of a study in which the protein in the diet was increased, the students as before being unaware of such a change. This could have been done easily within the given limits of expense, and yet there seemed no real need for more protein, judging by the comments of the students on the diet or as evidenced by any lack of tone in health.

THE DIETARY STUDY.

As previously stated, the usual methods were followed for ascertaining the kinds and amounts of food eaten during the study.² An account was kept of all the food on hand at the beginning and end of the study and of all materials purchased during its progress. An attempt was made to have the cooked food on hand at the beginning and end of the study balance as nearly as possible. No analyses of food materials were made. None of the foods eaten were unusual in kind, and it was believed that the nutrients furnished by the articles of diet could be calculated with sufficient accuracy by the aid of figures for average composition of similar American food materials.³

The meats were purchased at retail from local dealers. While the fact was recognized that it is advantageous to purchase meat in wholesale quantities, it was not found practicable, since the college had no facilities for storing any considerable quantity of meat and the local butcher would not do this without extra compensation. At the same time the prices paid were somewhat lower than those charged other

¹ See tentative standards in U. S. Dept. Agr., Office of Experiment Stations Bul. 21, p. 213.

² For details of method see earlier bulletins reporting dietary studies given in list on cover.

³ U. S. Dept. Agr., Office of Experiment Stations Bul. 28 (revised).

regular customers, owing to the large amounts purchased, in the aggregate. The hams used during the study were larger and fatter than was usual. However, all wasted fat was used for the manufacture of soap for the college, and so does not represent an actual loss. The milk was supplied night and morning, and was the mixed milk of a local herd. The butter used was of excellent quality. Potatoes were purchased in quantity in the fall and stored at the college. In preparing mashed potatoes the following facts were noted: Thirty-six pounds of potatoes (as purchased) yielded 13 pounds of parings and 22.5 pounds cooked material before mashing. To the 22.5 pounds of potatoes three-fourths of a pound of butter and 4 quarts of milk were added. The weight of the mashed potatoes was 31 pounds.

Most of the groceries were purchased from local dealers. Coffee, tea, and "vegetole," a fat which was used in place of lard, were purchased in quantities in Chicago. All the bread used was made by the students under the supervision of the pastry cook as part of their college duties. It was uniformly of excellent quality. White bread and either graham or whole-wheat bread were served at all meals. The wheat breakfast foods represent a number of commercial brands, and were used in such a way as to give variety to the breakfasts. Some corn breakfast food was also used.

The dietary study began with dinner January 17, 1900, and included ten days, closing with lunch January 27. It is the custom of the college to serve dinner at night and luncheon at noon except on Sundays, when dinner is served in the middle of the day and supper at night. The supper is about the same as the ordinary week-day lunch. The group studied numbered about 115. Twenty of these were instructors, four were in the kitchen force, and the remainder students. It should be added that a woman came one day each week to assist in the cleaning of the halls and rooms, making five servants for that one day. All the students and instructors took their meals in the regular dining room. The servants ate in the kitchen. These were women, with the exception of the colored cook. One other man, an instructor, took meals at the college on certain days in the week. In calculating the results of the study it is assumed that these men ate the same amounts as the women. It is believed the differences in amounts consumed when calculated by the factors ordinarily used would be within the limits of error, since the proportion of men to women was so small (2 to about 115). The small number of servants is accounted for by the fact that much of the dining-room work and some sweeping was done by the students, each of them being expected to perform some kind of household work for one-half hour each day.

During the dietary study there were a few visitors, usually at luncheon, and some of the students were occasionally absent for one or more meals. Careful record was kept of the number of persons present at each meal. The total number of meals eaten was 3,149, equivalent to

one woman for 1,049 days. As previously stated, the attempt was made to regulate the diet in such way that it should not exceed a definite cost and at the same time please the students. The menu of the meals served may not be without interest. This was as follows:

DAILY MENU.

WEDNESDAY, JANUARY 17.

Dinner.—Corned beef, mashed potatoes, turnips, bread, butter, rice pudding.

THURSDAY, JANUARY 18.

Breakfast.—Baked apples, hominy grits, creamed dried beef, bread, butter, milk, coffee.

Luncheon.—Cheese, pudding, raspberry jam, bread, butter, milk, tea.

Dinner.—Roast beef, potatoes, parsnips, bread, butter, chocolate pudding.

FRIDAY, JANUARY 19.

Breakfast.—Oranges, wheat breakfast food,¹ corned-beef hash, corn rolls, butter, milk, coffee.

Luncheon.—Oyster stew, wafers, bananas, bread, butter, tea.

Dinner.—Pot roast, potatoes, beets, bread, butter, brown betty, lemon sauce.

SATURDAY, JANUARY 20.

Breakfast.—Wheat breakfast food,¹ bacon, baked potatoes, bread, butter, milk, coffee.

Luncheon.—Beef in gravy, pickles, sauce, milk, bread, butter, tea.

Dinner.—Lamb chops, potatoes, canned peas, bread, butter, cherry tapioca, cream.

SUNDAY, JANUARY 21.

Breakfast.—Oranges, wheat breakfast food,¹ fried mush, maple sirup, bread, butter, milk, coffee.

Luncheon.—At night on Sunday. Stewed apricots, cake, milk, tea, bread, butter.

Dinner.—Stewed chicken, mashed potatoes, cranberries, bread, butter, cottage pudding, hard sauce.

MONDAY, JANUARY 22.

Breakfast.—Bananas, wheat breakfast food,¹ rolls, codfish balls, bread, butter, milk, coffee.

Luncheon.—Beet salad, raspberry jam, milk, bread, butter, tea.

Dinner.—Hamburg steak, browned potatoes, squash, bread pudding.

