

## Inadequacy of the 24 hr. Dietary History as a True Estimate of Food Intake in Times of Acute Food Shortage as Demonstrated by Experience in Vienna in 1946

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In times of food shortage it is often of great practical importance to obtain a reliable estimate of the actual food intake of a population. Such an estimate may be needed for at least two purposes: (1) to support the evidence obtained by medical surveys for making predictions of the trends in health which may be expected from future changes in food supplies, and (2) to decide how much food, in addition to the official rations, is being obtained by the population through illicit and other channels.

One of the principal methods used for the rapid estimation of the food consumption of large populations has been the '24 hr. dietary history'. This method depends on single personal interviews with an adequate sample of the population, designed to determine the amount and character of the food eaten in the preceding 24 hr. period. Under normal circumstances such histories are subject to well recognized errors, but they generally provide an adequate and useful knowledge of the caloric value and quality of the diet. They have been used for this purpose for several years by various groups of workers concerned with human nutrition. The method has been used extensively during and after the recent war in surveys of populations on short rations.

The purpose of this paper is to present data from one such survey in order to demonstrate the unreliability of this method under conditions of severe shortage of food. The material presented was obtained in the course of a survey conducted during the months of June–September 1946, to evaluate nutritional conditions in the city of Vienna. More than 10,000 individuals were the subjects of this survey, which was conducted by the writer under the auspices of the Health Division of U.N.R.R.A., European Regional Office, London, and of the Austrian Government. The opinions and deductions expressed here are solely those of the author and do not necessarily reflect the opinions or policies of any official agency.

### *The background: the food situation in post-war Vienna*

Information about the amount of food officially distributed in Vienna was available for the interval between April 1945, when the city was liberated, and September 1946, when the survey was completed.† All items of food were strictly rationed during this

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† This information was presented to the Allied Authorities and U.N.R.R.A. by Austrian officials.

period, and the official issue of food was considered to represent nearly the total that was available to eat. This conclusion was reached because any supplementation of the official rations appeared to be difficult; indigenous production was extremely limited and presumably under total state control; there were sharp restrictions on all civilian travel into and out of Vienna; the control of imports and exports was complete and black-market prices seemed prohibitively expensive. Small gardens in the suburbs appeared to be capable of contributing in a minor way only, and individual aid from overseas was not yet appreciable.

The following information on food distribution was known for certain:

(a) The 'target levels' for rations distributed to various categories of the population, as agreed by the Allied Control for Austria after consideration of the food available from both indigenous production and scheduled imports. These targets were provisionally set in June 1945, revised in September 1945, and again revised in March 1946.

(b) The actual distribution which was frequently at a level lower than the targets because of shortages. Food was actually released by the Ministry of Food in amounts which depended on the availability of stocks and were announced by official decree each week. These weekly distributions of rations were checked by the British Allied Control experts (personal communication from the Nutrition Section, British Element, of the Allied Control for Austria, 1946), who maintained weekly surveys of about fifty shops in all districts of Vienna, to find out whether the ration allowances, as officially announced in the newspapers, were equivalent in caloric value to the food actually purchased on ration cards in the shops.

It was generally assumed that the caloric value of the food as actually eaten was approximately equal to that distributed. Normally, the factor of waste does not permit this assumption but, under conditions of severe food shortage such as existed in Vienna, the difference was probably not significant, particularly since the principal foodstuffs distributed (including bread, flour, beans and canned meat) were edible in their entirety. Accordingly, the food officially distributed in Vienna during the first 1½ years after its liberation, might be assumed to provide an index of actual food intake.

