

## THE DIETS OF LABOURING CLASS FAMILIES DURING THE COURSE OF THE WAR.

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IN 1915–1916 I studied the dietaries of forty-seven Glasgow labouring class families with the object of comparing the food of healthy and rachitic children. The results of this work were published by the Medical Research Committee<sup>1</sup>.

In order to ascertain how the food was affected by war conditions subsequent studies were made of a few typical families at three different periods.

(1) Ten families were investigated in February 1917, when, though prices were high, all food-stuffs, save potatoes, were still plentiful.

(2) Eight of these families consented to a third study, which was carried out in November 1917, after voluntary rationing had been urged by the Minister of Food.

(3) In December 1918 five of these families were studied for a fourth time, this time during the period of compulsory rationing of meat, sugar and fats.

We have, thus, a series of four investigations of the same five families under different conditions and extending over a period of three years of the war. The present report summarises the information gathered.

The studies included three men, five women, twelve children over ten years and fourteen under ten years of age.

In each case the food was weighed for the period of a week.

The method of investigation adopted is explained in Professor Noël Paton's introduction to the report of the dietary studies made by Miss Dorothy Lindsay in 1911–1912. Miss Lindsay's work was done in Glasgow upon the same class, and forms a pre-war standard of comparison with the present results.

A comparison of the results is given in Table I.

### I. *The effect of Rationing.*

The present study shows that rationing had little effect upon the protein content or the energy value of these diets, but that the average consumption of fat fell 14 gms. per man per day. Four of the five families consumed less fat. Where strictest economy is necessary, as was the case here, the housewife generally relies on margarine as her chief source of fat, the fats in meat being

<sup>1</sup> See *Special Report Series*, No. 20, 1918, and also, from the economic standpoint, in *Proc. Roy. Soc. Edinburgh*, Vol. xxxvii, part II.

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so much more expensive. Dripping and lard could have been used instead of margarine, but that would have been contrary to the usual dietary habits of the families in question, and the housewives seem to have preferred simply to reduce the allowance of fat. Table II shows the extent of the reduction.

Table I.

*Energy Value, Protein and Fat Consumption per man per day calculated on the basis of Atwater's allowances.*

	First study, 1915-16				Second study, Feb. 1917			
	Protein in gms.	Fat in gms.	Energy in calories	Family income	Protein in gms.	Fat in gms.	Energy in calories	Family income
S 84	86.0	93.0	2836	27s.	77.5	63.8	2530	30s.
N 31	128.9	128.2	4174	36s.	103.0	67.8	3112	39s.
H 47	88.9	67.2	3003	22s.	85.0	62.3	2714	23s. 5d.
M 112	88.0	97.5	3318	30s.	105.9	98.1	3476	55s. 6d.
N 150	148.4	105.3	3568	25s.	138.6	112.8	3690	35s. 6d.
Average	108.0	98.2	3380	—	102.0	81.0	3104	—
Average*	93.1	84.2	2897	—	87.4	69.4	2661	—
	Third study, Nov. 1917				Fourth study, Dec. 1918			
S 84	82.3	66.0	2289	38s.	79.9	65.3	2713	55s.
N 31	123.1	77.2	4079	44s.	104.7	60.3	2892	41s. 6d.
H 47	100.1	77.2	3159	34s.	93.3	62.9	3003.1	34s.
M 112	119.9	134.6	3650	41s.-61s.	100.0	71.0	3332.1	61s.
N 150	105.0	92.7	3202	48s.	146.1	117.4	3691.1	68s.
Average	106.1	89.5	3276	—	104.8	75.4	3126	—
Average*	87.5	76.7	2808	—	89.6	64.6	2680	—

\* Corrected to Lusk standard (p. 411).

Table II.

*Amounts consumed per man per week in lbs. on the basis of Atwater's allowances, and the food value purchased per penny spent in each study.*