TUESDAY, JANUARY 23.

Breakfast.—Hominy grits, minced lamb, milk, bread, butter, coffee.

Luncheon.—Pea soup, crackers, bananas, tea, bread, butter.

Dinner.—Roast pork, baked sweet potatoes, cold slaw, bread, butter, dates.

WEDNESDAY, JANUARY 24.

Breakfast.—Bananas, hominy grits, bacon, potato cakes, bread, butter, milk, coffee.

Luncheon.—Baked beans, brown bread, pickles, milk, bread, butter, tea.

Dinner.—Roast beef, boiled potatoes, spinach, bread, butter, boiled rice, maple sirup.

THURSDAY, JANUARY 25.

Breakfast.—Oranges, wheat breakfast food,¹ meat hash, French toast, bread, butter, milk, coffee.

Luncheon.—Cheese, gingerbread, bread, butter, cocoa.

Dinner.—Beefsteak, mashed potatoes, Lima beans, bread, butter, baked potatoes.

FRIDAY, JANUARY 26.

Breakfast.—Cream of wheat breakfast food,¹ creamed beef, rolls, bread, butter, milk, coffee.

Luncheon.—Pea soup, croutons, apple butter, bread, butter, tea.

Dinner.—Baked ham, catsup, stewed tomatoes, potatoes, bread, butter, fruit custard.

¹ Several different brands were used during the study to give variety.

SATURDAY, JANUARY 27.

Breakfast.—Oranges, wheat breakfast food,¹ beef in gravy, bread, butter, milk, coffee.

Luncheon.—Boiled rice, stewed prunes, milk, bread, butter, tea.

The average results of the dietary study follow.

TABLE 9.—Weights of foods and nutrients consumed in dietary study of a club of women students at Painesville, Ohio (No. 323).

[For explanation of numbers in parentheses, see Appendix, p. 39.]

Kinds and total amounts of food.	Cost, composition, and fuel value of food per woman per day.				
	Cost.	Protein.	Fat.	Carbohy- drates.	Fuel value.
<i>Food purchased.</i>					
ANIMAL FOOD.					
Beef: Corned, 49.5 lbs., \$3.42 (13); corned cooked, 5 lbs., 90 cts. (15); dried, 4 lbs., 80 cts. (16); pot roast, 29.9 lbs., \$3.88 (2); rib roast, 39.0 lbs., \$6.37 (3); sirloin roast, 32.5 lbs., \$4.88 (2); Hamburg steak, 27.5 lbs., \$3.43 (9); porterhouse steak, 29.8 lbs., \$6.03 (6).....	2.8	17	16	.....	220
Mutton: Chops, 51 lbs., \$7.14 (23); chops, lamb, cooked, 4.5 lbs., 95 cts. (22).....	0.8	3	7	.....	75
Pork: Bacon, side, 22 lbs., \$2.85 (30); ham, 37 lbs., \$5.63 (27); rib roast, 44.5 lbs., \$6.12 (24); pickled, 4 lbs., 32 cts. (29).....	1.4	8	19	.....	210
Poultry: Chicken, 42.8 lbs., \$8.18 (35).....	0.8	4	3	.....	45
Fish: Codfish, salt, 28 lbs., 27 cts. (39); oysters, 18.3 lbs., \$3.13 (44).....	0.3	1	.....	.....	5
Eggs: 28.6 lbs., \$4.80 (45).....	0.5	2	1	.....	20
Dairy products: Butter, 133 lbs., \$34.11 (49); cheese, 12.5 lbs., \$1.83 (53); cream, 12 lbs., \$1.12 (62); milk, 710 lbs., \$15.97 (58).....	5.1	11	64	16	705
Total animal food.....	11.7	46	110	16	1,280
VEGETABLE FOOD.					
Cereals: Corn meal, white, 16.5 lbs., 33 cts. (63); corn meal, yellow, 9.5 lbs., 15 cts. (64); hominy, 6 lbs., 32 cts. (67); wheat breakfast food, 5.4 lbs., 36 cts. (83); wheat breakfast food, 9 lbs., \$1.23 (84); wheat breakfast food, 10.7 lbs., 79 cts. (82); wheat breakfast food, 8.2 lbs., 63 cts. (83); rice, 15.3 lbs., \$1.05 (70); graham flour, 74.2 lbs., \$1.45 (79); wheat flour, 204.8 lbs., \$5.15 (77); wheat flour, 103.7 lbs., \$2 (78); whole wheat flour, 7.2 lbs., 19 cts. (73); oyster crackers, 0.5 lb., 5 cts. (90); salted wafers, 3 lbs., 42 cts. (94).....	1.3	24	3	152	750
Sugars, starches, etc.: Sugar (granulated), 157 lbs., \$8.16 (99); sugar (powdered), 7.3 lbs., 44 cts. (105); sugar (loaf), 0.5 lb., 3 cts. (104); molasses, 13.2 lbs., 40 cts. (106); sirup (maple), 14.3 lbs., \$1.13 (109); chocolate, 2.4 lbs., 74 cts. (113); cornstarch, 1.8 lbs., 11 cts. (110); tapioca, 4 lbs., 20 cts. (111).....	1.1	.....	.....	82	335
Vegetables: Lima beans (dried), 10.8 lbs., 76 cts. (116); navy beans, 14.7 lbs., 56 cts. (118); beets, 31 lbs., 65 cts. (121); cabbage, 10 lbs., 39 cts. (123); parsnips, 35 lbs., 65 cts. (131); peas (canned), 22.6 lbs., \$1.74 (132); peas, green (dried), 4.4 lbs., 27 cts. (133); potatoes, white, 305.8 lbs., \$3.54 (138); potatoes, sweet, 36.5 lbs., \$1.33 (141); spinach, 11.3 lbs., \$2.25 (142); squash, 37 lbs., \$1.31 (143); tomatoes, 24.4 lbs., 95 cts. (144); turnips, 32 lbs., 50 cts. (147); pickles, cucumber, 10.5 lbs., 66 cts (135).....	1.4	7	1	43	215
Fruits: Apples, 97.5 lbs., \$3.50 (148); apple butter, 30.3 lbs., \$3.25 (150); apricots, 11.5 lbs., \$1.95 (151); bananas, 66 lbs., \$3.75 (153); cherries (canned), 9.8 lbs., 75 cts. (157); cranberries, cooked with sugar, 26.2 lbs., 77 cts. (158); dates, 19.3 lbs., \$1.63 (161); figs, 3 lbs., 37 cts. (162); lemons, 6 lbs., 46 cts. (165); oranges, 150 lbs., \$8.65 (168); prunes, 10.7 lbs., 97 cts. (173); raisins, 1.5 lbs., 11 cts. (175); raspberry jam, 14 lbs., \$2.38 (178).....	2.7	1	1	41	180
Total vegetable food.....	6.5	32	5	318	1,480