Table 1 shows the caloric value of food distributed throughout the period April 1945–September 1946 for the 'normal' consumer and for the 'average' of all consumer categories. For comparison, the target levels also are shown. From April 1945 until mid-June there was no organized distribution of food. Thereafter rations were released which had a daily value for the 'normal consumer' of 800 Cal. The normal consumers, constituting nearly 50% of the total population, were the 'non-employed' adults such as housewives, men without jobs, and old folks; also children of 12–18 years were mostly included in this category. Workers, pregnant women and people in some other categories received extra rations beyond the 800 Cal. allowed on the basic or 'normal'\* card, thus bringing the average value of the rations distributed to the entire population to about 980 Cal./head daily. Distribution at this level continued until the latter part of September 1945 (Pyke, 1945; Editorial, 1945). By that time order had been restored to the densely populated city of 1,500,000 people. The Allies were in occupation and the

\* The distinction between the 'normal' and 'average' consumer is made clear in Table 2, which shows the distribution of the population in the various categories.

surrounding zone was under rigid military control. The Allied Control for Austria found itself able to allow substantial increases in the targets for rations to levels which, if met, would at least sustain the population, although not in optimal nutrition. The actual distribution improved and, by October 1945, approached for a short time the newly established target levels, but thereafter the caloric value of the rations steadily declined, owing to crop shortages and difficulties with imports.

Table 1. *Ration targets, amounts of food actually distributed, and estimates of the food intake made by dietary survey, in Vienna, January 1945–September 1946*

Month	Target levels		Food actually distributed		Estimates by dietary survey	
	Normal consumer	Average consumer	Normal consumer	Average consumer	Normal consumer	Average consumer
	(Cal./head/day)					
Jan. 1945*	—	—	1430	1640	—	—
Feb. 1945*	—	—	1420	1630	—	—
Mar. 1945*	—	—	1210	1390	—	—
Apr. 1945†	None	None	None	None	—	—
May 1945	None	None	None	None	—	—
June 1945	800‡	980‡	800‡	980‡	—	—
July 1945	800	980	800	980	—	—
Aug. 1945	800	980	800	980	—	—
Sept. 1945	800	980	940	1140	1000§	—
Oct. 1945	1550	1773	1540	1740	—	—
Nov. 1945	1550	1773	1500	1710	1700	2000
Dec. 1945	1550	1773	1450	1650	—	—
Jan. 1946	1550	1773	1390	1610	—	—
Feb. 1946	1550	1773	1370	1520	—	1700¶
Mar. 1946	1550	1773	1370	1520	—	—
Apr. 1946	1200	1460	1162	1384	—	—
May 1946	1200	1460	1047	1377	—	—
June 1946	1200	1460	1179	1401	1179**	1268**
July 1946	1200	1460	1247	1496		
Aug. 1946	1200	1460	1239	1480		
Sept. 1946	1200	1460	1225	1482		
Av. Apr.–Sept. 1946	1200	1460	1183	1440		

\* German regime. † Liberation of Vienna. ‡ Food distribution started in latter half of June 1945. § Pyke (1945). || Pyke (1946). ¶ Personal communication from the Nutrition Section, British Element of the Allied Control for Austria, 1946. \*\* Average for this survey, June–September 1946.

Shortage of food in March 1946 necessitated a third set of ration target levels with 1200 Cal. as the 'normal consumer' level. Even this level could not be met and, from all facts available to the authorities, no other view could be held at that time than that of the gravest concern. This situation was created by interruptions in grain and other imports, and by the inability to replenish the 'stock pile' required for smooth distribution. Actual distributions in April, May and June 1946 fluctuated widely from week to week, often falling far below the target of 1200 Cal. The worst month was May 1946. At this time a conference of experts in medical nutrition was called in London, by the Health Division of U.N.R.R.A., to make recommendations on the type of help to be given in the event of frank famine (Anonymous, 1946*a*). The nutrition survey, referred to in this paper, grew out of this conference. During the remainder of the summer of

1946, food distribution was at only slightly higher levels, with an average of 1440 Cal. daily for the 6 months' period, April–September 1946.

