

Editorial.

STUDIES IN NUTRITION.

IN March this year the Medical Research Council issued a Report on an inquiry into the diet of families in the Highlands and Islands of Scotland by Professor E. P. Cathcart and Mr. A. W. T. Murray.

The Council state that among the basic data for research on human nutrition, and for application of scientific knowledge to its practical problems, it is clearly necessary to have definite information as to the actual diet of the people. This can only be obtained by careful and laborious studies of samples of the population.

A number of surveys of this kind have been made by Cathcart and others. In 1931 a report was issued on studies at St. Andrews, and in 1932 another report on similar studies in Cardiff and Reading. In 1936 a further report was issued on an analysis of the same data from the standpoint of actual foodstuffs rather than of fundamental constitution (protein, fat, carbohydrates, minerals, and vitamins).

The studies now described relate to the Highlands, and were made in summer on a selected number of families to determine the food intake of each for the period of one week. Duplicate studies of some of the families were made in winter, partly to reveal any seasonal variations and partly as a check on the reliability of a single week's observations as an index of the diet as a whole. The evidence so obtained showed that their method was sound, although there were some differences in food consumed in summer and winter respectively. The figures obtained in these studies relate to family groups and not directly to individuals.

Cathcart writes that although much information has now been collected on the nature and composition of diets consumed by urban and semi-urban communities, little is available as to the diets of those living in purely rural areas, in many cases far removed from large shopping centres. The difficulty of obtaining such data for the Highland and Island areas of Scotland was clearly brought out in a report to the Department of Health for Scotland (1936) by the committee which inquired into Scottish Health Services. Many witnesses deplored the passing of the old staple foods of porridge, salt herring, and potatoes, and the substitution of shop bread, tinned foods, tea and sweets, and other substances purchased from traders' vans. At the request of the committee a number of doctors supplied them with diets which they regarded as typical; they thought that a firm conclusion could not be drawn from their data and recommended further investigation. The majority of the doctors practising in these areas to-day maintain that though the diets may be lacking in variety and the amount of oatmeal used has

diminished in quantity, the families are reasonably well fed. A small minority of doctors believe that owing to the dispersion of shop-made articles the dietary is on the downward grade.

Cathcart considers there is certainly a general, and it would seem a well-founded complaint, about the lack of home-grown vegetables, the diminishing consumption of fish, and the widespread winter shortage of milk.

The present dietary study in the Scottish Highlands, in which the dietaries of 56 families were investigated by the methods previously used, was made on a number of relatively isolated areas in the counties of Ross, Sutherland, and Inverness. Most of the families belonged to the crofting class, but many had subsidiary occupations as fishermen, labourers, and so on. It was impossible to obtain trustworthy information as to their economic status, and even if it had their income in terms of money would give but little information of their real economic status.

The number of people involved in the study was 349, of whom 118 were children under 12 years of age. The average family man-value on the Cathcart-Murray scale was 4.62, and the average diet man-value 4.76. The average caput value was 6.02. The use of these coefficients was explained in the Cathcart and Murray report of 1931. To express a family diet in terms of the amount consumed by an adult male, it is necessary to divide the total by a figure which is arrived at by assigning a fractional value—on a scale based on experience—to each member according to sex and age. This figure is the family man-value. The “diet man-value” is a corrected figure in which allowance is made for individual absence from meals and for entertainment of visitors. The caput value is merely the number of persons in the family and gives the consumption per head irrespective of age and sex.

The question whether the data obtained from a single week's observation of the dietary of a single household can be regarded as a reliable guide to the average diet of the family is still under discussion. In the last report of the Technical Commission on Nutrition of the Health Organization of the League of Nations it is recommended that “all inquiries be repeated three or four times during the course of the year in order that seasonal variations may be brought to light. These variations are not of equal importance in all circumstances.” Cathcart states that seasonal variation under modern conditions of urban life is most obvious in respect of vegetables, especially green vegetables, and also to a certain extent of fruits. These differences may definitely affect the quality of the diet but play an infinitesimal part on the quantity or energy side. Unfortunately the purchase of green vegetables does not form a striking item in the budget of the majority of the poorer members of the community at any time; seasonal variation is not in practice a major factor. When the income is available for the purchase of seasonal foodstuffs other than vegetables, seasonal variation may quite definitely influence the type of dietary.