¹Several different brands were used during the study to give variety.

TABLE 9.—Weights of foods and nutrients consumed in dietary study, etc.—Continued.

Kinds and total amounts of food.	Cost, composition, and fuel value of food per woman per day.				
	Cost.	Protein.	Fat.	Carbohy- drates.	Fuel value.
<i>Food purchased—Continued.</i>					
UNCLASSIFIED FOODS.					
Lard substitutes: Cottolene, 8 lbs., 68 cts. (180); vegetole, 11 lbs., 61 cts. (181)	0.1	.....	8	.....	75
Total food	18.3	78	123	334	2,835
<i>Waste.</i>					
ANIMAL FOOD.					
Beef: Corned, kitchen waste, 4.5 lbs. (182); corned, table waste, 2.5 lbs. (182); pot roast, kitchen waste, 2.8 lbs. (183); pot roast, table waste, 1.3 lbs. (184); rib roast, table waste, 2.5 lbs. (185); sirloin roast, kitchen waste, 2 lbs. (186); sirloin roast, table waste, 1.8 lbs. (187); porterhouse steak, table waste, 3 lbs. (187)		2	3	.....	35
Mutton: Chops, kitchen waste, 0.8 lb. (190); chops, table waste, 2 lbs. (190)			1	.....	10
Pork: Bacon, table waste, 1.8 lbs. (188); ham, table waste, 2 lbs. (27); rib roast, table waste, 3.5 lbs. (189)		1	1	.....	15
Miscellaneous, 40 lbs. (199)		3	1	1	25
Total animal food		6	6	1	85
VEGETABLE FOOD.					
Cereals: Breakfast foods, 3.2 lbs. (201); rice, 4.6 lbs. (200); breads, 4.8 lbs. (206)		2	1	4	35
Vegetables: Beans, cooked, 1.5 lbs. (207); beets, 1.8 lbs. (208); cabbage, 1 lb. (123); parsnips, 6.3 lbs. (131); peas (canned), 2.5 lbs. (132); potatoes, white, 14.8 lbs. (209); potatoes, sweet, 1.3 lbs. (210); toma- toes (canned), 1 lb. (144); turnips, 10.8 lbs. (147); pickles, 0.5 lb. (218)		1	.....	3	15
Fruits: Apples, 7.5 lbs. (148); cherries, 0.8 lb. (157)				1	5
Miscellaneous, 35.5 lbs. (217)		1	1	4	30
Total vegetable food		4	2	12	85
Total food		10	8	13	170
<i>Food actually eaten.</i>					
Animal food		40	104	15	1,195
Vegetable food and unclassified		28	11	306	1,470
Total food		68	115	321	2,665

According to the dietary standards above referred to, a woman with little muscular work requires about 90 grams protein and sufficient fats and carbohydrates to bring the fuel value of the diet to about 2,400 calories per day. A woman at moderate muscular work requires about 100 grams protein and 2,800 calories of energy per day. Although the subjects of the study at Lake Erie College performed a small amount of muscular work, they may perhaps be fairly considered as of sedentary habits. It will be seen that the amount of protein supplied was somewhat less than that called for by the dietary standard for a woman with little muscular work, while the amount of energy was somewhat in excess. As previously noted, the subjects were in good health and satisfied with their diet. It is believed by many physiologists that a deficiency in protein may be offset, within

limits, by a high fuel value; at all events the diet seemed suited to the needs of the students. It is interesting to compare the results of the study at Lake Erie College with the results of similar studies with clubs of women students at the University of Chicago,¹ at Fargo, N. Dak. (see p. 23), at Middletown, Conn.,² and with the average of clubs of men students at different American universities.³ In order that the results obtained by the study of women's clubs may be compared with results obtained with clubs of men students, and with families in different regions of the United States, the results have been recalculated in terms of "per man per day" by making use of the usual factor, which assumes that a woman consumes 0.8 as much as a man at similar employment. Thus, the 68 grams protein, 115 grams fat, 321 grams carbohydrates, and 2,665 calories energy, costing 18 cents per woman per day in the diet of the Lake Erie College, would correspond to 85 grams protein, 144 grams fat, 401 grams carbohydrates, and 3,330 calories, costing 22½ cents per man per day. The 108 grams protein, 102 grams fat, 381 grams carbohydrates, and 2,955 calories, costing 25 cents per woman per day in the study of the woman's club at the University of Chicago, would correspond to 135 grams protein, 128 grams fat, 476 grams carbohydrates, and 3,685 calories, costing 31¼ cents per man per day. Similar calculations are readily made for the other studies of women clubs. In the following table are shown the results of the dietary studies of the Lake Erie, Chicago, and Wesleyan women students' clubs. For purposes of comparison the average results of sixteen studies with clubs of men students at a number of American universities and of fourteen families of professional men are included.