The obvious question was, did the distribution figures, shown in Table 1, represent the actual total intake of the people? In the summer of 1945 the answer was quite probably 'yes', because there were many cases of famine oedema, and an epidemic of bacillary dysentery had an unusually high morbidity and mortality. The first issue of food in June 1945 had been made in frank recognition of the fact that private, hoarded supplies were exhausted.

The harvest of 1945 brought a change in the situation. Careful dietary studies by Pyke (1946), employing 7-day inventories as well as 24 hr. histories, disclosed for the first time that the food intake during November was nearly 300 Cal. more than the rations actually distributed. But with falling levels of distribution during the winter, by February 1946, it was found that the actual food intake was probably no more than 200 Cal. above the official allotment (personal communication from the Nutrition Section, British Element, of the Allied Control for Austria, 1946). By May 1946, when the present survey was undertaken, any additions to the official rations were presumed to be virtually absent. Official reports on indigenous production during the summer of 1946 further supported the belief that little other food could be available than that officially distributed.

#### METHODS

A sample of over 10,000 individuals, in all ration categories and in every sector of the city, was selected by a careful sampling method. Of these, 7516 underwent a special medical examination. The sampling technique, criteria of diagnosis and complete medical findings were reported (Collins, 1946) for restricted circulation and are now being prepared for publication elsewhere. Only the general conclusions from the medical side of the survey are included in this paper.

Dietary histories of the amounts and kinds of food consumed over the preceding 24 hr. were obtained by direct questioning from 1822 individuals in the sample. The dietitians employed for this purpose were six intelligent Austrian school teachers, trained at the Nutrition Section, British Element, Allied Control, under the direct supervision of British personnel, who instructed them in the fundamental principles of taking a good dietary history. There was no alternative to this plan since no group of professional persons existed in pre-war Austria comparable with British or American dietitians, who were not in any case available. The methods were those customarily used in estimating diets in medical clinics, including the use of models and sample dishes for size. Constant effort was made throughout the survey to supervise the taking of histories and to improve technique. In general the food was very simple, with bread as the basic item, and the diets were uniformly monotonous. Articles such as dried peas or beans were distributed for prolonged periods, and consequently the chance for error introduced by elaborate cooking was slight. The conversion tables used were those current and official in the Allied Control and related to Austrian products at the time. All calculations were checked by a second individual who was one of the Allied members of the team.

## RESULTS

The findings of the dietitians are summarized in Table 2, where a comparison is made between the caloric value of the rations actually distributed and of the food intakes reported in the dietary histories. The caloric values of the food intakes were estimated from the food which the individuals claimed to be eating daily, and, if accepted, support the idea that the food intake was indeed very low. It is striking that the average

Table 2. *Distribution of the Viennese population by ration categories and comparison of the average amount of food distributed with the amount consumed as judged by the 24 hr. dietary history, Vienna, April-September 1946*

Ration category	Percentage of population, June 1946	Actual distribution of rations, April-September (Cal./head/day)	Intake calculated from dietary histories, June-September (Cal./head/day)
Children:			
0-3 years	3.3	1041	1223
3-6 years	3.8	1238	1328
6-12 years	4.0	1340	1378
Normal consumers	48.8	1183	1179
Employees	13.5	1420	1249
Workers	21.3	1926	1374
Heavy workers	4.5	2636	1566
Mothers	0.8	2315	1827
Average		1440	1268

daily food consumption for all categories of consumer, estimated from their claims at 1268 Cal./person, was nearly 175 Cal. less than was actually distributed. The normal consumers claimed an average daily intake of 1179 Cal., a figure remarkably close to the value of 1183 Cal. for the rations officially distributed to them. This shows that the normal consumers, who constituted 48.8% of the total population, claimed to be eating the exact amount of food actually distributed to them and unshakably refused to acknowledge more. The simplicity of the diet made it easy for them to do this, as may be seen from the following weekly issue to normal consumers during the week 5-11 August 1946, expressed in g.: fat 70, canned meat 300, soup powder 80, noodles 70, flour 180, potatoes 1400, bread 1500, and one egg. The average daily value of these foodstuffs was stated to be 1190 Cal.