	First study							Second study						
	Flour	Potatoes	Meat	Sugar	Milk in c.c.s	Butter and margarine	Calories per lb.	Flour	Potatoes	Meat	Sugar	Milk in c.c.s	Butter and margarine	Calories per lb.
S 84	4.97	4.03	1.0	.86	2267	.51	354	5.64	.78	.91	.84	739	.64	265
N 31	7.51	1.7	1.69	2.08	2191	.52	413	7.58	.7	1.6	.68	801	.45	324
H 47	4.0	4.0	.91	1.52	868	.50	418	7.69	—	.62	.57	340	.57	330
M 112	4.55	4.52	1.71	1.43	2079	.71	400	7.87	2.1	1.79	.87	808	.85	303
N 150	7.04	8.16	3.69	.56	2464	.21	277	7.08	5.55	3.29	1.23	1360	.49	182
Av.	5.61	4.48	1.8	1.29	1974	.49	372	7.17	1.83	1.74	.84	810	.6	281
	Third study							Fourth study						
S 84	6.26	2.04	1.18	.52	1041	.33	222	4.69	2.93	1.15	1.25	1420	.47	217
N 31	9.63	5.12	.97	1.16	2431	.88	378	7.55	3.49	1.74	.81	1453	.47	223
H 47	7.06	5.95	.96	.58	800	.57	345	6.89	3.68	.99	.83	477	.46	269
M 112	6.32	5.72	1.21	.90	1737	1.32	241	7.72	3.38	2.12	1.34	1560	.32	192
N 150	5.13	9.9	2.72	.73	1459	.58	203	6.10	5.40	4.0	.50	2470	.20	148
Av.	6.88	5.75	1.41	.78	1494	.74	278	6.59	3.78	2.0	.95	1476	.38	210

The diet which shows an increase of fat (N 150) is that of a family, which had a considerable advance of income during the war. The fat eaten by this family came mainly from meat, particularly from unrationed sausages and bacon. Indeed they did not draw their full margarine ration, and the mother was in the habit of using a small quantity of dripping each day to light the fire!

The official weekly rations at that time were: Sugar  $\frac{1}{2}$  lb., Margarine  $\frac{1}{4}$  lb. and Butter 1 oz. Meat (excluding rabbits, bacon and sausages, which were not rationed) could be purchased to the value of 1s. 3d. per person per week. There were also lard and jam rations each amounting to  $\frac{1}{4}$  lb. weekly. The former none, and the latter only two of the families purchased.

*Meat.* All the families had slightly more meat at the fourth than during previous studies. This was probably due to the butter and margarine restrictions. The average amount of rationed meat eaten during the study week was only  $\frac{1}{2}$  lb. per person.

*Sugar.* Families S 84 and M 112 had the Christmas increase to  $\frac{3}{4}$  lb. per person. N 150, on the other hand, did not use the full  $\frac{1}{2}$  lb. ration. On the whole the sugar consumed was more than at the previous study, though not so much as in 1915.

Rationing thus brought about singularly little change. The more determinative factors were income, and the dietary habits of the families.

## II. *A Consideration of the Adequacy of the Diets.*

From Table I it will be seen that, with one exception, there is a singular uniformity in the energy value of the diet of each family at the four different periods. This, however, is no guarantee that the food is sufficient. Recent investigations would seem to show that Atwater's allowances for age and sex, upon which these and all previous dietary studies have been calculated, are not adequate. Lusk has suggested that the following values may be taken as representing the ratio of the food requirements of the child to that of the average man, and this has been accepted by the Food Committee of the Royal Society, and the International Committee.

LUSK		ATWATER	
Age	Coefficients	Age	Coefficients
0-6	0.5	Under 2	0.3
6-10	0.6	2-5	0.4
10-13	0.83	6-9	0.5
13-20 (boys)	1.0	10-13	0.6
Average man	1.0	14-16 (boys)	0.8
		Average man	1.0
13-20 (girls)	0.83	14-16 (girls)	0.7
Average woman	0.83	Average woman	0.8

These figures were calculated on the basis of the standard measurements of the Anthropometric Committee, 1883, and on the experimental work of Du Bois, who proved that the energy expended per unit of body surface is greater

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in children than in the adult male. The adoption of Lusk's coefficients instead of Atwater's raises the average equivalent per person in the five families from 0.6 to 0.7 of a man. The values of the diets according to Lusk's allowances are given at the foot of Table I. These are much below what is usually thought necessary. The explanation of this probably lies in the fact that in three of the families the children were markedly below the Anthropometric Committee's averages. Omitting N 150, where there were only two small children under five years, whose dietary needs were small compared with those of the parents, the figures were as follows:

*Height in cms.*

Age	Anthropometric Committee		N 31		S 84		H 47		M 112	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
2	85.5	81.1	—	—	—	—	66.7	—	—	—
5	104.2	103	—	—	91.4	—	—	—	—	—
6	111.8	108.9	—	—	—	—	90.1	—	—	—
7	116.8	112.9	—	—	101.0	—	—	—	108.6	—
8	119.5	118.4	—	—	—	—	—	105.4	—	—
9	126.2	123.8	126	—	—	125	—	—	111.8	—
10	131.7	129.7	132	—	—	—	—	107.6	—	—
11	135.8	134.9	—	—	131.4	—	—	—	—	—
12	139.7	141.4	—	—	—	—	123.2	—	—	125.7
13	144.6	146.7	—	144	—	—	—	125.7	—	125.7
14	150.7	151.9	—	153	138.4	—	—	—	136.5	—
15	155.4	154.6	—	156	—	—	—	—	—	—
Adult	171	159.3	—	159.2	174	161.3	170.1	156.2	—	154.7