TABLE 10.—*Comparison of dietary study of women student's club at Lake Erie College with other dietary studies.*

[Quantities per man per day.]

	Number of persons.	Protein.	Fat.	Carbo- hydrates.	Fuel value.	Cost.
		<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	<i>Calories.</i>	<i>Cents.</i>
Women students' club, Lake Erie College.	103	85	144	401	3,330	23
Women students' club, Chicago University.	130	135	128	476	3,685	31
Women students' club, Middletown, Conn.	35	105	160	330	3,270	.....
Women students' club, Fargo, N. Dak.	11	80	124	450	3,325	16
Average of 4 women student's clubs.		101	139	414	3,405	23
Average of 16 men students' clubs.		105	147	465	3,705	23
Average of 14 professional men's families.		104	125	423	3,325	.....
Proposed standard for man with light muscular labor.		112	.....	.....	3,000	.....
Proposed standard for man with moderate muscular labor.		125	.....	.....	3,500	.....

¹ Review of Reviews (1896, p. 300) and pamphlet entitled "Food as a Factor in Student Life."

² Connecticut Storrs Sta. Rpt. 1894.

³ See list of bulletins on cover and Connecticut Storrs Station Rpts. 1893-1895.

As will be seen, the amount of protein in the Lake Erie College dietary was practically the same as was found in the dietary of a club of women students at Fargo, N. Dak., and was less than the amount found in any of the other dietary studies or averages quoted. When the other nutrients are considered, the figures agree more closely and the total fuel value of the Lake Erie College dietary is about equal to that observed in other studies carried on under normal conditions and is practically the same as the amount found in the average diet of fourteen professional men's families. The cost of the food at Lake Erie College was about one-third greater than at Fargo, N. Dak., and about the same amount less than at the University of Chicago. If the same sum had been expended at Lake Erie as at Chicago, the diet could have been increased to yield at least 117 grams protein, 195 grams fat, 537 grams carbohydrates, and 4,495 calories, using the same kinds of food as before. In such a case the fats and carbohydrates would be greatly in excess of the amounts required by the commonly accepted dietary standards. It would perhaps be best, as intended, if a larger sum were expended on the diet, to increase the protein rather than the fats and carbohydrates. When the figures for the four women students' clubs expressed in terms "per man per day" and those for the sixteen men students' clubs are compared, it will be seen that the averages for the women are somewhat smaller than those for the men, and not greatly different from those for the families of professional men. It will be remembered that in making these comparisons the amounts eaten per woman per day were calculated to the basis per man per day on the assumption that a woman consumes 0.8 as much as a man engaged in the same kind of muscular work. The agreements pointed out above indicate the approximate correctness of this factor.

WASTE.

By waste is meant that portion of the food which, although containing nutritive matter, is thrown away. More or less waste was inevitable both in the kitchen and at the table. An attempt was made to keep the waste from the different groups of food materials separate, so as to determine where the greatest loss occurred. The quantities of waste are shown in Table 9.

Table 11 shows the relative amount of animal, vegetable, and total waste in the dietary study at Lake Erie College and in other dietaries and averages quoted for purposes of comparison.

TABLE 11.—Comparative amounts of waste at Lake Erie College and other institutions.

	Protein.	Fat.	Carbohy- drates.	Fuel value.
ANIMAL FOOD.				
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Women students' club, Lake Erie College.....	6.6	5.1	0.4	2.8
Women students' club, Middletown, Conn.....	19.5	16.2	.....	10.3
Women students' club, Fargo, N. Dak.....	4.1	5.3	.....	1.9
Average of 3 women students' clubs.....	10.1	8.9	.1	5.0
Average of 14 men students' clubs.....	11.9	16.8	.2	8.0
Average of 13 professional men's families.....	2.0	3.1	.....	1.7
VEGETABLE FOOD.				
Women students' club, Lake Erie College.....	4.5	1.4	3.4	2.8
Women students' club, Middletown, Conn.....	2.8	2.3	12.6	6.4
Women students' club, Fargo, N. Dak.....	4.0	.3	3.8	3.0
Average of 3 women students' clubs.....	3.8	1.3	6.6	4.1
Average of 14 men students' clubs.....	4.9	.7	10.7	4.7
Average of 13 professional men's families.....	.4	.....	.9	.5
TOTAL FOOD.				
Women students' club, Lake Erie College.....	11.1	6.5	3.8	5.6
Women students' club, Middletown, Conn.....	22.3	18.5	12.6	16.7
Women students' club, Fargo, N. Dak.....	8.1	5.6	3.8	4.9
Women students' club, University of Chicago.....	14.3	14.5	5.2	12.3
Average of 3 women students' clubs ^a	13.8	10.2	6.7	9.1
Average of 4 women students' clubs.....	14.0	11.3	6.4	9.9
Average of 14 men students' clubs.....	16.8	19.2	10.9	14.9
Average of 13 professional men's families.....	2.4	4.0	.9	2.2

^aNot including that at the University of Chicago, in which the division of waste between animal and vegetable foods was not reported.

Of the total protein in the food purchased during the dietary study at Lake Erie College, 11.1 per cent, and of the total energy 5.6 per cent, was wasted. The percentage of waste was about the same as at Fargo, while the protein wasted was about one-half and the energy one-third that of the corresponding amounts found in the dietary study at Middletown. In general the waste was less than the average in men students' clubs, and considerably more than in the families of professional men. As will be seen by reference to Table 9, the largest amount of waste occurred in the meats and cereals.