The children under 12, particularly those under 3 years, apparently ate appreciably more than the amount officially distributed for them. On the other hand, employees, workers and others entitled to additional rations, did not acknowledge a food intake as high as their official allocation. It was generally contended that these individuals shared their supplementary rations with their families thus accounting for their claims of low intake. This undoubtedly was partly true. Nevertheless, a brief calculation shows that the increment received by children under 12 years by no means balanced the deficit claimed by those receiving supplementary rations. These children, comprising 11.1% of the population, were said to receive, on the average, 180 Cal. daily above the official distribution; this would amount to 2000 Cal. daily for each 100 people in the

average population. On the other hand, those entitled to extra rations, representing 40.1% of the population, claimed that they consumed on the average 500 Cal. less than was allotted to them, or *c.* 20,000 Cal. less for each 100 people. The discrepancy of 18,000 Cal. for each 100 people indicates a failure of the dietary history to obtain a record of food intake even up to the level legitimately allowed, it being assumed that there was no waste between distribution and intake. This error of about 180 Cal./head on the average diet might perhaps be interpreted as within the allowable fluctuations in the technique of dietary history, but the medical evidence adduced in the following section forces the rejection of this interpretation; the actual consumption must have been considerably greater than was acknowledged.

*The results in relation to the state of nutritional health in Vienna*

The serious deterioration in health of the population in the summer of 1945 was halted in the autumn, apparently because of the better rations, as already mentioned. A knowledge of the official distribution of food, together with the evidence of previous dietary surveys, would suggest that the present survey was carried out not only after months of inadequate rations, but at a time when the consumption levels approached those in the Holland famine in 1944-5 (Stare, 1945). Yet, contrary to the bleak expectations, only moderate degrees of undernutrition and an insignificant incidence of malnutrition were found. A brief summary of the writer's evaluation of the medical evidence, issued at the time for the medical press and reviewed in *The Lancet* (Anonymous, 1946*b*), may be quoted here:

The state of nutritional health of the people of Vienna could be said to be that of maintenance at a level below normal, but not at a level that would constitute actual nutritional disease. There was evidence of retardation in the growth of children, particularly in the 7-13 year age group. Adults over 40 years were definitely underweight, and this deterioration increased with age. Oedema of the ankles was present in 6.3% of the population, but in nearly every case this could be accounted for through the presence of varicose veins, heart disease, or other ailments. The incidence of oedema that could not be explained on such grounds, and which was consistent after medical history and examination with 'famine oedema' was 0.3%.

Clinical evidence of deficiency of specific vitamins was rare. There was no clear evidence of thiamin deficiency and only 0.8% showed signs suggestive of riboflavin deficiency, while 6.7% showed signs suggestive of nicotinic acid deficiency. The diagnosis of scurvy was not made in any case, but deficiency of ascorbic acid was suggested in 0.6%.

Signs probably due to vitamin A deficiency were present in 0.7%. Unlike the situation at the end of World War I there was little evidence of vitamin D deficiency in young children, presumably because cod liver oil and milk were preferentially distributed throughout World War II and afterwards.

The vital statistics substantiated this cursory clinical evaluation, and gave strong evidence that the health of the people was at least holding its ground and apparently steadily improving. The following rates (crude, because of uncertainties in the census), as available to the Allied Control, are illustrative (Health Branch, British Element, Allied Control for Austria, 1946):

The crude death rate fell from 41.6 per 1000 in July 1945 to 14.4 and 12.2 in June and August respectively in 1946. The average of the crude death rates over the first eight months of 1946 was 20.4 per 1000, to be compared with 16.4 in 1939. . . (Neonatal and infant mortality rates) provided evidence that in spite of the very difficult food supply position, it remained possible satisfactorily to protect young life.

