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**BRITISH NEEDS AND RESOURCES OF
CALORIES, PROTEIN AND CALCIUM**

Chairman: THE RIGHT HON. COL. WALTER ELLIOT, P.C., M.P., F.R.S.

The Food Needs of the United Kingdom

By E. R. BRANSBY and H. E. MAGEE, *Ministry of Health, Whitehall, London, S.W. 1*
and M. C. BOWLEY and B. R. STANTON, *King Edward's Hospital*
Fund for London, 10 Old Jewry, London, E.C. 2

The purpose of this paper is to provide an estimate of the amounts of foods required to meet the needs of calories, protein and calcium of the population of the United Kingdom. The first step was to plan, for representative individuals in the various age and other groups, diets which would conform with British dietary habits unhindered by rationing, and provide a sufficiency of calories, protein and calcium in accordance with the recommendations of the Technical Commission of the League of Nations (Table 4, columns headed R).

The general type of representative menu for adults and older children is shown in Table 1, and specimen menus for a week, in more detail, in Table 2. Suitable modifications were made for young children. The menus are intended to cover all foods eaten in the home and outside it, in natural or manufactured form. Estimates were then made of the amounts of the foods needed to provide each age group for 1 week with the diets thus planned (Table 3), then for each of the groups for a year, and, finally, these foods were collected into eight broad categories, and the needs were estimated for the population in the near and distant future compared with that pre-war (Table 5). The estimates are, by their nature, approximate. The pre-war population was taken as that in 1934-8, that for the near future as being the same as at the end of 1946, and for the distant future as being that estimated for 1964†.

Requirements of calories, protein and calcium

The first report of the Technical Commission of the Health Committee (1936) of the League of Nations sets out the energy and protein requirements for all ages, for expectant and nursing mothers, and the extra energy needs for various grades of muscular activity and, in addition, gives a number of dietary schedules 'to show how

* See notice on p. 306.

† Prepared from figures calculated by Mr W. A. B. Hopkins, Member of the Staff of the Royal Commission on Population.

a selection of common protective foods will ensure safe intakes of the necessary protein, minerals and vitamins for a pregnant and nursing woman and for infants and children of ages up to 14 years'. The second report of the Technical Commission on Nutrition (1938) of the League of Nations gives further particulars of the supplementary energy required for varying grades of muscular work and suggests levels of intake for minerals and vitamins.

Table 1. *Type of menu in diets as planned for older children and adults**

Breakfast	Supper
Cereal with milk and sugar, or fruit, cooked protein dish	Cooked protein dish
Bread, butter or margarine, preserve	Salad or vegetables
Tea or coffee	Sweet or cake or fruit
Dinner	Bread and butter or margarine
Cooked protein	Tea or coffee
Potatoes and vegetables	Bedtime
Sweet or cheese, butter or margarine and bread or biscuits	Milk drink
Tea	Biscuits or sandwiches
Tea	
Bread, butter or margarine	
Preserve, a salad, or fish or meat paste	
Buns or cakes	

* The menu consists of three main meals, breakfast, dinner and supper together with one subsidiary meal, tea or a bedtime snack. The size and composition of the meals would vary according to local custom.

In discussing the quality of protein, the Technical Commission of the Health Committee (1936) merely said that it should come from mixed sources and that 'it is desirable that a part of the protein should be of animal origin'. No support was given to the earlier statement of the Mixed Committee on the Problem of Nutrition (1936) that 'it is usually held that about 50% of the protein in the diet should be of animal origin'. The many statements that have been made that definite amounts or proportions of animal protein are essential for good nutrition are not supported by any experimental evidence. We, therefore, have based the composition of the planned diets, on which our estimates have been made, on prevailing dietary habits and not on any alleged standard for animal protein.