Saving of waste, i. e., uneaten or "left over" food usually means increased labor—an expensive factor. The wide difference shown between the waste in private families and that in institutions is probably due, not only to the difference in the amount of service rendered in proportion to the number served, but also to the fact that an intelligent housekeeper has the advantage of a more accurate knowledge of individual appetites and a greater latitude in serving "made-over" dishes than is possible at public commons.

On the whole, the above comparison seems to be favorable to the Lake Erie College study. It is worthy of note that the waste (11.1 per cent) is only about 1 per cent above the amount (10 per cent) considered by some as a minimum amount. Considerable care and vigilance were exercised to prevent waste in this study, and it is probable that it would have been further diminished if a second study had been conducted.

COST.

The proportion of the total cost of the diet which was expended for meats, butter, cereals, sugars and starches, fruits and vegetables in the Lake Erie College dietary, and in dietaries and averages with which it is compared, is shown in the following table :

TABLE 12.—*Comparison of relative cost of different foods at Lake Erie College and other institutions.*

	Lake Erie College.	University of Chicago.	North Dakota Agricultural College.	Average of 3 womens' clubs.	Average of 10 men's clubs.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Meats, fish, etc.:					
Beef, veal, and mutton.....	19.2	22.9	24.6	22.3	17.4
Pork, lard, etc.....	8.5	2.8	6.1	5.8	8.9
Poultry.....	4.3	4.6	4.4	4.4	3.6
Fish.....	1.8	2.5	.....	1.4	4.0
Total meats and fish.....	33.8	32.8	35.1	33.9	33.9
Eggs.....	2.5	3.0	6.1	3.9	4.8
Dairy products:					
Butter.....	17.8	12.8	14.5	15.0	11.8
Cheese.....	.9	.3	.3	.5	.4
Milk.....	8.4	12.1	7.1	9.2	11.3
Cream.....	.6	4.7	.....	1.8	.2
Total dairy products.....	27.7	29.9	21.9	26.5	23.7
Total animal food.....	64.0	65.7	63.1	64.3	62.4
Cereals.....	7.4	12.0	8.7	9.3	11.5
Sugars and starches.....	5.9	5.8	12.8	8.2	8.5
Vegetables.....	7.8	7.1	5.2	6.7	10.0
Fruits.....	14.9	9.4	10.2	11.5	7.6
Total vegetable food.....	36.0	34.3	36.9	35.7	37.6

At the Lake Erie College about one-third of the total cost of the diet was expended for meats and fish. This is practically the same as was found in the study in the averages of ten men students' clubs, and at the University of Chicago. The total sum expended for dairy products was somewhat greater than the average for men's clubs—about the same as at the University of Chicago and somewhat more than at Fargo. In reference to butter it may be said that of the 133 pounds used during the ten days of the study at Lake Erie College, 30 pounds was "cooking butter;" that is, butter somewhat cheaper and inferior in flavor to that used on the table. This leaves an average of 10.3 pounds per day of table butter. This, distributed among 103 persons, means an average of 1.6 ounces per individual per day. This is not an excessive quantity, as a personal dietary study of one of the authors had shown that she ate on an average 1.5 ounces per day. It should be remembered also that there were frequently small uneaten portions of butter left on the table. Moreover, the bread and butter provided by the college were always of the best quality, and were eaten with evident relish, particularly at luncheon. Butter is usually considered a very digestible form of fat, a nutrient sometimes lacking in a school-

girl's diet. It is of course an expensive fat, but it seems an open question whether it is not a desirable form in which to provide it in this particular instance, because it is by no means certain that sufficient fat would have been eaten in the form of meat fat. The proportion expended for milk was less than at the University of Chicago, or the average for men students' clubs. Yet milk was used freely in cooking, as a beverage twice a day, and in soups as often as seemed consistent with variety. The milk was obtained from a dairy within five minutes' walk of the college, and was brought twice each day immediately after milking. From the quantity purchased (20 quarts in the evening and 15 quarts in the morning) a considerable amount of cream could be obtained when preferred to whole milk. In some instances this diminished the amount of extra cream required. When the total animal food is considered, the proportion expended is a little greater at Lake Erie College than at Fargo, or the average for ten clubs of men students.

The proportionate cost of cereal food eaten at Lake Erie College was smaller than in any of the other studies of averages shown in the table, and that of sugars and starches was smaller than in any except the dietary made at the University of Chicago. The relative cost of the vegetables was slightly in excess of that in any of the studies of women students' clubs, but smaller than the average in the men students' clubs. As was previously stated, the cost of the fruit at the Lake Erie College was high and out of proportion to the total nutrients furnished by such material. It is believed, however, that such material stimulates the appetite and exercises a beneficial hygienic effect, and in other ways has a favorable effect which can not be measured in dollars and cents. Judged by the figures in the table cereals, sugars, starches, and fruits are quite variable items in the diet.

APPENDIX.

In the details of the dietary studies given on the previous pages the figures used for calculating the proportion of nutrients were not given. Following the quantity of each food used is a number in parentheses which corresponds to a number in Table 13, which follows. The figures for percentage composition following this reference number in Table 13 show the values found by analysis or assumed from averages of similar analyses given in Bulletin 28 (revised), which were used for computing the nutrients furnished by the different foods. Such of the values in the table as were determined by direct analysis of samples of food materials taken in connection with dietary studies reported above are indicated by the letter *a*. It has already been explained on page 14 that some of these figures are based upon the amounts of the different samples analyzed as well as upon the actual composition of these. They represent what was considered the true average composition of the different kinds of food material used rather than the average of analyses.