It is abundantly clear that the general state of nutritional health as summarized above does not correspond to an average food consumption of only 1268 Cal. daily; at such a level, signs of gross underfeeding or even starvation would be expected. In the writer's opinion, the condition of the people corresponded to what might be expected on an 'emergency subsistence' level of food consumption as defined by the Food and Agriculture Organization of the United Nations (1946), that is, a level 'needed to prevent the most serious under-nutrition leading to disease and the danger of civil unrest'. 'Emergency subsistence' was defined by F.A.O. as corresponding to an average intake of 1900 Cal./head/day for a European population with approximately the same age, sex and occupational distribution as that of the United States. In post-war Vienna the population has contained an unusual number of women and young children, so that for this particular population, an 'emergency subsistence' level of food consumption would correspond to about 1800 Cal./head/day.

It is concluded that, during the time of this survey, and probably for many months previously, the actual food intake of the population cannot have fallen below this level.

#### DISCUSSION

There was, in short, a gross discrepancy between the health of the people and the quantity of food apparently available, as judged by the official rations and by the dietary histories. According to all information available to the authorities at the time, the people of Vienna were headed straight for famine in early 1946, yet they managed to avert disaster by obtaining more food than was actually accounted for. It is not to be inferred that the Viennese ate well (they did not) but that they managed to 'get by'. The subjects interviewed probably underestimated their food consumption in order to impress the authorities forcibly. They were not aware that there might be cross-checks such as body-weight, general physical condition and the vital statistics.

The discrepancy between the health of the people and the food apparently available to them was far greater than that commonly expected from the 24 hr. dietary history technique under normal circumstances. We satisfied ourselves that these results were not due to poor technique in taking dietary histories. The Austrian school teachers who obtained these data conscientiously strove for an accurate result and were technically equipped for the purpose. Further, we feel that their language facility, *rapport* and knowledge of local food habits, permitted them to collect more accurate data than could have been obtained under similar circumstances by highly trained, but foreign, dietitians. There were of course minor variations in the findings of the different interrogators but these were of no consequence when compared with the gross discrepancy between true food intake and food intake admitted upon interrogation.

The dietary histories were of no value in estimating this discrepancy, and the conviction was unavoidable that, in times of acute food shortage, the 24 hr. dietary history technique is unreliable as a true estimate of food intake.

It is perhaps unreasonable to expect people to relate, in a single brief interview, their true food intake, including both the officially allotted ration and supplements obtained by whatever means, whether honestly from home-grown produce and meals at work,

or through illicit channels. Unfortunately, the failure of the 24 hr. dietary history technique in these circumstances is a serious handicap. The inclusion of rapid and trustworthy estimates of food intake in medical surveys of the state of nutrition would permit more complete understanding about the relationship between nutritional health and nutrient intake. Such correlations would strengthen confidence in predictions made about the trends in health to be expected from changes in food supplies. In addition, in the absence of accurate information on true food intake, any estimate of the quantity of 'off-the-ration' food that may be available, becomes speculative only. Correct dietary evaluation can probably be made through the use of more complex methods, such as compiling an inventory of the foods purchased and used over a week's period, but such techniques may be too time-consuming for use in mass surveys.

The equitable distribution of foodstuffs throughout the world is a matter of tremendous importance, and to attain this goal the exact knowledge of the food available and the amount consumed by various categories of the people is essential (Editorial, 1948; Pyke, 1947). The experience in Vienna emphasizes that when there are critical shortages of food it may be extremely difficult, if not impossible, by means of a simple dietary history to determine what people eat. This does not imply, however, that the same is true of similar dietary histories obtained during normal periods when the food available is adequate.

#### SUMMARY

In the circumstances of rigid rationing of limited food supplies which existed in Vienna in 1946, 24 hr. dietary histories failed to give an accurate picture of the diet of the people. They recorded the consumption of a smaller amount of food than was issued on the rations and a much smaller amount than was reflected in the nutritional state of the people.

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