*Weight in kgms. (without clothing).*

Age	Anthropometric* Committee		N 31		S 84		H 47		M 112	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
5	18.1	17.8	—	—	14.32	—	—	—	—	—
6	20.1	18.9	—	—	—	—	14.0	—	—	—
7	22.5	21.6	—	—	15.91	—	—	—	17.27	—
8	24.9	23.6	—	—	—	—	—	19.32	—	—
9	27.4	25.2	22.05	—	—	20.45	—	—	20.0	—
10	30.6	28.1	25.45	—	—	—	—	19.54	—	—
11	32.7	30.8	—	—	30.5	—	—	—	—	—
12	34.8	34.6	—	—	—	—	25.0	—	—	23.87
13	37.5	39.5	—	31.82	—	—	—	26.82	—	23.4
14	41.7	43.9	—	44.54	30.45	—	—	—	32.5	—
15	46.7	48.3	—	47.73	—	—	—	—	—	—

\* The Anthropometric Committee's average includes clothing. In the present investigation the weight of the clothing varied from 1 kgm. in the case of children of five or six years to 3 kgm. for the older ones.

The measurements of the children in height and weight fell so far below the Anthropometric Standard upon which Lusk's coefficients are based, that an independent calculation of the probable basal needs of the various children of each family was made.

The body surface was calculated from the formula

$$S = 0.007184 \times W^{0.425} \times H^{0.725},$$

where  $S$  is the surface in square metres,  $W$  the weight in kilograms, and  $H$  the height in centimetres, and the heat evolved per square metre per hour by the formula  $\log y = 1.8362 - 0.0118x$ , where  $x$  is the age in years and  $y$  the required basal metabolism per hour.

From the total calories consumed during the week by each family were subtracted first the requirements of the parents on the basis that they were persons of average size. The women's food requirements, *i.e.* as eaten, were taken as being equal to 0.83 that of a man at a sedentary occupation, *i.e.* 2500 calories per day. Allowances were made for the men according to their occupations. The basal requirements of the children, calculated as indicated above, were then subtracted, the remainder being the energy available for movement, heat production, muscular work, digestion and growth. The Food (War) Committee of the Royal Society<sup>1</sup> have attempted to deal in this manner with the food requirements of children. Although sufficient data were not forthcoming to allow the Committee to make a definite statement, they tentatively suggest doubling the basal needs for ordinary life and trebling in the case of a very active child.

From the poor physique of the children, in the present investigation, it is apparent either that their food has not been sufficient to allow for normal growth, or that some other factor or factors have inhibited growth. In approaching this question it is necessary to find out whether the diets were the result of unrestricted choice, or whether poverty compelled the mothers to limit the children's food. Each family will be considered by itself.

A. *Families, whose diet has been fairly constant in energy value at the four periods of study.*

	Calories
S 84. Total calories in 7 days' food ... ..	95,160
Father, labourer, at 3500 calories daily ... ..	24,500
Mother at 2500 calories daily ... ..	17,500
Calories remaining for children ... ..	53,160
Basal needs of Alexander (14) ... ..	8,701
,, Charlie (11) ... ..	9,100
,, Emily (9) ... ..	7,651
,, Tommy (7) ... ..	6,713
,, David (5) ... ..	5,999
,, Baby (3) ... ..	5,250
Total basal needs of children for 7 days ... ..	43,414
Calories in the food available for energy expenditure in growth, etc. ...	9,746

or 22 per cent. of the basal needs.

All the children are below the Anthropometric Standard Average. Allowing 2 kgms. for clothing their average deficiency in weight is 3.7 kgms. or 13 per cent.

<sup>1</sup> *Report on the Food Requirements of Man and their Variations according to Age, Sex, Size and Occupation, March 1919.*

		Calories
H 47.	Total calories in 7 days' food ... ..	100,894
	Father, shoemaker, at 3150 calories daily ... ..	22,050
	Mother 2500 calories daily ... ..	17,500
	Remainder for children ... ..	61,344
	Basal needs of Hannah (13) ... ..	7,903
	„ Walter (12) ... ..	7,609
	„ Ina (10) ... ..	6,629
	„ Jessie (8) ... ..	6,692
	„ William (6) ... ..	5,600
	„ Sandy (2) ... ..	5,250
	Total basal needs of children for 7 days ... ..	39,683
	Calories available in the food for energy expenditure in movement, growth, etc. ... ..	21,661

or 55 per cent. of the basal needs.

All the children are below the average in size. Allowing 2 kgms. for clothing, their deficiency in weight averages 6.28 kgms. or 21.5 per cent.