TABLE 13.—Percentage composition of food materials used in calculating the amount of nutrients consumed in the different dietary studies.

Reference No.	Material.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.
	<i>Animal food.</i>						
	<i>Beef:</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Percent.</i>
1	Roast, round <i>a</i>			16.6	20.1		
2	Roast, sirloin and "pot" roasts.....		68.3	19.6	11.9		1.1
3	Roast, rib.....		55.5	17.5	26.6		.9
4	Rump, boiled <i>a</i>	6.3	58.9	16.4	17.2		.9
5	Steak, round <i>a</i>			20.4	10.1		
6	Steak, porterhouse.....		60.6	18.5	20.2		1.0
7	Steak, sirloin, medium fat <i>a</i>	20.4	49.8	15.9	13.2		.8
8	Steak, sirloin, fat <i>a</i>	13.7	40.4	16.0	29.1		.8
9	Steak, Hamburg.....		65.5	20.3	13.6		1.1
10	Stew.....		69.8	20.4	8.6		1.1
11	Liver <i>a</i>	7.3	65.6	20.2	3.1	2.5	1.3
12	Tongue <i>a</i>	9.2	69.2	20.2	.8		1.0
13	Corned.....		53.6	15.6	26.2		4.9
14	Corned <i>a</i>		45.0	13.3	32.7		10.0
15	Corned, cooked (canned).....		51.8	26.3	18.7		4.0
16	Dried.....		54.3	30.0	6.5	.4	9.1
	<i>Veal:</i>						
18	Loin, cutlets <i>a</i>	12.2	59.2	16.4	11.3		.9
19	Roast <i>a</i>			15.8	10.2		
20	Steak <i>a</i>			17.2	7.6		
	<i>Lamb:</i>						
21	Leg.....		63.9	19.2	16.5		1.1
22	Chops, cooked.....		47.6	21.7	29.9		1.3

a Analyzed in connection with the studies.

TABLE 13.—Percentage composition of food materials, etc.—Continued.

Reference No.	Material.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.
	<i>Animal food—Continued.</i>						
23	Mutton chops.....	<i>Per cent.</i> 16.0	<i>Per cent.</i> 42.0	<i>Per cent.</i> 13.5	<i>Per cent.</i> 28.3	<i>Per cent.</i>	<i>Per cent.</i> 0.7
	Pork:						
24	Chops and ribroast.....		52.0	16.6	30.1	.....	1.0
25	Roast <i>a</i>			17.9	24.4	.....	.....
26	Steak <i>a</i>			15.3	24.7	.....	.....
27	Ham, smoked, fried.....		36.6	22.2	33.2	.....	5.8
28	Ham, sugar-cured <i>a</i>	4.5	33.2	25.7	31.0	.....	5.6
29	Salt and pickled.....		7.9	1.9	86.2	.....	3.9
30	Bacon.....		18.8	9.9	67.4	.....	4.4
31	Bacon <i>a</i>			8.0	61.7	.....	.....
32	Sausage.....		39.8	13.0	44.2	1.1	2.2
33	Lard <i>a</i>		3	.....	98.1	.....	.....
34	Do.....				100.0	.....	.....
	Poultry:						
35	Chicken.....		63.7	19.3	16.3	.....	1.0
36	Chicken <i>a</i>			14.8	1.1	.....	.....
37	Do.....		34.1	8.5	1.8	.....	.5
	Fish:						
38	Cisco <i>a</i>			16.2	7.6	.....	.....
39	Cod, salt.....		53.5	21.5	.3	.....	24.7
40	Cod <i>a</i>	1.6	54.8	27.7	.3	.....	14.7
41	Fish (kind not known) <i>a</i>			8.7	1.8	.....	.....
42	Trout, brook, canned <i>a</i>	3.5	66.1	21.5	5.9	.....	3.6
43	Trout, lake <i>a</i>			10.7	4.8	.....	.....
44	Oysters.....		88.3	6.0	1.3	3.3	1.1
	Eggs:						
45	Hens'.....		73.7	14.8	10.5	.....	1.0
46	Hens' <i>a</i>			13.1	9.5	.....	.....
47	Do.....			12.2	9.0	.....	.....
	Dairy products:						
48	Butter <i>a</i>		8.2	.7	88.5	.....	2.6
49	Butter.....		11.0	1.0	85.0	.....	3.0
50	Butter <i>a</i>		9.5	.7	86.6	.....	3.2
51	Do.....			1.2	81.8	.....	.....
52	Cheese <i>a</i>		30.2	28.3	35.5	1.8	4.2
53	Cheese.....		34.2	25.9	33.7	2.4	3.8
54	Cheese <i>a</i>		28.1	24.5	36.2	7.6	3.6
55	Do.....			24.4	34.6	3.0	.....
56	Cheese, cottage <i>a</i>			21.1	1.0	4.3	.....
57	Milk <i>a</i>		87.2	3.2	4.1	4.8	.7
58	Milk.....		87.0	3.3	4.0	5.0	.7
59	Milk <i>a</i>		88.2	2.6	3.8	4.6	.7
60	Milk, condensed <i>a</i>		28.2	7.8	9.0	53.3	1.7
61	Buttermilk.....		91.0	3.0	.5	4.8	.7
62	Cream.....		74.0	2.5	18.5	4.5	.5
	<i>Vegetable food.</i>						
	Cereals:						
63	Corn meal, white.....		12.6	7.1	1.3	78.4	.6
64	Corn meal, yellow.....		12.5	9.2	1.9	75.4	1.0
65	Corn meal <i>a</i>		11.9	10.4	2.0	74.8	.9
66	Do.....		9.6	9.4	4.0	75.5	1.5
67	Hominy.....		11.8	8.3	.6	79.0	.3
68	Oatmeal <i>a</i>		8.0	17.7	7.4	65.3	1.6
69	Do.....		10.1	15.3	7.8	64.8	1.9
70	Rice.....		12.3	8.0	.3	79.0	.4
71	Rice <i>a</i>		12.4	7.4	.4	79.4	.4
72	Do.....		13.0	11.3	.1	75.4	.2
73	Wheat flour, whole.....		11.4	13.8	1.9	71.9	1.0
74	Wheat flour <i>a</i>		9.8	11.4	.5	77.9	.4
75	Do.....		8.8	12.8	1.1	76.8	.4
76	Do.....			13.6	1.2	72.5	.....
77	Bread flour.....		11.5	11.4	1.0	75.6	.5
78	Pastry flour.....		13.1	12.3	1.1	73.0	.5
79	Wheat flour, graham.....		11.3	13.3	2.2	71.4	1.8
80	Wheat flour, graham <i>a</i>		10.2	12.7	2.6	72.8	1.7
81	Do.....		10.6	13.6	1.8	71.9	2.1
	Wheat preparations—						
82	Cracked and crushed.....		10.1	11.1	1.7	75.5	1.6
83	Miscellaneous.....		9.4	13.1	2.1	74.1	1.3
84	Parched and toasted.....		8.6	13.6	2.4	74.5	.9
85	Cracked <i>a</i>		8.9	12.4	1.7	75.4	1.6
86	Macaroni <i>a</i>		11.1	15.9	.3	71.7	.9
	Breads, etc.—						
87	Wheat bread, white <i>a</i>			10.1	.5	49.3	.....
88	Wheat bread <i>a</i>		32.3	8.8	1.7	56.3	.9