That seasonal variation has only a small influence in determining the

nature of the food consumed by the less wealthy members of the community is certainly suggested by the duplicate dietary survey made in St. Andrews. There the mean values obtained for the two studies were to all intents and purposes identical. The general impression was that there was little difference in the consumption of food in winter and summer, although there were distinct differences between individual duplicated studies. The general impression given, both from the money expenditure and the type of food-stuffs purchased, was that on the whole there was little real difference in the consumption of food in winter and summer. While this conclusion may be valid for urban it might not be true for communities far removed from shopping centres, as the family has to subsist to a greater or less extent on home-grown materials and the simple staples. This point was tested by a further study of 44 families in the late autumn and winter season. There are thus duplicate data for 44 families at six months' interval. The results obtained are stated in the following table:—

TABLE I.—SUMMARY OF DIETS OF 58 HIGHLAND FAMILIES (USING THE CATHCART-MURRAY MAN-VALUE SCALE).

	Family man-value=4.62 Diet man-value =4.76	Protein	Fat	Carbohydrate	Total Calories	Calories, less 10 per cent
Daily intake per man		118 g.	128 g.	587 g.	4,082	3,673
Standard deviation		32.8	41.3	164.8		939
Percentage of total calories ..		11.8	29.3	58.9		

Cathcart considers that the formula for calculating man-value gives a reasonably fair measure for the population in this country. Quite recently Evang and Hansen used this scale as being best suited for their study of a population in Norway very similar to our own.

The values stated in terms of the international scale, calculated on a 3,000 calorie basis, are given in Table II.

TABLE II.—COMPARISON OF CATHCART-MURRAY AND INTERNATIONAL FAMILY COEFFICIENTS.

No. of families	Diet man-value	Coefficient	Intake per man per day			
			Protein (grammes)	Fat (grammes)	Carbohydrate (grammes)	Total calories
58	4.76	C.M.	118	128	587	4,082
58	4.57	International	124	136	620	4,313

It will be noticed that 10 per cent is allowed for loss. As this could not be determined, the gross intake was reduced by the conventional figure of 10 per cent. The difficulty of determining the actual consumption was due to certain of the constituents of the household meals, particularly potatoes, which are prepared in larger amounts than are required for the household meals, and the excess is used for the feeding of fowls, etc. The actual waste of edible calories is very small and probably is quite comparable to that determined in former studies, viz. a wastage of the order 2.5 per cent and probably a reduction of 2 to 3 per cent in the cases of protein and fat would more than cover such losses as take place.

The percentage derivation of the total calories corresponds to the general

distribution found in the previous studies. There is, however, a slight increase in the calories derived from protein and a diminished percentage from fat.

So far as gross quantities are concerned the rural Highland diets were superior to the earlier urban ones. The amount of protein consumed is definitely high and the fat consumption substantial. The intake of total carbohydrate is also higher than in the previous studies.

Duplicate studies of 44 of the families are shown in the following table :—

TABLE III.

	Protein	Fat	Carbohydrate	Total calories	Calories less 10 per cent
<i>Summer—</i>					
Family man-value = 4.51					
Daily intake per man	122 g.	134 g.	587 g.	4,155	3,744
Standard deviation	32.6	41.3	187.6		895
Percentage of total calories ..	12.0	30.0	58		
<i>Winter—</i>					
Family man-value = 4.57					
Daily intake per man	118 g.	138 g.	567 g.	4,080	3,681
Standard deviation	30.6	38.0	124.1		744
Percentage of calories	11.8	31.4	56.8		

There is close agreement between the two sets of studies. While the winter protein is some 3.6 below, the fat is 2.8 above the summer intake ; winter carbohydrate is about 3.5 per cent below summer intake, as is also the energy content by about 1.6 per cent. The striking agreement suggests that seasonal variation plays only a modest role in influencing the average intake of a group of families.

It might have been expected that there would have been a definite increase in food intakes in the winter period, but this is not apparent. The probable explanation is that the inclement weather and shortness of the working day caused the families to lead a less strenuous life as regards out-of-door activities with a consequent diminution of energy expenditure. At the same time heat-loss is diminished by keeping the house warmer and wearing heavier clothes.

MINERALS AND VITAMINS.