The reports of the Technical Commission cannot be applied as they stand to a mixed population because they contain numerous gaps. For instance, the dietary schedules cover only the expectant and nursing mothers, and children from 0 to 7 years and from 12 to 14 years, and only general statements are made about other people. The result of applying the Technical Commission's recommendations to the population of Great Britain was worked out for the Ministry of Health's Advisory Committee on Nutrition by Mr R. F. George and one of us (H. E. M.). In doing this, account had to be taken of the age and sex distribution of the population, their body-weight, type of occupation and other particulars, such as the muscular activity of children and adolescents. The results of this study have already been published (West Riding of Yorkshire County Council, 1939; Magee, 1943; Bransby & Magee, 1947), and the values obtained for protein, calories and calcium are those used to represent the requirements in the columns headed R in Table 4.

Table 2. Specimen menu for 1 week for diets as planned for older children and adults

Meal	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast	Porridge Milk and sugar Bacon	Raw orange Haddock	Cereal Milk and sugar Egg	Grapefruit Kipper	Cereal Milk and sugar Bacon	Porridge Milk and sugar Sausage	Stewed fruit Bacon
Dinner	Cold meat Mashed potato Salad	Stew Potatoes Root vegetables	Cheese savoury Potatoes Grilled tomatoes	Cutlets Onion sauce Potatoes Green vegetables	Steamed fish Sauce Potatoes Carrots	Steak and kidney pudding Potatoes Green vegetables	Roast meat Yorkshire pudding Potatoes Green vegetables
Tea	Steamed pudding	Eve's pudding	Trifle	Milk pudding	Baked sponge	Stewed fruit Custard	Fruit pie and custard
Supper	Tea with milk and sugar, bread, butter or margarine, preserves or salad, or fish or meat paste or vegetable extract spread, cakes or buns	Macaroni cheese Vegetables	Ham, tongue and salad	Pork pie and salad	Savoury omelette Tomatoes	Fish Potatoes	Cheese Salad

Bread, and/or potatoes and vegetables, butter or margarine, sweet or cake, fruit, tea or coffee with milk and sugar

Note. For expectant and nursing mothers: milk mid-morning and bedtime, and milk puddings served more frequently.

In planning the diets on which we base our estimates, we aimed at what was described by the International Labour Office (1938) as the 'comfort' level. We fully realize that there can be no hard and fast dietary regimen for the country as a whole, but are of the opinion that the general pattern we have chosen conforms with the tastes of the majority. Within this dietary framework we adopted certain estimates for the amounts of the various foods.

Table 3. *Suggested weekly amounts of foods needed for various groups of the population to supply the diets as planned*

Food item	Under 1 year*	1-2 years	3-6 years	7-11 years	12-14 years	15-16 years	17-20 years	Males	Females	Ex-
								over 21 years	over 21 years	pectant mothers
Milk (pt.)	10½	10½	10½	10½	10½	7	7	3½	3½	14
Meat, fish, bacon and offals (oz.)	1½	4	8	16	30	40	40	44	35	35
Eggs (no.)	3	4	4	4	4	4	4	4	4	7
Cheese (oz.)	0†	1	2	3	4	6	3	3	3	0†
Potatoes (oz.)	4½	18	36	48	84	91	96	96	64	72
Vegetables (oz.)	3½	19	21	32	35	42	42	42	35	42
Fruit‡ (oz.)	14	29	28½	38	37	36	36	36	32	37
Total fresh-fruit equiv.§ (oz.)	14	30	30	40	40	40	40	40	35	40
Pulses (oz.)	0	0	0	0	4	4	2	2	2	2
Sugar (oz.)	8	6	8	10	15	20	20	20	20	20
Preserves (oz.)	0	2	3	4	6	8	8	8	6	6
Sweets (oz.)	0	2	4	4	4	4	4	4	4	4
Total sugar (oz.)	8	8½	12½	15	21	27	27	27	26	26
Cereals (oz.)	2	4	5	6	6	6	6	6	6	6
Flour¶ (oz.)	2	8	15	35	53	54	58	63	40	45
Total grain** (oz.)	4	12	20	41	59	60	64	69	46	51
Fats (butter, margarine, etc.) (oz.)	1	3	6	10	13½	13½	14	15	12½	12½
Total fats†† (oz.)	1	3½	7	11	14½	14½	15	16	13½	13½

* The foods allotted to the infant are average quantities throughout the 1st year of life and may be eaten either by the infant or the mother.