a Analyzed in connection with the studies.

TABLE 13.—Percentage composition of food materials, etc.—Continued.

Reference No.	Material.	Refuse.	Water.	Protein.	Fat.	Carbohy- drates.	Ash.
<i>Vegetable food—Continued.</i>							
Cereals—Continued.							
Breads, etc.—Continued.							
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
89	Wheat bread, graham <i>a</i>		34.9	10.8	0.6	51.9	1.8
90	Crackers, oyster		4.8	11.3	10.5	70.5	2.9
91	Crackers, oyster <i>a</i>		4.6	17.3	11.3	65.3	1.5
92	Crackers, soda <i>a</i>		4.4	10.7	10.0	73.0	1.9
93	Crackers <i>a</i>		9.6	12.2	11.1	64.0	2.9
94	Wafers (saltines)		5.6	10.6	12.7	68.5	2.6
95	Cake, wheat <i>a</i>		34.4	8.0	3.4	53.3	.9
96	Cake, fig <i>a</i>		33.2	5.3	6.7	53.7	1.2
97	Cake <i>a</i>			6.0	8.4	64.3	.....
98	Cookies <i>a</i>			7.8	15.8	66.9	.....
Sugars, starches, etc.:							
99	Sugar, granulated					100.0	.....
100	Sugar, granulated <i>a</i>		3.0			96.2	.....
101	Do .....		.2			99.7	.....
102	Sugar, brown <i>a</i>		5.4	2.4		88.4	3.8
103	Sugar, "C" <i>a</i>		1.2	.3		98.2	.3
104	Sugar, loaf					100.0	.....
105	Sugar, powdered					100.0	.....
106	Molasses		25.1	2.4		69.3	3.2
107	Molasses, sorghum <i>a</i>		52.4			46.6	.....
108	Molasses <i>a</i>					68.0	.....
109	Sirup, maple					71.4	.....
110	Cornstarch					90.0	.....
111	Tapioca		11.4	.4	.1	88.0	.1
112	Cocoa		4.6	21.6	28.9	37.7	7.2
113	Chocolate		5.9	12.9	48.7	30.3	2.2
Vegetables:							
114	Beans, navy <i>a</i>		12.6	23.1	2.0	59.2	3.1
115	Beans, canned <i>a</i>		69.2	6.7	2.3	20.0	1.8
116	Beans, Lima, dried		10.4	18.1	1.5	65.9	4.1
117	Beans, navy, white <i>a</i>		10.3	22.2	1.6	62.3	3.6
118	Beans, navy		12.6	22.5	1.8	59.6	3.5
119	Beans, string <i>a</i>		91.7	2.2	.2	5.2	.7
120	Beans, string, cooked <i>a</i>		95.3	.8	1.1	1.9	.9
121	Beets		87.5	1.6	.1	9.7	1.1
122	Beets, including tops <i>a</i>	39.8	56.5	.8		2.2	.7
123	Cabbage		91.5	1.6	.3	5.6	1.0
124	Cabbage <i>a</i>			1.5	.2	5.1	.....
125	Celery <i>a</i>	47.6	49.8	.5	.1	1.5	1.5
126	Corn <i>a</i>	68.1	27.1	.9	.2	3.5	.2
127	Corn, canned		76.1	2.8	1.2	19.0	.9
128	Cucumbers	15.0	81.1	.7	.2	2.6	.4
129	Onions	10.0	78.9	1.4	.3	8.9	.5
130	Onions, raw <i>a</i>			1.1	.7	8.3	.....
131	Parsnips		83.0	1.6	.5	13.5	1.4
132	Peas, canned		85.3	3.6	.2	9.8	1.1
133	Peas, green, dried		9.5	24.6	1.0	62.0	2.9
134	Peas, green <i>a</i>			3.8	.3	7.8	.....
135	Pickles, cucumbers		92.9	.5	.3	2.7	3.6
136	Pickles, cucumbers <i>a</i> .....			.4	.1	8.2	.....
137	Pickles, mixed <i>a</i>		93.8	1.1	.4	4.0	.7
138	Potatoes		78.3	2.2	.1	18.4	1.0
139	Potatoes <i>a</i>	33.3	54.2	1.3		10.7	.5
140	Do			1.3	.1	11.6	.....
141	Potatoes, sweet		69.0	1.8	.7	27.4	1.1
142	Spinach		92.3	2.1	.3	3.2	2.1
143	Squash	50.0	44.2	.7	.2	4.5	.4
144	Tomatoes, canned		94.0	1.2	.2	4.0	.6
145	Tomatoes, canned <i>a</i>		94.3	.8	.1	4.3	.5
146	Tomatoes, fresh <i>a</i>			1.0	.2	3.4	.....
147	Turnips		89.6	1.3	.2	8.1	.8
Fruits:							
148	Apples		84.6	.4	.5	14.2	.3
149	Apples <i>a</i> .....			.2	.1	6.4	.....
150	Apple butter		61.1	.2	.8	37.2	.7
151	Apricots	6.0	79.9	1.0		12.6	.5
152	Apricots, dried <i>a</i>		5.1	6.5	1.0	81.0	6.4
153	Bananas		75.3	1.3	.6	22.0	.8
154	Bananas <i>a</i>	37.8	46.1	.8	.4	14.2	.6
155	Blackberries <i>a</i>			1.3	.7	10.5	.....
156	Blueberries, canned <i>a</i>		89.1	.4	.3	10.0	.2
157	Cherries, canned		77.2	1.1	.1	21.1	.5
158	Cranberries, sugar cooked					53.8	.....
159	Currants, dried <i>a</i>		5.3	4.7	.4	85.3	4.3
160	Dates, dried <i>a</i>		9.9	2.1	.6	86.3	1.1