The intake of protein, fat, carbohydrate, and total calories may be regarded as fully adequate—are the minerals and vitamins similarly adequate ? Cathcart calculated the summer and winter intakes both per caput and per man. The results suggest, if the Sherman standards of 0.68 gramme for calcium, 1.32 grammes for phosphorus, and 0.015 gramme for iron be adopted, that both on the man and caput basis the needs of the families were on the average satisfied both in the summer and winter studies. Cathcart's figures are : *Summer, per man*, calcium 1.32, phosphorus 2.49. *Per caput*, calcium 1.04, phosphorus 1.98. *Winter, per man*, calcium 1.13, phosphorus 2.25 ; *per caput*, calcium 0.89, phosphorus 1.79. Even the lower caput value of 0.89 gramme of calcium in the winter study would allow 1.2 grammes to each child below age 12 and leave 0.7 gramme per head for the remainder of the family.

The vitamin intakes, so far as A, B₁ and C are concerned, were calculated from special scales drawn up by Fixsen and Roscoe, and on one which was compiled by the Rowett Research Institute, from the data for vitamins A and C prepared by Fredericia and for B₁ from the data of Baker and Wright. The B₂ and D estimates were only available on the Fixsen-Roscoe scale; and for these mean values were calculated.

The last report of the Technical Commission on Nutrition of the Health Organization of the League of Nations states that "the existing data on vitamin requirements are difficult to apply and also to establish, and all figures contained in this section of the report are to be regarded as approximate and provisional." The figures given in the report are for vitamin A 1,400-3,000 International Units, for B₁ 300 International Units, and for C 600 International Units (30 mg. of ascorbic acid). For vitamin D no general figure is given; the requirement depends on the amount of sunshine enjoyed, as well as on the quantities of calcium and phosphorus in the diet. Cathcart's figures in terms of International Units per day are:—

Vitamins	FREDERICIA SCALE.				FIXSEN-ROSCOE SCALE			
	Per man		Per caput		Per man			
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
A	2,653	2,637	1,997	2,177	9,232	6,672		
B ₁	1,033	974	778	780	1,185	1,257		
C	1,179	1,378	924	1,090	2,240	2,740		
D	—	—	—	—	3,855	4,464		
B ₂	—	—	—	—	0.66*	0.56*		

* Mg. of Riboflavin.

Cathcart considers the intakes of A, B₁ and C, are adequate.

Study of the foodstuffs used was also made and certain items may be regarded as of universal consumption. These include butter, white bread, potatoes and (curiously enough) a luxury in the form of "tea" bread. Eggs belong to the same group. Beef, ham and bacon, cheese, and root vegetables form a second group of food materials, common to about three-quarters of the families studied. It is interesting to note that, as in the case of St. Andrews, the consumption of fresh fish by the Highland families is low—even in the summer study. The consumption of leafy vegetables is also low, although that of root vegetables other than potatoes is high.

DIETARY STUDY IN THE ISLAND OF LEWIS.

At the suggestion of Sir Edward Mellanby, Cathcart undertook an investigation of the small group of families living in an isolated area in the Island of Lewis. The 23 families investigated were again mainly crofting families, although in most the men had other activities such as fishing. It was found that the Lewis intake of protein is slightly above and the intake of fat definitely above that of the Highland families studied. The percentage of first-class protein in the diet is also above that of the mainland. The mineral and vitamin content of the diets seem to be adequate.

All the Lewis families consumed fresh fish, fatty fish being preferred to white fish.

The inhabitants of Lewis have always been reputed to have excellent teeth, and this reputation has been sustained by the recent examination of the teeth of many of the children by King. The results of his examination are striking, as is evident from the following excerpt from Table III of his report.

Age group (years)	District	All teeth		Average caries figure
		Number	Percentage carious	
All ages up to	Lewis (rural)	23,877	14.0 \pm 0.2	0.30
15	Lewis (urban)	5,708	33.0 \pm 0.6	0.76
	W. Ross-shire mainland.	2,198	34.7 \pm 1.0	0.83
	London	6,320	36.3 \pm 0.6	0.76
	Sheffield	4,836	32.3 \pm 0.7	0.76

King is of opinion that the superiority in both tooth structure and freedom from caries among the Lewis rural children is to a large extent attributable to the relatively high content of the fat-soluble vitamins and of calcium and phosphorus in their foodstuffs. He found no evidence to suggest that the consistency of the food or the carbohydrate content of the food played a part either direct or indirect, as in both the urban and rural areas of Lewis the general soft consistency of the food was reflected in the low incidence of dental attrition. Further, the condition of the gums of both the urban and rural children in Lewis was found to be rather worse than in other districts.

Cathcart's inquiries made it clear that on the average the utilization of the ordinary articles of diet other than fish, mainly herring, by the Lewis householders, is lower than that of the families on the mainland.