† No cheese is allotted to the expectant mother, or to the infant under 1 year, to be eaten by the mother. In both cases, the calcium requirements are met by the foods already included. Both the expectant and newly delivered mother may, however, care to substitute cheese for some of the meat and eggs.

‡ Includes dried fruit.

§ Includes fresh and dried fruit and fruit content of preserves.

|| Includes sugar content of sweets and preserves.

¶ Includes bread.

** Includes cereals and flour.

†† Includes butter, etc., and the fat in sweets.

Requirements of individual foods

Milk

The Technical Commission recommended that expectant and nursing mothers should have about 2 pt. (1 l.) of milk daily, and that a comparatively large quantity should be provided for infants, children and adolescents; the Advisory Committee on Nutrition, Ministry of Health (1937) stated that 'the desirable amount of milk is, for children, from one to two pints per day; for expectant and nursing mothers about two pints per day,

Table 4. *Intake of protein, calories and calcium from the planned diets by various groups of the population, compared with their requirements calculated from the standards of the Health Organization of the League of Nations*

(Technical Commission of the Health Committee, 1936; Technical Commission on Nutrition, 1938)

Nutrient	Under 1 year		1-2 years		3-6 years		7-11 years		12-14 years		15-16 years		17-20 years		Males over 21		Females over 21		Expectant mothers*	
	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N
Protein: Total (g.)	—	33	42	44	50	51	65	68	95	92	100	96	90	91	70	85	60	66	80	96
Animal (g.)	—	30	—	36	—	37	—	43	—	52	—	53	—	49	—	41	—	36	—	62
Vegetable (g.)	—	3	—	8	—	14	—	25	—	40	—	42	—	42	—	44	—	30	—	34
Calories	800	1100	1100	1110	1500	1500	2100	2110	2900	2900	3000	3000	3000	3010	3000	3010	2400	2400	3000	3000
Calcium (g.)	—	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.4	1.4	1.1	1.2	0.8	0.9	0.8	0.8	1.5	1.7

R = Requirements according to the Health Organization of the League of Nations.

N = Nutrients provided by diets as planned.

* Estimated for 6 months of pregnancy only.

Note. The average requirement/head/day of the United Kingdom population at the end of 1946, calculated on the above bases was: Calories 2520, protein 66 g., calcium 0.95 g.

The nutritive values of the diets were calculated from the tables of the Accessory Food Factors Committee (1945).

Table 4a. *Percentage of the population* constituting the various population groups*

Date	Under 1 year		1-2 years		3-6 years		7-11 years		12-14 years		15-16 years		17-20 years		Males over 21		Females over 21		Expectant mothers	
	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N	R	N
End of 1946	1.87	1.3	3.20	2.5	5.98	5.1	6.91	6.6	4.09	4.1	2.57	3.0	5.04	5.9	32.28	34.3	37.08	36.5	1.00	0.7
End of 1964	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Population at end of 1946, 48,016,000; 1964, 50,149,000; pre-war, 47,078,000.

Table 5. Amounts at the retail stage of consumption of eight principal categories of food, needed to provide diets as planned in 1946 and in 1964, compared with the amounts actually consumed in 1934-8