		Calories
M 112.	Total calories in 7 days' food ... ..	84,968
	Father, seaman, for 1 whole day and 2 meals ... ..	5,830
	Mother 2500 calories daily ... ..	17,500
	Calories remaining for children ... ..	61,638
	Basal needs of James (14) ... ..	8,624
	„ Sarah (13) ... ..	7,553
	„ Peggy (13) ... ..	7,490
	„ Robert (9) ... ..	7,079
	„ David (7) ... ..	6,895
	„ Kathie (2) ... ..	5,250
	Total basal needs of children for 7 days ... ..	42,891
	Calories available in the food for energy expenditure in growth, movement, etc. ... ..	18,747

or 44 per cent. of the basal needs.

All the children are undersized. Allowing for clothing as above, they fall short by 8.71 kgms. or 25.5 per cent. of the Anthropometric Committee's averages.

*B. Family, whose diet has varied considerably from time to time.*

		Calories
N 31.	Total calories in 7 days' food ... ..	86,769
	Mother at 2500 calories daily ... ..	17,500
	Calories remaining for children ... ..	69,269
	Basal needs of Nettie (15) ... ..	10,881
	„ Bessie (14) ... ..	10,734
	„ Alice (13) ... ..	9,043
	„ Robert (10) ... ..	8,491
	„ John (9) ... ..	8,958
	„ Tommy (3½) ... ..	5,600
	Total basal needs of children (7 days) ... ..	53,707
	Energy in the food remaining for movement, growth, etc. ... ..	15,562

or 29 per cent. of the basal needs.

The two elder girls are above the Anthropometric Committee's average in size, the four younger children are slightly below. The marked fluctuations in energy value of the food consumed by this family were entirely due to changes

in income. When first studied they were in comfortable circumstances. At that time they were consuming, on Atwater's allowances, 4174 calories per man per day. At the second study, owing to the rise which had taken place in the cost of living without a corresponding increase in the family income, they could only afford 3112 calories per man per day. With an improvement in income, when the eldest girl left school, the value of the diet again rose to over 4000 calories, which is equivalent to more than twice the basal needs. In December, while the cost of living had further risen, the eldest girl had had to leave her work to help her mother at home. The Government Separation Allowance was then their only source of income, and this fact at once made its influence felt on the food. In spite of the temporary periods of shortage, the children appear to have suffered little interruption of growth.

Probably in all the foregoing families the metabolism is lower than it would be with a plentiful diet. This would make it possible for them to go on for some time on such small supplies. But if this is so, it will be accompanied by a lessening of the muscular activity necessary to healthy development.

### III. *The cost of living.*

The average value obtained by the five housewives was 210 calories per *ld.* This represents very economical purchasing, the diets including almost no milk, no eggs, little meat, little fish, and little fat. The energy came chiefly from bread and potatoes. Possibly the stunting of growth noticed in the children may be due to a deficiency in food containing the accessory growth-producing factors.

The problem narrows itself down to one of poverty. Only one family (N 150) could afford even the freedom of choice allowed by the rationing scheme. Assuming that children require twice as much food as their basal needs, we can calculate how many calories each mother ought to purchase in food. If divided by 210, the average number of calories purchasable per penny, this will represent the amount which, at the very least, each mother ought to spend on food. More could with advantage be spent so as to allow of more milk, eggs, etc. The following table compares the amount which, from the above calculation, should have been spent on food with the total weekly income of each family:

Table III.

No. of family	Cost of food	Weekly income
	£ s. d.	£ s. d.
S 84	2 11 1	2 15 0
H 47	2 7 4	1 14 0
M 112*	2 3 4	3 1 0
N 31	2 9 11	2 1 6

\* Father intemperate, mother careless.

In addition to food the mother has to make her income cover the costs of rent, coal, gas, clothing, boots, cleansing, and insurance.

## SUMMARY.

1. Throughout the war the food value of the dietaries investigated with one exception showed great constancy, temporary shortage of certain commodities being compensated for by the greater use of others, especially of flour.

2. The food consumed was determined much more by the income and dietary habits of the families than by the restrictions imposed by rationing. The marked variations in the energy value of one dietary from time to time (normally a generous one) were directly caused by changes of income.

3. The children of three families were markedly below the average in height and weight. As the energy available in the food of these families only averaged 40 per cent. above their basal requirements calculated according to age and body surface, it seems probable that the interruption of growth had been caused by an insufficient supply of food.

4. A fourth family had at two periods of study an equally low intake of energy, but during the other two studies had at least 100 per cent. above the basal energy requirements. As the children were normal in development, growth was apparently unchecked by the temporary periods of food shortage.