a Analyzed in connection with the studies.

TABLE 13.—Percentage composition of food materials, etc.—Continued.

Reference No.	Material.	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.
<i>Vegetable food—Continued.</i>							
<i>Fruits—Continued.</i>							
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
161	Dates	10.0	13.8	1.9	2.5	70.6	1.2
162	Figs		79.1	1.5		18.8	.6
163	Figs <i>a</i>		11.6	2.6	.3	83.1	2.4
164	Huckleberries <i>a</i>		81.9	.6	.6	16.6	.3
165	Lemons	30.0	62.5	.7	.5	5.9	.4
166	Lemons <i>a</i>		89.3	1.0	.9	8.3	.5
167	Do.	36.9	56.4	.6	.1	5.7	.3
168	Oranges	27.0	63.4	.6	.1	8.5	.4
169	Oranges <i>a</i>	35.8	56.4	.7		6.8	.3
170	Peaches <i>a</i>	14.0	76.8	.8	.1	7.9	.4
171	Pears <i>a</i>	10.6	75.8	.6	.1	12.6	.4
172	Pears, dried <i>a</i>		16.5	2.8	5.4	72.9	2.4
173	Prunes	5.8	75.6	.7		17.4	.5
174	Prunes <i>a</i>		22.2	3.3	4.7	67.5	2.3
175	Raisins	10.0	13.1	2.3	3.0	68.5	3.1
176	Raspberries, dried <i>a</i>		8.1	7.3	1.8	80.2	2.6
177	Raspberries <i>a</i>			1.9	1.6	13.0	
178	Raspberry jam		36.7	1.2	.1	58.5	3.5
179	Tomato preserves <i>a</i>		40.9	.7	.1	57.6	.7
<i>Unclassified:</i>							
180	Cottolene				100.0		
181	Vegetole				100.0		
<i>Waste.</i>							
<i>ANIMAL FOOD.</i>							
<i>Beef:</i>							
182	Corned			13.7	41.9		
183	Pot roast, kitchen waste			16.5	31.1		
184	Pot roast, table waste			26.2	34.9		
185	Rib roast			18.8	38.0		
186	Sirloin roast, kitchen waste			16.9	28.0		
187	Porterhouse steak			23.5	20.4		
<i>Pork:</i>							
188	Bacon			20.5	65.6		
189	Rib roast			19.9	45.4		
190	Mutton chops			12.0	43.0		
191	Meat			18.2	34.7	1.1	
192	Do			17.6	32.4	8.3	
193	Do			17.2	26.6	5.9	
194	Do			22.8	40.6	7.9	
195	Do			17.3	28.9	9.7	
196	Lard				100.0		
197	Fat				100.0		
198	Miscellaneous animal			25.8	29.8		
199	Do			15.4	7.6	5.6	
<i>Cereals:</i>							
200	Rice			1.7	.1	15.6	
201	Breakfast foods			12.1	1.8	75.2	
202	Miscellaneous			6.6	6.8	39.5	
203	Bread			5.1	8.8	19.7	
204	Do			9.6	10.3	60.4	
205	Do			5.8	9.2	20.4	
206	Do			9.2	1.3	53.1	
<i>Vegetables:</i>							
207	Beans, cooked			6.9	2.5	19.6	
208	Beets			2.3	.1	7.4	
209	Potatoes, white			2.5	.1	20.9	
210	Potatoes, sweet			2.6	3.0	17.8	
211	Miscellaneous			3.8	4.9	21.1	
212	Do			2.3	7.0	18.6	
213	Do			3.4	4.1	19.7	
214	Do			4.6	6.0	18.6	
215	Vegetables and fruits			3.9	3.3	19.0	
216	Miscellaneous vegetable			4.8	7.5	12.1	
217	Do			4.8	8.8	25.6	
218	Pickles5	.3	2.7	

a Analyzed in connection with the studies.

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