	1	2	3	4	5	6	7	8
	Actual amount retail 1934-8 (lb./head/year)	Actual change in 1946 compared with 1934-8 (%)	Estimated food needs in 1946* (lb./head/year)	Actual amount retail 1934-8 (metric t./year × 10 ³)	Estimated food needs 1946* (metric t./year × 10 ³)	Estimated food needs in 1964* (metric t./year × 10 ³)	Change: 1964 need compared with actual 1934-8 (%)	Change: 1964 need compared with actual 1934-8 consumption (%)
Food category								
Dairy products, as milk solids†	38.3	+29	55.5	820	1212	1233	+48	+50
Sugar‡	105.8	-28	88.7	2264	1936	2056	-14	-9
Meat, fish and eggs	166.9§	-13	155.3§	4107	3899	4163	-5	+1
Potatoes	176.0	+67	269.8	3766	5890	6316	+56	+68
Vegetables	107.4	+8	133.5	2298	2914	3098	+27	+35
Fruit, as fresh-fruit equivalent	141.5	-25	137.4	3028	2999	3159	-1	+4
Fats¶	45.0	-23	44.1	963	963	1026	0	+7
Grain**	209.8	+12	192.5	4489	4202	4507	-6	0

* The populations on which these are based are given in the footnote following Table 4a.

† Includes cheese, excludes butter.

§ Edible portion.

¶ Fat content.

‡ Excludes sugar used for brewing.

|| Carcass basis.

** Flour or product basis.

and for other adult members of the community half a pint of milk daily'. We have allowed the following quantities daily: up to 14 years, 1.5 pt.; 14-20 years, 1 pt.; nursing and expectant mothers, 2 pt.; other adults, 0.5 pt.

Meat, fish, offals and eggs

Neither the Technical Commission nor the Ministry of Health's Advisory Committee made specific recommendations of the desirable amounts of the individual foods in this group. Our menus include one or more cooked meals a day for persons of all ages except infants, comprising helpings of these foods sufficient to make tasty and attractive dishes.

Potatoes, fruit and vegetables

These provide alternative sources of ascorbic acid in the diet, except for infants. The Ministry of Health's Advisory Committee recommended that the pre-war consumption of potatoes could be increased with advantage and, therefore, we allowed for a consumption of potatoes greater than that pre-war, but somewhat less than at the present high level. We retained the vegetable consumption at about the wartime level and included about the amount of fruit consumed before the war, for the sake of variety and palatability.

Sugar

Excessive consumption of sugar is not looked on with favour because it displaces more nutritious foods from the diet, tends to pervert the taste and blunt the appetite of children, and seems to play a part in causing dental caries. Nevertheless, well-balanced diets can be achieved containing fair amounts of sugar, as long as the flour is of high extraction. Moreover, sugar is a good and easily assimilated source of carbohydrate. Weighing up the advantages and disadvantages we concluded that a consumption level between the pre-war one and that of 1946, which was insufficient for domestic purposes, would meet the tastes of the majority, with a minimum of dissent from nutritional experts.

Cereals

We made allowances of breakfast and pudding cereals sufficient for customary domestic practice. The amount of flour allotted to each group was not based on any recommendation, but was adjusted to bring the calorie intake up to the requirements; it was, thus, used as an 'elastic reserve'.

In framing the diets we took account of other nutrients besides calories, protein and calcium; without discussing these in detail, it can be said that the diets did provide for adequate intakes of all these other nutrients.

Adjustment of differences between amounts retail and the edible, together with the inedible, portion of food, for purposes of comparison

In our planned diets the amounts of food allotted to each age group (Table 3) are expressed in terms of the food as edible, together with the inedible, portion, but the pre-war, base-line figures of national food consumption (Table 5, column 1) are those

for foods entering the retail stage of distribution. Our estimates had, therefore, to be adjusted back to the retail stage of distribution to make comparison possible. Before the war 3000 Cal./head/day entered the retail stage of distribution, whereas the average requirement was 2590 Cal./head/day (Ministry of Food, 1947). The number of calories entering the retail stage thus exceeded the theoretical requirement by 16%, reduced to 13% in 1946. We, therefore, increased our totals of food 'as purchased' by 15% to bring them back to the retail stage.

Statement of requirements

Our final estimates of food requirements are set out in Table 5. This shows the actual amounts of the eight categories of food reaching the retail stage of consumption in 1934-8 in lb./head/year (column 1); the percentage change in these amounts in 1946 compared with pre-war (column 2); the estimated amount of food needed in lb./head/year in 1946 (column 3); the actual amounts of food in metric t., retail stage, in 1934-8 (column 4); the gross needs estimated at the retail stage in metric t. for the estimated populations at the end of 1946 and of 1964 (columns 5 and 6, respectively); and the percentage changes in the two last amounts compared with the first (columns 7 and 8, respectively).

Many estimates have been made of the food needs of the United Kingdom. We shall discuss only those presented by the Food and Agriculture Organization of the United Nations (1946) (F.A.O.) and by Leitch (1944). Leitch expressed her estimates/head and, as our calculations for 1946 relate to a population only 2% larger than the pre-war one, we could compare our findings with hers without any serious readjustments. The F.A.O. estimates, like ours in Table 5 (columns 5 and 6), are gross, but F.A.O. differed from us in estimating for the population in 1950, for which an increase of 6% over the pre-war one was allowed, compared with an increase of 2% at the end of 1946. We, therefore, adjusted the estimates of F.A.O. to a 2%, instead of a 6%, increase in population to make the two sets of estimates comparable. The results are in broad agreement except that we recommend increases of 56% in potatoes and 11% in fruit and vegetables compared with F.A.O.'s respective values of 2% and 64%. For potatoes, fruit and vegetables combined, we estimate an increase of 30%, and F.A.O. one of 43%. The apparent disagreements between these figures and those in Table 5 and in the report of the Food and Agriculture Organization of the United Nations (1946) are due to weighting and adjustments. The F.A.O. figures are based on 'a moderate cost diet drawn up by nutrition experts in the U.S. Department of Agriculture', and Leitch's are based on the moderate cost and liberal diets of Stiebeling, and also on the League of Nations standards. There are substantial differences between the F.A.O. figures and those of Leitch based on Stiebeling's moderate cost diet. On the basis of consumption/head, Leitch estimates an increase of 100% for milk and cheese against F.A.O.'s 49%; for meat, fish and eggs the corresponding figures are -27 and 0%; for sugar -34 and -17%; and for grains -26 and -8%.

Leitch's estimates and ours, both based on the League of Nations standards, agree broadly for sugar and cereals. For milk Leitch suggests an increase of 141% against our 48%. For meat, fish and eggs a decrease of 26% compared with our

decrease of 5% is suggested by Leitch, and for potatoes, fruit and vegetables (excluding legumes) a decrease of 8% compared with our increase of 30%. Leitch's estimate for meat, fish and eggs would reduce consumption to about that in 1941, the worst period of the war. The differences are doubtless due to differences in selection of the kinds and amounts of foods whereby the targets set for nutrients by the League of Nations could be reached. We regarded as fundamental the satisfaction of the public taste and this obviously could not be achieved in these islands without liberal amounts of meat, fish and eggs. Since Leitch's estimates for these foods are far below ours, it would seem that she attached less importance to this criterion than we have done.

Our procedure was governed by two important assumptions, that there would be no rationing, and that nobody would obtain more or less than the quantities we had allotted to them. Without strict rationing, the latter would not apply and consumption would be influenced by factors such as income. It would, therefore, be necessary to provide more of the nutritious and dietetically desirable foods than the estimates in Table 5 allow. These considerations raise questions of a social and economic nature which might well form the subject of a future symposium of the Society.

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Home Production of Wheat, Potatoes and Sugar-beet

By E. T. JONES, *Welsh Plant Breeding Station, Aberystwyth*

Home production in 1946

Taking 1946 as a basic year, the estimated quantities of wheat, potatoes and sugar-beet harvested in the United Kingdom in that year, as given by the Central Statistical Office (1947), were 1,967,000, 10,166,000 and 4,522,000 t. respectively. To arrive at the net amounts available as food for human consumption, deductions have to be made for seed and screenings of wheat and potatoes retained on the farm, the sugar-beet total